

Understanding Social OER Environments—A Quantitative Study on Factors Influencing the Motivation to Share and Collaborate

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Abstract—Social software environments are increasingly used for open education: teachers and learners share and collaborate in these environments. While there are various possibilities for the inclusion of such social functionalities for OER, many organizational, individual and technological challenges can hinder the motivation of teachers to share and collaborate in these environments. Current research cannot explain what barriers teachers face in social OER environments and how those challenges influence their motivation to engage in such environments. An exploratory factor analysis was used in the context of schools and higher education institutions to investigate the possible barriers to engaging in social OER environments; a linear regression analysis was used to predict how the extracted factors influenced the motivation of teachers ($N = 754$) to share and collaborate. The findings allude to barriers within social OER environments; the main challenges relate to the lack of organizational support, language and culture as well as quality concerns. The key results depict how teachers' motivation to share and collaborate in these environments decreases when they perceive higher language and cultural barriers. These findings can support OER providers as well as educational institutions in their efforts to minimize those barriers.

Index Terms—Social technologies, knowledge management, knowledge sharing, user generated learning content

1 INTRODUCTION

ADOPTION of open educational resources (OER) and related services and practices has emerged as an important topic in distance education. Nowadays, several educational institutions and organizations provide their learning materials freely online. One of the most recognized examples is MIT Open Courseware [1], which offers all educational materials as OER, including clear conditions of intellectual property rights (IPR), by attaching licensing information to each resource. Several OER researchers have recognized the lack of sustainability of existing OER projects that do not seem to result in active participation and usage of their environments [2], [3], [4]. On the other hand, Ochoa and Duval [5] pointed to exceptions of a few OER repositories that have showed exponential growth over time. Still, there is a high interest in research on why educators and providers struggle with OER.

OER has been discussed as an efficient mechanism to complement other types of learning materials and to make education more transparent [2], [6]. Focus points for increasing the adoption of OER have varied in the existing literature. One focus area concerns identifying and overcoming barriers that hinder or negatively influence OER usage for educational purposes [2], [4], [6], [7], [8], [9]. The focus has often been on reaching sustainable initiatives and business models for OER [2], [4], [9]. As indicated by previous

studies, the successful adoption and usage of OER is influenced by several factors. Some key aspects relate to the practices of educational institutions [2], [4], [7], the technological readiness of the institutions [2], [7], [9], awareness of OER and its purpose [2], [7], and knowledge of how to find good quality OER [8], [9], [10]. Finally, it has much to do with users and their willingness to use such offerings. Arguably, one of the main drivers of OER is the motivation to share [4], [6], [9]. Agarwal et al. [11] elaborated on how teacher/student sharing practices often failed because of lack of motivation.

The motivation or willingness to share knowledge has been extensively discussed outside the OER context, especially in organizational knowledge management [12], [13] and on user-generated content in Wikipedia [14], [15]. Some of the key motivators in organizational knowledge sharing are reciprocity, incentives as well as contributing to the success of the team and organization [12]. In terms of user-generated content, contributors to Wikipedia are rarely compensated; a belief in their own abilities as well as the satisfaction they receive from their contributions are key motivators [14]. Based on a survey by Nov [15], Wikipedians share because contributing to Wikipedia is fun, and respondents feel that information should be free. While the factor of openness is the same as in OER, it is important to recognize what makes the OER context distinguishable, that is, the community-orientation instead of the organizational view. Additionally, the artefacts that teachers share are their own ideas, lesson plans and learning materials that many teachers do not want to expose to public [7].

It is important to point to the strong connection or interrelation between versatile barriers and motivation or willingness to share. As shown by Agarwal et al. [11], many

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organizational (e.g., the need for rewards and acknowledgements) and individual barriers (e.g., lack of trust) influence teachers' motivation to share information. Therefore, overcoming a particular barrier is likely to positively influence other related challenges.

As the usage of social networking and media sharing services have rapidly increased in popularity in recent years, the educational domain and OER movement have, in turn, reacted to these developments. Existing studies have clarified opportunities to support pedagogy and facilitate teaching through different types of social software services [16], [17], [19]. However, current OER-related studies do not specifically address the implications of social and collaborative services for OER environments. Many initiatives and OER providers have now moved from the provision of basic repository functions to the inclusion of social and collaborative services around resources [19], [20], [21]. This approach sees teachers and educators as the key users of the services. Another difference with traditional OER repositories is that these social OER environments allow educators to prepare their courses, re-use, adapt and collaboratively work to prepare their teaching resources, the focus being, therefore, on the preparation of learning materials as well as sharing best practices with other educators. Sharing and collaborating over distance can give rise to multiple challenges. Noll et al. [22] and Pallot et al. [23] showed that cultural and language distances are some of the key barriers to distributed collaboration. In social environments, there is also a strong risk that only a few people will contribute, while the majority remains as passive consumers [24]. As many initiatives and OER environments have now established this connection, to provide social functionalities around the resources, possible emerging challenges must be understood in order to avoid unnecessary pitfalls and to find ways of overcoming such challenges. Current barrier-related studies conducted for OER can inform providers, educational institutions and, most importantly, educators on the challenges of OER in general. However, those studies cannot indicate how social functionalities are perceived and which factors influence the motivation of teachers to share and collaborate in these social OER environments.

We have addressed this key issue for OER adoption by analyzing the types of factors that influence motivation in social OER environments. We address this by means of exploratory research in the form of a survey ($N = 754$). Our focus is on teachers in schools and in higher education as these institutions are the main users of OER. This study allows us to contribute to the existing OER literature by defining the key challenges for engaging stakeholders in social OER environments. Specifically, the exploratory factor analysis and linear regression allow us to extend the existing body of knowledge with new factors that determine the impact of those key challenges. Most importantly, our contribution enables an indication of the barriers that can predict motivation. Such knowledge is necessary for both providers and adopter organizations to attract and support OER adoption.

The paper is organized as follows. In the next section, we describe the theoretical background of the topic, and

the subsequent section describes the methodology of the study. After this, the key results of the exploratory study are presented. The paper concludes by discussing the implications of the results for both theory and practice.

2 BARRIERS TO OER

2.1 OER Usage and Adoption

Studying barriers to and opportunities within OER was recognized in research on distance education after the UNESCO Declaration on OER in 2002. OER was described by UNESCO [25] as "technology enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes". Resources for open education could therefore be in any study subject, educational level/context and appear in any format. Barriers to OER have been a subject of study, which aims to understand and find ways of overcoming challenges that may hinder OER adoption. Existing research has approached the classification of OER barriers according to specific areas of focus. Chen [2] categorized OER barriers on the basis of availability and interoperability, awareness and promotion mechanisms, and fitness of the resources to curriculum. Hatakka [7] focused on factors that inhibit content developers from re-using existing resources instead of creating new ones from scratch. The qualitative analysis of Hatakka [7] found a variety of challenges, e.g., educational rules, language issues, relevance of materials, access, and technical issues.

OER studies that focus on barriers have also been conducted at different levels of education. One of the focus sectors has been universities and institutions of higher education [26], with further focus on the management domain [19]. Similar studies have been conducted to explore social practice barriers to OER [8]. Richter and Ehlers [8] showed that teachers often lacked proper support and equipment; there were also limitations in an awareness of ways of adapting resources for one's own purposes. Additional approaches have emerged to extend OER to industry and the corporate world [27]. Notwithstanding, within the current study, the focus is especially on the school and university context with teachers as the adopters of the environments.

As existing barrier studies on OER concentrate on ways of improving stakeholder engagement and active participation in available OER environments, ways of fostering change must be identified. One of the key aspects for OER appears to be motivation or willingness to share information as well as aspects that influence the motivation to share [6], [7]. According to OECD research [6], the motives for sharing might be varied, ranging from altruistic to personal reputational gain, publicity, and so on. These factors seem to differ from other contexts. Nov's [15] study on Wikipedia saw career advancement and networking as less important for Wikipedians. Vuori and Okkonen [12] summarized key motivational factors from studies on organizational knowledge sharing and stated that contributing to organization's success, incentives, reputation gain and reciprocity are some of the most important to enhance knowledge sharing. Hendriks [28] argued that personal ambition has to match the group

TABLE 1
Barriers to OER Adoption and Use Reported in the Literature

<i>Lack of motivation to share resources or information around those resources [11]</i>
<i>Lack of resources for sustaining services, content and infrastructures [31]</i>
<i>Lack of time for production and localization of OER [7]</i>
<i>For sharing OER, Need for Rewards and Acknowledgement [11]</i>
<i>Hard to find suitable material—where to look from [7]</i>
<i>Lack of contextual information for the resources—how can be used or modified [26]</i>
<i>Open content do not fit the scope of the course/Curriculum [2]</i>
<i>Lack of training how to apply and re-use resources [7]</i>
<i>Lacks policy support from the institutional level [2]</i>
<i>Lack of trust towards unknown authors or systems where resources retrieved from [7]</i>
<i>“Not invented here” notion. Hesitation to receiving knowledge someone else has created [7]</i>
<i>Language of the resources [26]</i>
<i>Lack of support from top management and IT practice for using and producing OER [32]</i>
<i>Hard to assess the quality and relevance [9], [31]</i>
<i>Unclear Intellectual property rights (IPR) and copyrights [9], [26]</i>

ambition for organizational knowledge sharing to succeed. Studies on non-governmental organizations (NGOs) have shown that cohesive groups, high interpersonal trust and strong internal motivation are strong predictors to active knowledge sharing between the members of the organization [29]. Comparing the contexts between each other, knowledge sharing in OER environments, similarly to Wikipedia, can be distinguished from organizational knowledge sharing by the lacking goal-orientation and organizational commitment. In organizational knowledge management, shared goals and reciprocity or peer support with closely working colleagues are key motivators in the sharing of knowledge [12]. Similarly, NGOs strive towards common goals [30] and deal with internal knowledge flows between workers. OER environments often are community-oriented [19], [21] and in theory, enable intra-organizational formation of groups. However, such restricted sharing of good practices and materials is not typical usage of the environments that strive for openness [19]. Similar to Wikipedia, OER aims towards access for wider communities but does differ from Wikipedia by different motivators as explained previously as well as the types of contributions that are expected from the users. While users of Wikipedia contribute with their knowledge on entries rather anonymously to wider public [15], users (mostly teachers) of OER environments share their own teaching materials and practices so that the contributor is visible for the visitors [21].

As OER research is still in its embryonic phase, the existing research cannot yet explain which barriers are most likely to occur in a given context or how they might influence motivation. Notwithstanding, the available literature can inform us well on the basic challenges surrounding OER and some of the aspects that might explain the lack of

motivation. Table 1 summarizes some of the basic challenges according to the OER literature.

In this paper, our focus is on social OER environments. As these environments are based on well-established functions and concepts in the social software and knowledge sharing literature, it is important to clarify the implications to our study.

2.2 Implications of Social Software and Knowledge Sharing

The rapid adoption of social software services has led to increasing interest from OER providers towards collaborative environments with knowledge sharing possibilities. In this paper, we address the connection between social software and OER repositories. This connection is established by recent OER providers [19], [21] but has not been properly addressed in research. Such environments provide social functionalities to share OER within an online community and to discuss and collaborate with peers within the portal or platform. These functionalities have various purposes, e.g., to support user communication, group building, cohesion, and networking, all of which are key components of social software as presented by Wever et al. [33]. Social software can be described as a set of tools that enable interactive collaboration, managing content and networking with others [33]. While exposure to social functionalities and services around OER can lead to many benefits, our focus is to understand the barriers that hinder the adoption of such social OER environments.

There are many possible barriers to using social software, such as technical aspects for security and privacy [34], [35], [36], and lack of interoperability between systems [35], [36]. One of the most critical barriers to overcome is the lack of understanding of the possibilities of the tool itself [34], [37], [38]. The analysis of these social environments is based on knowledge sharing activities for various application areas that have been discussed in the literature in recent years. Agarwal et al. [11] found that culture can play a crucial role in the knowledge sharing activities of teachers and students. As reported by Riege [39], there are various other challenges related to knowledge sharing. Those can relate to individual, organizational as well as technological aspects, for example, how to reward contributions [39], [40] and the lack of opportunities for sharing in terms of availability and allocation of time or established physical and online networks for sharing [39], [40]. One of the crucial issues for knowledge sharing is the lack of motivation to share information [11], [40], which is also the focus of this study.

Studies on specific social software services have been investigating what aspects influence the motivation of users to participate and share. Such influencing factors seem versatile and context specific. As explained by Dimicco et al. [41] in the context of social networking within IBM, key motivations to participate include career advancement, building new relations and campaigning for projects. It is crucial to point out that motivational factors are closely related to behavioral intention when a user intends to take an action [42]. Kalb et al. [43] indicated in the context of higher education that various aspects influence researchers' intentions to share OER on

TABLE 2
Barriers to the Adoption and Use of Social Software/Knowledge Sharing Reported in the Literature

<i>Management does not give or allocate sufficient amount of support</i> [24], [39]
<i>Alternative technologies harder the adoption choice</i> [39]
<i>Security and privacy concerns</i> [34], [36]
<i>Lack of training for the technology</i> [39]
<i>Lack of motivation to share information</i> [11], [40]
<i>Lack of collaboration incentive</i> [23], [24], [46]
<i>Behavioral intention / how much would I benefit from using the system</i> [34]
<i>Differences in experience levels</i> [39]
<i>Lack of common ways for the usage of the technology</i> [23]
<i>Cultural distance in differing values, perceptions, viewpoints and practices</i> [22], [24]
<i>Different preferences in working styles</i> [47]
<i>Language distance and differences</i> [22], [23]
<i>Difficulties to receive or transfer knowledge from and to others</i> [24], [39], [40]
<i>Geographical/temporal distance in distributed collaboration</i> [22], [23]
<i>Lack of compatibility between diverse IT systems and processes</i> [39], [46]
<i>Lack of understanding of the possibilities of the tool itself</i> [24], [34], [37], [38]
<i>Existing relationships preferred</i> [48]

social networking services. Expected reputational gain, anticipated reciprocal relationships, and support from top management were the most important factors. The study of Paroutis and Al Saleh [44] on employee's participation in social media showed that expected benefits as well as perceived support from colleagues and the organization affect knowledge sharing positively. In relation to using Twitter in informal communication at work, Zhao and Rosson [45] reported that keeping in touch with friends and colleagues, raising visibility, increasing one's own professional competences, seeking support and releasing emotional stress were the key motivations. As elaborated within the theoretical background, the key influencing factors for increased motivation do have similarities in heterogeneous contexts and for different social software tools. However, the context of OER seems to differ from the others inspected not only because of the artefacts being shared but also in terms of the context and modes of collaboration that lack the organizational goal orientation and reciprocity. Thus, the key motivations to share and collaborate in the context of social OER environments require further investigations. Table 2 highlights some of the key barriers to social software and online knowledge sharing in general.

As elaborated by Riege [39], while barriers are discussed separately in the literature, it is highly likely that combinations of barriers are present in organizations as well as in real life contexts. Such knowledge is not available for social OER environments or knowledge sharing in general. As elaborated previously, OER sharing practices often fail

because of lack of motivation. In our study, the focus is to see which of the barriers can engender lack of motivation to share and collaborate in social OER environments.

3 METHODOLOGY

As previously elaborated, motivation is widely researched in the field of social software; however, there is a gap in the literature on key factors that influence the lack of motivation to engage with OER and especially social OER environments. In order to analyze how the barriers to social OER environments influence teachers' lack of motivation to share and collaborate in such environments, a large-scale study was conducted with teachers across Europe. Utilizing a survey, the study sought to understand which barriers negatively affected the usage of social OER environments. The study first identified the possible barriers; by incorporating barriers that describe the lack of motivation, the analysis allowed an inspection of which aspects included in our study could explain higher or lower levels of motivation in teachers. The methodology and research design were based on design science research (DSR) [49]. Following the DSR process for design and development [49], this problem-centered study is part of a design effort in the new social OER environment. This paper only describes the factors influencing motivation, not the design of social OER environments.

The research effort can be divided into three main parts:

- 1) The exploratory inquiry was first set to operationalize the survey to be used in the data collection, and the selection of barriers needed to be justified for social OER environments. As the barriers for such environments are not addressed in the OER and social software and knowledge sharing literature, a focus group approach with OER experts was chosen to refine and enrich the potential barriers identified from the literature (Tables 1 and 2). Items describing lack of motivation were also operationalized.
- 2) Data collection was conducted in OER workshops in 19 European countries.
- 3) Data analysis defining how barriers to social OER environments can influence lack of motivation in teachers to share and collaborate.

The details of the methodology are clarified in the next sections.

3.1 Operationalization

As expressed in the theoretical background, the number of potential factors influencing the usage of social software supported OER environments can be rather comprehensive. For the purpose of this study, the selection of barriers needed to be very specific as teachers could not remain engaged throughout a large and time-consuming taxonomy. In order to select most of the promising barriers for this study, the challenges presented in Tables 1 and 2 were used as a basis of the discussion to then eliminate irrelevant barriers by a group of experts. Such an approach helped us understand which of the barriers could become relevant in social OER environments and eventually be used in our study.

TABLE 3
Barriers Included in the Study

Barrier	Reference
<i>Do not have enough time to use digital educational resources</i>	Adapted from Humbert et al. [32]
<i>Lack of training on how to use digital educational resources for my work</i>	Adapted from Hatakka [7] towards use of OER in work
<i>Lack of reward for the efforts made (e.g., not getting paid extra to prepare digital educational resources)</i>	Adapted from Agarwal et al. [11] with clearer focus on steps to prepare OER for lessons
<i>Lack of support within my own organization on how to use digital educational resources</i>	Adapted from Humbert et al. [32]
<i>Difficult to find relevant digital educational resources for my purpose</i>	Adapted from Hatakka [7]
<i>Hard to judge the quality of digital educational resources without spending time evaluating them</i>	Adapted from Hylén [9]
<i>Hard to judge the quality of tools and services (around digital educational resources) which I'm unfamiliar with</i>	A new barrier identified in the session to describe quality of services and tools that are essential components of OER social software
<i>Digital educational resources should be available in my own native language</i>	Adapted from Hatakka [7] with clear indication for native language
<i>Language is the key". I only want to contribute to online communication/collaboration when my own native language is used</i>	A new barrier for OER identified in the session based on language distance barrier [22] and multi-lingual setting being a source of misunderstanding in distributed collaboration [23]
<i>Challenging to apply digital educational resources which are culturally distant (values, symbols, beliefs etc.) from my own</i>	Partly new barrier that was discussed in the sessions and adapted from Richter [50] and Hatakka [7] to the extent that culturally distant resources are harder to handle in adaptation process
<i>Impact of cultural and geographical distance—Lack of trust towards authors of digital educational resources</i>	Adapted from Pallot et al. [23] for <i>lack of interpersonal awareness creating distance</i> , from Hatakka [7]: <i>lack of trust for OER in terms where they get it from</i>
<i>Lack of common practice—People are not accustomed to use and share digital educational resources within my organization</i>	Partly new barrier adapted from <i>lack of policy</i> [2], <i>missing culture of practice</i> [8] and <i>lack of university rules and regulations for OER</i> [7]
<i>Digital educational resources do not give enough information on the context where it is / was created and used</i>	Adapted from Davis et al. [26] with clearer differentiation of the origin and the actual usage
<i>I feel reluctant to use the digital educational resource if there is license or copyright information attached to it</i>	Adapted from Hylén [9] with stronger emphasis on reluctance to use such resources
<i>Matching digital educational resources to own curriculum is extremely demanding</i>	Davis et al. [26]

In order to enrich and specify the barriers to social OER environments, a group of experts was addressed in a focus group session co-located at the Open Discovery Space project meeting in Athens in the spring of 2012. This focus group session served as the pre-phase and orientation for the study. The experts were from Open Discovery Space—consisting of project management and work package lead. All 26 participants had previous experience with OER, including development projects, working as consultants or educators. During the session, each barrier from Tables 1 and 2 was discussed, and potential related challenges were identified by the experts. The discussion was focused especially on the social component of OER environments to consider potential challenges not covered in the existing OER literature. The discussion was recorded and analyzed for the selection of barriers for the study and for the discovery of potential new barriers. The final selection of barriers for the exploratory study was determined on the likelihood that it would be relevant for social OER environments and for the teacher community.

Since the possible challenges of using social OER environments is not fully explained in the existing OER literature, the possible challenges related to knowledge sharing and usage of social software were included in the focus group discussion. Each identified item was formulated as a barrier addressing the usage of social OER environments. The barriers in Table 3 were selected for the study to measure how teachers perceived them and to the extent they could predict their motivation to share and collaborate. As presented in the table, many of the existing barriers were adapted from the expert discussions in order to focus the study at hand. Additionally, two new and two partially new barriers were identified during these expert discussions. The new barriers indicated that assessing the quality of services and tools around OER might be challenging and that contributing to online communication and collaboration might only be suitable when one's own native language is used. The partially new barriers related to applying culturally distant OERs as well as organizations lacking a common practice for using and sharing OER. Each barrier was noted down, as per the discussions, and cross-referenced

against the existing literature on OER, social software and knowledge sharing. The closely related challenges from the literature are presented in Table 3 alongside the newly identified ones.

As the main interest of the study was the lack of motivation towards sharing and collaborating in social OER environments, the decision was taken to use two Likert-scale items to describe lack of motivation. The first item was “*I lack the motivation to share my own digital educational resources*” [11]. It was selected as it provided an understanding of the sharing barrier rooted in the OER literature. Since the existing research does not provide barriers that address the social interaction aspect of OER, which goes beyond sharing, a barrier was formulated on the basis of the existing challenges of *lack of collaboration incentive* [22] and *lack of motivation to contribute/what’s in it for me* [51] as the second item: “*I lack the motivation to contribute to discussions around digital educational resources*”. Both items were included in the survey in addition to the previously presented barriers.

Finally, we needed information on the level of maturity and experience of respondents and their organizations in terms of information and communications technology (ICT) usage in general. This information also helped us to understand whether more experienced teachers and organizations were more motivated. The ICT maturity of an organization was operationalized as a Likert-scale of five variables. The items were adapted from items created from the project activities of the Discover the Cosmos project [52]. These items were originally applied from the VALNET validation framework, which served to facilitate knowledge about innovation in schools [53]. Those variables were “The Internet is commonly used as a source for learning resources throughout my school”; “I integrate ICT to provide learning opportunities in my classes”; “My students use ICT to collaborate and develop knowledge on curriculum activities”; “eLearning and ICT are used to promote learning in my school on campus”; and “eLearning and ICT techniques are used to promote learning in my school off campus”.

3.2 Data Collection

The focus of this enquiry was on teachers in primary, secondary and higher education. The data collection was conducted within Open Discovery Space—project engagement activities with schools. Open Discovery Space [21] is an EU-funded FP7 project that builds a federation from existing learning object repositories and provides a social online environment around the resources. The research effort is part of the design process of the upcoming social OER environment relating to the requirements analysis of the constructive effort.

Within these engagement activities, a total of 92 workshops were organized in 19 countries where approximately 2,300 stakeholders participated. Each country is expected to run a series of workshops during 2012-2014 with schools adopting and learning to adopt OER. This step was conducted for the initial engagement activity—introducing social OER environments to schools. Our focus was especially on teachers, but students could also attend. Additionally, teachers from several universities took part in the sessions. Four of the workshops were organized online; the

remainder were face-to-face sessions organized by local partners. Each workshop followed the same structure:

- 1) Participants were introduced to OER
- 2) Participants were introduced to the aims and services of Open Discovery Space
- 3) Good practices and sample cases of OER usage in their curriculum areas were presented
- 4) The main needs, limitations and barriers for making use of the resources in school practice were discussed
- 5) A survey of participants’ views was collected.

The intention of the survey was to explore various aspects around possibilities of and barriers to OER in the school context. While the scope of the survey went beyond this study, our focus here was only on the quantitative aspect of the barriers. As the social software of Open Discovery Space would be designed and developed according to the needs and requirements of the participants, a selection had to be made on the environments to be presented during the sessions. Each workshop presented one or more OER environments that focused on the curriculum areas or topics of the participants. As the intention was to explore the needs and limitations of collaborative and social functionalities, the selection of environments favored those with such functionalities. The most common OER environments demonstrated within the workshops included:

- OpenScout¹—OER for business and management
- OSR²—Open science resources
- Discover the Cosmos³—Astronomy resources
- Photodentro⁴—Greek Digital Learning Object Repository

A total of 1,175 individuals from 19 European countries returned the questionnaire. The respondents were mainly teachers in primary, secondary and higher education. Additionally, a number of students and policymakers responded to our survey. For the purposes of our analysis, we only included the responses from teachers, which resulted in $N = 754$ responses. The mean age of the respondents was 39.8 years ($SD = 10.00$), and 70 percent of them were female. The missing data patterns were analyzed, and multiple imputation was used to replace the missing data.

3.3 Data Analysis

The main variables used in the analysis were the five items on the scale of organizational ICT maturity, two items on the lack of motivation towards online collaboration, and the 13 barriers. Missing values were imputed for these data. The scale for organizational ICT maturity was calculated as the average of its five items, and the lack of motivation towards online collaboration as the average of its two items.

In order to construct latent variables to represent barriers to social OER environments, an exploratory factor analysis (principal axis factoring) was performed. The correlation of the extracted factors was permitted by using the promax rotation. The Kaiser-Meyer-Olkin measure of sampling adequacy greater than 0.600 and a statistically significant

1. <http://learn.openscout.net>.
2. <http://www.osrportal.eu>.
3. <http://www.cosmosportal.eu>.
4. <http://photodentro.edu.gr/jsptui/>.

TABLE 4
Factor Loadings for Exploratory Factor Analysis of the Barriers

Barriers for sharing and collaborating in social OER environments	Factor		
	1	2	3
Lack of support within my own organization on how to use digital educational resources	0.82	-0.08	-0.13
Lack of training on how to use digital educational resources for my work	0.63	-0.02	0.15
Lack of common practice—People are not accustomed to use and share digital educational resources within my organization	0.57	0.09	-0.03
Do not have enough time to use digital educational resources	0.55	-0.02	0.09
Lack of reward for the efforts made (e.g., not getting paid extra to prepare digital educational resources)	0.39	0.08	0.09
“Language is the key”. I only want to contribute to online communication/collaboration when my own native language is used	0.06	0.71	-0.19
Digital educational resources should be available in my own native language	0.11	0.58	-0.02
Challenging to apply digital educational resources which are culturally distant (values, symbols, beliefs etc.) from my own.	-0.13	0.68	0.02
Impact of cultural and geographical distance—Lack of trust towards authors of digital educational resources	-0.05	0.54	0.18
Digital educational resources do not give enough information on the context where it is / was created and used	0.12	0.39	0.12
Hard to judge the quality of digital educational resources without spending time evaluating them	-0.07	-0.05	0.92
Hard to judge the quality of tools and services (around digital educational resources) which I’m unfamiliar with	0.07	-0.01	0.67
Difficult to find relevant digital educational resources for my purpose	0.28	0.09	0.40

Note. $N = 744$. Highest factor loading is in boldface.

Bartlett’s test of sphericity were expected to suggest that the factoring of the barriers would be possible. We tested different extraction and rotation methods to confirm the robustness of the resulting factor structure. The latent barrier variables revealed by the exploratory factor analysis were calculated as the mean of the variables, which were chosen for their factor loadings and contextual similarities. Cronbach’s alphas were calculated to confirm the internal consistency of the scales. In addition to alphas, we reported the factor score covariances of the factors (true reliability). In constructing the summated scales, averages were used instead of factor scores because the study was exploratory and we wanted to retain the original scale of one to five.

To predict the lack of motivation towards sharing and collaboration, we constructed two linear regression models. The first model included the control variables, which were the age and gender of the respondents, and the ICT maturity of the organizations. At this point, the model included 730 responses due to missing values, which could not be imputed. The second model included the sum variables representing the latent factors of the barriers towards increasing adoption of social OER environments.

The results of our inspection are presented in the following sections.

4 RESULTS

4.1 Factor Analysis of OER Barriers

The Kaiser-Meyer-Olkin measure of sampling adequacy for the OER barriers was .859, and the Bartlett’s test of sphericity was statistically significant ($p < 0.001$). The promax rotated factor matrix is displayed in Table 4. The first factor included items associated with lack of organizational support for OER and explained 36.6 percent of the total variance. Lack of organizational support therefore consisted of lack of support for using OER, lack of training on how to apply OER for one’s

own work, an organization does not dedicate enough time to apply OER, lack of common practices for using OER. Lack of reward for efforts in using OER had a slightly lower factor loading and was excluded from the sum variable.

The second factor included items associated with language and cultural barriers and explained 11.4 percent of the total variance. The factor combined language challenges regarding collaboration in the social platform and resource availability in one’s own native language. It also included cultural and context-related barriers regarding the cultural distance of the resources and the impact of such distance in relation to trust in other authors. Resources that did not give enough contextual information on origin and use were also associated with this factor, but the item was not used for the sum variable calculation because its factor loading was smaller.

The third factor included two items associated with the difficulty of assessing the quality of educational resources and associated services. The next item on the third factor was also associated with the difficulty of assessing the relevance of the resources and was hence included in the third factor despite its smaller loading and cross-loading on the first factor. These barriers explain the challenges of assessing the quality of resources and services as well as finding relevant resources for one’s own purposes.

The additional barriers chosen for the exploratory inspection were left out from the remainder of the analysis because of the methodological decision to apply factor analysis. These included barriers to integrate the retrieved OER with one’s own curriculum as well as IPR challenges. The loadings of those barriers were too low to be included. However, this does not imply that they would not have significance in terms of adoption of social OER environments. This should therefore be an aspect of further research on the topic.

The descriptive statistics of the five constructed sum variables are displayed in Table 5. Internal consistencies

TABLE 5
Descriptive Statistics of the Sum Variables

	N	rel	α (items)	Mean	SD
Lack of motivation towards online collaboration	742	–	– (2)	2.35	1.17
ICT maturity of the organization	749	0.81	0.78 (5)	3.90	0.75
Lack of organizational support	751	0.82	0.75 (4)	2.82	1.02
Language and culture barrier	752	0.76	0.72 (4)	2.86	0.99
Barrier for quality of OER and services	746	0.84	0.77 (3)	2.94	1.09

Note. *rel* = factor score covariance. α = Cronbach's Alpha. *SD* = Standard Deviation. Range for each scale is 1-5.

(Cronbach's alpha) of the scales were all sufficient (over 0.70). We chose to calculate the sum variables as means of the items instead of using factor loadings as regression weights as this was an exploratory study and we wanted to preserve the range of the original questionnaire items.

The means of the three factors were all slightly under the midpoint scale of 3.00. Language and cultural barriers recorded a mean of 2.86; lack of organizational support recorded a mean of 2.82, and the barrier of assessing the quality of resources and services recorded 2.94. The variable representing the focus of our study, lack of motivation towards OER collaboration, had a relatively low mean of 2.35, and the ICT maturity of the organizations, as reported by the respondents, had a relatively high mean 3.90.

4.2 Predictors of Motivation

To predict the lack of motivation towards sharing and collaborating, two linear regression models (Table 6) were used. From the first model, it was evident that the ICT maturity of the organization was associated with the lack of motivation towards OER. This implied that higher ICT maturity of an organization reduced motivational barriers. However, the amount of variation explained by Model 1 was low, only $R^2 = 2\%$. The second model increased the explained variation to $R^2 = 26\%$ and allowed for an elaboration of the predictors of lack of motivation towards sharing and collaborating in social OER environments.

The findings suggest that language and cultural barriers are the best predictors of lack of motivation. This tells us that the less challenges a teacher experiences in relation to language and culture, the higher the motivation to share

his/her own resources and collaborate in a teacher community. Another crucial finding is that lack of organizational support and quality concerns also influence motivation although not as strongly. Organizational support and efforts to improve quality mechanisms in social OER environments therefore have a strong influence on reducing these barriers. The findings finally suggest that on its own, the ICT maturity of an organization cannot predict lack of motivation as implied by the first model.

5 DISCUSSION

The key results implied that language and cultural barriers showed the strongest influence on lack of motivation. Lack of organizational support and quality concerns also showed a strong influence in decreasing motivation. As for language and cultural barriers, the focus was on the language of the resources, the language of collaboration, the cultural distance of the resources to one's own context and the cultural distance of OER authors. These findings are in line with existing research especially on knowledge sharing and collaboration over distance where culture has been one of the strongest inhibitors of knowledge sharing [22], [23]. Also, existing qualitative research on OER has elaborated on the strong role of culture in the adoption of OER [2], [26], [50]. The language of collaboration or OER resources has only been discussed in OER research to the extent of the language of the resources [2], [7]. Previous study by Vuorikari and Ochoa [54] on cross border OER discovery interestingly pointed out that every fourth tag entered by a user is not in his/her

TABLE 6
Predictors of Lack of Motivation Towards Sharing and Collaborating in Social OER Environments

Variable	Self-reported lack of motivation towards OER online collaboration		
	Model 1 B	B	95% CI
Constant	3.008**	0.447	[-0.158, 1.052]
Age	0.002	-0.001	[-0.009, 0.006]
Gender	-0.013	-0.002	[-0.163, 0.160]
ICT maturity of the organization	-0.191**	-0.025	[-0.304, -0.077]
Lack of organizational support		0.213**	[0.118, 0.308]
Language and culture barrier		0.314**	[0.230, 0.399]
Barrier for quality of OER and services		0.189**	[0.104, 0.275]
R^2	0.02	0.26	
F	3.75*	43.00**	

Note. *N* = 730. *CI* = confidence interval.

* $p < 0.01$. ** $p < 0.001$.

mother tongue. Therefore, discussion on interventions for language and cultural barriers should not exclude the use of foreign languages in social OER environments.

The findings of our study indicate that the language used for collaboration in OER environments should be taken into account when discussing barriers to OER. This is especially the case when the OER environments build upon services for communication and collaboration, e.g., social networking and collaborative adaptation. The finding of contextual information attached to resources was heavily correlated with language and cultural factors but was not included in the sum variable because of the smaller factor loading (<0.40). Despite being highly related to how teachers perceive resources that are created or used in a context that is distant from their own, the item should still be discussed because of its strong correlation. Existing initiatives have shown efforts to specify the right amount of cultural and contextual information as part of the metadata provision for OER [19], but the issue has not been elaborated in detail in OER research. However, Davis et al. [26] described how OER should contain rich information to describe where the material was used, how it was used, and where it is supposed to be used. We argue that OER initiatives should consider as much rich metadata as possible for lowering any perceived barriers to culturally distant OER.

Another important finding of the study was the strong connection between organizational support and motivation. This finding is supported by the study of Kalb et al. [43] that top management support has positive influence on the OER sharing intentions of researchers in social networking services. The finding is also supported by Igbaria et al. [55] on personal computing performance in small firms. However, our focus of organizational support differs from these studies. While our exploratory study indicated that lack of support, training, allocated time and common practices form the organizational barrier, the focus and context differ in related studies. The study of Igbaria et al. [55] addressed only the role of top management support. The study of Lin [56] addressed organizational knowledge sharing and organizational support from the perspective of encouragement and expected participation in knowledge sharing. The similarity was in the allocation of support, while the hypotheses of the confirmatory approach were not comparable with our study because of the lack of a viewpoint on motivation. Similarly, various studies on knowledge sharing have been undertaken but do not focus on OER and related social environments, e.g., while Karahanna [57] and Venkatesh and Bala [58] addressed training, it was in the context of technology acceptance. While lack of rewards was not used for the sum variable, similar to lack of contextual information, it should be discussed because of the strong relation to the factor. Gao et al. [48] explained that rewarding mechanisms should be developed to increase motivation for sociability aspects of social software. In terms of OER, Hylén [9] elaborated that for educational institutions, the lack of a rewarding system was one of the most critical barriers to devoting time to produce OER. Our results indicate that the lack of allocated time is part of the factor of organizational

support. Such a barrier was previously elaborated by Hylén [9] and Humbert [32] in the context of OER. However, the findings of this study indicate that the role of common practices, allocation of time and provision of training significantly increase the motivation to share and collaborate in social OER environments in addition to the previously addressed management support.

Similar to organizational support, quality aspects included in the study influenced the motivation of teachers. During the expert discussions in the pre-phase of the data collection, a new barrier was identified that related to the difficulty of assessing the quality of tools and services. This barrier is new and discusses how teachers might find it difficult to assess the value of the social and collaborative tools and services of the environment. This issue becomes especially relevant when teachers are not accustomed to using social software. As elaborated by Zhang [24], there might already be existing competitive networks. Therefore, teachers must consider and spend time evaluating whether the adoption of a new tool is beneficial. In our study, the relevance of the resources remained part of the sum variable even though the factor loading was relationally smaller compared to the assessment quality of the resources and tools. While we cannot fully explain why the loading was smaller, the existing literature shows a strong connection between the quality and relevance of OER. Hylén [9] elaborated on the issue of assessing the quality and relevance of OER as one of the fundamental challenges for OER. Similarly, Hatakka [7] elaborated that quality relates not just to relevance but also to correctness, coherence, context, differences in opinion of the subject, and so forth. Therefore, as also shown by Clements and Pawlowski [10], the relevance of OER should be considered when discussing the variety of issues relating to quality.

The influence of ICT maturity on motivation was shown in the first linear regression model. However, the inclusion of the barriers in the second model reduced the influence and implied a non-significant correlation. However, we should consider whether a mediating effect through organizational support could exist on the basis of the initial finding of the influence on motivation. One explanation could be that ICT-maturity increases as more organizational support is given, e.g., increase in the competence of individuals and the organizational unit, as more training or other types of support are in place.

Another crucial remark has to do with the significance of lack of motivation within the sample. As indicated, the mean of the latent variable was rather low on the significance scale and could be interpreted as a minor issue for respondents. Before jumping to conclusions on what this means, we must understand the context of the data collection. The set of workshops organized across Europe mostly relied on enthusiastic teachers to participate in our sessions through invitations or co-located events. One could argue that the participants were already motivated or interested as they participated in the sessions. Naturally, this can have an impact on the results.

The focus of our study was to see which barriers could predict lack of motivation. It is important to also discuss how the respondents perceived the barriers in general. The challenge for assessing the quality of the resources and

services was perceived as the strongest barrier while the mean (2.96) did not imply that the selection of teachers was a highly significant problem. Language and cultural barriers were, in general, regarded as a bit less critical (2.86), and organizational support attained a rather good level (2.82). From an inspection of the predictors of motivation, we see that the means of the barriers are in line with the target barrier of motivation. Higher perceived lack of motivation would have implied more significant barriers. It can be interpreted that the respondents were rather motivated and had sufficient support; did not feel a strong cultural distance in terms of using resources created in a foreign context or to engage with an unknown online community; and did not think it was too demanding to assess the quality of the resources or tools. The results on ICT maturity indicated that the teachers regularly applied ICT in their work.

5.1 Limitations

There are some limitations to our study that should be addressed. The width of the exploratory study cannot explain all factors that influence motivation. The study could not take into account all potential barriers in the final survey, which targeted teachers. We do recognize the variety of challenges that relate to re-use and adaptation of OER [10], [50], which have not been addressed in detail in our study. Since these limitations were recognized before the study was initiated, the decision was made to specify the focus of our inspection through the explained focus group procedure. Another limitation relates to the data collection method through face-to-face workshops across Europe. The teachers were mainly invited to take part in such events and mostly motivated or active teachers attended. Such a sample does not necessarily represent the entire teacher community and the barriers they perceive. Our study highlights the perceptions of teachers from both school and university contexts. We acknowledge that the practices between these contexts differ and additional influencing factors for motivating teachers might well differ.

5.2 Theoretical Contributions of This Study

This article describes some of the key barriers to uptake of social OER environments and shows how those predict lack of motivation. By the factors identified within this exploratory study, we were able to determine OER-specific constructs. The statistical analysis showed that the reliability of the constructs was good, which is a requirement for construct validity. The items were also contextually closely related to each other, therefore being understood as depicted by the regression. Existing constructs do have similar focus points, as addressed by Igbaria et al. [55] in relation to management support and Lin [56] in terms of organizational support measures, but they do not highlight or reflect the challenges addressed by the OER domain as well as teachers when they collaborate and share in social OER environments. As an example, the identified factor for organizational support combines many of the mechanisms that organizations can apply to increase the level of support.

As outlined in the theoretical background, the existing research on OER does not provide evidence of the factors

that influence motivation in the context of social OER environments. Studies that address motivational factors or willingness to share in other contexts, such as in organizational knowledge management, NGOs or in open approaches such as Wikipedia, are not applicable to OER as such. While previous studies have showed similar predictors of successful knowledge sharing between these contexts, teachers' engagement to OER environments lacks the organizational and team view that organizational knowledge sharing hugely relies on. While collaboration around OER can be specific to certain individuals that share with each other, the principles of openness aim towards wider access. In addition, the artefacts being shared differ since in OER these vary from learning materials teachers have created to ideas about improving pedagogy. Existing studies on OER have often raised the delicacy of sharing such personal knowledge as own teaching assets [3], [7]. Especially because of the general lack of awareness about IPR and re-use [2]; what is allowed to be shared online without getting in to trouble or even violating institutional regulations. These OER-specific issues do point out the need for studying motivational factors even further. The influencing factors identified within this study do not consider the whole spectrum of motivational factors but do contribute to setting the basis for such research.

5.3 Recommendations for Overcoming Lack of Motivation in OER Uptake in Schools

We can argue that the findings cannot necessarily be addressed and overcome by one entity in the educational domain, e.g., a teacher or educational institution. The implications for practice can be discussed both from the perspective of an OER provider as well as that of an educational institution. If we consider an OER provider and developer of social software for OER, only a few of the related challenges can be addressed, namely, quality of services, provision of meaningful and rich metadata for resources, and striving for multilingualism and good coverage of resources in the native languages of users. The importance of mechanisms that improve the quality of resource discovery as well as the access and usability of social OER environments should not be underestimated. Through the widespread adoption of mobile devices and tablets by learners, the preparation of OER as well as access to the environments have to comply with new hardware-influenced requirements [59]. The exploitation of recommender systems and linked data are promising to improve information discovery and precision [60]. Recent efforts that seek to improve recommender systems and to support large-scale learning analytics by combining social and usage data from different learning environments are an important step forward for users to find relevant material that fits their context and language requirements [61]. Similarly, the work on social tagging [54] addresses the same requirements and can help with reducing some of the language and cultural barriers.

From an organizational point of view, there are many steps an educational institution can take to foster motivation. One of the key lessons on knowledge sharing is the organizational adoption. As emphasized in several studies on organizational knowledge sharing, striving towards same goals and reciprocity are key enablers [12], [28], [29]. Such

adoption and organization-wide adoption of OER environments is not common but would be likely to increase the uptake. Additionally, organizations should provide a common ground and an overall practice/strategy for OER and ensure that each teacher has proper training and an adequate amount of time to learn how to apply OER. While our study does not provide an answer to this, we can emphasize the impact of dedicated support and common practices of OER in lowering some of the language and cultural as well as quality barriers. As argued by Hatakka [7] and Chen [2], lack of awareness is a serious challenge. In many cases, challenges might seem bigger than they actually, especially when a new system or form of sharing is introduced with little information or prior experience. As an example of organizational activities that increase awareness, OER training could be designed to introduce teachers to the contextualization and adaptation of existing resources for their own purposes. Emphasis could therefore relate strongly to the usage of collaborative services and adaptation mechanisms for this purpose. Such activities could build stronger awareness of the possibilities and limitations of social OER environments and could finally make it easier for teachers to assess the appropriateness and quality of resources and services.

6 CONCLUSION

In this paper, we have addressed OER barriers in one of the first quantitative studies on the topic. Through regression and exploratory factor analyses, we were able to define how the inspected barriers influenced lack of motivation. Our focus was on social OER environments where teachers are the main users. The results indicated that language and cultural barriers were the strongest predictors of lack of motivation. An almost similar level of influence was identified in lack of organizational support and quality aspects. These findings provide evidence of measures that both OER providers and educational institutions can take. Through this research effort, providers and educational institutions can likely lower those challenges that negatively influence the motivation of teachers to share and collaborate in social environments around OER.

Our intention is to enhance discussion in the educational domain on whether existing theories can actually explain the adoption decisions and actions around OER environments that strongly rely on social software functionalities and services. The identified constructs can be incorporated as part of future research in confirmatory studies to determine whether existing theories could be enriched with aspects that explain OER phenomena. As part of future research, the focus should be on separating the perceptions of behavior from actual behavior. As explained in the theory of planned behavior [42], the actual behavior of an individual depends on various influencing factors, from attitude towards behavior and perceived behavioral control to subjective norms. As this study set an exploratory approach to identify barriers that can influence lack of motivation, it would be crucial to address a theoretical verification of these findings to estimate and capture actual behavior around OER. As elaborated by Ajzen [42] and Triandis [62], social factors and normative beliefs that describe social pressure or

what is expected behavior in a particular role and context are important factors in studying user behavior. These aspects should be incorporated in follow-up studies on motivational aspects in social OER environments. As educational systems and practices vary between many countries, OER integration and adoption might also vary. Regarding upcoming research on this, an understanding of whether some of the predictors of motivation are more specific to certain countries would be beneficial.

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