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CONTAINER CHALLENGE – PROTOTYPING DISTRIBUTED COLLABORATION

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ABSTRACT
This paper describes the process and results of "Container Challenge", a remote collaboration exercise that was designed to help global, multi-disciplinary teams to prototype their online collaboration tools while they were still co-located during a course kick-off at CERN.
The exercise was organized in the first week of advanced product design course called Challenge Based Innovation, where the multidisciplinary students from countries around Europe met each other for two weeks to start a five-month long collaboration.
The teams worked on a short design challenge in "containers" that simulated the coming division they would encounter after travelling back to their home universities. The purpose of the exercise was to help the teams to use prototyping and iterative design methods, not only on products and services, but also while designing their own working process.
The previous experiences from similar courses has shown to authors, that a dedicated exercise would be needed to guide the teams to actually test and improve their collaboration plans during their first two weeks together. While there was no statistically significant comparison, the implemented Container Challenge -exercise seemed to have positive effects in developing collaboration plan; the challenge brought out several issues related to distributed work, including the need for virtual empathy and occurrence of increased complication when reflecting on the design activities. It also managed to serve as a shared learning experience that could be used to improve the future collaboration of the teams.

Keywords: Online collaboration, prototyping, product design, communication planning

1 INTRODUCTION

The act of design is all about bringing something new into life. When conceiving such novel solutions, one of the methods often utilized by designers, is prototyping. Through prototypes the role, look, feel and the integration of different separate parts of the product takes shape and crystallizes.
The authors of this article have a long history of facilitating distributed design team projects with universities like Stanford, Aalto, and HSLU utilizing methodology stemming from Problem-Based Learning [1] and learning by doing [2, 3]. The question they wish to explore in this article is related to the applicability of prototyping to different parts of the design process itself. Could this rapid small scale, low resolution "build it and test it" approach be a useful tool also beyond the typical product and service design processes?
A recurring problem the authors have faced while coaching student teams, is coordinating distributed design teamwork, as online collaboration tools tend to increase the amount of misunderstandings during the process. This article describes an attempt to transform the static collaboration plan devised by the teams into a dynamic prototype to fail fast in order to keep developing throughout the class.

1.1 CERN, IdeaSquare and Challenge Based Innovation

The European organization for nuclear research, CERN, is one of the world's largest and most respected centers for scientific research located in Geneva, Switzerland. During its 60 years of existence, CERN has been making scientific discoveries that have increased our understanding about the structure of the universe.

Since early 2013, both authors have been involved in a pilot project at CERN that started as a collaborative feasibility study with Aalto Design Factory few months earlier. The pilot project, currently running under the working name IdeaSquare, is building a new creative work environment to support collaboration within selected particle detector R&D projects. In addition, IdeaSquare aims to increase the societal impact and collaboration with possible external partners, like SMEs and universities.

One of the first pilots of creating impact to the society is an advanced product design course Challenge Based Innovation (CBI) that is aimed for master level students around Europe. The structure and pedagogical background of CBI owes a great deal to several other similar course formats that the authors and the rest of the teaching team of the course has been involved in, most notably Stanford University's ME310 [4] and the overall PBL variation described as Model II by Savin-Baden [5]. CBI includes prototyping and testing solutions, heavy user engagement and it aims to combine novel technology and a human centered approach. Some of the typical course phases of the design process include problem re-definition, need finding, benchmarking, ideation & selection and finally prototyping and testing. However, the teaching focuses heavily on *how* these activities are performed.

The first round of CBI ran from 28.10.2013 to 7.3.2014 with 17 multidisciplinary students, and all the empirical data for this paper was collected during the first two-week intensive period that launched the course. Purpose of this two weeks intensive period was to introduce design thinking methodology to the students and allow the students from different countries to meet each other physically. In addition to the first two weeks, the students have travelled to CERN in 3 other intensive periods, in total for 7 weeks. Rest of the time they have been working together remotely from their home universities in Finland, Greece and Italy.

The starting points of the team members were really heterogeneous. Some of them had already gone through several global collaborative projects and learned how to use the tools in practice, as others had only theoretical knowledge of the topic.

1.2 Online collaboration

As the total common time at CERN was only 7 weeks, most of the team work was done remotely with various online collaboration tools. Computer-supported distributed collaboration has been used in engineering design for decades [4i] and the advancing technology and faster network connections are creating more alternatives for a distributed team to collaborate with. However, the amount of alternatives is also a problem, especially for newly formed teams that don't have previous experience about the collaboration tools they are about to start using. The newness of the technology can cause more challenges in the teamwork than all the other factors in a newly formed team [6].

In addition to the technical challenges, coordination and communication are major issues affecting the performance of a distributed design team [7]. Compared with their face-to-face counterparts, computer-mediated teams viewed their discussions as more confusing and less satisfying, spent more time devising decisions, and felt less content with their outcomes. [8]

Meeting all the remote members face-to face has been shown to be one of the best ways to improve these negative effects that the technology and distance can cause to the group performance [9, 10]. In addition to countering the negative effects, the early physical meetings are also increasing the overall effectiveness of the following online collaboration [11].

2 THE PROBLEM WITH ONLINE COLLABORATION PLANS

Fluent online collaboration is a crucial ingredient for the success of the student teams. What we usually see in projects like CBI, is a preliminary online tool selection and remote collaboration plans that are put to action only when the teams move to distributed locations. The selection of tools is superficial and problems are not noticed during the kick-off - in other words the teams make their best guess and don't have the chance to put the plan to the test. We often prompt students to test their tool setup during the kick-off week, but subtle reminding has not been enough to disrupt this pattern of team behaviour.

This means that the problems often occur after the project has been running for a while and the teams have started implementing their online collaboration plans in their home universities. Sometimes changes are made to the plan, but unfortunately these changes usually occur late into the project and a lot of time is lost in improving and finding alternative tools to fill the gaps in the original selection.

Figure 1 illustrates the difference between the typical tool selection and implementation process to one aimed with Container Challenge.

Figure 1. Comparing typical behaviour to container challenge

2.1 Surfacing problems with Container Challenge

To overcome this gap, the authors created a short exercise with the aim to help the teams to transcend from making static and theoretical collaboration plan to dynamically prototyping and testing the plan.
In order to offer an experience of what remote collaboration is like while the team members are still co-located, we organized a special challenge. The teams were taken through the one-hour exercise in separate spaces or "containers" during the first intensive week in CERN. The aim was to simulate a distributed working experience, observe arising problems and through reflection improve the teams' online collaboration plan.
The challenge set to the teams was selected so, that it would be meaningful for their process and that it would encompass most of the elements of the design process: re-defining the problem, ideation and building a prototype [12]. We wanted to offer a variety of activities, since the diverse exposure could allow a maximum amount of problems to surface. For this particular exercise the teams were asked to create a team poster considering the elements described in Figure 2.

Figure 2. Task definition

The teams were given an hour to complete the task and then share the results to the whole class immediately after completion. During the exercise the students were divided into four different spaces ("containers") to simulate their future distributed working environments:

- Team Finland 1
- Team Finland 2
- Team Greece 1 & 2
- Team Italy 1 & 2

The teams were not allowed to meet physically during the exercise to simulate an authentic distributed situation. Communication between different locations was limited to maximum of 20 minutes of synchronous global working with voice and video between the whole team. Cutting the time for global communication was done to stress that the meeting time with the whole team is often limited and should be treated with consideration.

3 TWO LEVELS OF REFLECTION

To facilitate learning from the experiment, two levels of reflection were introduced. After the challenge, the teams gathered together and presented their process and results. These presentations were used as a base to open up a reflective dialogue amongst the whole class and pick up specific themes and problems that the students just experienced. This allowed the students to share their experiences and to understand the events from other viewpoints.

Another layer of reflection was added a week later, when the each student participated in a private semi structured interview. The questions posed were focused on the individual and team level learning, changes in their team roles and changes in their collaboration plans.

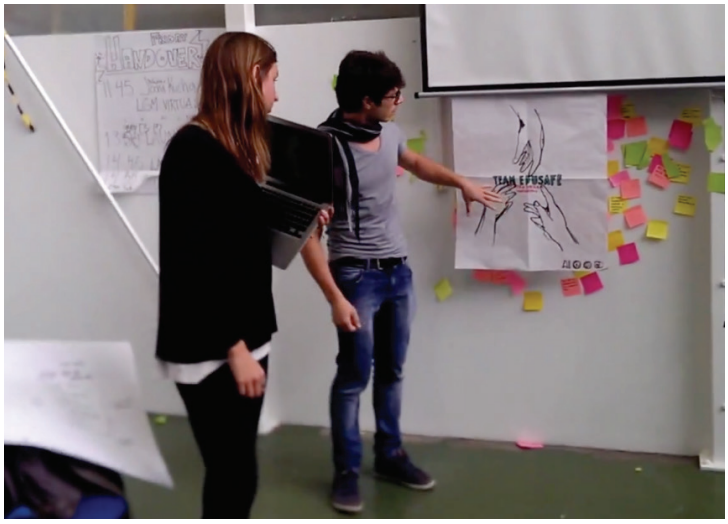

Figure 3. Presenting the results

3.1 Collecting data

The base for the data gathering was the whole class of Challenge Based Innovation 2013 that participated in the container challenge - 17 students in 2 teams. Each individual sub-group session was recorded on video by the moderators during the Container challenge. The videos primary function was to serve as memory support. The semi-structured interviews described in the previous chapter were conducted in one afternoon by two parallel interviewers in English. All the individual interviews were also recorded on video for further analysis. These results will be analyzed and discussed in the next chapter.

4 RESULTS

4.1 General

The teams experienced some challenges while making the collaboration plan, as the distributed collaboration looks quite different in theory and practice. One of the biggest mentioned benefits of prototyping the collaboration in the container challenge was bringing the team to a common ground and giving them shared experiences on the online collaboration for further planning - "I understand that the problems I have studied really exist, not only in theory" "Now I have learnt the practice".

In the interviews, several themes emerged regarding the students experiences. Three frequently mentioned key points were the following:

- Communication and reflection of the activities gets more laborious and needs dedicated time
- Gaps/silent parts of the communication need to be interpreted correctly to avoid negative interpretations
- New communication channels pose different benefits and challenges

4.2 Communication & reflection of the activities

The students experienced, that designing the poster and on the other hand communicating what was being designed was more laborious than while working around the same table. Some felt, that communication was actually contradicting the making, since they had to stop their work in order to be able to communicate, share and exchange feedback in the "global" sessions. One of the students concluded, "I learnt that communication and doing should be split into two separate parts. It is sometimes hard to do all at the same time." Reflection, one of the key parts of learning, was also seen as more challenging than before actually implementing it.

4.3 Interpretation of silent gaps

Several students experienced that the silent gaps during work might be misinterpreted as not caring about the project or slacking off: “Group members should know, that it is silent in the other end because they are focused on doing“. Also, differences in tool usage might result in confusion: “If I don’t immediately reply on Facebook it’s not because I don’t care - I go there only once a day so there might be a gap in my response”. There might also be other reasons for delayed response time due to asynchronous nature of the communication “In virtual work it takes longer to answer - I want to make sure people understand me and what I mean since they might not ask even if they don’t understand me.”

4.4 Different communication channels

One of the students stated, that using the technology is not the problem, but chatting in English might be very uncomfortable. One of the positive effects of the distributed work environment was getting the native language back. The language was seen to have an effect on a deep level as “Changing the language made working really effective - there were no cultural and language barriers and less conceptual differences.” The virtual environment introduced two new channels - text chats and video. Leveraging the additional channels allowed some unheard voices to emerge - “Through writing you could be heard even stronger than talking”. However, sharing visual material was seen as more challenging. Even though the online tools had options like screen sharing, they were not familiar to all of the participants. This led to creative solutions, as for example one of the students considered using a mirror to be able to show his computer screen through the video connection.

5 DISCUSSION

Based on the interviews, it is safe to say that the prototyping the remote collaboration process with the container challenge managed to bring out some of the problems related to virtual work. The students realized that the communication of their design efforts is a time consuming, yet important step. In a co-located work environment, seeing what other team members are doing and exchanging a few sentences is a light and intuitive way to keep track of the progress. It seems as the challenge also brought out an important need in the virtual environment - empathy. As the lag in communication can be interpreted as negative, there needs to be a strong emphasis on positive thinking and understanding the reasons behind the lag. Since the virtual work brought out some problems (e.g. sharing visual material) and new solutions (e.g. having two layers in discussions with video and text chat) the teams had lot to consider when rethinking their selection of tools after the exercise.

5.1 Criticism

The teams had not set up their tools or shared Skype contact details, so the challenge begun by using the already established channels, email and Facebook, to find the missing information. One of the improvement ideas was to allow 10-15 minutes of setup time before the challenge to share all the necessary contact details and test them - basically run even faster prototype on the tool usage. The internet connection quality in the exercise location was another topic for feedback, as the wireless network had some capacity issues and blind spots, which caused problems to some of the participants. On the other hand, the challenges with Internet connectivity are a part of the global collaboration in any case, and some of the interviewees even suggested adding random errors to the connection to simulate the real-life connectivity issues.

5.2 Development

Container challenge showed positive short-term results while the teams were selecting their remote collaboration tools, and it helped the team to avoid some potential challenges in starting their distributed work. However, as a single exercise its power and reach was limited, and the teams still encountered most of the typical issues we set out to avoid later during the class. Yet, the positive effects to the teams seemed to be significant compared to the time investment of the exercise, and the overall process of prototyping these meta level skills showed good potential for further development of Container Challenge and similar exercises to other challenging parts of the whole design process.

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