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ORIGINAL ARTICLE

OBI - Developing an idea sharing platform for online collaboration and distributed student projects

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ABSTRACT

Online Based Innovation (OBI) is a development project to create and test a scalable online platform to support globally distributed learning, collaboration and concept development. OBI development is coordinated by IdeaSquare, an innovation experiment at CERN, the European Organization for Nuclear Research.

This paper will focus on defining the initial steps and structure for setting up a comprehensive online collaboration platform to support multidisciplinary development projects, and also to optimize the learning experience and collaboration efforts for the participating students. The empirical work is based on research during an earlier project with more co-located periods, called Challenge Based Innovation @ CERN. To make sure that such an approach can work in a wide range of extreme engineering challenges, IdeaSquare is starting to collaborate in a couple of engineering-driven pilot projects to continue improving and developing OBI.

Keywords: Online, innovation, collaboration, product development.

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INTRODUCTION

CERN, the European Organization for Nuclear Research, has been carrying out groundbreaking fundamental research in particle physics for over 60 years and has made numerous important discoveries in the field – latest widely known example being the Higgs boson in 2012. The current research endeavours are done through intensive international collaboration, CERN gather over 12 000 scientists from around the world in an effort to collaborate in scientific experiments, and to develop new hardware and software solutions for the highly accurate technology driven prototypes.

IdeaSquare at CERN is an innovation experiment established in 2013 in order to explore new ways to demonstrate the value of applying material developed for fundamental research to societal challenges, and create a positive feedback loop for ideas and potential technologies back to the research. To fulfill this purpose, IdeaSquare is hosting long-term research projects on detector R&D (with a societal component) as well as facilitating multidisciplinary student projects and promoting different innovation-related events and hackathons. Most of these activities are hosted at a dedicated building, also called IdeaSquare, at the main CERN campus.

This work is based on initial version of the platform developed and tested during the Challenge Based Innovation @ CERN -course, known in short as CBI (Kurikka et al., 2016). This was done during the second iteration of CBI in 2014 – 2015, during a 6-months project including over 60 teachers, coaches and students from 3 different disciplines, 7 different universities and 16 different nationalities. The overall results from this implementation, including feedback from students and teachers, and usage data from the online platform, is used for developing the future pilot platforms, which in turn will collect more improvement possibilities from their users.

In OBI, using a flexible and modular online platform structure, we expect to reach maximum efficiency in both development and usage. This allows the users the freedom to choose from the most suitable software tools, but at the same time also capture and record all the crucial data to the centralized platform instead of it being scattered and stored across different unconnected services.

THEORETICAL BACKGROUND

Working together over distances via different computer systems has been around for decades (Järvenpää and Ives, 21996), and the advancing technology and faster network connections are opening a lot of new possibilities to take this remote collaboration further. However, the number of alternatives can also cause problems in selecting the best tools to use, and for example in some teams, just the novelty of the technology can cause more challenges in the teamwork than any other observed factor (Hollingshead et al., 1993).

There has been a lot of research on supporting remote work with co-located meetings, which are shown to be one of the best ways to improve these negative effects that the technology and distance can cause to the group performance (Ramesh and Dennis, 2002). Physical meetings are also shown to increasing the overall effectiveness of the following online collaboration (Robey et al., 2000). This can also be seen as a research (and development) gap, a possibility to increase the quality and efficiency of remote collaboration to the same level and above to physically meeting your partner team.

Considering educational components in an online environment, especially on the scale of thousands or hundreds of thousands, is a newer approach, enabled among other developments especially by the wide spread of highspeed internet connectivity and active development of universities looking into scaling their resources with MOOCs, massive and open online courses (Breslow et al., 2013). Still, interactivity with the instructors and among course participants has been ranked as clear factors increasing satisfaction and learnign[14], and finding a good balance with quantity and quality can still be significantly improved.

The pedagogical theory behind the OBI project structure and platform development, is Design Thinking and overall human-centred approach (Simon, 1969, Brown, 2008) that were also crucial in designing CBI course format. It is also strongly connected to a pedagogical area called inquiry-based learning (Barron, and Darling-Hammond, 2010), which includes project-based learning, problem-based learning and learning through design.

METHOD AND DATA

The author is currently working at CERN as part of the IdeaSquare development team, and has participated in planning and coordinating the CBI course through all the seven iterations of the course implemented so far. The material for this paper has been collected and analyzed from this viewpoint using participatory action research methodology (Whyte, 1991, Baum et al., 2006).

The primary data for this paper was collected during one CBI iteration, from the usage data of the online platform, and three extensive and compulsory surveys that almost all the students (n=37 - 46) answered before starting the course, after the first visit to CERN, and at the end of the course.

The online platform the CBI students used was based on the existing open source learning management system Open edX, which is also used to run one of the world's biggest online education platforms, edX (Porter et al., 2015). It was used for hosting teaching material submissions from all the participating universities in text and video formats, and also hosting the submissions and discussion channels for the students. Most of the course scheduling and organizing info was also shared through the platform.

To be able to fully customize the platform, the author installed a fully self-contained version of the latest stable release from Open edX to CERN computer infrastructure, more specifically to an Ubuntu 12.04 Linux server running on OpenStack virtual computer cluster. Such installation, or similar virtual computer setup, allows dynamic scaling of computing resources to match the number of participants, ranging from a couple of test users all the way up to millions of users currently visiting edX MOOCs online.

The Open edX setup was also extended with external file hosting with OwnCloud servers at CERN and accepting student submissions through Google Drive and Dropbox.

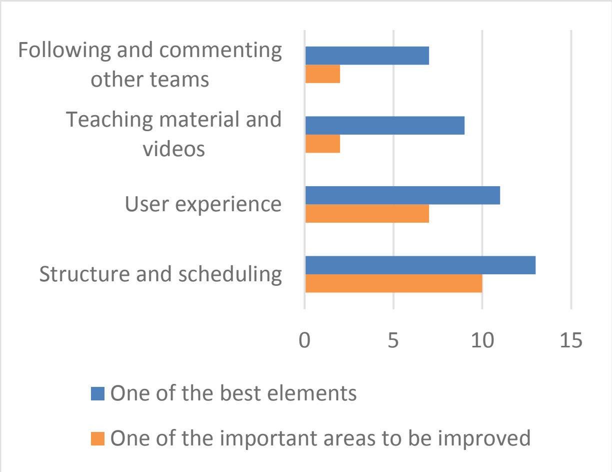
User input and ideas for the future development of the platform has been also collected from the initial planning meetings of an upcoming pilot project on high speed aviation (Ramping-up Workshop of the "High Speed Initiative" Student Innovation Challenge. Available at https://indico.cern.ch/event/570268/ [accessed 28.2.2017]).

RESULTS

After working on the platform for 5 months and visiting CERN twice, at the beginning and at the end of the course totaling 4 weeks, all the students were asked to comment their experiences with the platform in two sections of the final survey; the best elements and the biggest needs for improvement.

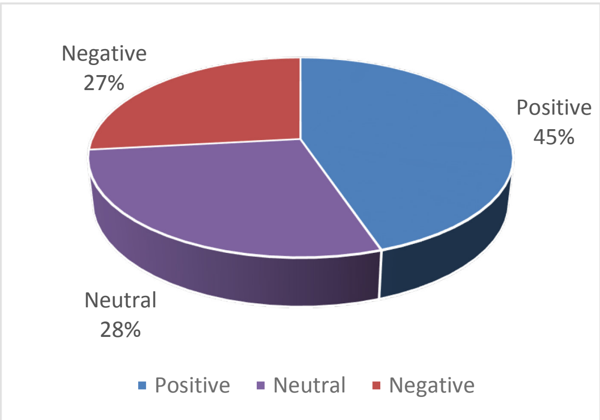
The biggest positive weights came from short video lectures as a remote teaching format ("*Delivery system, delivery explanatory videos and team's deliveries visualization*") and the ability to follow, reflect and comment deliverables done by other teams ("*Share our work with other teams, clear and simple*"). The structure of the platform divided opinions a lot, but weighted more on the positive comments ("*Easy to get overview, good to have a common platform for all and easy deliveries*"), same than the general usability ("*Functionality, it was easy to use*"). These evaluations depend more on the subjective preferences and expectations of the participants, and further research and development is needed to create more uniformly positive experience. Some positive examples in these areas can be seen from Table 3, building on the assumption that the students have based their feedback and opinions by comparing the platform to the other tools they are using most frequently. The feedback is further opened in Table 1.

Tab. 1. The main areas for feedback from final survey



In addition to the highlighted areas above, the students commented a wide range of positive comments ("*Layout, course info and easy to get around*"), neutral improvement suggestions ("*Could be given notification to when our team has gotten feedback*") or more negative comments ("*Too difficult to find things and too complicated organization*"). The division between these three tones is shown in Table 2. Overall, all the feedback, both positive and negative, gave over 116 different feedback comments to improve and develop the platform further. Over half of the classified feedback was opened further in Table 1, the rest of the comments were more scattered to a wide range of smaller development areas.

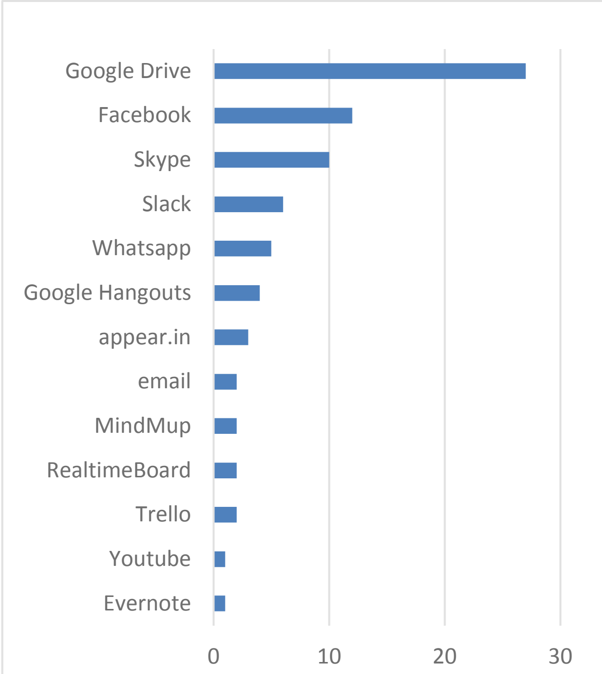
Tab. 2. Feedback tone division



It has to be acknowledged, that this kind of feedback collection method can give a good overview of some of the major areas, but it can also easily mix user feelings about the course content and platform functionality, and allows comments like "Frankly, about 90 percent didn't like using this platform what so ever" or "It was ok", which do not open up any of the reasons or issues the users might have encountered.

As a second track, the survey also tracked various external tools the teams had self-selected to either fill the functional gaps in the common collaboration platform, or to use the tools they were more familiar with. The results are presented in Table 3.

Tab. 3. The most important external online tools, mentioned by 37 students.



DISCUSSION AND CONCLUSIONS

The results collected during CBI have been an interesting and important input for the development of the next version of the platform. The basic technical structure worked well, all the implemented technical features worked, and the platform experienced zero downtime despite relatively heavy use.

As indicated by the additional tools and services used by the students, the platform still covered only a part of their online work during the course. To better capture and track the development of the projects, and encourage supportive interactions between the projects, more of this workflow should be covered by the next versions of the platform. However, this requires a challenging balance in also allowing the use of (some of the) familiar tools and services. This could be mitigated through service APIs and importing data from the external services the students have selected to use. In some cases, a better alternative might be just to integrate strong open source tools to extend the functionality of the platform, and encourage all the participants to transition to these tools for the duration of the project. Two clear examples of these tools would be interactive video connectivity with good compression and proxy services, and data storage to guarantee capacity, speed and archivability of the saved documents. The user experience of the platform was also a strong feedback point, and measuring and improving it should get significant attention in future work. In addition to survey feedback, we could also test biometric measurements on a selected group of users, for example eye tracking, heart rate, pulse and EEG. Finding a good set of metrics and evaluating it properly is a research question in itself.

The next step in technical development is to focus on more engineering-driven test cases to refine the platform functionality and connections with a wide range of external services. One of such pilot projects is envisioned to be on the topic of high speed aviation, planned by ESA and a network of avionics universities, aiming to develop a commercially viable concept for high speed aviation ecosystem, which includes the student-designed airplane, plane interior and user experience, airport infrastructure and business model concepts to make commercial operations viable.

In addition to the technical development and testing allowed by the engineering driven projects, another interesting research track will be around developing and improving the collaborative processes around such a platform – how can we correctly acknowledge all the contributions towards a common goal, and identify the most potential ideas and people among the mass of participants. Also, when the number of participants increase, how can we make sure that the quality and quantity of the positive and relevant human interactions stay on the optimal range, and not collapse like in many of the current massive online environments.

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REFERENCES

Barron, B. and Darling-Hammond, L., 2010, Prospects and challenges for inquiry-based approaches to learning, in *The nature of learning: Using research to inspire practice*, Dumont, H., Istance, D., Benvides, F. (Eds.) pp. 199-225.

Baum, F., MacDougall, C. and Smith, D., 2006, Participatory action research, *Journal of epidemiology and community health*, 60, 10, pp. 854-857.

Breslow, L., Pritchard, D.E., DeBoer, J., Stump, G.S., Ho, A.D. and Seaton, D.T., 2013, Studying learning in the worldwide classroom: Research into edX's first MOOC. Research & Practice in Assessment, 8.

Brown, T., 2008, Design thinking, *Harvard business review*, 86, 6, 84-92.

Hollingshead, A. B., McGrath, J. E., & O'Connor, K. M., 1993, Group task performance and communication technology a longitudinal study of computer-mediated versus face-to-face work groups, *Small Group Research*, 24, 3, 307–333.

Järvenpää, S. L., & Ives, B., 1994, The Global Network Organization of the Future: Information Management Opportunities and Challenges, *Journal of management information systems*, 10, 4, 25–57.

Kurikka, J., Utriainen, T. and Repokari, L., 2016, Challenge based innovation: translating fundamental research into societal applications. *International Journal of Learning and Change*, 8, 3-4, pp.278-297.

Porter, B., Haseltine, M. and Batchelder, N., 2015, The state of Open edX. In *The Open edX Conference*.

Ramesh, V. and Dennis, A.R., 2002, The object-oriented team: lessons for virtual teams from global software development, in *Proceedings of the 35th Annual Hawaii International Conference on System Sciences (HICSS)*, pp. 212-221

Ramping-up Workshop of the "High Speed Initiative" Student Innovation Challenge. Available at https://indico.cern.ch/event/570268/ [accessed 28.2.2017]

Robey, D., Khoo, H., & Powers, C., 2000, Situated learning in cross-functional virtual teams, Technical Communication, 1–35.

Simon, H. A., 1969, *The sciences of the artificial*, Cambridge, MA.

Swan, K., 2001, Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance education*, 22, 2, pp.306-331.

Whyte, W.F.E., 1991, *Participatory action research*, Sage Publications, Inc.