Design Principles for Collaboration Platforms for Open Education

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Abstract: Increasing the current low uptake of Open Education Resources (OER) is a key challenge for researchers and practitioners in the field. User studies have shown that collaboration is a main success factor for successful open educational activities. However, effective collaboration in open educational contexts requires well planned processes and platforms supporting collaboration, in particular in physically distributed settings. We have been investigating the value of such platforms, their main features and user requirements to enable collaboration from immature ideas to completed resources. We used quantitative and qualitative research methods to collect insights from potential users of such collaboration platforms to validate our approach. Based on these insights, we developed a collaboration platform for open education. We validated our platform using observation groups and focus groups to identify the key design principles of powerful collaboration platforms for Open Education. Examples are the need for a simple tool, use of a common terminology, and considering Intellectual Property Rights. In this paper, we present our findings from an initial validation of our collaboration platform and give recommendations towards powerful collaboration platforms for open educational contexts.

1 INTRODUCTION: OPEN EDUCATION

Emerging technologies have been enabling a multitude of opportunities for creating innovative and attractive forms of Open Education. The main approaches currently discussed in the context of Open Education are Open Educational Resources (OER) and Open Educational Practices (OEP) (Chen, 2010; Hatakka, 2009; Richter and Ehlers, 2011). OER deals with the learning and teaching objects that are commonly shared in online repositories once they have been implemented and applied in a particular context and using an open license such as Creative Commons (Davis et al., 2010). OEP are shared as experiences or good practices after they have been tried out in real life (Richter and Ehlers, 2011), helping others determining potentially good learning designs. In principle, OER and OEP are mainly shared after the resources are completed and applied in a particular context, allowing little chance for reflection and collaboration.

Researchers have observed that the wealth of available OER and OEP is not up to their full potential (Ochoa and Duval, 2009). It has been shown that the main barriers against the adoption of OER are related to several social, cultural, and organizational issues that keep open education reaching its potential (Hatakka, 2009; D'Antoni, 2009; Chen, 2010). The main identified barriers include trust and personal relations, and lack of awareness of open educational opportunities and advantages (AbuJarour et al., 2014). The key to Open Educational success is to overcome these barriers and to increase trust among users and corresponding repositories or platforms.

This article addresses the observed problems by a new approach to get educators better engaged

to the process of creating teaching and learning resources. Our approach aims at improving the uptake of OER through a collaborative process. The main idea of our approach is to emotionally attach educators to OER by engaging them at an early stage of the OER activity's development process, i.e., when the resources are still in the ideation phase. This engagement is enabled through a collaboration platform, where educators can collaboratively create and shape ideas of OER. We approach this problem using a mixed approach of applying design science research approaches, combining quantitative and qualitative methods.

This article reports from an ongoing inquiry. So far we have arranged discussion groups in the form of six workshops and several interviews to collect preliminary insights from educators on their perceptions and actions towards open education and the collaborative creation of teaching resources (AbuJarour et al., 2014; Pirkkalainen and Pawlowski, 2014). Based on these insights, the basic requirements on our proposed approach were generated for the purpose of this study. Our proposed approach was refined and a collaboration platform for open education was developed. This study presents the validation results of our developed collaboration platform with potential users through observation and focus groups. The main objective is to give recommendations in a form of design principles for powerful collaborations platforms in open educational contexts.

In this paper, we report on our journey of investigating the low-uptake of OER problem, leading to our validation phase including observation and focus groups, and our key findings with respect to the design principles of collaborative open educational platforms.

The key contributions of this paper are:

- Identifying key challenges, success factors, and barriers for collaboration around OER.

- Revealing key design principles of collaboration platforms that facilitating idea sharing approach in open educational contexts.

This paper is structured as follows: This introductory section is followed by the necessary background in Section 2. Then, we describe our methodology and instruments in Section 3. In Section 4, we introduce our key findings with respect to the design principles of collaboration platforms in Open Education. We discuss the key points in Section 5. Finally, we conclude this paper in Section 6.

2 THEORETICAL BACKGROUND

In this section, we give the necessary fundamentals to proceed with the rest of this paper. In particular, we explain the importance of OER reusability and the value of collaboration and idea sharing in Open Education.

2.1 Re-using Open Educational Resources (OER)

Open education consists of many approaches to strive for openness on different levels of education. Open Educational Resources (OER) are defined by UNESCO as "open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes" (UNESCO, 2002). OERs can be multifold digital resources ranging from simple presentations,such as, PowerPoint files to full online courses provided openly for educators and learners to apply (Downes, 2007; for Educational Research and Innovation, 2007). Teaching and learning resources are re-usable and can be modified and adapted to different contexts to improve the education experience (Richter and Ehlers, 2011). Common research approach has been investigating how to make learning objects available and reusable for educators and learners (Hylén, 2006; Hatakka, 2009; D'Antoni, 2009).

Several OER initiatives have observed huge potentials for the wide spread of OER and proposed approaches to use, apply and re-use OER. Part of these initiatives have dedicated efforts to provide sets of guidelines and best practices about how to re-use OER. For instance, Okada et al. propose using of social media (Okada et al., 2013), whereas Inacol (2013) and Pirkkalainen and Pawlowski (2010) propose practical guides with step by step procedures on re-using OER. However, such OER guidelines are typically crafted based on ideal processes and basic assumptions for creating OER rather than real, conducted collaborations.

Many OER collaborative experiences have been reported in the form of case studies from cross-institutional OER creation (Educause, 2013) to case studies in Africa (Sapire and Reed, 2011). Such case studies draw attention to the opportunities and benefits of co-creating and re-using OER. While being exemplary cases, the collaborative efforts in open education are not yet a common practice.

Reviewing the main approaches of OER presented above, we observe that the main character of OER is

focused on re-using and adapting complete materials, resources, or scenarios (e.g. lesson plans) during the development of new activities (e.g., courses). This means that OER are applied after the resources have been shared in existing repositories and much of the context-sensitive and pedagogical thinking might be lost.

Reconsideration of the ways to make OER sustainable needs to be addressed. Previous studies on the existing OER platforms uptake have shown how the open education still struggles to reach active communities and knowledge sharing (Ochoa and Duval, 2009) Educators experience difficulties and barriers that usually relate to social and organizational aspects and unawareness of OER (D'Antoni, 2009; Chen, 2010). However, the open education movement benefits from the increasing use of ICT in education, as teachers are exposed to new ways of open and transparent didactics with a multitude of social media applications for education (Wever et al., 2007; Lai and Chen, 2011).

2.2 Lessons Learned From Related Disciplines and Practices

While OER and open education is general is a rather new domain area, it still deals with approaches and issues that are encompassed in related disciplines. It has become common approach to engage educators in to virtual OER communities and expose them to services most commonly witnessed and discussed for social media (Ha et al., 2011). It is critical to discuss how to embed the new types of OER platforms to the daily practices of educators and to design these to allow maximum efficiency and effectiveness.

The design of information systems has been a prominent topic for decades within Computer Science as in Information Systems literature (Iivari, 2014). The research paradigm of Design Science Research (DSR) has included discussions on meta-designs and meta-requirements to elaborate how particular systems should and could be designed (Hevner et al., 2004; Walls et al., 1992).

Static information repositories that allow retrieval and sharing of OER have been a common practice for years across all educational levels, ranging from national to international databases containing wide range of educational resources (Tabuenca et al., 2012; Ochoa and Duval, 2009; Davis et al., 2010). Yet, only handful of these repositories reaches sustainable user bases (Ochoa and Duval, 2009). Many authors have argued that the didactical concepts, intentions, the reasoning and the background of OER is not properly understood and remaining shallow during

the data retrieval process within repositories (Atkins et al., 2007; Chen, 2010; Richter and Ehlers, 2011). The possible solution for this has been argued through increasing knowledge sharing between educators to elaborate and discuss how to best apply these resources in practice (Hatakka, 2009).

While virtual communities and deployment of better options for knowledge sharing can be argued to be vital, the contribution behavior in online environments has been witnessed to be challenging to sustain. Such barriers have been identified and explained in educational contexts (Pirkkalainen and Pawlowski, 2014) as for open source communities (Roberts et al., 2006) and for distributed settings in general (Noll et al., 2010; Pallot et al., 2010). Tsai and Bagozzi (2014) argued that group norms, attitudes and anticipated emotions contribute to towards behavioral we intentions that are crucial for knowledge sharing in virtual communities.

To overcome those barriers, different interventions are possible. We focus on intervening during build time using design principles which describe inherent attributes which determine the success of a technology (Mueller and Strohmeier, 2011). As an example, Mueller and Strohmeier (2010) propose necessary attributes for Virtual Learning Environments, amongst them reliability, security, interactivity, appeal, multimodality, or enjoyment. Similar recommendations have been made for Social Environments for Learning (Dron, 2007) and Collaboration Environments (Kollock, 1998) or Virtual Worlds (Chaturvedi et al., 2011) in general. Therefore, we utilize the approach of Design Principles to provide recommendations and ensure the usefulness for practitioners.

The research activity described within this article focuses especially on the ways to reach a commitment and sense of belonging within virtual communities in open education.

2.3 Towards Collaboration and Idea Sharing in Open Education

In our research, we focus on tweaking the steps that are accomplished before having the resources complete and shared. In particular, in situations when ideas are initiated, shaped, and shared with like-minded people in order to create new educational outcomes, such as OER. Our approach is based on the initiative of Pirkkalainen and Pawlowski that suggests taking a step back and defining what could encourage the collaboration in early stages and sharing new ideas that are not yet matured to existing OER (Pirkkalainen and Pawlowski, 2014). This

initiative proposes that collaboration is more likely to take place when educators feel emotional ownership (Pawlowski, 2012) of the knowledge they create. Emotional ownership is described as the degree that individuals perceive that the knowledge belongs to them (Björnberg and Nicholson, 2012). Jones and Jordan assume that the lack of emotional ownership could be one of the main reasons that the uptake of OER is very low (Jones and Jordan, 1998).

Although, idea sharing processes are not new, they are not considered within the open education context. The purpose of such processes is to engage the collaborators to the collaboration process and to the resources being created. Therefore, stakeholders do not have to re-use completed resources, but they are rather involved in the development process itself. A similar approach is discussed from a design perspective by (Treviranus, 2010) described as the Wabi-Sabi principle. This principle aims at designing resources in an imperfect way that later adopters have certain space to incorporate their own design, pedagogical, and technical ideas. This principle enables stakeholders to be involved in an early stage and build new OER.

3 METHODOLOGY AND INSTRUMENTS

In this section, we describe our methodology and instruments that were applied for validation purposes to derive the main design principles of collaborative platforms in open educational contexts. Following a design science research approach (Hevner et al., 2004), we decided to interweave qualitative and quantitate methods whenever it is possible and reasonable in order maximize the "knowledge yield"

(McCall and Bobko, 1990) of an evaluation endeavor. The goal of applying this approach is: (a) to validate the concept of idea sharing in creating OER in higher education and business related environment, and (b) to find out the needs within Open Education and to validate our proposed approach. Both goals lead to identifying key design principles towards successful collaborative platforms for open education.

3.1 Case Study: OEI2-Project

The research we conduct deals with new ways for educators to share and collaborate on OER. The context of inquiry is especially set to higher education. The study was conducted in EU-project "Open Educational Ideas and Innovations – OEI2" (http://www.idea-space.eu). One of the key aims of the project is to create a collaborative platform for open education. As discussed previously in this paper, several steps were taken to identify the perceptions of educators towards collaborative creation of OERs and towards idea sharing. The requirements gathering and the conceptual work that were accomplished through a series of workshops and interviews will not be discussed in this article. Based on the results of the workshops and interviews (AbuJarour et al., 2014), a collaboration platform for idea sharing in open educational contexts was created.

The validation of the collaboration platform for open education will be discussed in this article, leading to elicitation of design principles that serve as meta-requirements or meta-artifacts (Walls et al., 1992) for further creation of collaborative platforms for Educational purposes. The platform is developed to showcase collaboration idea sharing in the context of OER.

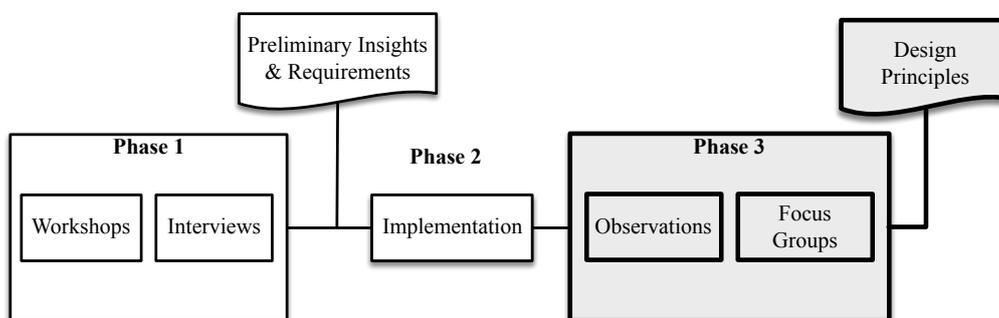Figure 1 depicts the main steps of our methodology.

Figure 1: Our methodology: Workshops and Interviews to gain preliminary insights and user requirements, implementing these requirements, and validating the implemented tool to gain design principles (Highlighted areas depict the focus of this study).

This online collaboration platform is designed to enable and support collaboration throughout the entire OER lifecycle. The core of our portal is a component that enables educators to co-create and share any type of ideas. Registered users can use it to create OER, open e-textbooks, MOOCs or even an educational software solution or virtual mobility action between two or more universities. "Ideas" represent the basic entity of this space. Registered users can initiate ideas or join the development of existing ideas. Through collaborative discussion, these initial ideas can become mature and therefore form OER. The basic functionalities of our platform are:

Idea Posting and Sharing Providing educators the possibility to create new ideas (courses, materials, documents, etc.) that they can subsequently share with other interested peers.

Idea Search Enabling users to search for ideas based on several criteria, e.g., topic, educational level, language, country, etc.

Idea Development Providing a refined innovative, but yet simple to use, collaboration space where ideas can be discussed, designed and developed towards OER. The collaboration space includes functionalities to structure the idea to several activities, to write collaboratively, to comment on others contributions and to use video conferencing within the collaborative documents.

Idea Administration Idea owners and administrators can edit basic idea fields (e.g., title, description, idea visibility) and also add more idea members (collaborators) either from existing portal members or by inviting (via email) non-registered colleagues, delete participants or redefine idea members' roles.

OER Repository Including a wealth of collected OER for business and management in addition to the published OER that come out of our platform.

3.2 Validation Approach

Our validation approach consists of two phases: Observation groups and focus groups. During the observation groups phase, educators were invited to use the idea sharing space. We collected their feedback on the platform and we observed their behavior. During the focus groups phase, involved users were invited to join workshops regarding their feedback to the advantages and limitations of the initial portal prototype.

The groups of potential users interested in collaborative idea generation were introduced to the initial version of our project. The observation activities took place face-to-face, through Adobe Connect or Skype video conferencing facilities when collaborating educators were testing the platform. The users invited collaborators to their idea and tried all the available functionalities for idea creation. During the observation, the users could freely use the tool how they see best for creation of their idea. They could develop new ideas or join existing ideas.

During the observation group, 23 teams have been built in project partner organizations around educational ideas whereas each team consisted of 26 collaborators. In total 56 users from 4 European countries – Finland, Germany, Greece and Lithuania have validated the process using initial infrastructure of the portal.

Most of the observed educators were also invited to express their ideas in the focus group interviews after that and the feedback of their discussions was documented. The focus of each session was to discuss: 1) How did they like the platform, 2) how would they improve it and for what reason, 3) whether the tool is easy to navigate, 4) how to improve the usability of the platform, 5) discussing the opportunities for using the tool beyond collaborative course development, 6) open discussion on the participants perceptions and feelings towards the tool and the conceptual foundation behind it.

There were 52 participants in 5 focus groups. The educators and researchers who participated in the open idea sharing space validation represented different fields of education: Economics, management, business administration, marketing and communication, statistics, business information systems, education, IT, eLearning, etc. Some educators were more experienced in the field of creating or using OER while others were interested, but did not have much experience in collaborative idea sharing or creating OER. Some participants were experienced in different aspects of technology enhanced learning – teaching online using video conferencing tools, creating, using and administrating OER.

Table 1 summarizes the demographics of the observation and focus groups.

Table 1: Demographics of our validation phase

Host	Groups	Participants	Medium	Educational Fields & Positions
(Partner 1)	4	12	Face to Face & Skype	- Information Systems Researchers / Teachers - E-learning
(Partner 2)	4	10	Face to Face & Adobe Connect	- Business Information Systems - Information Technology - Master Student, IT - Mathematics - PhD Degree, IT
(Partner 3)	4	12	Face to Face	- Organizational Strategy and Change Management - Information Systems - MSc, PhD Candidate, PhD holder - Management and Tourism
(Partner 4)	5	10	Face to Face	- Academia - IT, Education
(Partner 5)	6	12	Face to Face	- Academic Assistant - Co-rector - Communication Manager - Marketing Manager - Prof. for Consumer Goods - Prof. in Economics - Prof. in Management Studies - Prof. in Quantitative Methods and Business Administration - Prof. of Economy and Visiting Lecturer - Researcher, Educator, Business consultant - Researcher

4 FINDINGS AND DESIGN PRINCIPLES

The findings of our research are structured as follows. First we present the validation results from our observations and focus groups. Secondly, we present a synthesis on these findings and discuss our recommendations for further developing the concept of collaborative idea generation as well as the collaboration platforms for OER.

4.1 Validation Results

The Look of the Portal: The remarks regarding the look of the idea sharing space portal provide a rich variety of reactions ranging from very positive remarks (e.g., "almost perfect") to average assessments (e.g., "OK") and all the way to rather negative reactions. 17 collaborating teams liked the simple look of the portal, its design, colors and that it is not crowded but rather structured and easy to understand. 2 Teams indicated user-friendliness and usability of the idea sharing space. One team expressed positive attitude towards the portal, but found it too anonymous as it was not clear with whom collaboration is going on. One team was very critical and felt that the portal is very chaotic and not self-explanatory. Another team indicated that it was "very basic, little bit old-school", while another team indicated a contrary and found it as "a very modern, well-designed portal following all current trends in web development".

The Positive Aspects of the Portal: 8 teams of collaborating educators indicated that they found navigation easy and not complicated, as some have pointed out "the portal is really easy to use even for a beginner". Others (9 teams) agreed that it is generally easy to navigate, but also some additional improvements are needed, such as missing descriptions of specific aspects in some of the pages, next steps, some buttons are not clear or quick comment function. 4 Teams mentioned that they found navigation not very easy and think that it should be improved "It looks simple, but not very easy to navigate". It was indicated 3 times that there is a need for a manual or video tutorial. 8 teams found the portal difficult to navigate and indicated some specific

aspects: "It is not clear what is the difference between to collaborate, chat and comment", "when a new user is selecting an idea it is not clear who has initiated the idea".

The participants, who also participated in the workshops and interviews, when trying the open idea sharing space indicated different aspects that they like about the portal. Part of the collaborating educator teams (8 teams) mentioned that they liked the idea of open idea sharing space itself. They expressed their feedback clearly: "You don't have to meet face to face and create a course online", "I like the fact that I can join groups of people with supplementary ideas to mine", "I like the fact that a new platform is being developed which will give me the opportunity to build and develop an idea faster and in a more collaborative way removing time and space barriers", "I like the interactive work between collaborators". Several teams (9 teams) like the fact that they may follow the collaborating partners on the screen, interact with them and follow their contributions: "The conferencing function in the etherpad is great". Moreover, they also like to see different partners contributing in different colors, the video feature. and the comment option: "The ability to comment is an excellent one particularly for everyone using social media...this makes the portal very engaging". Several educator teams indicated that they like the simplicity and clarity of the portal (16 teams: "It is kept very simple which it should"; "template is very clean, organized, with perfect navigation, distraction free", "the platform looks clean and not too crowded", "easy navigation with the three steps: search, create, repository", "the layout is nice, and I like the flat design", "easy overview", "easy navigation", etc. Different teams like different aspects and features of the idea collaboration team; a "lightweight" and "responsive" mobile template, WYSIWYG (What You See Is What You Get) editor with a lot of capabilities, the feature of showing the newest idea, the template to help in creating the idea, "the look and feel" that is "very modern", "serious and friendly", "pleasant" user experience, the idea of linking to OER, which is "nice, interesting, and useful", the entry page that is "well-structured and easy to create or search a new Idea".

Aspects to Improve: The educators trying the collaborating space for idea development also mentioned different aspects that they deemed should be improved. Some limitations that users expressed are related to the current initial stage of the portal development and will be eliminated in further stages, e.g., users indicated that the temporary warnings of the site with insecure content should be removed and asked for more features (3 teams) such as possibilities to connect MS Word, MS PPT documents, links to social media, etc. These features are planned to be added in further stages of project development. One educator team regretted that the space was not useful for creating MOOCs. Their remarks are very important in this initial phase of portal development as they provide clear directions for further development and validation of the collaboration space.

4.2 Design Principles

It is crucial that such new services for open education are designed to fit the needs and requirements of educators. For this purpose meta-designs and artifacts (Walls et al., 1992; Hevner et al., 2004) are important to extract fundamental and crucial components of these platforms. This observation emphasizes the need for key design principles for collaboration platforms in the context of open education. The key principles based on our current research are: This observation emphasizes the need for key design principles for powerful collaboration platforms in the context of open education. The key principles based on our current research are:

The need for simple tools: New tools for OER should have a simple layout and intuitive navigation. User experience on the system should match user experience on social networks and common websites, such as Google (Okada et al., 2013).

Diversify and adapt based on the user: When creating ideas and building those towards OER, the needs for the technology differ radically. It is important to make clusters of main user groups of the system and provide each with specialized contents, structures and support. The system needs to adapt and be responsive based on the information users have given about themselves.

Enable the creation of multiple types of outcomes and personalize based on those: Educators do not only create course materials from PDFs to PowerPoints, but they also would like to create MOOCs, e-Textbooks and educational software. Each of the outcomes generated have implications on the collaborative process and the structures and guidance the system should offer. Users expect such structures to be there automatically without spending a lot of time modifying the offered templates.

The use of a common terminology: New technologies and ways of working easily introduce new terms for users. This might raise confusion. Just a term OER can be confusing to a teacher, even if they are familiar what the practice and concept stands for. Therefore, it is important to introduce the terminologies used in such systems.

Enable the integration of social media tools and OER adaptation tools: Users expectations differ drastically when it comes to use of social media and Information and Communication Technology (ICT) in their collaborative efforts. It is important to design the platform similar to successful social media sites while adapting it specifically to educational collaborations. The further integration of tools should be at the hands of the user. Offering an API (Application Programming Interface) for educators is not enough. The tools should be easy to drag and drop to the collaboration space when there is need for such.

Provide simple user support regarding the stages of the collaboration: It is important to guide the educators during their usage of the platform. Next steps should be explained in advance by means of pop-up or tooltips. For instance, what happens when they start/stop collaboration, post an item, search for ideas, etc. Without structure, educators easily get lost when there is a new way for collaboration involved.

Version control: In collaborative work, it is essential to track changes. It is important to track what is changed, when, and by whom. Sometimes, it is helpful to go back to earlier versions of the original idea or its surrounding materials to verify that the development progress is going in the right direction (Whitehead Jr. and Wiggins, 1998).

Consider Intellectual Property Rights: Those rights are not only related to completed OER. The general question regarding the future of the idea: What happens if I want to take my idea away? Is it possible at all to delete it? Is it possible to delete my user? (Richter and Ehlers, 2011; Gray et al., 2008).

Support uploading different file formats to the ideas: Rich content formats are vital to build strong ideas. Textual descriptions and short comments are helpful, but other file formats make the idea richer. For instance, Excel, Word, PDF, PPT, video, audio, etc. Users are friends of desktop tools, therefore such tools need to support these desktop tools to survive.

Low on-boarding barriers: To attract educators to new platforms, it is important to keep the on-boarding efforts minimal. There are a plenty of existing educational tools, and educators do not want to learn yet another tool. Also, the structures and designs of new platforms should be comparable to the structures and designs of tool educators are used to. For instance, user profiles can be extended by importing user profiles from existing professional networks, e.g. LinkedIn, Xing, Research-Gate, etc.

Personalized recommendations and match-making: Give educators recommendations on similar ideas and further collaborators based on their interests. Extended user profiles can be used to achieve this goal. It is crucial to simplify the user experience and the effort / time educators need to use.

5 DISCUSSION

The validation results showed how educators are rather new to collaborative practices on OER. What needs to be discussed is the fact that many of the collaborations taken place in the online platform were initiated face-to-face by individuals who already know each other. Additionally, many collaborators who were active in the discussions face-to-face did not engage in online ones. While discussing the technical point of view for designing collaboration platforms for OER, the non-technical perspectives and soft issues will mostly define whether the tool will be used or not. It is especially important to reduce the amount of time educators need to use in getting familiar with the technology. Satisfying the needs for an efficient collaborative practice is important but also to place the platform in line with other successful technologies in the market. To strive towards this goal, the study at hand presented a validation of a collaborative platform for open education, leading to generalizable design principles that can be further applied by related initiatives and developers.

Our research has shown that educators and learners see the benefits for online collaboration on the idea-level, for instance, when new courses and educational offerings are being planned. Nevertheless, one of the challenges is the context of higher education where openness is not always a goal to strive towards. Universities have been developing their regular and online-courses individually. Learning content for specific courses is either developed by individual instructors or any collaboration is restricted to intra-university

communities and/or includes limited external contributors that form part of the instructor's academic acquaintances. Therefore, it is critical to the success of idea sharing in Open Education to (a) address the educators' lack of awareness of the advantages of collaborative idea generation, and (b) promote and empower a dedicated community of contributors.

This study contributes especially in understanding the requirements of educators and learners towards collaboration platforms in open education. Our research resulted in key design principles for powerful collaboration platforms in the context of open education. Part of these design principles, support main findings in existing research and emphasize them.

There is extensive research on the user's need for simple tools, in particular with regards to social networks and Web 2.0 applications (Crumlish and Malone, 2009). Our validation results support this argument and therefore, the new collaboration tools for OER should have a simple layout and intuitive navigation just like the common used websites (Okada et al., 2013). With the capabilities of rich Internet applications, complex user interfaces are now feasible over the web, such as Adobe Flash, Microsoft Silverlight, and JavaScript. However, it is a key for the success of collaborative platforms in open education, to keep these platforms as simple as possible. Such complex components should only be used if they bring a considerable value to the platform. Otherwise, they should better be avoided.

The platform should also enable the integration of social media tools and OER adaptation tools. User experience on the system should match user experience on social networks and common websites, such as Google (Okada et al., 2013). Moreover, our results showed that it is recommended to provide simple user support regarding the stages of the collaboration. It is worth mentioning that a reasonable level of user guidance and user support through online platforms should be provided. However, so much guidance might be overwhelming and therefore might have negative impact. Extensive user research is necessary to identify the right balance of user guidance ranging from no guidance at all to full user guidance.

The essential role of version control has been identified since the introduction of collaborative authoring on the Web (Whitehead Jr. and Wiggins, 1998). It supports the storage of important resource revisions for later retrieval. Version control can also support collaboration by allowing two or more authors to work on the same resource in parallel. Automatic versioning records successive modifications to a resource made by versioning-unaware clients (Whitehead Jr. and Wiggins, 1998). Our research has shown the importance of this core feature of online collaborative platforms in the context of open education.

Our findings reveal one of the main challenges in the context of Web 2.0 authorship, namely, Intellectual Property Rights (Gray et al., 2008). Although this issue is typically discussed with respect to completed resources in the context of Web 2.0, it is even more complicated in the context of open education, because it applies also to partially complete resources and even initial ideas. Therefore, establishing and enforcing standards for IPRs is a key element towards the success of collaboration in open education.

In addition to the aforementioned design principles, which appear in existing literatures, our research reveals another set of design principles. These include: (1) Enable the creation of multiple types of outcomes and personalize based on those, which could be done by providing ready-to-use templates for different types of expected outcomes, such as textbooks, courses, or educational software. (2) The use of a common terminology and introduce this terminology in the system. (3) Support uploading different file formats to the ideas. (4) Low on-boarding barriers, and (5) Personalized recommendations and matchmaking. These newly identified design principles as well as the previously identified ones should be considered for upcoming collaboration platforms for open education.

6 CONCLUSIONS & FUTURE WORK

This article describes the findings of the preliminary validation of a collaboration platform for open education. The focus was especially in collaborative idea generation that leads to the production of OER. Such platforms were not considered for open education before this. Additionally, collaborative practices in open education are usually not handled in online contexts. There is a need to develop collaboration platforms in open education further. Within the discourse of the researchers as well as the developers in our project, the following issues were seen critical: The need for simple tools, diversify and adapt based on the user, enable the creation of multiple types of outcomes and personalize based on those, the use of a common terminology, enable the integration of social media

tools and OER adaptation tools, provide simple user support regarding the further stages, version control, consider IPRs, support uploading different file formats to the ideas, low on-boarding efforts, and personalized recommendations and match-making.

The online collaboration idea generation platform should accommodate a collaborative community, encouraging members to externalize and extend their ideas in a collaborative fashion. Action is needed in order to tackle any motivational barriers towards collaboration and exchange and to encourage educators to leverage the internet and online social collaboration media to collaboratively and openly develop educational ideas into educational resources. Yet, while there is a proliferation of online collaboration tools, a platform whose scope is limited to facilitating collaboration would not add value to content creation. Instead, a collaboration platform for open education should aim at supporting the development process from a methodological point of view, including the accommodation of different content types. Adopting a rigid process flow would reduce the platform's applicability, while opting for a free-flow approach could limit its sense of purpose.

In this context, an attribute of paramount importance to collaborative idea development is workflow flexibility, since there cannot be a standard work process for learning content development, consisting of fixed work stages. Indeed, standard university courses build on structured workflows, while the design of complex learning objects (e.g., educational games) poses different requirements and calls for more versatile (less-structured) approaches. Consequently, each idea development project has its unique characteristics. Therefore, one important step towards enhancing the usability of the platform is the provision of customized idea templates. By selecting a predefined idea template, the idea schema is created using a specific format that applies to the respective educational resource, for educators to collaboratively fill out and extend.

The platform should support the discoverability of shared ideas, providing universal access to such resources. The issue of sustainability is also imperative to be addressed. A shared idea may inspire one or more idea development projects yielding an equal number of open educational resources. Sustainability refers to the idea development project's ongoing ability to meet its goals. This calls for a systematic approach in the idea development process: Transparency and methods for documenting and maintaining control over individual contributions, document versions, etc. are required. Contributors should be able to revisit and rework the idea development project, in order to adapt it to changing requirements.

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REFERENCES

AbuJarour, S., Bick, M., Pawlowski, J., Volungeviciene, A., Trepule, E., Bagucanskyte, M., Pirkkalainen, H., Ehlers, U.-D., Hudak, R., Makropoulos, C., Pappa, D., Pitsilis, V., Vidalis, A., and Tannhauser, A.-C. (2014). Enhancing the Experience of Online Users of Open Education. In *International Conference on Web and Open Access to Learning (ICWOAL)*, pages 1–6.

Atkins, D. E., Brown, J. S., and Hammond, A. L. (2007). *A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities*. Creative common.

Björnberg, Å. and Nicholson, N. (2012). Emotional Ownership: The Next Generation's Relationship with the Family Firm. *Family Business Review*.

Chaturvedi, A. R., Dolk, D. R., and Drnevich, P. L. (2011). Design Principles for Virtual Worlds. *MIS Quarterly*, 35(3):673–684.

Chen, Q. (2010). Use of Open Educational Resources: Challenges and Strategies. In *Hybrid Learning*, pages 339–351. Springer.

Crumlish, C. and Malone, E. (2009). *Designing social interfaces: Principles, patterns, and practices for improving the user experience*. O'Reilly Media, Inc.

D'Antoni, S. (2009). Open Educational Resources: Reviewing Initiatives and Issues. *Open Learning: The Journal of Open, Distance and e-Learning*, 24(1).

Davis, H. C., Carr, L., Hey, J. M., Howard, Y., Millard, D., Morris, D., and White, S. (2010). Bootstrapping a Culture of Sharing to Facilitate Open Educational Resources. *IEEE Transactions on Learning Technologies*, 3(2):96–109.

Downes, S. (2007). Models for sustainable open educational resources.

Dron, J. (2007). Design Principles for Social Software in E-Learning. *Control and Constraint in E-Learning: Choosing When to Choose*, pages 248–270.

Educause (2013). Adopting OER: A Case Study of Cross-Institutional Collaboration and Innovation.

for Educational Research, C. and Innovation (2007). *Giving knowledge for free: The emergence of open educational resources.* Organisation for Economic Co-operation and Development.

Gray, K., Thompson, C., Clerehan, R., Sheard, J., and Hamilton, M. (2008). Web 2.0 authorship: Issues of Referencing and Citation for Academic Integrity. *The Internet and Higher Education*, 11(2):112–118.

Ha, K.-H., Niemann, K., Schwertel, U., Holtkamp, P., Pirkkalainen, H., Boerner, D., Kalz, M., Pitsilis, V., Vidalis, A., Pappa, D., et al. (2011). A novel approach towards skill-based search and services of Open Educational Resources. In *Metadata and Semantic Research*, pages 312–323. Springer.

Hatakka, M. (2009). Build It and They Will Come?–Inhibiting Factors for Reuse of Open Content in Developing Countries. *The Electronic Journal of Information Systems in Developing Countries*, 37.

Hevner, A. R., March, S. T., Park, J., and Ram, S. (2004). Design Science in Information Systems Research. *MIS Q.*, 28(1):75–105.

Hylén, J. (2006). Open Educational Resources: Opportunities and Challenges. *Proceedings of Open Education*, pages 49–63.

Iivari, J. (2014). Distinguishing and contrasting two strategies for design science research. *European Journal of Information Systems*, 24(1):107–115.

Jones, P. and Jordan, J. (1998). Knowledge Orientations and Team Effectiveness. *International Journal of Technology Management*, 16(1):152–161.

Kollock, P. (1998). Design principles for online communities.

Lai, H.-M. and Chen, C.-P. (2011). Factors influencing secondary school teachers' adoption of teaching blogs. *Computers & Education*, 56(4):948–960.

McCall, M. and Bobko, P. (1990). Research methods in the service of discovery. *Handbook of industrial and organizational psychology*, 1:381–418.

Mueller, D. and Strohmeier, S. (2011). Design characteristics of virtual learning environments: state of research. *Computers & Education*, 57(4):2505–2516.

Noll, J., Beecham, S., and Richardson, I. (2010). Global software development and collaboration: barriers and solutions. *ACM Inroads*, 1(3):66–78.

Ochoa, X. and Duval, E. (2009). Quantitative Analysis of Learning Object Repositories. *IEEE Transactions on Learning Technologies*, 2(3):226–238.

Okada, A., Meister, I., Mikroyannidis, A., and Little, S. (2013). "Colearning"–Collaborative Open Learning through OER and Social Media. *Okada, Alexandra ed. Open Educational Resources and Social Networks*.

Pallot, M., Martínez-Carreras, M. A., and Prinz, W. (2010). Collaborative distance: A framework for distance factors affecting the performance of distributed collaboration. *International Journal of e-Collaboration*, 6(2):1–32.

Pawlowski, J. (2012). Emotional ownership as the key to OER adoption: From sharing products and resources to sharing ideas and commitment across borders. In *EFQUEL Innovation Forum*.

Pirkkalainen, H. and Pawlowski, J. (2014). Collaborating on ideas: Tackling Barriers to Open Education. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2014*, pages 1844–1852, Tampere, Finland. Association for the Advancement of Computing in Education (AACE).

Richter, T. and Ehlers, U. (2011). Barriers and Motivators for Using Open Educational Resources in Schools. eLearning Papers.

Roberts, J. A., Hann, I.-H., and Slaughter, S. A. (2006). Understanding the motivations, participation, and performance of open source software developers: A longitudinal study of the Apache projects. *Management science*, 52(7):984–999.

Sapire, I. and Reed, Y. (2011). Collaborative Design and Use of Open Educational Resources: A Case Study of a Mathematics Teacher Education Project in South Africa. *Distance Education*, 32(2):195–211.

Tabuenca, B., Drachsler, H., Ternier, S., and Specht, M. (2012). OER in the mobile era: Content repositories' features for mobile devices and future trends.

Treviranus, J. (2010). The Value of Imperfection: the Wabi-Sabi Principle in Aesthetics and Learning. In *Proceedings of Open Ed 2010*, Barcelona. United Nations.

UNESCO (2002). Forum on the Impact of Open Courseware for Higher Education in Developing Countries. UNESCO.

Walls, J. G., Widmeyer, G. R., and El Sawy, O. A. (1992). Building an information system design theory for vigilant eis. *Information systems research*, 3(1):36–59.

Wever, B. D., Mechant, P., Veevaete, P., and Hauttekeete, L. (2007). E-learning 2.0: social software for educational use. In *Ninth IEEE International Symposium on Multimedia Workshops, 2007.*, pages 511–516. IEEE.

Whitehead Jr., E. and Wiggins, M. (1998). WebDAV: IEFT standard for collaborative authoring on the Web. *Internet Computing, IEEE*, 2(5):34–40.