

Factors Influencing Co-Creation of Open Education Resources Using Learning Object Repositories

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Abstract: Open Education Resources (OERs) have been identified as instrumental in facilitating access to quality teaching and learning materials. However, despite the rapid development of technologies capable of making OERs, the uptake and co-creation of OERs by educators is still low. This paper outlines a study conducted in order to investigate the use of Learning Object Repositories (LORs) in co-creation of OERs by educators. Using the Uses and Gratification theory, a survey was conducted with 36 educators in order to identify learning objects commonly used by educators and, additionally, to determine the factors that can positively influence educators to be co-creators of OERs. The results indicate that sharing knowledge, contributing to other people and intellectual challenge are factors that are highly correlated in motivating educators to be co-creators of OERs. The results also indicate that the learning objects commonly used by the educators are the course modules and presentation slides. In conclusion, in order for educators to be co-creators of OERs they need to be intrinsically motivated and be able to collaborate with others for non-selfish reasons. The results of this study have the potential of influencing how LORs should be designed in order to facilitate effective co-creation of OERs.

1 INTRODUCTION

Open Educational Resources (OERs) initiatives sought to take advantage of evolving technologies to increase access and enhance transfer of knowledge from tertiary institutions to a wide range of users. Alongside the development of OERs has been the need to ensure that education content remains relevant and not static. This entails both learner and educator collaborating to ensure that the learner's feedback, opinions, and intellectual capabilities are integrated alongside institutional resources. This process has been referred to as value co-creation.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) defines OERs as teaching, learning and research materials available in the public domain or released under an open license that enables them to be accessed, used and adapted with limited or no restrictions. In as much as the benefits of OERs, such as the ability for individuals to easily access quality information and their effectiveness in influencing positive student learning outcomes (Venegas Muggli and Westermann, 2019), are well-known, there are a number of barriers associated

with the adoption of OERs. Chief among the barriers/challenges is the co-creation of content. Incidentally, one of the objectives associated with UNESCO's OER recommendations involves building capacity of stakeholders to create, access, use, adapt and redistribute OERs.

While there are a number of possible solutions for addressing OER co-creation challenges, a potentially viable approach requires that an effective OER repository—a type of Learning Object Repository (LOR)—is in place to facilitate the storage and access of co-created content. LORs are a specialised type of Digital Library (DL) (Arms, 2001; Phiri, 2013) specifically designed to store teaching and learning resources. In essence, LORs enable educators to effectively share educational resources. A crucial aspect of LOR is the metadata standard that they implement in order to facilitate effective discovery of learning objects—entities that are used for learning, education or training (Pavani, 2016).

This paper presents a study conducted in order to investigate the use of Learning Object Repositories (LORs) in order to facilitate the co-creation of OERs by educators. Specifically, appropriate OER types to be stored in OER LORs were identified, through a user survey. In addition, personal motivating fac-

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tors that are capable of encouraging educators to co-create OERs were determined using the Use and Gratification theory. Finally, an OER platform was implemented, in order to demonstrate the feasibility of setting up an OER LOR that is flexible enough to incorporate user-centric design inputs. The main contribution of this work are as follows:

- List of OER types that can be stored in OER LORs
- User personal motivating factors that can be incorporated into the design process when implementing OER LORs
- Experimental results of studies conducted

The remainder of this paper is organised as follows: Section 2 provides a synthesis of literature that is related to this work; Section 3 describes the research approach and design followed to conducted the study; Section 4 presents and discusses the findings of the studies conducted and, finally, Section 5 provides concluding remarks and future work.

2 RELATED WORK

2.1 Open Education Resources

Rapid advancements in technology and the widespread use of the Internet has led to the emergence of several open practices in education including, online learning, e-learning and distance education. Coupled with this is the open education movement, which aims to facilitate access to high-quality teaching and learning resources. The open education movement is strongly linked to the OER movement, which over the last few years has been endorsed by a number of organisations and foundations, such as UNESCO and the Hewlett Foundation (Conole, 2012).

Butcher proposes that OERs refer to any educational material that is designed for use in teaching and learning, is made openly available for public consumption and has no associated payment royalties and/or licence fees (Butcher, 2015). Butcher's definition of OERs aligns with UNESCO's definition which classifies OERs as teaching, learning and research materials available in the public domain or associated with any open license, such that they can be accessed, used and adapted with little or no restrictions. In essence, any material that facilitates teaching, learning and research and, additionally, is made publicly available without restrictions can be classified as an OER. It is in fact this broad definition of

OERs that has initiated debates on whether Massive Open Online Courses (MOOCs) can be classified as OERs (Stracke et al., 2019a; Stracke et al., 2019b). With the increase in the complexity of digital content that is currently generated, other researchers have proposed the creation of orchestration appliances, comprising of bundles of teaching and learning materials (Parker et al., 2018; Phiri, 2018). Over the last few years, there are a variety of globally accessible OER platforms that have been implemented, such as MIT OpenCourseWare¹. Other examples include Khan Academy², OER Commons³, OpenStax⁴ and Open Culture⁵. Since OERs stored in these platforms are published using an open license, such as the Creative Commons license, they allow the reuse, revision, remix, redistribution and retention of materials, making use of OERs easy and flexible. For those creating OERs, this allows a creator to easily specify permission while still sharing the work with other co-creators.

The benefits of OERs in facilitating access to quality educational resources are well-documented (Hylén, 2021). Hilton et al. report on cost savings that was a direct result of college students' adoption open textbook OERs (Hilton III et al., 2014). A study carried out Kay and Knaack on the impact of learning objects in secondary school examined the impact of learning objects from the perspective of 850 students and 27 teachers of science, mathematics or social sciences (Kay and Knaack, 2008). According to the findings of the study, teachers typically spend one to two hours finding and preparing for learning objects based lessons plans that focused on the review of previous concepts. Both teachers and students are positive about the learning benefits, quality and engagement value of learning objects, although teachers are more positive than students. Student's performance increased significantly when learning objects were used in conjunction with a variety of teaching strategies. It is reasonable to conclude that learning objects are a viable teaching tool in a secondary school environments. More significantly, the potential of OERs in fostering development in the so-called Global South has been highlighted (Hodgkinson-Williams and Arinto, 2017).

Despite the widespread availability of information about OERs there still remain a number of challenges (Hylén, 2021) that hinder their adoption. In this work, we argue that a well-designed OER LOR that

¹<https://ocw.mit.edu/index.htm>

²<https://www.khanacademy.org>

³<https://www.oercommons.org>

⁴<https://openstax.org>

⁵<https://www.openculture.com>

takes into account user needs has the potential of encouraging the wide adoption of OERs.

2.2 Motivating Factors for Co-Creation of OERs

A number of studies have been conducted in order to determine factors that affect the adoption of OERs. A qualitative study by Cox and Trotter at three universities in South Africa suggests that adoption is influenced by multiple factors, ranging from infrastructural access, legal permission, conceptual awareness, technical capacity, material availability, and individual or institutional volition (Cox and Trotter, 2017). In this paper, a similar argument to individual volition is made: it is argued that personal motivating factors have the potential to encourage co-creation of OERs.

Mishra reports on a study conducted to identify factors that can encourage the use, reuse, creation, sharing or adaptation of OERs. The study was aimed at understanding the motivations of higher education educators to use and adapt OERs. The study revealed that participants were highly motivated to use, create and share OER for different academic, professional and individual purposes (Mishra, 2017). While most respondents expressed their desire to receive additional support to use and adapt OERs and, were for the most part not aware of OERs, they were also intrinsically motivated to use and adapt OER.

A quantitative survey was developed to measure the use, creation, and attitudes towards OERs. The sample of the study composed of academic, professional and administrative staff at Athabasca University. According to the findings of the study, evidence of intrinsic motivation aligns with Pawlowski's emotional ownership model of OERs creation and use (Pawlowski, 2012). Academic quality is the highest factor for both use and creation this has to do with emotional investments and the factors identified are as follows: Academic quality, time to find, review, select, knowledge about OERs, desire to reduce cost of student's hardware/software to facilitate use, environmental concerns, support from administration and course team support recognition. The participants were all involved in designing learning and they want their students to succeed. Knowledge of OERs is also high on the list for both creation and use. This could be because in the higher education environment, there is an intrinsic component to acquiring new knowledge. Possible limitations to the study include self-selection: faculty and staff at Athabasca University could naturally be interested in OERs and feel confident in their knowledge in this area and may be early adopters of educational innovation.

2.3 Learning Object Repositories

While there are a number of possible solutions for addressing OER co-creation challenges, a potentially viable approach requires that an effective OER repository—a type of Learning Object Repository (LOR)—is in place to facilitate the storage and access of co-created content. LORs are a specialised type of Digital Library (DL) (Arms, 2001; Phiri, 2013) specifically designed to store teaching and learning resources. In essence, LORs enable educators to effectively share educational resources. A crucial aspect of LOR is the metadata standard that they implement in order to facilitate effective discovery of learning objects—entities that are used for learning, education or training (Pavani, 2016).

In order to facilitate the co-creation of useful OER content, such as so-called virtual orchestration appliances (Phiri, 2018; Parker et al., 2018), it becomes necessary to design and implement OER repositories that are effective and, additionally, third-party tools for facilitating the creation of OERs. More significantly, it is also important to take into account learning objects to be deposited into the LOR and, additionally, potential motivating factors associated with co-creation of OERs.

3 METHODOLOGY

This study was conducted using a mixed methods approach involving a comprehensive literature review and a user survey. The literature review was conducted in order to identify an appropriate theory for identifying motivating factors that positively influence co-creation of OERs and, additionally, to understand how learning object repositories are designed and implemented. The survey was conducted in order to determine learning objects commonly used by educators and, more importantly, to empirically determine the motivating factors that have the potential to positively encourage educators to co-create OERs.

3.1 Factors Influencing Co-Creation of OERs

3.1.1 Uses and Gratification Theory

As earlier mention in Section 1, one of the main objectives of this study was to determine the factors that can positively influence educators to be co-creators of OERs using LORs. The Uses and Gratification theory (Katz et al., 1973; Blumler, 2019) was used

due to its widespread use and success when examining how users consume media (Shao, 2009) and digital content (Rafaeli et al., 2009) in order to understand how the use of digital content gratifies user needs.

While the original Uses and Gratification tend to focus on five aspects—cognitive needs, affective needs, personal needs and diversion needs—, this study adopted the cognitive and integrative motivation factors proposed by Rafaeli et al. in their study that was aimed at understanding Wikipedians' motivations for contributing Wikipedia content (Rafaeli et al., 2009). Personal motivation is determined by seven key aspects:

- Reputation—Desire to increase their reputation in a specific field
- Discussion—Desire to initiate and/or participate in discussions
- Contribution—Desire to contribute to existing content
- Intellectual Challenge—Intellectual challenging resulting from content contribution
- Pleasure—Derive pleasure from contribution
- Sharing Knowledge—Desire to share knowledge with others
- Learning—Desire to learn new things

3.1.2 Study Design

Random sampling was employed to recruit study participants from a target population comprising of College/University Lecturers, Secondary School Teachers and Student Teachers. The assumption made is that individuals that have been trained to teach are best suited to identify OERs that should be stored in LORs.

An online Google Forms⁶ question was used to collect survey responses data. The questionnaire included a section used to capture participants' demographic details, another section used by participants to ranking learning objects that would prefer to be stored in an OER LOR and, finally, a section dedicated motivating factors aligned with the Uses and Gratification theory, outlined in Section 3.1.1.

3.2 OER LOR and Implementation

In order to demonstrate the feasibility of implementing a scalable and useful OER LOR, the Islandora open source digital asset management framework (Leggott, 2009) was used to setup a prototype OER

⁶<https://www.google.com/forms/about>

LOR. Islandora was selected as a candidate framework due to its scalability and flexibility. Fundamentally, the Islandora framework base architecture, comprising of Fedora⁷, Drupal⁸ and Apache Solr⁹, which result in a flexible and scalable platform capable of facilitating effective discoverability of digital objects. Drupal provides the user interface and additional services that is used by end users to interact with repository objects. The storage of the repository objects are performed by highly available and scalable Fedora component. Apache Solr provides a search and indexing service that ensures effective discoverability of repository objects.

The resulting platform can further be easily extended through Drupal's extensible architecture—extensibility of the platform would ensure that the platform is customised to suit requirements for an OER LOR. Specifically, Islandora 2.1.1, configured with Fedora 5 and Drupal 8, was used. A typical OER LOR should be designed to scale due to the diversity nature and quantity of OERs that would ultimately be ingested into the platform. The scalability aspect was informed by survey responses—outlined in Table 1, in Section 4—which clearly indicate that most educators would benefit from a platform that is able to store different types of OERs.

4 Results and Discussion

4.1 Educator Survey

4.1.1 Participants' Demographics

A total of 42 educators were recruited and successfully responded to the survey. Table 1 shows the demographic details of the survey participants. While there was an equal distribution for the gender demographic, the majority of participants (65%) has less than one year teaching experience. More significantly, 70% of participants were Student Teachers—individuals with experience teaching but still undergoing training.

4.1.2 Preferred OERs to Store in LOR

In order to determine appropriate OER learning objects to be stored in to the LOR, survey participants were required to indicate and ranking types of OERs that they would prefer to be stored into the LOR. Figures 1 and 2 show participants' ratings of preferred

⁷<https://duraspace.org/fedora>

⁸<https://www.drupal.org>

⁹<https://solr.apache.org>

Table 1: Summary of Participants’ Demographic Results From Use and Gratification Survey.

Demographic	Demographic Aspect	Count
Gender	Male	20
	Female	23
Teaching Experience	> 1 Year	28
	1–5 Years	7
	5–10 Years	2
	10–15 Years	5
	15–20 Years	1
Level of Teaching	Junior Secondary	1
	Senior Secondary	7
	College/University	5
	Student Teacher	30

OERs and participants’ willingness to create types of OERs, respectively.

As shown in Figure 1, the most preferred OER resource is of type “Assessment Questions”, where 79% of participants indicated that they “Agreed ” or “Strongly Agreed” that they would desired learning objects of that type to be made available in the LOR. Following “Assessment Questions” are OERs of type “Lecture Notes”, “Course Modules” and “Presentation Slides”, each of which had 76%, 76% and 67% participants positively rate them, respectively. Interestingly enough, the least preferred OER was of type “Sound Clips”, which saw only 21% of participants preferred to have the resources of that type available in the LOR.

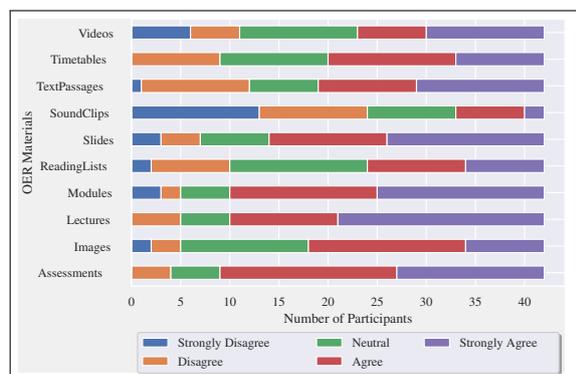


Figure 1: Participants’ Preferred Learning Objects to Store in LOR.

In order to determine participants’ willingness to create OERs, OERs that require significantly more effort were presented to the participants as options. Participants were generally willing to create “Syllabii” (69%), “Videos”, “Images” (57%) and (52%), however, there was a lack of willingness to create animations (21%), likely due to the relative effort required

to create such OERs.

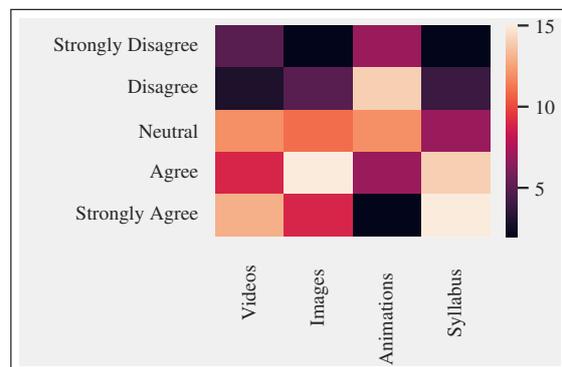


Figure 2: Participants’ Willingness to Co-Create OERs in LOR.

4.1.3 Uses and Gratification Motivating Factors

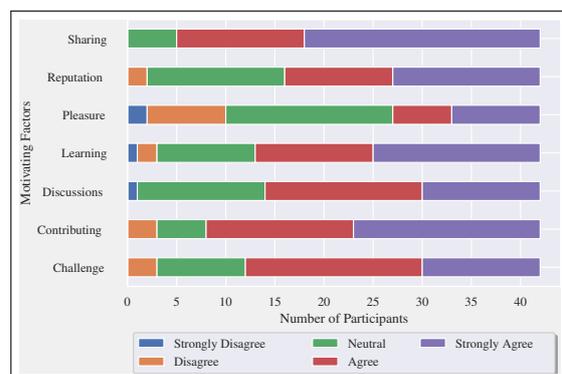


Figure 3: Participants’ Ratings of Uses and Gratification Motivating Factors.

In addition to the seven Use and Gratification personal motivation items, participants were asked to provide an optional open-ended statement regarding their subjective view on what could potentially inspire and/or influence educators to participate in the co-creation of OERs. A thematic analysis of the responses is summarised in Table 2. Of the 41 responses with feedback, 80% of the responses are aligned with either one of the seven aspects of the Uses and Gratification theory outlined in Section 3.1.1, with the majority associated with the “Sharing Knowledge” and “Learning New Things” and “Reputation” aspects. These results have the potential to inform design considerations to be taken into account when implementing OER LORs; for instance, the LOR could be implemented in such a manner that co-creators of OERs are awarded points after successfully contributing content.

The feedback from participants that was not asso-

Table 2: Summary of Participants’ Feedback on What Inspires Co-Creation of OERs.

Classification	Motivating Factor	Count
Use & Gratification	Contribution	1
	Discussion	4
	Intellectual Challenge	3
	Learning	7
	Pleasure	3
	Reputation	5
	Sharing Knowledge	9
Unclassified	Content	1
	Incentives	4
	Obstacles	1
	Technology	3

ciated with the Use and Gratification theory were categorised into comments linked to “the need for incentives to encourage contributions”, “technological approaches that could potentially encourage more contributions” and “identification of obstacles that hinder contributions”. Some example comments for the unclassified themes are presented below

“IF A FINANCIAL INCENTIVE IS PROVIDED” (Incentives) [Participant #10]

“Provision of enough resources and materials” (Incentives) [Participant #34]

“Recognition of one’s works in terms of rewards and awards” (Incentives) [Participant #39]

“What can influence them, is the technological advancements happening across the globe , they have to move in line with technology” (Technology) [Participant #18]

“Adopting technology in their teaching methods, possessing necessary knowledge on OERs” (Technology) [Participant #20]

“Providing interactive learning objectives” (Technology) [Participant #42]

“I believe the obstacles which deter people to do more of physical learning interactions” (Obstacles) [Participant #24]

4.2 Learning Object Repository

Islandor 8¹⁰ was installed and configured on an Ubuntu 18.04.6 LTS¹¹ operating system, which was preconfigured with all the pre-requisite software components. Figure 4 shows a screenshot of the install

¹⁰<https://islandora.github.io/documentation>

¹¹<https://releases.ubuntu.com/18.04>

Islandora 8 framework, configured with the Bootstrap 8.x-3.23 Drupal theme. Due to Islandora’s flexibility, implementation of extensions for incorporating feedback from the user survey outlined in Section 4.1 could potentially be accomplished. In addition, it is also possible to customise the OER LOR in such a manner that appropriate metadata schemes, such as the Learning Object Metadata (LOM) scheme (Barker, 2005) are used.

5 CONCLUSIONS

This paper presented a study conducted to investigate the use of LORs in co-creation of OERs by educators. A user survey, described in Sections 3.1 and 4.1, was conducted in order to identify appropriate OER types to store in LORs and , additionally, to ascertain educators’ willingness to co-create OERs. In order to determine appropriate factors that have the potential to positively influence educators to be co-creators of OERs, the Use and Gratification theory was employed by focusing on personal motivating factors. Finally, the feasibility of implementing an OER LOR was demonstrated through the implementation of an Islandora platform, outlined in Sections 3.2 and 4.2.

Systematically determining user-centric factors to be used as design and implementation input has the potential of ensuring that the resulting system is effective, usable and useful, all of which are key software attributes. While the architecture of the system and services integrated with it heavily influence its effectiveness and usability, the usefulness of the system is ultimately dictated by user factors. In this work, we identify personal motivating factors that have the potential of ensuring that the resulting OER LOR is ultimately useful to end users.

As part of future and on-going work, a production quality Islandora platform is being extensively customised with plans to deploy it for public use. In addition to this, future work could involve the implementation of third-party offline tools capable of not only synchronising content with OER repositories, but with the ability to operate offline.

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OER Repository
Home
Collections
Batch Edit
Help

Learning Objects Categories

Here you can browse learning objects by category. Clicking on the category will provide additional contextual overview about the learning object category. You can sort, filter, and change how the categories are displayed by editing the [LOR Category](#) view. You can even configure its link in the main navigation menu and the url of this page.

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Figure 4: Collection View: Open Education Resources Learning Object Repository.

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