Educational Hackathon: Innovation Contest for Innovation Pedagogy

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Abstract: This paper addresses the educational hackthon as innovation pedagogy method for teaching fuzzy front end of innovation (FFEI) in higher education institutions (HEIs). Specifically it focuses on the process design and execution. This study is based on the idea that educational hackathons are a specific type of innovation contest aimed at teaching and learning, thus incorporating a set of design variables. Therefore, the paper reports a case study according to those variables in HEI teaching in university-industry-collaboration. This paper presents both the process description along with students' learning and feedback, i.e. the development suggestions for the method. Presenting conclusions for both academic use and practical design of hackathons in teaching, the paper clarifies the literature of educational hackathons as a type of innovation pedagogy method, for teaching FFEI in HEIs beyond IT-industry.

Keywords: hackthon; educational hackathon; innovation pedagogy; innovation contest; innovation competition; idea generation; fuzzy front end; FFEI; coopetition, pitching;

1 Introduction

Innovation pedagogy aims to bridge the gap between the educational context and working life (Kettunen et al., 2013), so that the students have the innovation capabilities they are required upon their graduation. It emphasizes interactive dialogue between the educational organization, students, surrounding working life, and society. The methods of learning and teaching in innovation pedagogy extend the individual learning with collaborative group-based and networked learning, often in a multidisciplinary environment. (Kettunen et al., 2013) Hackathons incorporate the feature of innovation in team level coopetition, i.e. concurrent collaboration and competition, as well as pitching, i.e. condenced verbal presentation (Briscoe and Mulligan, 2014; Leckart, 2012). Recently spilled also to educational sector, hackathons provide a promising methodology for teaching fuzzy front end of innovation (FFEI) in Higher Eduation Institutions (HEI). Educational hackathons as one particular focus area of hackathons, have not been throroughly researched beyond IT-industry, yet (Porras et al., 2018). Therefore, insights on using educational hackathons in the teaching of FFEI in HEIs are needed.

This paper studies innovation pedagogy, focusing on the methodology of innovation contests, especially educational hackathons, in teaching of the FFEI in the context of university-industry collaboration in HEIs. We aim to clarify the role of educational hackathons in the literature of innovation contests, and their usability as teaching methods of FFEI in HEIs. The study describes a case of a educational hackathon, where multidisciplinary students are exposed to a specific, innovation-requiring business context and appropriate idea generation tools, carried out in two HEIs and university-industry-collaboration. In our study we focus on the educational hackathon process design and development suggestions as a innovation pedagogy method, as well as in accordance with constructivism, both reflections of their learnings and feedback from the learning method were gathered from the students.

Our research question is:

What kind of novel innovation pedagogy method is feasible for teaching the fuzzy front end of innovation in HEIs with university-industry collaboration in the form of hackathon?

In the pursuit of our goals, the paper is structured as follows: in the introduction we first acknowledge the need to study educational hackathons in teaching innovation outside IT-industry. In the second section, the literature regarding innovation contests, especially educational hackathons is discussed. The method and case description entails the presentations as well as ground for empirical case study, utilized in HEI context in university-industry collaboration. In results, we portray the process of the educational hackthon method as well as introduce the learnings together with the feedback. In discussion and further research, we contemplate the functionality of educational hackthon as innovation pedagogy method.

2 Innovation pedagogy and hackathons as type of innovation contests

Innovation pedagogy

> "Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome."(Crossan and Apaydin, 2010, p. 1155)

Innovation process generally includes four phases of which idea generation is considered the first one (Salerno et al., 2014), also called fuzzy front end of innovation (FFEI) (Koen et al., 2001). Experimentation, i.e. continuous exploration and exploration, is regarded one of the focal innovative competence, which needs to be strengthened, specially in static and rule based environment (Bozic Yams, 2017). However, exploitation of individual's own resources and capabilities require co-operation with others (Cassiman and Veugelers, 2002). Also, the companies need their employees to possess innovation competence (Michaelis and Markham, 2017), thus, the students are required to have innovation competence already upon their graduation. Solving the educational crisis between modern and post-modern society is the aim of innovation pedagogy by bridging the gap between the educational context and working life (Kettunen et al., 2013).

> "Innovation pedagogy is a learning approach, which defines in a new way how knowledge is assimilated, produced and used in a manner that can create innovations." (Kettunen et al., 2013, p 7).

Innovation pedagogy emphasizes interactive dialogue between the educational organization, students, surrounding working life, and society. The methods of learning and teaching in innovation pedagogy extend the individual learning with collaborative group-based and networked learning, often in a multidisciplinary environment. (Kettunen et al., 2013) Previous studies have shown that experiential problem-based learning can be utilized in teaching the FFEI in HEIs when students are exposed to a specific, innovation-requiring business context and appropriate idea generation tools and methods (Martinsuo, 2009). However, teachers in HEIs could benefit from further development of PBL-methodology for teaching innovation. Hackathons are regarded as a method of one type of PBL, i.e. inquiry-based learning (Kienzler and Fontanesi, 2017).

Hackathon as a type of innovation contest

Contests have a long history in stimulating innovation. However, research on the phenomenon from diverse perspectives from various fields has caused it to be scattered, e.g. there are strands of research with differenct foci, as well as multiple terms used to describe the phenomenon. (Adamczyk et al., 2012) Alternatives of terms include 'idea contest', 'ideas competition' along with 'innovation contest' (Adamczyk et al., 2012; Bullinger et al., 2010; Terwiesch, 2017). Bullinger et al. (2010) emphasize the particular use of term 'innovation', portraying that a contest covers the entire innovation process

from idea generation to selection and implementation. However, there are also differing definitions for innovation contest:

> "as a (web-based**)** competition of innovators who use their skills, experience and creativity to provide a solution for a particular contest challenge defined by an organizer." (Bullinger et al., 2010, p. 291)

> "could be generally defined as IT-based and time-limited competitions arranged by an organization or individual calling on the general public or a specific target group to make use of their expertise, skills or creativity in order to submit a solution for a particular task previously defined by the organizer who strives for an innovative solution. (Adamczyk et al., 2012, p. 335)

> "In an innovation contest, a firm (the seeker) facing an innovation-related problem (e.g., a technical R&D problem) posts this problem to a population of independent agents (the solvers) and then provides an award to the agent that generated the best solution" (Terwiesch, 2017, p. 1529)

These definitions comprise a contest or competition for using skills, experience and/or creativity of either general public or specific target group in an arranged event and defined challenge or task, as well as their solution. However, potentially influenced by the open innovation movement, (Chesbrough, 2003), these above mentioned definitions emphasize the role of information technology (IT), although the origins for using contests or competitions for idea or innovation stimuli was prior to the IT-era.

Adamczyk et al. (2012) have divided the literature regarding innovation contest into five perspectives or focuses: 1) economic and 2) management perspective, 3) education, 4) innovation, and 5) sustainability focuses. 'Education focus' entails innovation contests that are "conducted with the primary purpose of encouraging and motivating students to develop technical, design, teamwork and communication skills", mainly part of introductory courses. The innovation contests or competitions of education focus that are published in academic journals are mostly describing desing competitions in engineering teaching (Bullen et al., 2007; Gregson and Little, 1998, 1999).

Hackathon, term derived from 'hack' and 'marathon', roots back 50 years to programming at MIT (Leckart 2012, Zukin and Papadantonakis 2017). During the past decades, the phenonomenon evolved first to IT-community-wide one or two day co-creation events between project managers, graphic and interface designers. Today, the hackathons have spread beyond the conventional tech world to educational, creative, corporate, and government sectors due to its inclusiveness, so called 'come-one-come-all ethos' (Briscoe and Mulligan, 2014; Kienzler and Fontanesi, 2017; Leckart, 2012; Zukin and Papadantonakis, 2017). However, the thorough descriptions of hackathons in educations and particularly pedagogy's role are missing from the literature.

Innovation contests as desing have been analysed by a few researchers by using some generic features. Ebner et al. (2009), Bullinger et al. (2010), and Adamczyk et al.(2012) have altogether come up with 13 design elements, such as *media* (online/offline/mixed), *organizer, task/topic specificity* (problem specification), *degree of elaboration* (idea, sketch, concept, prototype, solution, evolving), *participation* (number of persons forming one entity of participant, mandatory/voluntary, low/medium/high number), *contest period* (very short/short/long/very long term), *reward* (monetary/non-monetary/mixed), *evaluation* (jury/peer review/self-assessment/mixed), *contest phases* (one/two/more),

replication (biannual/annual/less frequent/more frequent). When hackathons in general viewed thorough the innovation contest lense, they can be typed a particular, yet alternating form of innovation contests. As an innovation contest, hackathons are offline events with or without online feature in a centralized location with organizer and/or sponsor support, with a specific task or topic that is defined by the genre or organizer, where individuals gather togather to participate, yet form and collaborate in small teams, which mainly are voluntary, time-bound contest period is ranging from very short to short, i.e. 1-2 days to a week. The teams present their innovation output formally, 'pitching' and evaluation is performed by jury with the winner recognition. Hackathon as a contest has mainly one phase. The degree of elaboration, participation from low to high, rewards and replication may vary in hackathons. (Kienzler and Fontanesi, 2017; Lara and Lockwood, 2016). However, the mentioned generic design features of innovation contests do not highlight two of the specific features of hackathons: the individual level collaboration and the team level coopetition, i.e. simultaneous competition and collaboration between teams (Ghobadi and D'Ambra, 2012), which mainly takes place in same physical space, and the presentation feature of pitching, i.e. condensed verbal presentation of the idea to potential team members, judges, investors etc. (Briscoe and Mulligan, 2014; Leckart, 2012). Therefore, today hackathons can be considered as one type of innovation contest: a short-term coincidental social construct for multidisciplinary coopetition, knowledge sharing, co-creation, learning and networking in the context of e.g. new apps and ventures. However, when hackathons are used in innovation pedagogy purpose, also the pedagogy impact have to be considered.

In design contests as educational focused innovation contests, the contest is used as a vehicle for teaching. However, the contest design for teaching use requires some additional essential features. Safety should be first, but it should not require significant infrastructure. Moreover, also structuring open-ended task scaled to students engineering sophistication, which i.e. exploits their factual and procedural knowledge, yet is easy to understand. It should incorporate significant course material, i.e. provides experience in indentifying key concepts and acquiring new knowledge. It should expose students to plethora of ideas as well as foster their creativity. The design should permit intra- and intergroup learning as well as learning group dynamics, yet provides method for consistent assessment. Furthermore, the contest should be a strong motivator as well as a spectacle for the students. In addition, the goals of the contest from the program and the course viewpoint should be considered. (Gregson and Little, 1998, 1999) Designing hackthons for educational purpose would potentially benefit from these recommendations that were used to design contests in teaching engineering.

In their studies of hackathons used in teaching SW engineering, Porras et al. (2018) have introduced additional feature of hackathons. First of all they present, that in teaching hackathons can be focused to two directions: to teaching, i.e. educational hackathons, or innovating new teaching methods, i.e. innovation, in a similar manner as Adamczyk et al. (2012) portrayed educational and innovation as two of their five innovation contest perspectives or focuses. In addition, Porras et al. (2018) bring up that various hackathons may have various and multiple stakeholders, such as students, teachers, companies or their mix. Similarly the body of participation can be of various groups: students, intra- or interorganizational participants or their mix. Costwise they present that hackathon can be either with compensation or free of charge, also a sponsor can contribute or cover the total costs of the event. Additionally, they present seven uses of hackathons, which we disagree with them, since they list competition as one type. However, generally in the literature competition, or more specifically coopetition, is in the core of hackathon, the

other listed uses of hackathon by Porras et al., (2018) are more part of the collaborational learning by using programming events, than hackathons as innovation contests.

3 Method and case description

We chose a case study approach (e.g. Siggelkow 2007) to study educational hackathon as innovation pedagogy method. The purpose of the empirical study was to research the educational hackathon method's feasibility and impact in learning FFEI. A collaborative education hackathon type of innovation contest process was put into practice in HEI context in university-industry collaboration, and observed by a university researcher.

The case was chosen due to its idiosyncrasy: there are only a few reports on research in educational hackathon type of innovation contests in non-IT-teaching, especially in the context of FFEI teaching in HEIs. Therefore, from the innovation pedagogy theory, particularly regarding education hackathon type of innovation contest, this case is interesting.

In our case study, first, the theory of innovation contests, more specifically educational hackathons, were discovered via literature. Then, the hackathon was planned and carried out in the context of HEI in university-industry-collaboration in teaching FFEI. The contest concerned the products and services that people would want in their homes and would ease their lives, that the assigning company could provide. The case study was conducted in a multidisciplinary environment of two HEIs with university-industry-collaboration in October 2017 in Finland. The company involved in the case was a printing house and service center that is a part of a nationwide media group with 1000 employees. As participants, there were altogether 28 BSc- and MSc-students of university of technology and business school divided into five groups. The university MSc-students were participating in "RDI" –course (5 cr.) and students of the university of applied sciences gained credits as elective studies. The research material was gathered from multiple sources and it consists of data from a pre-course survey of a university course, the observations from the entire hackathon process by one university researcher and the reports written by three students groups including students from university of technology and business school. The written report covered the hackathon, in which the students described their innovation process, outcome, their reflections of learnings and feedback on the hackathons as a teaching and learning method.

4 Results from the empirical study

Our results were generated from the observation of the process of innovation pedagogy method of hackathon in the context of university-industry collaboration in HEIs, and the student reports on their experiences from the hackathon.

The process of educational hackathon

Our case, "The Easy Livin' Challenge", was a hackathon-type of innovation contest, which in Finnish are called IdeaPaja. These IdeaPajas have been arranged before and assigned by one or more organizations that applies various ideation-, evaluation- and analysis methods utilized in collaboration. The duration of IdeaPaja varies from few

hours to few days. The aim of the IdeaPaja hackathon is to create new ideas, solve problems and develop or increase efficiency by utilizing creative methods.

The aim of the one-day long Easy Livin' Challenge -hackathon was to present the students an opportunity to familiarize themselves to business world in a meaningful project, to network with with current and future experts and experiment new ideation and collaborative working methods. Additionally, the goal was to provide students with working tools for idea and concept development and sales. The students volunteered to the hackathon. However, university of technology students were taking part of RDI-course, to which hackathon was one option to get credits. Yet, their participation to hackathon was volunteer. The students of university of technology were supposed to form a team prior to the event, yet include also at least one member from the university of applied sciences.

Prior to the hackathon, the students were informed the name of the assigning company and their possible link to house fair to be organized locally in the summer of 2018. The official assignment was given to the students in the hackathon. The task of the the hackathon was to create product and service concept ideas for Alma Manu Oy. Alma Manu Oy provides services of printing and logistics. The focus of the hackathon was the distribution services and as additional focus area was the house fair. The task was to develop the company's operations and innovate future business opportunities. Although the company has long and strong roots, the rapid changes regarding digitalization has demanded the industry's actors to transform, therefore the company's aim is to develop, grow, and service their customers even better.

The official task was as follows: *Which services would you like into your home? How would you ease the everyday living of the people? Concrete ideas for easing the life and potential for new businesses.*

The structure of the day was a three-fold process with alternating sessions with activities (Figure 1.) 1) Idea Breaks, sessions comprising teaching 2) team ideation sessions, and 3) collaboration with case company/jury. It was designed as an entity in a manner, that the ideation process was consciously interrupted by the facilitators in every one hour. Each interruption called 'Idea Break' lasted approximately thirty minutes. In the Idea Breaks the facilitators, i.e. responsible teachers handled the themes regarding innovation and encouraged to question and enlarge the scheme of things by introducing creative thinking or innovation methods or tools. The Easy Livin' hackathon is analysed according to innovation contest, educational design contest, and educational hackthon variables (Table 1). Also the creative thinking tools taught by the teachers, the tools reported as used by the students together with integrated students views on each phase are presented in Table 2.

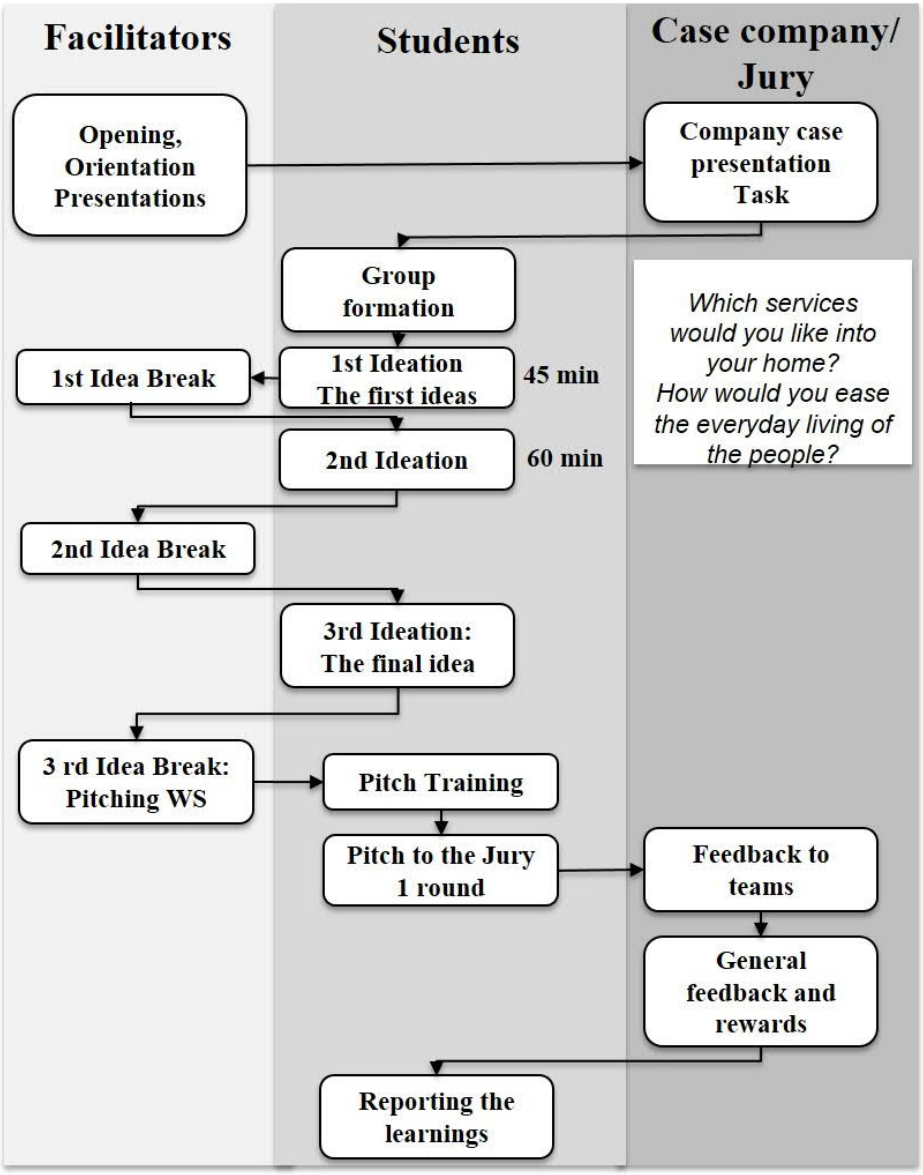

Figure 1 Easy Livin' educational hackathon process design executed with alternating activities

Table 1 The Easy Livin' Challenge's hackathon acc. innovation contest, educational design contest and educational hackathon variables (Adamczyk et al., 2012; Briscoe and Mulligan*), 2014; Bullinger et al., 2010; Ebner et al., 2009; Gregson and Little, 1998, 1999***); Leckart, 2012*); Porras et al., 2018**)

Variable	*At Easy Livin' Challenge hackathon*
Media and infrastructure	offline at school premises in safe environment with necessary space and equipment
Organizer	2 HEIs: one university of applied sciences and technical university with students also from business school in university-industry collaboration with company AlmaManu • 2 teachers from university of applied science, one from university of technology • 2 employees of AlmaManu marketing in the jury 1 executive from external company in the jury
Task	The students of two higher education institutions created product and service concepts ideas as self-formed teams according to the company assignment.
Focus of the hackathon)**	Educational and Innovation
Degree of elaboration	idea, sketch and/or concept
Participation	Body of participation: university students***) **) Participation: voluntary (university students were part of RDI-course, yet participation to hackathon was voluntary); Participation: in teams Team formation: predetermined teams, yet one team was formed on the spot Participation: low 28 students of university of applied science and university of technology with student body of 5000+2000 = 7000 Heterogeneity of the participants: main subjects of the students e.g. marketing, industrial engineering
Stakeholders)**	Individual level: Students and teachers of HEIs and employees of two companies, Organizational level: 2 HEIs, 2 companies (one task assigning, one in the jury)
Collaboration/ Competition*)	Individual level collaboration, Team level competition
Contest period	very short term, lasted altogether eight hours
Process:	was divided into three-fold activities including teaching with materials including creative problem solving methods and pitching
Presentation of the idea/innovation*)	Pitch – 1 round in front of jury.
Evaluation	Jury including 2 employees of AlmaManu marketing and one executive from external company
Reward:	monetary: gift cards
Facilitation	professional facilitation by teachers
Contest phases	1
Motivation*)	Memorable event (not spectacle)
Cost)**	Free of charge
Goals reg. course content *)**	Teaching students additional various creative problem-solving methods as well as applying the innovation theory in practice
Learning material *)**	Lectures of Creative learning tools and pitching
Assessment of hackathon as part course *)**	Hackathon reports were assessed acc. analysis of the innovation process, output and learning

Table 2. The taught creative thinking tools taught by the teachers, reported used tools by students and integrated students views of each hackathon phase

Educational hackathon phase	Used methods or tools *) additional, reported by students	Integrated student views
Opening **Orientation** **Presentations**	Shoes - present yourself with the help of your chosen shoe	Childish, yet atmosphere relaxing game.
Company case presentation **Task**	SUCCES: Simple, Unexpected, Concrete, Credible, Emotional and Stories (Health and Heath, 2007)	Company well introduced. Task was not limited in practice, made the idea generation more difficult and time consuming.
Group formation		People from multiple universities beneficial.
1st Ideation	Brainstorming *)	Easy ideation, versatile views, time flew.
	Grouping and organizing the ideas	Grouping ideas acc adjectives, actions/services/products, overlapping reduced, upperlevel items found, best ideas voted
1st Idea Break	4+1 (further elaborated) List of words	IdeaBreaks both beneficial breathers, lectures interesting and fitting to both the hackathon and the RDI-course.
2nd Ideation	Mindmap*) Brainstorming*	Ideation more challenging, using creative thinking tools, old patterns were hard to break
2nd Idea Break	As set of creating thingking views: Laughter paper, Childlike thinking - forget moral, Business view, Another truth vs. different truth, What successful innovation project entails 2 Utube videos: "The Button - Add drama to your life" "World's deepest bin"	IdeaBreaks also cut the thinking process and schedule had to be monitored, the syncronization of ideation and breaks could have been done differently, lectures even prior to the entire ideation.
3rd Ideation - The Final Idea	SWOT*) Segmenting*)	Choosing was difficult, but done acc. to assigning companys benefit, one group found SWOT beneficial
3rd Idea Break - Pitching WS	What is a good pitch? Crisp, clear, short Needs, Approaches, Benefits, Competition (NABC) (Stanford Research Institute)	There is seldom opportunities to train pitching. More time needed, everyone should have had opportunity to present, perhaps peer-reviews with other teams, also opportunity to comment back to the jury and discuss with the company about the created innovation.
Pitch Training	NABC Porter's 4 forces *), Logo design*), Mindmap *), Script *), Visual comic story*), NABC*	
Pitch to the Jury	3 minute pitch, which was also timed	
Feedback to Teams		Students happy about the feedback they got, every team was good some part.
General feedback and The learnings (innovation process, the learned things, feedback on the		

The novel 3+1 brainstorming method introduced to the students at the hackathon

The 3+1 brainstorming method that was introduced to the students at the hackathon combines four viewpoints (Figure 2).

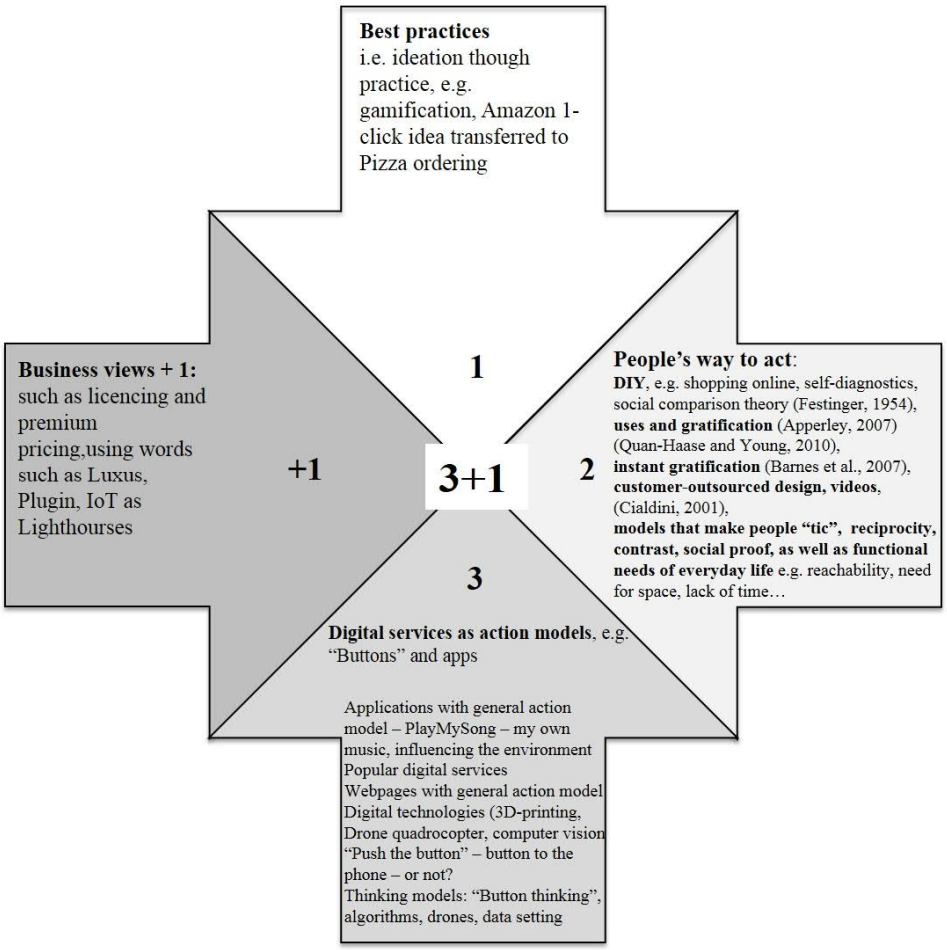

Figure 2 Novel 3+1 Brainstorming model includes four views on thinking creatively about an idea

Feedback from the pilot: The relevance of the hackathon method for learning FFEI in practice

Learning outcomes of the students

The learning outcomes of the students as yielded innovations, their inspirations regarding the innovation and the learnings they reported themselves are presented in table 3.

Table 3. The innovations the students teams yielded in hackathon, their inspirations and reported learnings

Innovation	*Insipiration*	*Learnings reported by the teams*
Team 1: Furniture rental service "AlmaLeasing" provided via platform benefitting from network affect and circular economy, and exploiting time- and place independent logistics, business model based on service fee on volumes, service free for end users but rental monthly payment	Trend: Owning things has become less attractive to people, therefore rental.	Many of the working methods were familiar, yet using them in practice enhanced the know-how and gives new perspectives. Hackathon requires social skills, leading the team further in each phase, also different roles, intra-team presentation and opening own ideas, but also presenting Idea generation, but also the process of refining ideas to end products Pitching as a form of oral communication: learning how to condence the most essential features of our idea, learning also from the other pitches, since they all were very different
Team 2: Rental service: new, used things mediating service concept using sharing economy - Incremental service concept, which has potential to develop into radical.	"The Air-BnB of Stuff" A video of Danish Vigga textile company of circular economy, that rents users childerns clothing	The challenges that are typical for idea generation: limitations and myopias
Team 5: Internet application, that combines various existing services to company's current logistics and distribution services with revenue model - Incremental online-service concept	Trend: people are lazy and comfort-loving, daily errands want to be run from home, "buing time"	

To sum up the main learning outcomes of the piloted hackathon method, the students with different discipline backgrounds truly expressed together integrated learning. They excelled in using both the taught methods, but also methods that they have learned prior to hackathon. Also they were very aware of the current trends of the world and especially business world and were able to integrate their knowledge in order to yield novel products and services and their combinations.

To summarize the main outcomes of the hackathon method utilized in university-industry collaboration from the organizational viewpoint, the event produced win-win-win benefits:

1. In university-university collaboration, multidisciplinary courses can be offered to the students.
2. For industry it creates realizable ideas for the company to contemplate further.
3. For university the collaboration with industry provides real-life on-demand problems to be solved with students, who gain experiences beyond academic environment.

Development suggestions for hackathon method

The development suggestions according to the students comments are portrayed in table 4.

Table 4. The summary of the development suggestions according to the comments reported by the students of the hackathon method

Hackathon phase/variable/issue	*Student comments*	*Suggestion*
Introduction	The shuegame was a bit childish, yet made the atmosphere relexed	
Sequencing the ideation sessions and Idea Breaks	Perhaps a longer lecture session in the morning (prior to the ideation), The Idea Breaks cut the thinking process, due to the schedule	The sequencing thought more in detail. Perhaps a longer lecture session prior to ideation
Task description	no boundaries makes the ideation slow, since a lot of time is taken by thinking about what the assigning company truly wants	More clear task description, potentially with
Facilitation	More facilitation during the ideation	More facilitation
Facilities	Perhaps a little bit more personal space	
Pitching	Facilitated practice for each group Comment possibility to the jury One can seldom train pitching. Therefore, it would have been nice to have more time ofr the practice. It could have been good that everyone could have practiced the pitch in front of another competing team, so that everone could have had the experience.	The pitching workshop should be designed with more time and possibilities for the students to practice and get feedback from both the teachers and the industry representatives.

5 Discussion and further research

Theoretical contribution and limitations

This article contributes to the concept of innovation contest by highlighting the contest design and execution process involved within a educational hackathon as a method of innovation pedagogy. The contribution regards the variables of innovation contest design introduced earlier in the literature (Adamczyk et al., 2012; Bullinger et al., 2010; Ebner et al., 2009) is two-fold: 1) By categorizing and defining educational hackathon as one type of innovation contest particularly in educational use, b) By enhanging the model with nine characteristics of contemporary educational hackathon found in the literature, i.e. team level co-opetition and output presentation by pitching (Briscoe and Mulligan, 2014; Leckart, 2012), in addition to Focus of the hackathon (e.g. educational), stakeholders, cost (Porras et al., 2018), as well as motivation, goals of the course content, learning material and assessment of the hackathon as part of the course (Gregson and Little, 1998, 1999).

The contribution regarding the educational hackathon process portrays a case held in industry-university collaboration involving two HEIs with voluntary, multidisciplinary student participation. Our case sheds light particularly on educational hackathon as a method of innovation pedagogy for teaching FFEI and its development suggestions for evolution viewpoint, as well the student's learnings.

From innovation pedagogy viewpoint, the results of our educational hackathon showed, that the method provides advanced integrated learning due to its multidisciplinary environment by combining not only learning new idea generation tools and capabilities, but also the understanding the business side, such as revenue models and profitability. Moreover, the students reported that they applied models that they have learned previously in their studies. Furthermore, as output of the hackathon, the students presented a variety of complex solutions, which were modern, technologically advanced and containing multiple contemporary trends. These results imply, that hackathon does incorporate multiple knowledge processes of sharing, integration and creation and as a learning environment allows the students to exploit their factual and procedural knowledge in fun, motivating and collaborative way. Additionally, the hackathons offer the students a chance to train the presentation skills of pitching, which is currently a vital skill in professional life in all branches.

In general regarding the design of educational hackathon, the students gave encouraging feedback. They considered the hackathon well organized, nice opportunity to collaborate with students from other schools. Although the day was long, but they felt it was rewarding too, since they had face-to-face feedback on their accomplishements. However, regarding the hackthon design, in our case we discovered three phases of hackathon, in which the organizers should particularly put efforts to: 1) the synchronization of the teaching and ideation, 2) task definition and 3) pitch-workshop. Firstly, our results show that the sequencing of the ideation and teaching, which occurred in Idea Breaks is a bit divaricate: on one hand the students thought that the IdeaBreaks did give a nice breather between the ideation, on the other hand they felt that the teaching could have altogether taken place prior to the ideation. Furthermore, the students felt that the first ideation should be longer compared to the second session, and not the opposite, which occurred in our case. Secondly, our result show that the task definition that did not

provide enough boundaries was a bit confusing for the students. It also slowed the first ideation down, as well as along the ideation process, since the students could not focus their idea generation towards a specific goal. Thirdly, the pitch workshop was highly appreciated by the students. However, they would have wanted to spend more time to the training, practice more, get peer-reviews, facilitation by the teachers, feedback and opportunity to discuss their innovation output more in detail with the assigning company representatives. Summarized we suggest, that when designing educational hackathons in practice, the preliminary synchronization of teaching and ideation sessions are thoroughly planned, keeping in mind that the pitching workshop would benefit from more time. Also the task description should be clearly defined, potentially with somewhat determined boundaries.

From university-industry collaboration viewpoint, the benefits from co-organized hackathons are from the university and student viewpoint the real-life company assignment, and novel ideas from the industry viewpoint. For HEI collaboration hackathon provides a platform to share the innovation tools and methods, as well as pedagogic ideas, thus improving the innovation teaching.

In sum, we conclude that educational hackathon, that incorporates coopetition, i.e.simultaneous collaboration and competition in teams, is a functional method for teaching and learning FFEI in university-industry-collaboration in HEIs.

As a single case study, this research does have its limitations. Particularly, as being a single case study it portrays only a specific application of the method.

Practical and academic implications:

The findings will benefit academics studying and teaching various innovation pedagogy methods, especially in the context of HEIs. Also, academics focusing on innovation contests or hackathons, as well as those studying university and industry collaboration, will benefit from the results. Additionally, practitioners operating in industrial settings, particularly in industrial product and production process development, aiming to enhance their open innovation processes in collaboration with HEIs will gain from this study especially examples on the ways and benefits that can be received from collaborating with HEIs in the FFE of innovation.

Further research

Further research is needed regarding educational hackathons as as innovation pedagogy methods. Especially, the synchronization of teaching and ideation sessions, as well as task design of hackathons need more research, as we discovered, that too boundless task may set constraints on innovativeness and slow down the start of ideation. Furthermore, the evaluation of hackathons as part of course curriculum should be developed and studied further, as the evaluation criteria’s of the tasks, may influence the involvement of the students in the process and their idea generation and the outputs, thus affect their overall learnings.

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