

***Digital “Hack Your Future” Event as Approach to Support Entrepreneurial Capacity of Students Through the Design Thinking Process***

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**Abstract**

The hackathons provide rapid, hands-on opportunities to explore the innovative creation of new business ventures, digital solutions, start-ups and students' entrepreneurship capacity, which incorporate novel technology as a vital component of their business models and operations. A hackathon is an event in which participants involved in software development collaborate intensively over a short period of time on solving the company's problem. In this work, a hackathon is proposed to generate creative concepts, rapid innovation capacity, design methods, and tools to co-create and solve the companies' problems with the help of students. However, at the same time in hackathon events, problem-solving opportunities create business opportunities for 55 participating students. This paper describes the process and results of the event and shows that a hackathon is a viable approach to accelerate the co-creation, design thinking process, and support entrepreneurship education to increase student entrepreneur capacity.

Keywords: Entrepreneur Education, Design Thinking Hackathons, Entrepreneurship Capacity

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## Introduction

For many companies, the hackathon event has evolved into a new design thinking process and a platform that facilitates the rapid development of fast-paced innovations. (Komssi et al. 2015). In this study, we try to understand if the hackathon event aligns with the design thinking process and does it support participants' creativity and expectations and experience of entrepreneurial possibilities. Our research problem is: How we can use Hackathons as a tool to increase students' entrepreneurial interest? and how the design thinking process in Hackathon events can raise awareness of entrepreneurial and problem-solving skills? In this case Hack of Your Future event (a hackathon organized at and in collaboration with Satakunta University of Applied Sciences, has been developed fully on a digital Discord platform. Discord is an open-source and free platform. Discord servers are organized into topic-based channels where users can collaborate, share, and just talk about their ideas. Hackathon events have used digital technologies to enable the creation of new business ventures and digital start-ups. These companies incorporate novel technologies as a vital component of their business models and operations. In this sense, digital technologies are enablers of entrepreneurial activity. (Von Briel et al. 2018) Digital technology also supports the creation of new contexts in which several actors with different goals and motives interact dynamically to implement business and innovation processes (e.g., hackathon events).

The spread of digital technology has thus created new opportunities for the development of entrepreneurship projects by leveraging collective intelligence (Anderson 2014). Hackathons and similar time-limited events have become a global phenomenon (Taylor & Clarke 2018) of interest to both companies and students (Anfarita & Nolte 2020). During such events participants typically form teams and engage in intensive collaboration over a short period of time to complete a challenge that is of interest to them (Pe-Than et al. 2019). Because they are diverse ways to develop innovative ideas (Cobham et al. 2017), add features to existing software (Trainer et al 2014), promote learning (Affia et al. 2017), and build new or expand existing communities (Trainer et al 2014), they are adopted in a number of areas, such as entrepreneurship (Nolte 2019), small and medium-sized enterprises (Komssi et al. 2015), large enterprises (Nolte et al. 2018), (higher) education institutions (Porrás et al. 2019), (online) communities (Angelidis et al. 2016) and others.

Hackathons, the development of open innovation, and participation are associated with the development of digital communities able to streamline crucial entrepreneurial activities such as start-up entrepreneurship. More than a new type of entrepreneurship, the concept of community entrepreneurship like "sister entrepreneurship" is thus delineating the emergence of a new entrepreneurial paradigm, which possesses two main features. First, it is strongly focused and/or enabled by the adoption of digital technologies and the online entrepreneurial community. Second, it is leveraging the innovation potential embedded into large and dispersed groups of individuals with heterogeneous backgrounds that participate in entrepreneurial activities sometimes students become entrepreneurial (Elia et al. 2020).

Hackathon supports the design thinking process because it encourages collaboration, iteration, and optimism using techniques that make addressing ambiguity and failure during the creative process more comfortable. In addition, it drives participants forward with ideas and can encourage confidence in an individual's creativity. Engaging educators, coaches, students, and company participants in the design thinking process can equip individuals with the techniques and mindset needed to address complex problems in technology solutions, sustainability circular economy solutions, and beyond. In this study, we understand the

design thinking process to be an important part of the students' design process, which provided tools and mindset to solve companies' challenges, innovate something new and increase entrepreneurial mindset. The novelty of the study is to combine hackathon events with the design thinking process and ideas developed by individuals during hackathons and facilitate a transition from hackathon teams to building start-ups and generally make students interested in entrepreneurship.

## Design Thinking and Hackathons

The paradigm of design thinking shifts from traditional product design to address complex issues and focus on consumer experiences. A design thinking strategy is a human-centred approach (Kelley 2001). The problems are significant: it will involve complex constructs (eg. how to define students' ability to work effectively on a business challenge while supporting student entrepreneurship and their own goals). One challenge is to build a sustainable guest boat harbour area and community activities with other businesses. The third challenge because of the shutdown of peat production and creating completely new business ideas for land and related machinery. We suggest that design thinking can provide a unique approach to address this and similar types of problems within hackathon events and provide examples from different backgrounds people to participants and shared experiences to co-create the solutions, which can increase business start-ups and even joint venture companies. The design thinking process provides structure and systematic approaches to creative problem-solving. Design thinking was first described more than 50 years ago (Archer 1979). Brown (2008) presented the design thinking process as a three-phase cycle: inspiration, ideation, and implementation. Kelley (2013) presents design thinking as an expanded five-stage process that includes: empathising, defining, ideating, prototyping, and testing. A summary of the design thinking process, definitions, and sample strategies is presented in Figure 1. As illustrated by the diagram, design thinking starts with the understanding that it is an iterative process that can occur in cycles. We have extended the design thinking process to include the Hackathon process layer the figure 1.

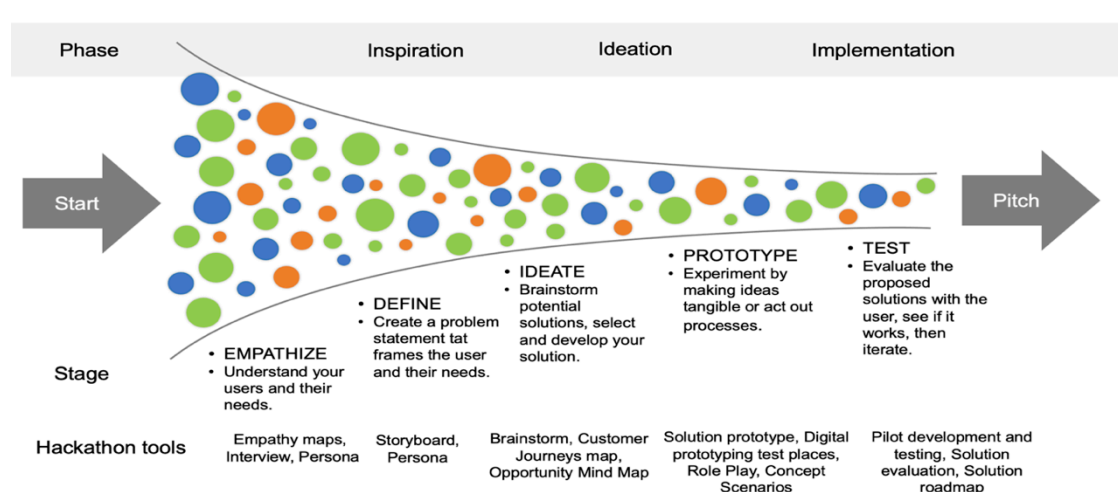


Figure 1: Design Thinking Process extended with Hackathon tools.

Hackathons can be seen as an inspiration and a vehicle in the first and most critical phase of design thinking. The goal of this step is to identify and describe the problem to be addressed. The hackathons are usually based on a problem that is set to be solved. The inspiration phase has two components: empathize and define. The goal of the empathize phase is to connect with the user through observation, interviews, empathy maps, personalities, and other

strategies to learn from their experience (Wolcott & McLaughlin 2020). For example, when solving companies' problems in the competition of hackathon and same time planning to establish their own business, this phase could include interviewing company staff members, subcontracting companies, and other students.

The purpose of this is to describe their current experiences, understand how they perceive the company problem and same time could a solution to the problem be their own business idea. At this stage, the perspective of the participants, their challenges, and their needs may differ from expectations. The information from the Empathize step is then used to define the problem, which guides the specific need to be addressed with the solution to be created. (Brown 2019) The inspiration phase is critical when it sets the phase for the remainder of the process and has consequences if not correctly performed. For example, if the problem is not clearly defined or targeted in the inspiration phase (Wedell-Wedellsborg 2017). Ideation is the second stage of the design thinking process. The goal of this phase is to produce as many ideas as possible, i.e. brainstorming, and emphasizing them quantity over quality. To optimize production potential creative solutions, design thinking is different and converging thought processes. Different thinking includes strategies to expand and grow several ideas, such as brainstorming, word association, and improvisational games (Curedale 2019).

The final phase, implementation, focuses on evaluating the proposed solution and verifying whether it sufficiently addresses the defined problem. The goal of the implementation phase is to conduct two processes: prototyping and testing. Prototyping includes having end-users engage with mock-ups, models, or samples of the proposed solution before finalized version is created. Early prototyping allows the students to get feedback and gain insights on how to refine the idea to improve the problem. The creation of prototypes leads to a constant convergence of ideas until a decision is taken on the proposed final solution. Insights from testing often identify whether the problem has been adequately addressed in earlier stages and whether further consideration is needed. Design thinking supports collaboration, inspiration, and implementation while offering a systematic process for creativity. In addition, design thinking benefits not only those for whom the solution is created but also those who engage in the process. We strongly encourage individuals with an interest in design thinking to explore the resources and try the strategies provided in this commentary to investigate how they can be applied to Hackathon events. (Wolcott & McLaughlin 2020) Same time we encourage students to establish start-up companies or design joint companies with the student group which has solved the problem in hackathons.

## **Data Gathering**

We have created Hack Your Future event 2021, which takes a whole day 11 hours (18.03.2021). The hackathon event was four challenges and at least one to three company members participate in the event. Our Hackathon events staff includes a ceremony leader, a design thinking mentor, six coaches, digital platform ICT persons, a music DJ, and an additional four persons who helped the companies. The Hackathon event itself had 55 student participants, most of the participants were from Satakunta University of Applied Sciences, and a few students were vocational education students from Sataedu and Winnova.

The data was collected forms 1) mentor and company interviews and feedback form, 2) participant whiteboards, and solution ideas and 3) from a post-survey targeted for participants. 24 participants answered the post-survey.

## Technical Infrastructure

We used Discord as the Hackathon platform, where we split people into groups, and they all have group video chatting. Separate rooms for companies, the stage and IT support were created. Discord has launched in 2015, it has branched out to include communities from all over the internet. It has boomed in popularity during the pandemic, as more people have worked, played games, and socialized online, and the Discord describes that it now has more than 140 million active monthly users. (Kumar 2012) We have around more than 20 teams because we have around 55 participants in Discord platform.

We also used YouTube and Twitch for streaming for the Hackathon. Participants were able to follow the stage at all times through the stream. We had live performances, interviews, and such for people only following the stream. Hack Your Future has been live streaming on Twitch. Twitch is a live streaming platform focused on video games generally. It was founded by Justin Kan in 2011, originally as a spin-off Justin.tv. Amazon saw the potential of Twitch and by August 2014, Twitch had become an Amazon property, with just short of \$1 billion changing hands in its acquisition of the streaming platform, which was now up to 55 million monthly active users. (Nelly 2021) YouTube live streaming has become increasingly mainstream. Live video is an incredibly powerful tool and YouTube Live transforms online video into an interactive experience. There is more than 500 hours of video uploaded every minute, they're a way to stand out. (Iqbal 2021) Livestreaming fits well in Hackathon events, where it is for the participants to follow event flow. In our Hackathon event, we streamed to both YouTube and Twitch at the same time, as our audience is familiar with both channels. We can recommend that live streaming happens on both channels because at the same time as a backup plan, if one channel doesn't work, the other is likely to work.

## Hackathon Structure

As a structure for the hackathon, we used an in-house designed workflow. During a one-day hackathon, the schedule and flow need to be carefully pre-structured. All components of the hackathon flow, including the facilitation, mentor support, and support materials, are design based on the design process. We have six mentors in our event and more than 20 teams. Each mentor had five teams to mentor. Live mentoring / coaching: Mentoring was provided during each stage of the hackathon. For this particular hackathon, the work started from ideate focus due to time limitations. Emphasis and ideate were done in a way that participants had one hour question time with the challenge owner. The overall structure, with durations, was as follows (8am start – 7pm finish):

*Emphasize and define* - Challenge overview by the challenge owners and questions time for participants. The participants were mentored to formulate questions before meeting the challenge owners. One mentor also sat in each challenge group to actively push for more questions and a careful breakdown of the expectations and limitations.

Total duration around two hours.

*Ideate* – for one hour the teams were asked to only focus on generating ideas. A small briefing of ideation and idea harvesting was given. An interactive whiteboard was used in each team to collect ideas. Teams could also choose post-it notes. The specific briefing was to only focus on brainstorming and the generation of ideas. A typical challenge is that participants 'fall in love' with the first idea they come up with and the whole ideation phase

is skipped. Mentors were once more circulating in each team to make sure the teams focused on idea generation.

Total duration around one hour.

*Prototyping* – the majority of the work time was allocated to prototyping. The work was started with another workshop to discuss strategies to build concepts and prototypes. A structure that was provided was based on the NABC pitching model (Need, Approach, Benefit, Competition) to reduce the workload on the final stage of the hackathon. Mentors were once more circulating in the teams to provide alternative perspectives to building the concept and how to break the solution into meaningful parts, parts that also fit the NABC mode.

Total duration around three hours.

*Testing* – since one-day cycle rarely offers opportunities for actual development work and product testing, the test part was handled by pitching the idea and ‘testing’ it by hearing the crowd’s thoughts and comments. Also, a professional jury including the challenge owner reviewed the solution and gave feedback. The participants had around two hours to prepare their pitch-style presentation using the NABC mode, including a brief workshop on how to create good pitches/presentations. Finally, all solutions were presented in challenge groups and the best ideas were picked for the finals. Similar to previous stages, mentors were constantly helping the teams and ensuring none of the teams presented without at least one or two practice pitches to a mentor. Total duration around two hours and the final presentations.

## **Survey and analysis**

For this study, we collected data from hackathon participants through two types of instruments: a survey (quantitative data) and observation (pictures, videotapes, whiteboards) and some interviews (qualitative data). On the week after the hackathon event, an online survey was sent by email to students, and interviews were performed during the Hackathon. The survey consists of background, Hackathon events, Design thinking process professional attraction, entrepreneurial capacity, entrepreneurial intention, and feedback and there was a total of 14 open questions and 29 claims with a five-point Likert scale response format. The survey data analysis content analysis. One of the researchers performed the interviews, recorded, and later codified them. The first cycle consisted of a coding process where a generic coding method was applied followed by a second cycle where the number of codes was condensed, and codes categorized (Reidy 2020).

**Survey.** The survey aim was to get quantitative and qualitative data about the participants’ perception of the hackathon methodology and the effectiveness of the different design thinking techniques that were used, but also their interest in professional attraction with companies, entrepreneurial capacity, and creating their own startup.

**Observation.** The researchers observed different teams during the entire duration of the hackathon and observed their activities, took detailed field notes (screen pictures) because the hackathon happens in online, and made video recordings when possible.

**Interview.** The interviews were in-depth interviews with occasional students during the Hackathon. The interviews were recorded with the permission of the students. The interviews

took place in groups of about 3-4 people. These interviews lasted between 15 and 30 minutes. The aim was to make qualitative data to support the specificity of Hackathons, which supports both the design thinking process and the raising of awareness and encouragement of entrepreneurship.

**Ethics.** Although this approach may raise ethical controversy, we present information about the study at the beginning of the Hackathons and every student has the possibility to voluntarily participate in the study and answer the survey. The survey form detailed the objectives of the study, guaranteeing the confidentiality of the collected data and anonymity of the participants.

We have used content analysis as a systematic and objective means of describing and quantifying phenomena of Hackathon events. The aim is to obtain a concise and comprehensive description of the phenomenon, and the outcome of the analysis is the concepts or categories that describe the phenomenon.

Usually, these concepts or categories are intended to build a model, a conceptual system, a conceptual map, or categories. The researcher makes a choice between the terms 'concept' and 'category' and uses one or the other (Saldana 2015).

## **Results**

This was the first time for the Hack on Your Future event to happen completely online. It consists of a one-day online event that brings together 55 participants and 20 staff who share opinions and interact to identify themes and actions for exploring emerging challenges for new products, services, solutions, and business models.

The result shows that 72,7% have participated Hackathons before and 27,3% haven't had any experience before for Hackathons. As this was the first Hack on Your Future online, the participants' feedback was very positive and give us the opportunity to develop the Hackathon concept further. The participants raise up their expectations of the Hackathon, which were networking opportunities, interesting speakers, teamwork, and creativity. As one participant mention "Awesome experience" his/her expectation of the Hackathon. Participants describe the most important reason to participate in Hackathons three of main reasons were 1) Curiosity about trying new things 36,4%, 2) to learn about new things in Hackathon design methods, pitch, etc., 18,2% 3) to promote me and improve my professional career's prospects 18,2%. Participant expresses disagree about Hackathon's length 54,5% says that they didn't have enough time to design their concepts and 36,4% opinions were that hackathon challenges are too broad and the long hours for working was third reason 9,1%. Combined with how the organizers can improvements the hackathon event is that we could make more breaks and make Hackathon event to be two days long, which gives companies more time to present their challenges and give time to make deeper design thinking workshop, for example, used more tools like empathy map, different kind of free digital tools.

Design thinking aligns with the hackathon was only a small part of the hackathon, which hasn't been clear for every participant. At the hackathon, we propose some tools for brainstorming. For the ideation stage. Participants used Miro, Google Docs, Google Slides, Flinga, as a brainstorming tool. We encouraged participants to brainstorm as many ideas as possible and then combine the ideas together / pick the best one. Some participants started

searching for information on the Internet and doing “research work”. Some teams started to think about solutions directly and got a few ideas immediately. Some teams started to investigate for the company and trying to understand their values. Some teams even understood the need of the customer perspective and started doing interviews with customers. At the following design thinking process, we were asked our participants to highlight their concept work with emphasize stage. Some of the team focused on the stage of empathizing how to understand the needs of peoples and companies, as one participant mentioned “Empathy is one of the most important things if you want to understand people and their needs”. Some teams asked questions from the companies and co-workers. Some participants did not understand the importance of the design process for the Hackathon event, as some participants mentioned “Yes, but I didn't think it was important”. However, all the winners from each track demonstrated a high skill level and routine with following the hackathon structure and design process inside it. The same time those students describe that they are willing to established start-up company in the future.

Understanding the Design thinking process and problem-solving centered on human problems can be seen in three spaces. These are, as mentioned before, inspiration, ideation, and implementation. These can be seen in the five stages: empathize, define, ideate, prototyping, and test. The inspiration is the “problem or challenge that motivates the search for a solution, which means that empathize and define stages are the time participants explore all necessary information about the companies’ challenges, meet company members, ask a lot of targeted questions, and finally define the problem. That stage is also students thinking about their personal entrepreneurial skills, and tested their idea is the enough idea to make a company. Second is the ideation stage which is the creating, developing, and prototyping of ideas. However, the hackathon ideation stage needs to focus on making as many ideas as possible and the ideas were evaluated on a low prototype, such as the paper prototyping stage, allowing participants to better understand their concepts and find out what still they need from it. The last part is the implementation path that leads from the implementation stage into people’s lives. This is time to test the concept with users and see the result. Hackathon provides an opportunity to bring an early-stage concept into the testing part, allowing companies to test and understand innovation and potential quickly.

In this case study we have combined the Design Thinking process with hackathon tools and techniques, accelerate the structure of the Hackathon event, and systematizes the concepts of ideas to transform them into solutions. The participants create wonderful concepts. To mention a few examples: “Gamified experience combined with sports activities. Purpose - engage people with location and promote sustainable tourism conducted in a hybrid way.” Another group designed “Drone school business. Purpose - to sell drones piloting lessons and attract people to the local area that would help the local business.”

The result has shown that Hack Your Future most participants recommended our hackathon 36,4% and they graded our Hackathon 4,5/5. The student behind of the idea is ready to established drone business, they already have knowledge enough and business plan.

## **Discussions**

Hackathon support participants to expand their individual network within the company. As Komssi et al. (2015) has mention that “an often understated by-product of hackathons is the participants personal development and sense of achievement from working with new technologies, meeting, and collaborating with people they otherwise wouldn’t”. However, as



a Hackathon bring team members with a wide range of complementary skills and to initiate a good team environment and spirit, it is certainly worthy of consideration. When building a hackathon with multiple organization and especially with SME/Corporations, the participants can greatly expand their network in surrounding companies. Hack your future –event was especially targeted for companies with recruitment needs in the relevant fields (compared to the challenges and participant body) bringing career and project opportunities for the participants.

When looking at the final challenge proposals the participants' work was outstanding. Challenge owners, such as large local corporations, reported idea that 'our r&d departments would have never come up with'. This gives confidence in the strictly facilitated design process and its wider applications inside a higher education institute, in which the event was organized.

Feedback from students have also been very positive. Often the comments received directly from students are 'I would have no come if this would not have been mandatory, but I enjoyed it a lot and felt it was very meaningful for my studies. Looking forward to the next one.' This has encouraged our local higher education institutions to include more hackathons and design thinking in their curriculums. Teachers have, albeit unofficially, also reported back the increase in creative work capacity from participating students. This we'd like to verify and build methods to study this more carefully.

### **Conclusion and Future Thoughts**

The greatest potential and value of hackathons is to provide an opportunity for people to meet and collaborate to create new innovative solutions and even startups.

Clearly more evidence is needed, and our next step is a larger cohort data from the whole student population. The data will be collected each year and after every meaningful 'event', such as a hackathon, a delayer posttest is done to measure the change in entrepreneurial self-efficacy and competences in general. With self-efficacy we refer to student own assessment on their entrepreneurial capabilities, including the competences etc. By doing this we aim to receive a better understanding of each activity we provide to our student and how these activities build their entrepreneurial capacity and readiness to act entrepreneurial in general.

From our experience and the data collected for this study, we argue that facilitated design thinking processes in a form of a hackathon increase the overall entrepreneurial capability of students.

## References

- Affia, A-A., O., Nolte, A., and Matulevičius, R., (2020). *Developing and Evaluating a Hackathon Approach to Foster Cyber Security Learning*. In Nolte, A., Alvarez, C., Hishiyama, R., Chounta, IA., Rodríguez-Triana, M., Inoue, T. (eds) *Collaboration Technologies and Social Computing*. CollabTech 2020. Lecture Notes in Computer Science, vol 12324. Springer, Cham.
- Anderson, C. (2014). *Makers: The New Industrial Revolution*. Crown Business.
- Angarita, M.A.M, and A., Nolte (2020). *What do we know about hackathon outcomes and how to support them? - A systematic literature review*. In *Collaboration Technologies and Social Computing*, Springer.
- Angelidis, P., Berman, L., de la Luz., M., Casas-Perez, L. A., Celi, G. E., Dafoulas, A., Dagan, B., Escobar, D. M., Lopez, J., Noguez, J., Osorio-Valencia, S. (2016). The hackathon model to spur innovation around global mHealth. *Journal of medical engineering & technology* 40(7-8), 392–399.
- Archer, B., (1979) Design as a discipline. *Design Studies*, 1(1), 17-20.
- Brown, T., (2019). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. 2nd ed. New York, NY: Harper Business.
- Brown T. (2008). *Design thinking*. *Harvard Business Rev.* 2, 86(6), 84-95.
- Cobham, D., Hargrave, B., Jacques, K., Gowan, C., Laurel, J., Ringham, S., (2017). From hackathon to student enterprise: an evaluation of creating successful and sustainable student entrepreneurial activity initiated by a university hackathon. In *9th annual International Conference on Education and New Learning Technologies*. EDULEARN.
- Curedale, R., (2019). *Design Thinking: Process and Methods*. 5th ed. Topanga, CA: Design Community College Inc.
- Elia, G., Margherita, A., Passiante, G., (2020) Digital entrepreneurship ecosystem: how digital technologies and collective intelligence are reshaping the entrepreneurial process. In *Technological Forecasting & Social Change*, 150.
- Iqbal, M., (2021) *Twitch Revenue and Usage Statistics, Business of Apps*, March of 29, 2021. Accessed on 4 of April 2021. <https://urly.fi/1ZR2>
- Kelley, T. (2013). *Creative Confidence: Unleashing the Creative Potential Within Us All*. New York, NY: Crown Business; 2013.
- Kelley. T.A., (2001). *The art of innovation: Lessons in creativity from IDEO, Americas leading design firm*. Vol. 10. Broadway Business.

- Komssi, M., Pichlis, D., Raatikainen, M., Kindstrom, K., and Järvinen, J., (2015). What are Hackathons For? In *IEEE Software*, *IEEE Computer Society* 32(5), 60-67, Washington, USA.
- Kumar, V., (2012). *101 Design Methods: A Structured Approach to Driving Innovation in your Organization*. Hoboken, NJ: Wiley.
- Nelly (2021) *Discord Welcomes Tomasz Marcinkowski as New CFO*, Discord 18.3.2021, Accessed on 4 of April 2021. <https://discord.com/blog/discord-welcomes-tomasz-marcinkowski-as-new-cfo>
- Nolte, A., (2019). Touched by the Hackathon: a study on the connection between Hackathon participants and start-up founders. In *Proceedings of the 2nd ACM SIGSOFT International*.
- Nolte, A., Pe-Than, E.P.P., Filippova, A., Bird, C., Scallen, and S., Herbsleb, J.D., (2018). You Hacked and Now What? -Exploring Outcomes of a Corporate Hackathon. In *Proceedings of the ACM on Human-Computer Interaction 2*, CSCW (2018), 1–23.
- Pe-Than, E.P.P., Nolte, A., Filippova, A., Bird, C., Scallen, S., and Herbsleb, J.D., (2019). Designing Corporate Hackathons with a Purpose: The Future of Software Development. *IEEE Software* 36(1), 15–22.
- Porras, J., Knutas, A., Ikonen, J., Happonen, A., Khakurel, J., and Herala, A., (2019). Code camps and hackathons in education-literature review and lessons learned. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*.
- Reidy, T., (2020) *How to Use YouTube Live to Engage Your Audience: A Step-by-Step Guide*, Accessed on 5 of April 2021 <https://socialmedianz.com/social-media/2020/04/02/how-to-use-youtube-live-to-engage-your-audience-a-step-by-step-guide/>
- Saldana, J., (2015). *The coding manual for qualitative researchers*. Sage.
- Taylor, N., and Clarke, L., (2018). Everybody's Hacking: Participation and the Mainstreaming of Hackathons. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 172.
- Trainer, E.H., Chaihirunkarn, C., Kalyanasundaram, A., and Herbsleb, J.D., (2014). Community code engagements: summer of code & hackathons for community building in scientific software. In *Proceedings of the 18th International Conference on Supporting Group Work*. ACM, 111–121.
- von Briel, F., Davidsson, P., Recker J.C., (2018). Digital technologies as external enablers of new venture creation in the IT hardware sector. *Entrepreneur*. In *Theory Practice* 42(1), 47–69.
- Wedell-Wedellsborg, T., (2017). Are you solving the right problems? *Harvard Business Review* 95(1), 76-83.

Wolcott, M.D., McLaughlin, J.E., (2020). Promoting Creative Problem-Solving in Schools of Pharmacy with the Use of Design Thinking. *American Journal of Pharmaceutical Education* 84(10), Article 8065, 1271-1276.

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