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EXPLAINING BARRIERS TO THE USAGE OF LEARNING OBJECT REPOSITORIES: COMPARISON BETWEEN EUROPE AND LATIN AMERICA

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ABSTRACT

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Learning Object Repositories have a great potential to enhance knowledge sharing in the teaching community. However, the usage of Learning Object Repositories has not met the expectations that the supporting institutions (universities, colleges and organizations) had regarding its success. The barriers to the usage of LORs were explored to understand what stops users from being actively involved in creating, reusing and sharing contents on LORs. The investigation aimed to find out what barriers do managers consider the most significant to the use of LORs, how do barriers to LOR usage in Europe compare to those in Latin America and what are the main approaches that have been implemented to overcome the identified barriers. A qualitative approach was taken for obtaining an in-depth understanding of these topics. Barriers to knowledge sharing found in literature were mapped to the concrete LOR scenario and a questionnaire was created for conducting interviews to twenty LOR managers from both Europe and Latin America. The answers from the informants were analyzed to understand the relevance of each barrier, as well as the differences between these barriers as perceived by managers in Europe vs managers in Latin America. As expected, human-centered issues affect the usage of LOR. For instance, the main barriers affecting LOR usage found for Europe are language differences, knowledge sharing issues and lack of time. On the other hand, for Latin America the main barriers found are lack of skills, lack of sufficient infrastructure and lack of time, a finding that also shows how Latin America struggles with the "Global South" problems. The findings also reflect the relevance of the digital divide as an impediment to knowledge sharing and how most of the studied barriers could be overcome with the creation of policies to support LOR usage and exploit all the benefits it could bring to the teaching community.

Keywords: Open Educational Resources, Learning Object Repositories, Barriers, IS development, Qualitative Study, Culture, Knowledge Management, Knowledge Sharing.

FIGURES

TABLES

HEAT CHARTS

TABLE OF CONTENTS

1   INTRODUCTION

Open Educational Resources are all resources intended to aid in learning, education and training that are freely accessible, including literature and scientific resources, technologies and systems and open content, as well as related artefacts (Clements & Pawlowski, 2012). These Open Educational Resources are intrinsically connected to the notion of Learning Objects which are reusable multimedia content components. The reuse of such components is the central key to the enhancement of the quality of digital learning experiences, which will eventually lead to faster, cheaper, and better learning (Duval & Hodgins, 2003).

The availability of such components and resources through the creation of Learning Object Repositories (LOR) has been largely incremented in the past decade, empowering the users to execute numerous knowledge-related activities that will consequently enrich the existing educational content base. With the support of several universities, schools and organizations, these educational resources will be further strengthened and packed with even more knowledge from contributors from almost anywhere in the world, who can provide their own valuable insight and points of view to the benefit of the knowledge-sharing community (Chen, 2010).

The task of designing and developing LORs that provide a high level of quality to its users is no easy one. The developers must consider their users (students, teachers, parents, etc.), the possible scenarios in which these LORs will be used, and other features such as institutional policies, differences in curricula, the cultural and linguistic backgrounds of the users, and other considerations that can represent a challenge to the success of the repositories (Hatakka, 2009). Indeed, even if Learning Objects are great as resources for education, the use of LORs is not actually the most popular practice among teachers (Wiley, 2003). According to Davis *et al.* (2010), practitioners are not sharing their resources, or have not made them available to the education community, at least not in a way that reflects high usage and/or acceptance.

A successful LOR must be attractive and appeal to many returning users. It is usually an engaged community around the repository what keeps it alive.

If it is easy for the members to invite others, to participate and, most importantly, to use the repository, it is very likely that it will eventually become sustainable (Lund & Hojsholt-Poulsen, 2005). However, as previously mentioned, LORs are not been used to their full capacity. Sadly, there is high community desertion and low success rates (Clements & Pawlowski, 2012).

This research is directed with the intention of starting to fill a gap in previous work on the topic of educational resources. The current research on the topic tries to understand the processes of publication of learning objects in repositories, preferences of users when it comes to the features of a repository, (re)usability and interoperability issues. According to Tzikopoulos *et al.* (2007), not enough studies have been done to obtain an accurate idea of the nature and status of development of LORs, and very little has been covered in the field of barriers to usage of educational resources and, it has been done in a very quantitative manner (Chen, 2010, Hatakka, 2009).

With this in mind, this research aims to an audience composed of those actively related to the LOR arena, including developers of repositories/portals, individuals, and groups involved in projects around repositories, as well as institutions and organizations dictating policies around Education. The main idea is to look into the barriers to the success of LORs in terms of usage. In other words, from the point of view of community managers/experts: What is stopping users from being actively involved in the utilization of educational resources?

Ever since Hofstede started his studies around the dimensions of culture in the early 80s, the influence of culture has been a subject of interest for every field imaginable. This is the case too in the Information Sciences, and consequently in information systems, and educational repositories. This research reviews the barriers to the usage of repositories with a cultural perspective. With the aim of understanding how the background culture of a given individual influences their view on barriers and solutions to these barriers, this work intends to take an insight on the usage of LOR, perhaps suspecting that even with highly fitting and functional technical infrastructure foremost impediments to higher success are to an important extent human-centered, and thus cultural (Davis et al., 2010).

The research questions are posited as follows:

- What barriers do managers consider the most significant to the use of LOR?
- How do the barriers to LOR usage in Europe compare to those in Latin America?
- What are the main approaches that have been implemented to overcome the identified barriers?

A qualitative approach was chosen to get a grasp on issues that need a comprehensive study, as are barriers, especially since a cultural perspective is also being integrated. All in all, purpose of this work is to understand what the barriers to the use of educational repositories are, and how these are being tack-

led and, maybe even pick the minds of the repository managers to find out what kind of solutions they would like to see implemented in the future. Also, it is an objective of this research to understand the cultural differences behind barriers to LOR usage for two different regions of the globe, i.e., Latin America and Europe, with the aid of a cross-cultural comparison.

The structure will be as follows: the next three chapters contain the theoretical framework. A literature review on educational repositories and its adaption, then the barriers to the usage of education repositories used for this study are explained and, finally, the theory regarding the cultural aspects and how they are taken into consideration for this research are presented. Following the literature review, the methodology is explained, where the approach of qualitative study is justified. An analysis of the results will follow in a format that shows the most representative quotes for the findings of the research. In the discussion section, the findings will be mapped to the literature review. The conclusion will wrap-up the main findings, explain the limitations and suggest ideas for future research.

2   LEARNING OBJECT REPOSITORIES

The interest of this research is to understand what are the most signficant impediments to the usage of LORs. This and the following two chapters will provide the theoretical framework upon which this investigation was built. The first concept to be visited are LORs and the main terms surrouding them.

Before explaining LORs, OERs will be defined, as these are the building blocks of LORs. The United Nations Educational, Scientific and Cultural Organization (UNESCO) uses the following definition of Open Educational Resources: "The 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, p. 24). For Davis, et al. (2010), OERs are conceived within the parameters of proper licensing and reusability. Some authors find these definitions lacking as the sustainability of OER sometimes depends on creating a business model around it (Pawlowski & Bick, Open Educational Resources, 2012). Sustainability is a legitimate concern, given the expenses that the creation and management of repositories may represent. In fact, diverse governmental and non-governmental organizations have supported (and keep supporting) the OER movement worldwide (Chen, 2010, Davis, et al., 2010).

Some terms that are interchangeable are: learning resources, learning objects, and educational resources among others, though there are differences according to every author, especially when it comes to the openness of the resources. In a comported definition, as per Clements & Pawlowski (2012), OER are "all resources for the purpose of learning, education, and training that are freely accessible." Even if the term can is also be inclusive of all non-digital material, it is mainly used to refer to the digital type. Due to the ambiguity of the concept, Pirkkalainen & Pawloski (2010) state that in some sense, all the following may classify as OER:

- Learning objects or learning resources
- Software Tools for education
- Instructional/didactical designs and experiences

- Assets such as images, links or texts that can be used to illustrate a topic.

To provide further clarification about the above-mentioned resources, these will be defined next. A learning object is any entity, digital or non-digital, that may be used for learning, education, or training (IEEE Learning Technology Standards Committee, 2002). Examples of learning objects can be multimedia pieces, documents, simulations, and web resources. Electronic books, articles and others are also considered in this category (Pirkkalainen & Pawlowski, 2010). The range is wide, but the main idea is that a learning object is a chunk of unit of learning, in the sense that this resource can be taken independently and still be useful and meaningful to the user, even if it is associated to a collection of other objects (Wiley D. A., 2000).

Software tools for education cover a wide range of applications. For example, text, presentation, audio, and video editors can be considered tools for education if the material produced can be used for educational purposes (Pirkkalainen & Pawlowski, 2010). However, there is software specifically designed for educational purposes that cover subjects such as geometry, geography, and natural sciences, among others. Digital encyclopedias and dictionaries count as software aiding education too. Also, several Learning Management Systems (LMS), such a Moodle, ASKnLearn and others, provide a platform that help in the management of learning activities.

Instructional/didactical designs and experiences are the materials used by teachers that contain curricula, contents of courses, teaching methods, activities, schedules and plans for the delivery of classes, as well as other elements that could be considered best practices within education (Fulks & Alancraig, 2008). This type of material is very obviously of high value to teachers. According to Pirkkalainen & Pawlowski (2010), sharing experiences about materials and lessons amongst colleagues is one of the most valuable resources that these actors of the Education sector have.

Finally, web assets are simple resources, meaning that these are loose items. Web assets can be considered resources but do not stick strictly to the definition of learning object, given that these do not constitute a learning unit on themselves. Such resources are better defined by Metros & Bennett (2002) as information objects and can be easily found on web engines. Examples are images, audios, short texts, links, that may be included into a certain context to provide further illustration.

2.1 Learning Object Repositories

Learning Object Repositories (LOR) are databases into which educational resources are organized, classified, and stored (Tzikopoulos, Manouselis, & Vuorikari, 2007). These digital educational repositories not only store and provide resources, but according to many authors must also focus on the reuse and

sharing of the materials (Duncan, 2002, Glisby & Holden, 2003). LORs can be described according to the characteristics of the repository, the characteristics of contents provided, the technical characteristics and the quality characteristics (Tzikopoulos, Manouselis, & Vuorikari, 2007).

One important aspect of the learning objects is the metadata around them. Metadata is "data about data", and in this case, metadata is data referring to the characteristics of the OERs as well as the location of these (IEEE Learning Technology Standards Committee, 2002). Metadata allows an easier localization of the resources. There are two main categories of elements within metadata, the first are concerned with basic information, just like the attributes that would be found in index cards in libraries, such as author, title, keywords, etc. The second category is concerned with the web location and the web environment, such as the uniform resource identifier (URI).

Many of the metadata models used by repositories are based on the IEEE 1484.12.1 – 2002 Standard for Learning Object Metadata, or LOM, which is based on attributes such as type of object, author, owner, terms of distribution, and format. Further features regard pedagogical characteristics such as teaching or interaction style, grade level and prerequisites. These attributes are however not restrictive and different repositories may adopt different tailored application profiles, or already existing ones such as CanCore, UK LOM, LOM-FR and models such as SCORM, which is based on the IEEE LOM standard, as well as on other standards and norms created by other institutions. The IEEE LOM and the Dublin Core, another metadata standard, are the most used, according to a study by Tzikopoulos, Manouselis, & Vuorikari (2007).

There are two main methods for the storing and accessing the objects. LORPs (simply referred to Learning Object Repositories), store the OERs as well as the metadata, examples of LORPs are ARIADNE and Connexions. LORFs (Learning Object Referatories) (Ochoa & Duval, 2009), such as MERLOT and SMETE, only store metadata and information about the location of the resources, providing links to the content, but not the content itself (Neven & Duval, 2002; Tzikopoulos, Manouselis, & Vuorikari, 2007).

In their analysis of LORs, Ochoa & Duval (2009) provided a classification of repositories according to the process of publication. Besides LORPs and LORFs the classification also included OCW (Open Courseware) and LMS (Learning Management System). The former refers to initiatives like MIT's Open Courseware, in which an institution provides open and free access to educational materials. Learning Management Systems Learning are software systems that aid in learning and that contain tools for presentation, assessment, communication, and management tools (Ellis & Calvo, 2007).

The functionalities present in an LOR vary greatly and depend upon the nature of the repository. In general LORs offer the possibility to both, browsing through catalogues and searching for specific resources, which is mainly done through simple text search although sometimes advance search options are also available. Depending on the repository the metadata and some descriptions of the resources are available, although not many offer enough information to aid

the user in the selection of the materials. A highly appreciated feature is the possibility to comment and rate the contents. Commenting and rating sometimes require user profile creation, but this is not offered by all the repositories. Other features that might be offered by repositories are contribution of resources, educational tools (including dictionaries and glossaries) and discussion forums (Retalis, 2005).

An important feature of a repository is the languages that it supports. Most of the existing repositories have interfaces in English, and some offer the option to toggle to a variety of other languages. The same stands for the OERs found in the repositories, the vast majority is in English, and depending on the region, resources will be found in different languages as well (Tzikopoulos, Manouselis, & Vuorikari, 2007).

2.2   Adaptation Process of LORs

The LOR movement is based on free access to educational material and is thus tested by the necessity of creating and providing high quality resources in a sustainable manner. For non-for-profit repositories, besides the issue of financing, getting enough materials to fulfill the necessities of the targeted users is also challenging. Ochoa & Duval (2009) have found that repositories grow linearly and not exponentially over time, which is a somehow disappointing result when taking into consideration that an extensive pool of resources is seen as a success measure for LORs.

Repositories rely on users as contributors of material. The same study by Ochoa & Duval (2009) show that an average size LOR has from 500 to 1.500 contributors, that the number of contributors in most repositories grows linearly. However, the results also show that more than half of the materials are created by only the 10 percent (10%) of the contributors. User engagement has a huge roll in the sustainability of LORs. Engaging communities around the creation, utilization and distribution of LOR seems to be one of the harder tasks.

The availability of educational resources of good quality is highly dependent on the "share and reuse" activities that are at the disposal of the user communities (Neven & Duval, 2002). In fact, Pirkkalainen & Pawlowski (2010) state that making resources available and re-usable is the trendy topic in current related research. Re-usability implies that users will find an object and give it a different use than what it was initially intended for. Clements & Pawlowski (2012) state that the modification of resources leads to the multiplication and thus higher quality of resources.

An adaptation process is key to the re-use of resources, as it enables new scenarios of usage. Take, for example, a teacher in México that wants to re-use a presentation regarding healthy nutrition that was created by a teacher in Spain. The former will need to change those words that are different even if they are sharing a common language (such as "zumo" and "jugo", respectively, Spanish and Latinamerican variants for juice). Aditionally, the Mexican teacher will

want to adapt this material by including foods that are consumed in México instead of those consumed in Spain (tortillas instead of bread, for example).

Clements & Pawlowski (2011) make an adaption to the educational context of Pawlowski & Zimmermann (2007)'s Adaptation Model, in which the adaptation process is compossed of five phases (See Figure 1):

1. Search: Users seek for adequate resources.
2. Evaluation: Comparisson of the actual context of the found resource to the intended context.
3. Adaptation: Modification of the resource in order for it to meet the necessities of the user.
4. Use: The adapted resources is used in the new context.
5. Share: The adapted resource is inserted back for the community to benefit from it.

FIGURE 1 Adaptation Process of LORs

Sharing should be a must, and LORs managers must find ways in which they can foster it within the communities and create awareness through the use of social networks. In fact, although LORs have great potential, the teaching community is not benefiting from these to a full extent. Some barriers, which will be discussed in the next chapter, hold users from engaging in creating, adapting, using and sharing resources within LORs. It is the motivation behind this research to understand why are repositories not being used as widely and to their full capacities, what are the most relevant issues and what are the possible solutions.

3   BARRIERS TO THE USAGE OF LEARNING OBJECT REPOSITORIES

The remarkable development and growth of LOR around the globe, due to the support of universities, colleges, and diverse organizations, reflects the potential held by LORs to enhance knowledge sharing in the teaching community. However, how to integrate LOR into institutions and how to make the use and reuse of educational resources a common practice still seems to be a riddle. As per (Ochoa & Duval, 2009), the usage of LOR is not high enough to meet the expectations of participation and engagement in the collaborating community, thus the resources devoted to the development of repositories are underutilized.

It is of high interest to understand what the most significant impediments to the usage of LORs are, as it is the identification of these barriers what will later generate initiatives and appropriate solutions to overcome them. Barriers to knowledge sharing will be mapped to barriers to the usage of LORs. Knowledge sharing is the abstract field of this research. LORs are the environment where knowledge is contained and where knowledge sharing hap-pens or should happen (See Figure 2). The higher engagement and interaction within an LOR, the higher the levels of knowledge sharing. If the usage of an LOR is low, what are the barriers that are stopping the users from engaging in knowledge-sharing? Barriers that were found in knowledge management and LOR literature were taken into consideration for the present study and will be discussed in detail.

FIGURE 2 Relation of knowledge and knowledge related aspects to this research

3.1 Barriers to Knowledge Sharing

Knowledge sharing is a process, in which a person who owns knowledge passes it on to a person in need of knowledge who makes sense of it and makes it their own. In more technical terms the transmitter externalizes his knowledge onto the receiver, who then internalizes it (Agarwal, Tan, & Poo, 2007). Knowledge sharing is the core activity of Knowledge Management, however getting people to share their knowledge is not an easy task. Actually, successful Knowledge Management projects need to consider barriers to knowledge sharing and plan ahead in order to overcome them (CEN/ISSS, 2004). Given the nature of such barriers and the way in which these affect knowledge sharing, many authors have focused on researching barriers as a topic, which has high relevance within knowledge management.

Barriers to knowledge sharing vary from organization to organization, however, some barriers have been found to be more concurrent and thus very difficult to lower down. The classifications for barriers also vary from author to author, e.g. Riege (2005) presents a classification of barriers that considers individual barriers, organizational barriers and technology barriers. Szulasnki, (1996) classifies the barriers as follows: characteristics of the knowledge transferred, characteristics of the source, characteristics of the recipient, characteristics of the context (i.e. arduous relationships). Table 1 presents a list of barriers by level of ocurrence as per Bullinger, Wörner, & Prieto (1997).

TABLE 1 Most common barriers to knowledge management

Barrier	Percentage of occurrence
Lack of time	70,1%
Lack of understanding KM and its benefits	67,7%
Ignorance of knwoledge demand	39,4%
Attitude knowledge is power	39,0%
Missing transparency	34,6%
Missing reward system	34,4%
Too high specialization of personnel	32,2%
No organized knowledge exchange	28,7%
Inappropriate IT-Infrastructure	28,3%
Hierarchical structures	28,0%
Interdepartamental competition	27,6%
Missing business culture	26,7%

The global context also provides the ideal setting for limitations in knowledge sharing. Ralyté, Lamielle, Arni-Bloch & Léonard (2008) talk about different types of distances, such as geographical, temporal, socio-cultural, organizational, technological and knowledge-divergence. Clearly, the fact that two organizations are far apart by a couple of time zones implies that there will be differences at various levels (work practice, language, etc.) The global arena is quite particular and team leaders need to find a way to adapt general

guidelines to the local necessities and preferences (Desouza & Evaristo, Global Knowledge Management Strategies, 2003).

Educational institutions constitute a very particular type of organization, and many of the characteristics present in an enterprise or company are either very different or not valid in the Education field. However, despite evident divergence in motivation and time-constraints between organizational employees and schoolteachers/students, Agarwal *et al.* (2007) have found that the model of sharing hostitlites by Husted & Michailova (2002) should be also valid for e-learning knowledge-sharing initiatives. As per Dublin (2003) even when much effort has been poured into improving infrastructure and technological features for e-learning, not enough initiatives are devoted to get human capital to engage in knowledge sharing activities.

Finally, due to its relevance the research to Global Knowledge Management, this work will adopt Pirkkalaien & Pawlowski (2013) definition of a barrier as any challenge, risk, difficulty, obstacle, restriction or hindrance that might prevent a single person, a group or an organization to reach an objective and success in a specific context when the challenge is related to acting of working in a collaborative cross border setting.

3.1.1 Cultural Barriers

One of the main subtopics within the study of barriers to knowledge sharing is culture. As a matter of fact, when referring to culture, not only is the national cultures aspect included, but also the cultures inherent to any individual and that are part of their personality. The nationality, religion, education, cultural heritage, all shape the ideas and conceptions of the world that any individual has. The profession that the person practices and the professional environment also play a fundamental role in their thinking and acting, as well as the job positions held, and the different workplaces the person has worked at. The experiences undergone by each individual in each of the environment they interact at, form up the individual culture.

An organization is composed of many individuals, each of which put in their contribution to the different subcultures within the organization. Due to the many working departments and sections that form up an organization, and also to the different interests that individuals have (profesional or personal), these group subcultures are also defined. The organization itself has a culture, which is composed of the set of values and beliefs represented in the mission and vision of the enterprise.

The organizational culture is considered the largest barrier to knowledge management (Chase, 1997). Organizational culture deals with aspects such as collaboration and trust (Singh & Kant, 2008). A knowledge-oriented organization promotes trust creating activities within the employees and departments, to facilitate knowledge sharing and collaboration. Attitudes like knowledge hoarding and mistrust highly affect the knowledge flows within an organiza-

tion, and the management needs to find solutions to change the mindsets of those opposing resistance to knowledge sharing.

There are great differences in the points of view of a traditional organization, versus a knowledge-oriented organization. For example, back in time, individuals had a mindset that it was important to be knowledgeable but sharing such knowledge with others within an organization might jeopardize their job positions. However, today organizations try to change that mindset in order for individuals to understand knowledge as an asset that is much more useful and beneficial when shared. The following table (Table 2), by CEN/ISSS (2004), compares traditional versus knowledge oriented organizations.

TABLE 2 Comparisson of Traditional and Knowledge-aware organizations

Organizations with low awareness of knowledge	Knowledge-aware Culture
Limited information distribution	Wide information distribution
Many management levels	Few management levels
Uneven responsibility	Shared responsibility
Rules bases	Principles based
Formal structure	Informal structure
Risk adverse	Able to take some risks
Occasional training policy	Continuous learning policy
More financial focus	Multifunctional focus
Political	Open
Knowledge retention	Knowledge sharing & utilization
Low emotinal intelligence and cultural awareness	Welcomes influences on organizational culture from the networks in which an organization participates

Highly relevant to research of culture as a barrier to knowledge management is the work of Geert Hofstede, whose studies about national cultural differences across subsidiaries of IBM in 64 countries yielded the well-known theory of cultural dimensions. The first dimension, Power Distance, is concerned with how individuals from different countries accept an uneven distribution of power. Whereas, the second dimension, Uncertainty Avoidance, measures the degree to which individuals feel comfortable in a situation of uncertainty. The third dimension is Individualism, which is the opposite of collectivism, and measures the integration of individuals into groups. Masculinity (vs Femininity) is the dimension concerned with the distribution of emotional roles between genders. One last dimension, Long-Term Orientation deals with the values and virtues fostered, particularly, those oriented to a reward in the future.

The outputs of Hofstede's research show differences in national culture from country to country. Thus, even when a global organization defines its working culture, its branch offices around the world will always tend to have a different culture, given the different distances (regional, national, religious, language, etc.) among them. Collaborating organizations also need to find solutions to cultural differences, especially when distance is a factor

contributing to such differences. For instance, Pallot et al. (2010) state that in order to reach collaboration effectiveness in an international setting, the participants need to create a common culture and use a common language. Cultural aspects will be further discussed in a separate chapter.

3.2 Barrier Categories to Usage of Learning Object Repositories

The Framework for Global Social Knowledge Management (GSKM) barriers by Pirkkalainen & Pawlowski (2014) constitutes an important part of the background for this research. The framework was obtained after a careful literature review and a cross-domain approach that combines barriers from Global IS, Knowledge Management and Social Software. Instead of a more mainstream classification of barriers according to types within a given domain, this framework classifies the barriers following a category criterion.

From the GSKM Framework, the selection of barriers was based on those that also matched the search for the terms OER, e-learning, education and repository, knowledge sharing. Barriers that were also essential to the Educational resources topic were selected as well, e.g., some barriers that belonged to the category of management. Finally, a list of barrier categories that directly concern the LOR field was created.

Next, the categories of barriers selected will be described, as well as how these affect the usage of LOR with some examples. It is exactly these barriers that will be analysed in this research project, trying to get a finer grasp on them, through the insights from a group of LOR managers. At the end of each subchapter, questions regarding each barrier category will be stated. These questions will be used as a guide for the interviews.

3.2.1 Local Institutional Policies

This category encloses barriers that are somehow administrative, given that it is at school, university level or gubernamental level. These barriers can be highly impeding given that the policies established by an institution or by the government, in some cases, dictate how the users will act, and what their attitudes will be towards open content (Davis, et al., 2010). For instance, if the institution has policies that promote the use of LOR, then it is likely that teachers will at least try using LOR, but if the institutions are being too restrictive, then it is very likely that the users will not be engaged, as they are not willing to take the risk of acting against the rules of the institution. The lack of policies supporting the use, creation and distribution of educational resources may also affect, as teachers may feel without direction and doubtful about sharing materials openly.

Examples:

- Bureacracy and administrative procedures that delay the installment and the use of LOR (Ågerfalk et al., 2005), (Krishna et al., 2004), (Bures, 2003).
- Lack of incentive from the institution in order to get teachers started in the use of LOR (Gao, Dai, Fan, & Kang, 2010), (Riege 2005), (Zhang 2010), (Agarwal et al., 2007).
- Rules and regulations of universities and institutions that go against the open distribution of material (Hatakka, 2009)
- Rules and regulations at national/regional level that inhibit the use of LOR (Hatakka, 2009).
- Lack of resources devoted to the use/installment/creation of LOR (Chen, 2010), (Husin & Hanisch, 2011).

To be used as guide in the interviews:
Are there any impediments to the usage of the LOR that are related to regional, organizational or institutional policies, such as rules, restrictions, reward systems, bureaucracy, acceptance of hierarchy, lack of policies that support the usage of the LOR?

3.2.2 Attitude towards Knowledge Sharing

This category refers to all barriers that hinder the transfer of knowledge. These barriers have to do with all the harmful attitudes towards knowledge and information sharing, wether it is providing others with knowledge, or accepting knowledge from others (Szulasnki, 1996). Husted & Michailova (2002) describe levels of knowledge-sharing hostility (mild to strong) according to the behavior of individuals in relation to knowledge transmission, knowledge reception and the nature of the very knowledge sharing activity.

Examples:

- Attitude "Knowledge is the power" – fear of loss of power through sharing. (Bureš, 2003), (Husted & Michailova, 2002), (Agarwal, Tan, & Poo, 2007).
- Fear of "knowledge parasites" – fear that others will absorb knowledge and share nothing in return. (Agarwal, Tan, & Poo, 2007), (Husted & Michailova, 2002).
- Wish to avoid external parties from assessing the quality of the owned knowledge. (Agarwal, Tan, & Poo, 2007), (Husted & Michailova, 2002).
- Lack of group awareness and team spirit (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005).
- Doubts about other team members' capabilities and skills. (Riege, 2005), (Husted & Michailova, 2002).

- Lack of trust in the accuracy and credibility of knowledge due to the source. (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005).
- Preference for own ideas. Take too much pride on own contributions. (Husted & Michailova, 2002).

To be used as guide in the interviews:
Are there any impediments to the usage of the LOR that are related to the willingness (or lack of, thereof) of users to engage in knowledge sharing activities (providing or receiving) reflected in concrete attitudes like knowledge hoarding, lack of team spirit, lack of trust on the knowledge/capabilities of others.?

3.2.3 Differences in Curricula

This category of barriers refer to the impediments due to the differences in the organization and/or the contents of courses established by different institutions and/or teachers. In the case of LOR contents, every contributor will provide material as used by themselves, in accordance to their own necessites, and the necessities of their students. However, the way a particular topic is taught and addressed by a teacher at a scool in a particular region of the world will be quite unlike how it is taught by a different teacher, in a different school, in a different world region, etc.

Examples:

- Lack of suitable material for a particular group of students. (Hatakka, 2009).
- The content found in the repositories does not fit the scope of the course. (Hatakka, 2009).
- Difficulty to match the full set of course material to the curricula of different institutions. (Chen, 2010).
- Lack of relevance: the content is not flexible or easy to adapt, thus it is not reusable. (Chen, 2010).

To be used as guide in the interviews:
How adaptable to the particular necessities of the users are the contents (or organization of the contents) as established and created by different institutions or teachers?

3.2.4 Differences in Teaching Practices

The teaching methods vary depending on the teacher, the school, the region and the system in general. Good teaching requires good teachers, and thus, good training, management and remuneration (Vaillant, 2002). In order to get

teachers to use the interactive and personalized materials present in repositories, the traditional frontal eductation methods, associated to low quality of education, need to be reviewed and complemented with teaching initiatives that are more learning-centered, rather than just lecturing-centered (Schiefelbein & Schiefelbein, 1998).

Examples:

- Teaching methods that are highly book dependent. (Hatakka, 2009)
- Rigid pedagogical culture, with little chance for innovative methods. (Schiefelbein & Schiefelbein, 1998), (Joyce, 2006).

To be used as guide in the interviews:
Do the pedagogical methods support the use of LORs?

3.2.5 Intellectual Property Issues

This category refers mainly to the concern that users might have about using the material that is available at the repositories given that the copyright aspects need to be taken into consideration before using, modifying and reusing the material. On one hand, the creators of the resources need to understand what to do and how to specify what others can do with the material produced by them. On the other hand, those using the materials created by others need to have a clear idea of what their limitations are in terms of distribution, editing, and other modifications. (Hatakka, 2009), (Chen, 2010), (Larson & Murray, 2008).

To be used as guide in the interviews:
Are there any issues associated with copyright and intellectual properties thay may keep users from contributing with their own material or reusing material shared by others? Is there awareness regarding this topic?

3.2.6 Language

Clearly, language will always represent a barrier, specially when the repository is designed to provide miltilingual content (Retalis, 2005). A repository that not only offer material in different languages but that also provide a multilingual system with multilingual support is an idealistic goal that not too many repositories accomplish (Tzikopoulos, Manouselis, & Vuorikari, 2007).

Examples:

- Lack of language proficiency to use materials produced in foreign languages, and to communicate with other users within the community. (Pallot, Bergmann, Kühnle, Pawar, & Riedel, 2010), (Noll, Beecham, & Richardson, 2010).

- Language style makes the content hard to understand for the learner, because there are too many implicit factors (figurative speches, cultural expressions, etc.). (Hatakka, 2009).
- Need for accurate translation of the contents. Some specialized features such as discussion forums, dictionaries, glossaries are necessary in order for non-native speakers to understand some concepts. (Retalis, 2005).

To be used as guide in the interviews:
Are foreign-language contents used? Are the contents doubled, subtitled, translated?

3.2.7 Skills

The usage of the repositories also has to do with the users having enough skills to use and contribute to the repositories. As per Hatakka (2009), in order to use/contribute to LORs, teachers need to be trained and further supported so that they can develop their capacities.

Examples:

- Lack of skills to use the portals in general (ICT skills, written communication skills, technical skills, etc.) (Humbert, Rébillard, & Rennard, 2008), (Cloete, De Villiers, & Roodt, 2009).
- Lack of understanding of metadata, content packages, etc. (Davis, et al., 2010).

To be used as guide in the interviews:
Do the intended users have the skills necessary to use and/or contribute to the LORs?

3.2.8 Infrastructure

The use of LOR requires that users have access to technical resources. This is an issue particularly for developing countries and rural areas in general (Chen, 2010). Even when teachers might have access to technical resources, students might not have access, making the use of digital resources inadequate (Hatakka, 2009).

Examples:

- Low access to computers, for both teachers and students (Hatakka, 2009).
- Software and hardware requirements not met (Humbert, Rébillard, & Rennard, 2008).
- Minimum bandwidth requirement not met (Chen, 2010), (Larson & Murray, 2008).

To be used as guide in the interviews:
Is the available infrastructure for the use of the LOR sufficient in terms of software, hardware, broadband, etc.?

As previously mentioned, the motivation of this study is to understand the impediments for a better and wider dissemination of LORs. This set of barrier categories from the Framework for Global Social Knowledge Management (GSKM) barriers by Pirkkalainen & Pawlowski (2014) provide the background on which this research is going to be based on. In the next chapter, cultural implications for the European and Latin American regions will be discussed to provide background for the cross-cultural aspect of this research.

4 INFLUENCE OF CULTURE ON THE USAGE OF LEARNING OBJECT REPOSITORIES

The previous chapter provided the framework for this research in terms of the barriers to the usage of LORs. A hypothesis for this research is that cultural aspects also influence in the usage of LORs. Some LORs serve more than one specific region, which is the motivation to do a cross-cultural study. Figure 3 shows the mapping of barriers to the usage of LORS from audiences from diverse regions to barriers to global knowledge sharing. This chapter has the purpose of providing a more structured context regarding the influence of culture in global knowledge sharing environments, i.e., LORs targeting multicultural or multilanguage audience.

FIGURE 3 Relation of global knowledge sharing to this research

4.1 Theories of Culture

4.1.1 Hofstede's culture dimensions

According to Hofstede, culture is the collective programming of the mind that distinguishes the members of one group or category of people from another. As previously mentioned, Hofstede's studies on national cultures defines five cultural dimensions. The set of the measures of each dimension is what accounts for the particularity of any given culture. The mind-set, ideas, attitudes, and actions of an individual is, in a very general kind of approach, a consequence of their culture. Hofstede's dimensions are explained in more detail as follows:

1. **Power distance:** This dimension refers to the point up to which those with less power within a society are willing to accept an unequal distribution of power. This dimension in defined, logically, from a low level upwards, and not the opposite way, and it implies that inequality within a society will be weak or strong depending on both, the followers, and the leaders within it.

2. **Uncertainty avoidance:** This dimension is related to the level of comfort experienced by individuals when facing ambiguous circumstances, i.e. when being in front of situations that are not usual, or normal. Cultures with a high level of uncertainty avoidance have strict laws and rules and tend to be very absolutist when it comes to philosophical and religious beliefs. Within this type of culture, showing of and acting by emotion is not only common, but also encouraged. On the other hand, uncertainty-accepting cultures are more open to different lines of thought and lifestyles. People within these cultures are more apathetic and are not expected to communicate emotions.

3. **Individualism:** This dimension answers to the necessity of feeling integrated into groups. In the same line, but opposite to individualism, is collectivism. An individualist society is characterized by loose-fitting contact relationships. In collectivist societies, strong, solid groups are formed, and individuals are involved in them from the moment of birth. The family is not only nuclear, but extended to second, third and even lower grades of kinship.

4. **Masculinity:** Versus its opposite, femininity, this dimension is defined in regard to the distribution of emotional roles between the sexes. A highly masculine society is described as assertive and very competitive, as opposed to a feminine society, which is modest and caring. As per the results of the studies of Hofstede, women in feminine countries have the same modest, caring values as the men; in masculine countries, they are

somewhat assertive and competitive, but not as much as the men, so that these countries show a gap between men's values and women's values.

5. **Long-term orientation:** Opposite to short-term orientation, is the dimension that takes into consideration the importance that time horizon has in a given society. Long- term oriented societies encourage values oriented towards future rewards, such as hard-work and persistence. Whereas short-term oriented societies care for values related to the past and present such as respect for tradition and reciprocity. (Hofstede & McCrae, Personality and Culture Revisited: Linking Traits and Dimensions of Culture, 2004), (Minkov & Hofstede, 2012).

4.1.2 Trompenaars & Hampden-Turner's Dilemmas

In an attempt to describe culture, Trompenaars & Hampden-Turner (1998) created a Seven Dimensions of Culture model for elucidating national cultural differences in organizations. The model is based on seven dilemmas. Every dilemma represents an aspect of national culture, which is characterized by the tendency of such culture towards one side of the other of each dilemma. Table 3 presents these seven universal dilemmas of culture.

TABLE 3 Seven Dimensions of Culture Model

Dilemma	Tendencies
What is more important: rules or relationships?	• Universalism: Fosters values, codes, laws and rules. • Pluralism: Fosters friendship and human relations.
Do we function as a group or as individuals?	• Individualism: Foster self-realization and happiness. • Communitarianism: Fosters common well-being.
How far do we get involved?	• Specific: Fosters a clear distinction between the different elements of an individual's life (work, family, etc.) • Diffuse: Encourages relationships between the elements of an individual's life. High involvement.
Do we display our emotions?	• Affectivity: Fosters public demonstrations of affection and emotions. • Neutrality: Fosters minimal manifestation of emotion, and self-control.
Do we have to prove ourselves to receive status or is status given to us?	• Achievement: Fosters the accomplishment of goals. • Ascription: Fosters providing status according to the basis of the person's being.

| Do we control our environment, or do we work with it? | • Internal control: Believes in the domination of mankind over its environment.
• External control: Fosters the adaptation of men to external circumstances. |
| Do we do things one at a time or several at a time? | • Sequential: Believes in phase-by-phase organization and sees time as a commodity.
• Synchronic: Fosters the execution of several tasks at one time, and considers time is flexible and intangible. |

4.1.3 Hall & Hall's Definition of Culture by Context

Hall & Hall (1990) also define cultures as high or low context, according to how focused and specific communication needs to be. In low-context communication, information needs to be expressed in just the appropriate words, to avoid any ambiguity, whereas in high context communication, much of the information needs to be somehow decoded from the whole situation. (Petkova & Lehtonen, 2005). Culture also affects collaboration within locally disperse teams. As already mentioned, an implication of differences in culture is the appearance of barriers such as lack of trust, lack of common understanding of goals, requirements, and tasks, which may turn in "re-inventing the wheel" and delays in achieving milestones within projects (Noll, Beecham, & Richardson, 2010).

4.2   Differences in Culture affecting Knowledge Sharing

Given the obvious differences between national cultures, knowledge sharing practices differ vastly from place to place. The implementation of a specific knowledge sharing initiative might be very suitable and appropriate for a given location, but not accurate at all in another (Desouza & Evaristo, Global Knowledge Management Strategies, 2003). Furthermore, Noll et al. (2010) state that when collaborating between different locations, team members need to be conscious of the cultural heterogeneity, which also accounts for the diversity of preferences due to cognitive and learning styles, and knowledge sharing channels and practices (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005).

The usage of tools and services for knowledge sharing depends on the processes being developed, the characteristics of the group, and the environment, as well as the common culture created for communication within a team (Zigurs & Khazanchi, 2008). This is in agreement with Pallot et al. (2010) and Onyechi & Abeysinghe (2009) who state that the creation of such common culture is a requisite for the achievemnt of collaboration effectiveness.

As already mentioned, Pirkkalainen & Pawlowski (2014) proposes a barrier framework for Global Social Knowledge management, for identifying and analysing barriers and their solutions in distributed, Social Software supported

Knowledge Management efforts. Deriving from his work, those barriers in the framework that fell into the cultural category were selected, as well as some others from literature that are considered relevant to the cultural aspect. The implications of culture on collaboration are enumerated and described as follows.

1. Language difference is a great source of misunderstandings. The quality of communication is affected, as well as the channels chosen to communicate. Language diversity is very much based on history, culture and tradition, and thus it has a very relevant paper in cultural and cognitive behaviors. When members of a team are not confident in the language used for communication, they can be very prone to choose asynchronous, low-context communication media, e.g., e-mail, or chat. Besides trying to choose to collaborate with people in locations with the same linguistic preferences, not much can be done in order to overcome this barrier. (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005), (Pallot, Martínez-Carrera, & Prinz, 2010), (Noll, Beecham, & Richardson, 2010).

   Example related to LOR usage: If a teacher from France would want to use the materials from a teacher from Portugal, they would have to take time to translate the material. That might discourage the French teacher from using it.

2. Not knowing collaborators in advance also shows up as an impediment to collaboration. It is only normal that for people that don't know each other, there would be a mutual lack of trust, which can only be overcome after several interactions (Sclater, Grierson, Ion, & MacGregor, 2001), (Noll, Beecham, & Richardson, 2010), (Pallot, Bergmann, Kühnle, Pawar, & Riedel, 2010), (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005). At an initial point, team members have not had the chance to show their capabilities, which is also a source of lack of trust. An approach proposed by Sclater et al. (2001) is to provide the possibility for team members to have face-to-face meetings and get to know each other before the start of collaboration.

   Example related to LOR usage: Some teachers might find it really difficult to collaborate in the creation of material, or even recycling or reusing material from a teacher they have never met and may not trust in the reliability of the shared materials.

3. Asynchronous collaboration can be very frustrating for disperse teams. Even with synchronous communication channels available, the differences in time zones make it a requirement to use asynchronous media. However, the level of feedback required is not always met, and the abil-

ity to plan and make decisions quickly is lost. (Pallot, Martínez-Carrera, & Prinz, 2010) (Sclater, Grierson, Ion, & MacGregor, 2001), (Ralyté, Lamielle, Arni-Bloch, & Léonard, 2008). Some ideas found in literature to approach this issue are:

- setting clear objectives,
- having several communications via chat per day,
- texting messages stating check your email,
- redirecting of e-mails to home,
- designating one contact host,
- having as many real-time communications as possible.

Example related to LOR usage: Users living in different time zones and trying to interact in the same platform might feel it is too much of an inconvenience to share and interact with users outside their own or similar time zones, and thus miss on what might be a rich interaction with a user overseas.

4. There is a clear need for cultural training in order to avoid misunderstandings amongst team members (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005), (Dhanaraj, Lyles, Steensma, & Tihanyi, 2004). Dhanaraj et al. (2004) found that sending proxy persons and cultural ambassadors to remote sites, as well as executing awareness workshops can give good results and provide an adequate environment for knowledge transfer.

Example related to LOR usage: Certain expressions or terms might offend users of a multicultural platform if they are unaware of how these are used by people from a diverse background.

5. The lack of defined roles and responsibilities is another important source of conflict. When tasks are not well distributed, team members tend to be confused, given that cultural background can also affect the interpretation of priorities perceived by team members (Sclater, Grierson, Ion, & MacGregor, 2001), (Ralyté, Lamielle, Arni-Bloch, & Léonard, 2008). Solutions found by Sclater et al. (2001) are:

- defining the overall group objectives,
- identifying and prioritizing the tasks necessary to achieve the objectives,
- specifying the group working procedures.

Example related to LOR usage: The role and task of a community manager, for example, as understood by different members of a multicultural platform may vary according to what is typical in their regions, or on the platforms they are most familiar with.

6. Culture also influences the approach to problem solving held by different individuals within disperse teams. Differences in domain knowledge will arise difficulties in agreeing to appropriate solutions (Ralyté, Lamielle, Arni-Bloch, & Léonard, 2008), (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005), (Sclater, Grierson, Ion, & MacGregor, 2001), (Pallot, Martínez-Carrera, & Prinz, 2010). According to (Sclater, Grierson, Ion, & MacGregor, 2001), a general assessment of knowledge distance is always a suitable start-point for finding solutions to such an issue.

   Example related to LOR usage: Low quality contents created by users with educational deficiencies due to culture-related aspects (e.g., countries with higher level of corruption tend to cut Education budget).

7. One last implication has to do with the remote site's norm structures, institutional methods, perception of authority and hierarchy. As per Ågerfalk et al. (2005), the provision of clear information on norms/methods and formal and informal procedures is necessary to avoid any conflict having to do with laws, regulations, or rules.

   Example related to LOR usage: In places the norms of the institutions are unclear about content exchange on online platforms, users may hesitate to use LORs to stay out of trouble.

This list has been provided to facilitate a better understanding of the reasons behind the difficulties of working in disperse and multicultural teams. The idea, to the effects of this research, is to map or extrapolate these implications to the LOR arena. It is obvious that, besides language issues, the afore-mentioned barriers do have an influence on the use and reuse of LOR material amongst users from different cultures.

4.3   The Culture of Latin America

As previously mentioned, one of the main subtopics within the study of barriers to knowledge sharing is culture. With the hypothesis that cultural aspects influence in the usage of LORs, this research also aims to explore the differences between the barriers to the usage of LORs as perceived by users from Europe and users from Latin America. With the increasing need for LORs in Latin America, European (specifically Portuguese and Spanish) LORs have a great opportunity due to the language connection. It is relevant for these LORs that are serving both regions to understand and find ways to overcome the cultural barriers.

   With the above mentioned in mind, this section, as well as the next one (The Culture of Europe), is presented in order to give some context about both

regions and to be able to analyze the findings of this research from a cultural perspective. This comparison based on the cultural factor influence is a very important portion of this research. The idea is to understand how culture influences the utilization of LOR, how the culture contributes to build a barrier that is associated to LOR or why is this barrier not even relevant due to the culture itself. In this sense, a description of Latin American and European culture is provided to illustrate the reader and help create a more complete background.

The situation of Latin America is as complicated as it is complex. In what is considered a broadly understood definition, the region is geographically distributed across North America (Mexico), Central America (Guatemala, Nicaragua, Honduras, El Salvador, Costa Rica, and Panama), South America (Colombia, Venezuela, Ecuador, Bolivia, Peru, Uruguay, Paraguay, Chile and Brazil), and the Caribbean (Cuba, Dominican Republic and Puerto Rico). Thus, Latin America, at least for the effects of the present research, will be considered as the regions that were colonized by the Spanish and Portuguese Empires (Pan-Hispanic Dictionary of Doubts, 2005), and that, in its vast majority, reached independence through a common movement within the first quarter of the XIX century.

According to Lizcano Fernandez (2005), in Latin America there are three main mother ethnic groups: pre-Hispanic indigenous, pre-industrial Iberian and Sub-Saharan African. The first sub-ethnic groups formed from those are: mestizo (Indigenous and Iberian), mulatto (African and Iberian), zambo (Indigenous and African). For what accounts for the present times, the Ibero-American countries are divided as follows in four different groups: *criollos* (white European descendants), Indo-European (mestizos), afro-criollos (Iberian and African), afro-mestizos (Iberian, indigenous and African). It should also be mentioned that along the history other ethnicities, to mention French, Italian, German, Arab, Hebrew, Chinese and Japanese, also had an important influence in the constitution of the current ethnic composition of the Latin American countries.

As a matter of fact, miscegenation in Latin America has a much greater importance than in any other region of the world, as it is present in almost all its population. The cultural richness of Latin America is very much a consequence of the different ethnic groups that at some point of the history either inhabited or arrived in the region. It is not appropriate to say that there is one culture common to all Latin American countries. However, as a general description, it could be said that a tendency towards a western, much Iberian, culture is dominant and common to all Latin American countries. This western-culture tendency does not exclude the coexistence of indigenous and black ethnic groups, which are extremely valuable to the culture as a whole.

Latin American culture (in a general sense) is very particular, and having a look at Hofstede's dimensions of culture, the following findings by Harrison (2009) are an average of the dimensions in Latin American countries, individual realities may differ from these statements though. Concerning Power Distance, this dimension scores high. Authorities in Latin America are to be respected

and their decisions should not be questioned. Decision making is their responsibility, and it is not likely that people in a "lower level" will be involved. However, middle- and low-class movements throughout the countries are starting to raise their voices and starting to participate in political arena, and beyond.

Latin American cultures have a low index of Individualism. Perhaps this is a cultural heritage of indigenous ethnic groups, who's most distinguishing cultural characteristic is the sense of membership to a community (Lizcano Fernandez, 2005). In Latin America, loyalty to the group, no matter what is of higher value than individuality.

According to the same author (Harrison, 2009), the main components of the Masculinity index are somehow contradictory in Latin America. On one side, the level of aggression and competitiveness associated with successful business and entrepreneurial achievements does not rank high, even if monetary income is of high importance for Latin Americans. However, there is a high distinction between gender roles, and the stereotypical "machismo" is not far from reality.

Latin American culture scores high on Uncertainty Avoidance, and as per Hofstede: "does not readily accept change and is very risk adverse." This translates to preference for very specific direction and supervision, rather than independence. Table 4 presents a summary of the traits of Latin American Culture that can represent challenges to the collaboration of distributed teams. This table is the result of a literature review based on pieces obtained when searching different combinations of the terms "Latin America", "Culture", "Management", and the similar. Three main papers were selected: Elvira & Dávila (2005), Granell (2000) and Osland, De Franco, & Osland (1999). After a careful reading , the main characteristics of the Latin American Culture were derived and organized in the following table.

TABLE 4 Implications of Latin American Culture

Characteristic	Description	Implications	References
Empathy	• Good relationships are highly valued. • Courtesy and kindness are expected. • High emotional content within the personal relationships at the workplace.	• Face-to-face contact is highly preferred. • Bureaucratic procedures trumped by personal relationships. • Small talk preferred over "to the grain" conversations. • Conflict avoidance. • Loyalty, trust, flexibility and administrative efficiency are based on personal empathy. • Having "contacts" can help obtain special benefits.	Osland, De Franco, & Osland (1999), Elvira & Dávila (2005).

Characteristic	Description	Implications	References
Social distance	High classism. Different social groups don't mingle with each other. Highly collectivistic culture that favours high union only within the group. Use of titles is a common practice.	• Classism is reflected on workgroups/departments that engage in rivalry. • There is a low level of trust within teams/departments, making it difficult to collaborate with one another.	Osland, De Franco, & Osland (1999), Elvira & Dávila (2005)
Paternalism	The superior has the deed to protect the people under his supervision.	• Latin American workers expect their bosses to take interest in their personal lives and even solve financial problems. • Responsibility is avoided, as it should only be carried by the leader of the team. • Benefits from the company are expected, such as scholarships, vacation club memberships and private health care. • Creates inner competence in order to become the boss' favourite.	Osland, De Franco, & Osland (1999), Elvira & Dávila (2005)
Hierarchical relationships	High acceptance of authority and all the responsibility is held by the head of the group. High power distance index.	• Communication flows only from top management, downwards (lack of feedback) • Workers avoid contradicting managers. • Highly centralized management style. • Creates need for physical presence, as it implies proximity to power.	Osland, De Franco, & Osland (1999), Elvira & Dávila (2005)
Time management	Time is a very elastic parameter. Time constraints are not a source of stress.	• Latin Americans can be considered rude and inconsiderate to people from different cultures.	Granell, 2000
Importance of quality of life	Wellbeing is more important that professional achievements.	• In an international workgroup Latin Americans may seem less serious about their responsibilities at the workplace.	Granell, 2000

4.4 European Culture

When it comes to European Culture, especially in the current times, it is quite difficult to describe one particular cultural pattern that repeats throughout the region. It should be rather said that there are a series of cultures, which might even oppose amongst themselves. The history of Europe starts in the classical antiquity with the rise of city-states in the Ancient Greece. Many centuries separate the beginnings of European history to that of America and describing the facts that have formed up the cultural identity of Europeans is an extensive task. For the effects of this research some of the main elements that form up the cultural identity (or identities) of the region will be mentioned, however it is assumed that the reader is well acquainted with the general features of European Culture.

In the first place, the historic heritage is linked to the major cultural axes of Western Civilization: Greece, Rome, Christianity, Illustration and the scientific spirit. This historical sense of the human occurrences that molds the European way of thinking and living, which is also expressed through the universalism, implies openness to others in a continuous expansion also towards other continents. The European universality is a melting point of cultural traditions that are inseparable from their Christian roots and that, together with an intense scientific sense constitute the defining elements of the European reality.

The cultural identity of the continent is unique collage in which various heritages converge Judeo-Christian, Greco-Roman, barbarian, and within Christianity, the legacy of the Protestant Reformation, the Renaissance, the Illustration and also the three nineteenth-century components of this heritage: nationalisms, socialism and romanticism. In addition, the heroic and tragic legacy of the twentieth century: the loss of world-power, the perversion of totalitarianism and the concentration camps, the destruction caused by the world wards, and the return of Europe to the world scene. All the aforementioned elements are integral part of the European identity (Eliot, 1962).

The two wars, followed by the cold war divided the the continent into East and West. This vision brought the weakening of the Royalty with its national interests, and brought the internal divisions wrought by international working-class movements. At the present, Europe is composed of 32 nations, in which 67 languanges are spoken. The languagues play indeed a very crucial part in the development of the cultures and it is mainly the languages that keep the constant items within the diverse national cultures. The rest of the items in culture are relatively new and are the result of an integration capacity and a slight fragility, understood as renunciation and self-criticism, mainly as a reaction to the destruction of last century's world wars (Eliot, 1962, Borneman & Fowler, 1997).

In an attempt for unification, Europeans have created a European currency (the Euro), a flag, and a newspaper (the European), European television stations,

European universities, a European Champions League for soccer, a film festival, a European parliament, court, and law, and even a "Eurovision" song festival.

4.5 Implications of National Culture in Education

"Education consists primarily in transmission through communication… while every social arrangement is educative in effect, the educative effect first becomes an important part of the purpose of the association in connection with the association of the older with the younger" (Dewey, 1916). Culture influences education, and vice-versa. Indeed, education is socially and culturally built, and every aspect of the different Educational Systems around the world is very much a consequence of the diverse elements of national culture (history, tradition, social structures, etc.).

Taking Hofstede into consideration the implications of the dimensions of national culture in teaching and learning are (derived from Hofstede, 2008):

Large Power Distance: Educational models following such dimension are characterized by a high dependence of students on teachers. The teacher is the authority and has to be treated with respect. The teacher is the center of the education. Communication is one way only: from teacher to student. The personal knowledge and wisdom of teachers are transferred onto students, and such knowledge should not be questioned.

Short Power Distance: Teaching and learning is characterized by an equal treatment amongst teachers and students. The education is student-centered and communication in initiated both ways: from students to teachers, and from teachers to students. Also, teachers are considered experts that transfer impersonal truths to students.

Strong Uncertainty Avoidance: In an educational model characterized by strong uncertainty avoidance students have the necessity of knowing the right answers, and teachers must know these answers. Demonstrations of emotions in the learning environment are accepted, but there is high peer-pressure and a generalized need to fit-in. Parents are informed about the progress of the education of their children by the teachers.

Weak Uncertainty Avoidance: Such dimension is characterized by fostering discussion and debate and understanding different points of view. It is acceptable for the teacher not to know it all, as teachers are seen as enablers of learning processes, rather than gurus of knowledge. Control of emotions is in order at all times, and tolerance for differences is encouraged. Also, parents are involved in the education of the children, rather than just informed about it.

Individualism: In an individualist culture, the purpose of Education is "learning how to learn". Individual learning initiatives are supported by the system, so teachers are looking forward for students to share their views and opinions. Also, groups and associations are formed in agreement with mutual interests; and the achievement of goals and obtainment of diplomas increase economic-worth and self-respect.

Collectivism: For collectivist cultures, education is where students learn "how to do". Individual initiatives are not taken into consideration, and students only give out opinions when they are required to do so by teachers, or by the groups. Already existing groups mandate who can part-take, and degrees are opening keys to higher-status groups and associations.

Long Term Orientation: This implies that students will rely on hard work and effort in order to be successful. These cultures are characterized by hard studying people, with high performance at mathematics and applied sciences. Children learn to save and be prepared for the future.

Short Term Orientation: Short term orientation in education is characterized by students considering that success or failure cannot be controlled by them, because being successful or not is a matter of destiny and luck. They consider that life and youth is too short to be spent only studying, and that enjoyment is to achieve personal fulfilment. These students have low performance in mathematics and science, but talent in theoretical and abstract sciences.

However, Hofstede itself is not enough to understand the education from a cultural point of view. Considering the differences in culture and the influence of diverse world views and learning theories, Henderson (1996) provides a multiple cultural model of education, which is based on the recognition of the high importance of culture within learning and teaching, and the relevance of cultural awareness. Specially important for societies where multiple cultures interact (as well as for cybernetic learning spaces), this model takes into consideration the ways of thinking and doing, as well as the background of students coming from different realities of society.

A multiple cultural model is also valid for cultures that are not based on ethnicity, such as school culture, a wider culture of society, and/or the popular youth culture. The multiple cultural pedagogic model is composed of 14 dimensions, or social constructs, that take signficance due to the selective, academic traditions in which they are located. The set of dimensions provide a framework to assess the validity of educational material in multiple cultural settings. Dimensions like epistemology, pedagogical philosophy, underlying psychology, etc., vary along the axis of multiple cultural contextuality, which goes from not incorporated to actioned. The Figue 4 shows the Multiple cultural pedagogic model of instructional design.

Actioned

Multiple Cultural

Objectivism	Epistemology	Constructivism
Instructivism	Pedagogical Philosophy	Constructivist
Behavioral	Underlying Psychology	Cognitive
Sharply-focused	Goal Orientation	Unfocused
Reductionist	Instructional Sequencing	Constructivist
Abstract	Experiential Value	Concrete
Teacher proof	Role of Instructor	Equalitarian facilitator
Errorless learning	Value of Errors	Learning from Experience
Extrinsic	Motivation	Intrinsic
High	Structure	Low
Non-existant	Accomodation of Individual Differences	Multifaceted
Non-existant	Learner Control	Unrestricted
Mathemagenic	User Activity	Generative
Unsupported	Cooperativity Learning	Integral

Contextualization

Not Incorporated

FIGURE 4 Multiple cultural pedagogic model of IMM instructional design (Adapted from Henderson's 1994 adaptation of Reeves, 1992).

4.6   Social and cultural reality of Education in Latin America

This section will summarize the main remarks in terms of description of the schools, teachers and students in Latin America according to the Second Regional Comparative and Explanatory Study (SERCE) executed by the Latin American Laboratory for Assessment of the Quality of Education (LLECE, 2008).

4.6.1 Schools

More than 50% of the schools in Latin America are located in rural areas, making it difficult for the distribution of resources. The main problem for schools in urban areas is the high concentration of population, thus high demands in terms of resources needed. According to the study, only 76% of schools have potable water, and only around 30% of them have enough bathrooms for the students.

Only 50% of schools in Latin America and the Caribbean have a library, and only 37% of schools have at least one computer lab. The average number of computers available per school is around 16. It should be taken into consideration that these facts are average and that countries like Chile, Cuba, Argentina, Costa Rica and Uruguay are top of the group in most of the aspects, providing a more than acceptable number of resources for schools. However, other coun-

tries such as Nicaragua, Guatemala, Peru and Paraguay, are continuously shown as the ones having less resources devoted to Education.

4.6.2 Teachers

The study reveals that around the 60% of the teachers are women, and that the average age is 39 years old, with an average of 10 years of experience. According to the study, around a fourth of the teachers need to have a second job in order to suffice their economic necessities. The preparation of teachers in the region is found lacking, especially when it comes to teaching methods. In the region pedagogy has been described as "frontal", meaning highly theoretical, centered on memorization processes and with very little time devoted to research (García-Sipido, 1994). According to Vaillant (2002) teaching institutions in Latin America do not consider the pedagogical training as a relevant factor for their personnel.

4.6.3 Students

The SERCE study reveals that the ages of students attending the same school grade vary greatly. Some students start the first grade at the age of 8. Child labour is directly related to failure in education. Around 10% of the children within the region work, and this in mainly the case in the rural areas. The socioeconomic and cultural situation of students in Latin America is measured through the index of socioeconomic and cultural status (ISEC), which comprises variables related to the facilities of the housing unit, the goods available for their use in education, and the material with which the house is built of. The level of education of the parents, the native language, and the amount of books in the household is also considered for this assessment. According to the index three groups are characterized. The first one has a superior level, it is composed of Argentina, Chile, Costa Rica and Uruguay. The second group is on the average level. Countries within the second group are Brazil, Cuba, Ecuador, and Panama. A third group has levels under the regional average (LLECE, 2008).

4.7 Application of Henderson's Model to Latin America and Europe

Based on Henderson's Multiple Cultural Pedagogic Model, the map of Figure 5 has been created based on the information obtained from the interviewees that were spoken to for the present research, as well as from the information collected for this theoretical background regarding the education culture in Latin

America especially. This map also reflects the perception of the author of this work, who is Latin American, but has also lived in Europe for some years.

However, it should also be considered that both Latin America and Europe are quite diverse from country to country and even within each country, thus the information provided on this map is a generalization. The map shows pins for the perceived level of each of the elements of Henderson's model. The L-pin is where Latin America is perceived to be, and the E-pin is where Europe is perceived to be.
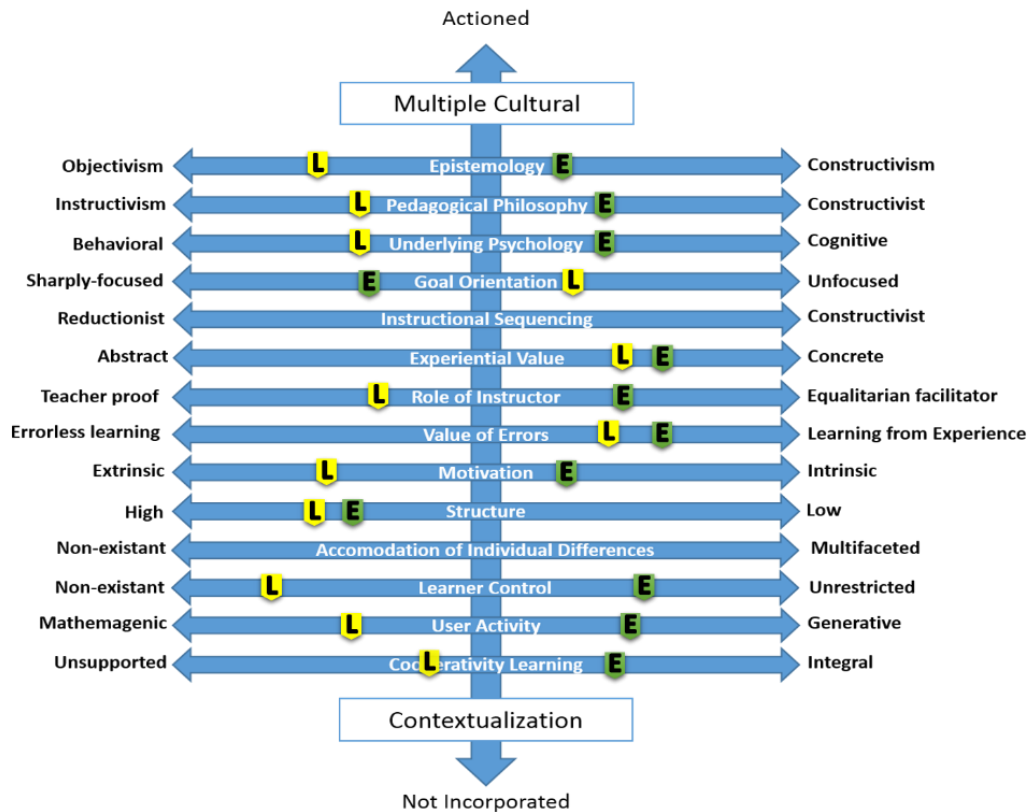
FIGURE 5 Perceived level of the elements of Henderson's model for Europe and Latin America

This chapter has provided an explanation of national culture and its influence on knowledge sharing. The implications of the differences amongst national culture are to be taken into consideration for the purposes of a cross-cultural analysis. A brief explication of the very complex Latin American culture was provided, as well as the implications of national cultures in Education; the large socio-cultural disparities in Latin American Education were also discussed.

Since this research aims to show that that cultural aspects also influence in the usage of LORs, not only the barriers to the usage of LORs were studied, but the cultural aspects were always taken into consideration throughout the whole investigation process. These cultural differences influenced in defining the questionnaire used for the research and were considered when analysing the data. The research was conducted with the hypothesis that there is a large dif-

ference when it comes to those barriers that are somehow influenced by the culture of the region. That is, barriers such as infrastructure, skills, curricula, teaching practices and policies will show to be stronger in Latin America than in Europe.

5   METHODOLOGY

In this chapter we will discuss the main objectives of this research and the methods used in it. The research problems are re-stated:

- What barriers do LOR managers consider the most significant to the use of educational repositories?
- How do the barriers to LOR usage in Europe compare to those in Latin America?
- What are the main approaches that have been implemented to overcome the identified barriers?

This research is aimed to provide LOR managers with deeper insight on the requirements that should be met and the barriers they should be aware of when designing, creating, and managing their repositories. Also, both the state-of-the-art and the future solutions can serve as "Best Practices", to provide users with suitable and useful repositories. According to Tzikopoulos *et al.* (2007), not enough studies have been done to obtain an accurate idea of the nature and status of development of LORs, and very little has been covered in the field of barriers to usage of educational resources and in a much quantitative manner (Chen, 2010, Hatakka, 2009).

The topic of this research is barriers to the usage of LORs. As already mentioned, these barriers have been found in literature, and the intention is to discover how repository managers feel about the relevance of these factors, regarding the acceptance and usage of LOR by teachers. To do so, a qualitative approach was taken to get a grasp on issues that need a comprehensive study, as are barriers, especially since we are also taking cultural backgrounds into consideration. As per Yin (2002), multiple case study was conducted.

The data analysis follows a positivist and interpretive approach (Ravishankar, Shan, & Leidner, 2011). The existing research on barriers was taken into consideration as well as the socio-cultural situations, thus providing expectations of what the significance of the barriers would be for managers in each region (Europe and Latin America). The answers from the informants were

assessed to check for confirmation of the levels of relevance expected. Following, the interviews were analyzed to topics and specific barriers within the categories.

5.1 Data Collection

Interviews to 8 repository managers from Latin America and 12 repository managers from Europe were conducted from June to July 2012. The choice of LORs was based on an overview of different types of repositories. For example, there is one federated repository from Latin America and one from Europe. Large, medium, and small repositories were selected to get a more global view of the current situation. It should also be pointed that as a measure taken to analyze the success of the diverse implementations, cases that have been active for some time were chosen due to the maturity of the solutions, in order to understand the keys to success and the reasons why the implementations were not successful.

For the repositories in Europe, the *known sponsor approach*, as per Patton, 1990 was used. Around twenty LOR managers, all from the Open Discovery Space Project, which is a joint effort of more than fifty repositories in Europe, were contacted for this research. The data for the Latin American section of the research was collected through well-known sources on LOR repositories. The 'snowball' tactic (Patton, 1990), was used, thus meaning that those managers that were interviewed provided the interviewers about other knowledgeable as well. Table 5 provides information about the interviewees and the repositories they represented.

The interviews were conducted via Skype, Flashmeeting and face-to-face. The duration of the interviews ranged from one to one and a half hours. The interviews had a semi-structured approach (Questionnaire to be found on the appendix). Two interviewers (early-stage researcher and experienced researcher) conducted the interviews. The interview style evolved throughout the interviews more to the direction of interviewees speaking freely rather than constant interrogation, thus allowing for less bias. The average duration of the interviews was around one hour. The interviews were performed in English language, except for two LORs from Latin America, which were performed in Spanish, as it would be easier for the interviewees to elaborate on their native language. These last ones were translated to English by a native speaker (the author). In some cases, the interviews were attended by 2 or more interviewees, and thus sometimes there are different nationalities provided on the table.

TABLE 5 Description of Repositories and Repository Managers

ID	Repository Name	Description of Repository	Cultural background of the interviewee	Primary role of the interviewee
EU1	Open Science Resources Repository	The portal provides educational material as educational content and as educational pathways. Users can search for the educational materials or upload their own materials to the OSR Repository. **Oriented to users of multiple nationalities.**	Greek	Manager, Technology developer, teacher trainer
	COSMOS	Collection of existing educational tools and on-line materials for science teaching. **Oriented to users of multiple nationalities.**		
EU2	*EduTubeplus Video Library*	*European hybrid, multilingual video-based service for schools, which integrates multi-lingual curriculum-related video-clips by major European educational TV & video providers, with tools for enabling educators to enrich the library with user-generated clips.* ***Oriented to users of multiple nationalities.***	*Romania*	*Manager, teacher trainer*
	SIVECO's ASPECT Portal	*Content developed by SIVECO for the Aspect project Best Practice Network for educational content involving 23 partners from 16 countries, including Ministries of Education, commercial content developers and technology providers working together improve the adoption of learning technology standards and specifications. – currently not accessible by any portal.* ***Oriented to users from Rumania.***		

ID	Repository Name	Description of Repository	Cultural background of the interviewee	Primary role of the interviewee
EU3	I2G Intergeo repository	Digital repository for mathematics teaching. Offers content in a searchable and metadata-tagged portal. Enables users to use their software of choice by specifying a common file format based on open standards. **Oriented to users of multiple nationalities.**	German & French	Manager, Technology developer, teacher trainer
EU4	*Key2Nature's Dryades repositories*	*Interactive educational tools for the identification of organisms for enhancing the knowledge of biodiversity at all educational levels across Europe.* ***Oriented to users of multiple nationalities.***	*Italian*	*Technology developer*
EU5	OpenScout Federation	Provides education services on the internet that enable users to easily find, access, use and exchange open content for management education and training. **Oriented to users of multiple nationalities.**	Finnish	Manager
EU6	*LaProf educational content repository*	*Provides free access to a variety of language teaching materials that intends to help the immigrating workforce of two sectors (ICT education and agriculture) to get more familiarized with the terminology used in their destination countries for their sectors.* ***Oriented to users of multiple nationalities.***	*German & Greek*	*Manager, Technology developer*
EU7	Miksike's LeFo repository	E-learning platform for teachers and learners. It features an electronic study material exchange and editing functions, a keyword search-engine, an expert answer scheme and communication tools. **Oriented to users from Estonia, Lithuania, and Latvia.**	Estonian	Manager

ID	Repository Name	Description of Repository	Cultural background of the interviewee	Primary role of the interviewee
EU8	*Bulgarian national educational repository, Virtual Bulgaria educational portal repository and Znam.bg Collection*	*Educational portals and repositories created to provide a source of materials in Bulgarian language.* **Oriented to users of Bulgarian nationality.**	*Bulgarian*	*Manager, Ministry representative*
EU9	BMU collection of eLearning content - Digiš school repository	Learning Management System that allows for the set up and creation of different materials, lectures, exercises, assignments, tests, presentations, and audio-video materials, through the use of Moodle. **Oriented to users of Serbian nationality.**	Serbian	Manager, Ministry representative, Teacher trainer
EU10	Croatian national school repository	*Education services and digital contents.* **Oriented to users from Croatian nationality.**	*Croatian*	*Manager, Technology developer*
EU11	Schule.at repository	Austrian web platform for schools, which holds a large collection of educational resources for teachers and students. **Oriented to users from Austrian nationality.**	Austrian & New Zealander	Manager, Technology developer, teacher trainer
EU12	*Organic.Edunet*	*Learning portal that provides access to digital learning resources on Organic Agriculture and Agro-ecology and aims to facilitate access, usage and exploitation of such content. Learning resources published are appropriate for school and university level, thus targeting pupils, students, teachers and researchers, apart from general learners.* **Oriented to users from multiple nationalities.**	*Swedish*	*Technology developer*

ID	Repository Name	Description of Repository	Cultural background of the interviewee	Primary role of the interviewee
LA1	Duda Library	Repository project that intends index, distribute, and manage Open Educational Resources from all around the world, and make it available at schools with low to no connectivity. **Oriented to users of multiple nationalities.**	Brazilian	Manager, technology developer
LA2	*Educopedia*	*Online platform for collaborative digital lesson plans and presentations geared for teachers who want to use the activities in the classrooms with the students are available. The platform features 32 lessons plans per subject and grade with issues, competencies and skills covered in the curriculum guidelines of the Municipal Education in Rio de Janeiro.* ***Oriented to users of Brazilian nationality.***	*Brazilian*	*Manager*
LA3	Recursos Educacionais Multimídia para a Matemática do Ensino Médio	Portal containing multimedia educational resources in digital formats for the teaching and learning of mathematics. ***Oriented to users of Brazilian nationality.***	Brazilian	Manager
LA4	*EducanDo*	*Portal directed for schools, teachers, students, administratives and parents, which provides digital contents according to the Dominican Curriculum. This portal is provided by the Ministry of Education.* ***Oriented to users of Dominican nationality, contents are in Spanish language – could be used by Spanish speakers.***	*Dominican*	*Manager*

ID	Repository Name	Description of Repository	Cultural background of the interviewee	Primary role of the interviewee
LA5	Educa Panamá	Portal belonging to the Ministry of Education, designed for the use of technology and digital resources in the teaching community. **Oriented to users of Panamanian nationality, contents are in Spanish language – could be used by Spanish speakers.**	Panamanian	Manager
LA6	*Federação de Repositórios Educa Brasil*	*Service of the National Experimental Teaching and Research Network (RNP) that organizes various repositories in a federation called hierarchical system, which centralizes the information in these repositories into a single portal.* ***Oriented to users of Brazilian nationality.***	*Brazilian*	*Manager*
LA7	LACLO	Open community made up of individuals and institutions interested in research, development and application of technologies related to Learning Objects in the Latin American education sector. **Oriented to users of multiple nationalities.**	Ecuadorian	Manager
LA8	*Wikimatematica & Academatica*	*Wikimatematica is website that is based on the addition of mathematics contents with the aid of a Wiki.* *Academatica is website that offers video lessons on mathematics for university students.* ***Oriented to users of multiple nationalities.***	*Guatemala*	*Manager, Technology developer*

5.2 Data Analysis

During the interviews, the relevance of the barriers according to the answers of the interviewees was assessed with integers from 0 to 2, zero (0) representing *non-significant,* one (1) representing *significant* and two (2) representing *highly significant.* This allowed the author to obtain a *Descriptive Analysis Table* (refer to the Results Analysis section) which helps for presenting the results, as an average of the relevance per barrier was obtained for each region. These weights based on the immediate assessment during the interviews were later corroborated/corrected when analysing the transcriptions of the interviews.

The analysis of the interviews was done following Miles & Huberman (1994) guidelines for coding, and with the aid of Atlas.ti. The codes used refer to the barriers researched are presented in the Appendix A. Each interview was carefully read and quotations of the answers were tagged with the aforementioned codes. With the help of Atlas.ti, a list of quotations for each category of barriers was obtained, which was again analysed in search of main subtopics or issues within each barrier. The same was done in order to obtain the state-of-the-art solutions as well as the ideas for future development that were suggested by the interviewees.

Please refer to table 6 for the methodological guidelines used. The methods are based on Sarker & Sarker (2009) due to the similarity of their study in terms of the interpretive approach taken.

TABLE 6 Methodological Guidelines with Illustrations.

Aspect of the Study	Methodological considerations	Additional Description	Illustration
Choice of repositories and access	Selecting appropriate repositories to study.	The objective was to get insight into the barriers to the usage of educational repositories, taking into consideration repositories at different stages of development and in different regions.	Repositories from the Open Discovery Space project were chosen because of the possibility of exploring a variety of cases with very diverse types of barriers. Latin American repositories were chosen because of the possibility to find out differences in barriers within different regions.
	Getting access to interviews	*"Known sponsor approach" (Patton, 1990), provided credibility to the researchers.*	*Since the University of Jyväskylä is part of the ODS project, the researchers received the support from the different repositories contacted.*
Data collection	Choice of Interviewees	The interviewees were suggested by the Global Information Systems research team at the University of Jyväskylä.	Interviewees were chosen because of their experience within the repositories they manage and their contributions to different projects regarding repositories for education.
		"Snowballing" technique was used, particularly for the Latin American region.	*Interviewees who had collaborated with repositories Latin America directed the researchers to one particular interviewee in Ecuador, who eventually provided cues to other potential interviewees in the region.*

Aspect of the Study	Methodological considerations	Additional Description	Illustration
	Conduct of the interviews	Following the principles of: • Flexibility • Non-direction • Specificity • Range	• The interviewers offered diverse possibilities for setting up the interviews and adjusted to the time differences between Latin America and Europe. • The interviewees were asked to speak their minds first. • Specific questions about barriers were asked after the interviewees had explained the situation of their repositories. • Even if there was a guideline, the interviews were conducted according to the type of repository and the region.
		The duration of the interviews was long enough to get sufficient insight of the barriers.	*The interviews were conducted via Skype, Flashmeeting and face-to-face, and took around 1 to 1.5 hours.*
	Maintaining empathetic neutrality	"Non-judgmental from of listening" (Sarker & Sarker, 2009 quoting Walsham, 1995), but maintaining enough distance.	The interviewers tried to be sympathetic at all times, getting "on the side" of the interviewees, especially if the barriers had to with Policies coming from their institutions and/or government.

Aspect of the Study	Methodological considerations	Additional Description	Illustration
Data analysis and representation	*Refining concepts through constant comparison.*	*To support and confirm the studied categories within the research, constant comparisons were performed.*	*Theoretical background as well as data coding was used to refine the concepts. The codes were defined in the initial phase of the analysis. Reformulation of some concepts was later done to comply better with the emerging information of the research.*
	Triangulation	Comparison of responses across repositories, respondents, and regions as part of the constant comparison process (Sarker & Sarker, 2009 quoting Charmaz, 2000)	The researchers confirmed that the significance and existence of barriers was confirmed by several of the interviewees and that at least within regions there would be some coherence.
		Lack of triangulation were identified and served to include and explore the different conditions and the contingencies experienced at different repositories.	*In some cases, interviewees did not agree to barrier categories that would be considered very relevant to researchers, however, this always led to further conversation and a better analysis of each particular situation.*
	Being suspicious about evidence	Work with caution about bias in information (Sarker & Sarker, 2009 quoting Klein and Myers, 1999)	The researchers were aware that interviewees could provide information that might be too subjective. It was clear for the researchers that some interviewees might be afraid about speaking their minds about their institutions and/or governments.

6   RESULTS ANALYSIS

In this section, the main findings of the study will be presented. The categories will be first introduced and later the findings for each region will be provided, with the most representative quotations. These quotations were selected because they: a) represented best the general thoughts about the categories, b) confirmed an expectation about a barrier, or c) stated a very particular issue and/or contradiction to an expectation. After the explanation of the categories for each region, a discussion will follow to compare and contrast the current findings with those of previous studies in this field.

The barriers categories were derived from the Framework for Global Social Knowledge Management (GSKM) barriers by Pirkkalainen & Pawlowski (2014) from which the selection of barriers was based on those that matched the search for the terms LOR, e-learning, education and repository, knowledge sharing. Barriers that were also essential to the Educational Resources topic were selected, e.g., some barriers that also belonged to the category of management. Finally, these are categories of barriers selected: Differences in Language, Intellectual Property Rights Issues, Infrastructure, Local Institution Pocilies, Skills, Pedagogical Practices, Differences in Curricual and Knowledge Sharing Issues.

Even if the barriers are not being quantified, a weigh was given to the relevance of these according to the answers provided by the interviewees. The average for each region and an overall average is given on a graph for every section. The weigh of the relevance goes from 0 to 2, 0 being non-relevant and 2, very relevant. Asigning this weigh could be considered subjective, but it still gives a visual idea of the relevance of each barrier for the two studied regions. It is not to be read as the rule for every studied repository as even within the same region, answers sometimes varied greatly.

6.1 Local Institution Policies

It seems that the policies held by governments both in Europe and Latin America are quite open about the use of LOR. The Ministries of Education seem to be

taking part and action in supporting the use and creation of educational portals. However, an issue that was several times mentioned by both groups of respondents was that even if the local institutions are not restrictive, they are still lacking the ability to create awareness about the existence of the resources within the teaching community. The next figure (figure 6) represents the results of the numerical analysis.
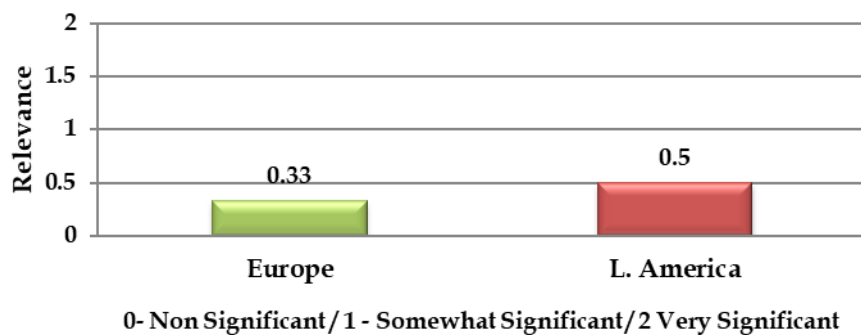

FIGURE 6 Graph: Descriptive Analysis – Relevance of Local Institutional Policies

6.1.1 Europe

The European interviewees mainly agreed that the policies held by the governments do not affect the usage in a restrictive manner. There exist, nonetheless, many concerns about the support that the authorities give to the LOR movement. The organizations and partnerships behind the LOR projects must strive a lot to raise awareness about the existence of digital resources and the helpfulness of these.

> "Basically, it was without much support from the Ministry. It was not just a lot of money. It was a lot of work, lots and lots of pathways. There are three parts. Especially the Eugenides Foundation they have a huge network of teachers, so every time we were doing a workshop there, we had lots of teachers. The other two foundations did a lot of work as well, so to begin with. We had two partners with big networks, we had double the teachers." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

> "We try to raise awareness with all types of activities, not just in the portal but in OpenScout in general like dissemination activities and so on, and to somehow make the OER movement better well known. Of course, in the portal we are keening out different types of best practices and how these OERs could be better merged to institutions, to teachers... In that sense we try to somehow push the OER better to the institutions: that it would be taken up and more discussed within the departments, so that it could be merged into the everyday life of institutions and therefore there would be policies, and some kind of rules, restrictions, etc. around LOR because now it is not in any way highlighted." (Henri Pirkkalainen, Finnish, Open Scout Resources).

About this awareness raising issue, respondents from the I2G Intergeo repository stressed the importance of having country representatives that can serve as a bridge between the projects and the authorities and being able to motivate and activate them. Having connections with associations and/or networks of teachers and schools was also mentioned as necessary for promoting the LOR movement. In this project (I2G Intergeo), the different levels of success across different countries had much to do with the support gotten from these country representatives.

> "We have a role called the country-representatives. So, what's the role of these persons? Our idea was that they are someone who serves as a contact point with the Ministry of Education and who is able to support the project and support the project's philosophy on a school-administrative basis. But we figured that the real problem was to activate these persons, it was quite a big problem to find the right persons for each country, so as you can see, we have only nine or ten persons out of twenty-five countries in Europe, and we were not able to activate them in the right way so that we could reach the administration of the country." (Chris Dohrmann, German, I2G Intergeo Repository).

It is also a matter of the institutions to enact the policies, or to create regulations that liven up the use of the digital materials. If the laws are elastic enough, then schools' administratives and teachers can include these resources within the study material. Yet again, the problem goes back to the awareness and the willingness to use LOR.

> "Every school from Rumania has an IT lab, or more. At this point, it is no longer the Ministry the problem, but it is a local and a at each school problem, and I think that more important are the principals than the Ministry of Education, because I've seen schools where they had two labs, and they made a lot of efforts and they got a third and fourth labs. So, it is more a local decision at the school level, I think the Ministry is the one setting this direction by the implementation. They did in the last years a lot of work in that direction. But the problems at the school level at the most important. This is my opinion; it is what I've seen. How is it possible for one school to have children working, and ok, and for others to have a lab but not to know where the key is for that lab?" (Delia Oprea, Romanian, EduTubeplus Video Library & SIVECO's ASPECT Repository).

Another aspect of the policies is that even if there are no restrictive laws directly affecting the use of LOR, there are laws that favor the use of textbooks and the purchase of printed materials from publishing houses.

> "There is a national standard, the Croatian National Education Standard, and it says nothing about the use of Open Content, there is just this thing that is, in the classroom, the Ministry has some textbooks that have to be used, but that is it. Other materials can be used. Not in replacement, but, like, in addition." (Renata Šimunko, Croatian, Croatian National Schools Repositories).

Bureaucratic processes held by institutions also affect the creation and use of LOR. In that sense, some interviewees also complained that the need for the

approval from the Ministries of Education and/or educational institutions make teachers reluctant and close-minded about the utilization of the digital materials.

> "The problem is that our educational system is very conservative, most of the experts in the Ministry have to approve every little textbook. In order for this acknowledgement to happen some expert need to review it, and this is the problem because most of the time if I want to involve, I have to pay them, nobody will do this review for free. Second, it is very difficult even to announce a lesson like in formal way if the content is not somehow approved by someone, our teachers and our directors are very sensitive because they don't want to have problems with the Ministry and with the other organizations that are monitoring the educational process." (Orlin Kouzov, Bulgarian, Bulgarian National Educational repository, Virtual Bulgaria Educational Portal Repository & Znam.bg Collection).

6.1.2 Latin America

The interviewees from Latin America all agreed that the government policies in these countries do not forbid or restrict the use of LOR. It should also be noted that three of the repositories studied were part of the Ministries of Education of their countries, which could be a source of bias. Seventy-five percent of the repositories studied are funded by the government directly or through some project or similar kind of initiatives.

> "The Ministry of Education does not forbid the use of any resources. In terms of bureaucracy, I think it is very flexible here. I think I know the institution, I know the norms and regulations, and we try to manage according to that. When there is a decision that requires high-level authorization, then it is managed by the Office the Minister, she would take her decisions, or consult with legal assessment. But we haven't gotten to that yet. We try to keep within that range, always keeping in mind that this is a pedagogic portal." (Sofía Medina, Panamanian, Educa Panamá).

As stated, the governments do not do any type of blockage, but much more needs to be done to create awareness about the existence of LORs. There are no restricting laws, but there are no supporting policies. Even if the governments invest financial resources for the creation of educational portals and/or repositories, some institutions are deficient in letting the teaching communities know that they can and should use those resources.

> I believe that we have a bad dissemination of the products. If we had more production of learning objects in Brazil, the people would want for the others to see it. I really don't believe that there is an effort to promote the development. The development of learning objects… no one is pushing this forward. I believe we could have many more and better learning objects if this kind of approach was made." (Luiz Rossi, Brazilian, Federação de Repositórios Educa Brazil).

Bureaucracy was also mentioned as a hindering factor for the use and creation of resources. Since most of these repositories are financed with public funds, many authorizations are required, making the processes very slow.

> "As far as this project goes, its development is very nice, but since this is public money, everything has to be authorized, so if we have to hire somebody to do something, it takes a long time for that. The bureaucracy is really huge. We know that, so we started knowing that it that this could be kind of a trouble, so we managed to live with the bureaucracy, which is another problem." (Samuel Rocha de Oliveira, Brazilian, Recursos Educacionais Multimídia para a Matemática do Ensino Médio).

Another aspect that proves true, at least according to one of the interviewees from Brazil, is that personalism/particularism as mentioned by Osland, De Franco, & Osland (1999) are indeed traits of the Latin American culture. Having the right contacts can be the key for success when trying to push forward a project, even in Education.

> "It would be interesting to have some government backing this up. I'm looking for that, I'm desperately trying to contact the State government. They have a lot of persons; nobody knows who decides what. If you don't have an important person that says: *'let's do it'*, then there won't be good results." (José Eduardo Nogueira, Brazilian, Duda Library).

Though the skills of teachers in the use of computers and technology will be further discussed, it was often mentioned with relation to the policies of the diverse Ministries of Education. At least half of the interviewees found that their governments are not effective enough in giving teachers a preparation good enough in terms of ICT literacy.

> We have been fighting it a lot here in Ecuador, to at least give some introduction to ICT to teachers, so they are able to produce materials. We have projects that do that, but not at a systematic level, like *'ok, this is the teacher training, every teacher has to take it'*, no. That is not present, and I feel that it is not the case in most Latin America, with some exceptions I think, Uruguay, and Costa Rica, Chile too is doing something, I think Colombia, also, they are starting to do it. I think it is changing, but sadly here in Ecuador, I could say that my reality… the Ministry of Education has other problems in their heads, so they are not thinking about it." (Xavier Ochoa, Ecuadorian, LACLO Repository).

6.1.3 Summary and discussion

It was expected that this barrier would score higher in both regions. The interviewees though referred more to the fact that there are no impediments to the usage. However, there is evidence of lack of supporting policies, as previously found by some authors (Chen, 2010), (Riege, 2005). The lack of reward systems, the failure to create awareness, etc. are all evidence of the need of a system that works from the top-down. Also, there is evidence of bureaucracy, especially in Latin America, which concurs with previous findings in the field (Bureš, 2003),

(Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Conchúir, 2005). To see a summary of the findings regarding policies, please refer to the table 7.

TABLE 7 Category: Local Institutional Policies

Region	Findings	State-of-the-Art	Future Development
Europe	• Policies are not restricting. • Policies are not supporting the LOR movement. • Some laws are rather supporting the publishers of textbooks.	• Contacting key people that would serve as a bridging agent with local governments. • Supporting best practices to set examples.	• Further than trying to push the authorities, most repository managers stated that this subject is out of their reach.
Latin America	• Policies are not restricting. • Policies are not supporting the LOR movement. • There is a lot of bureaucracy.	• Trying to contact governments to raise more awareness.	• Further than trying to push the authorities, most repository managers stated that this subject is out of their reach.

6.2 Knowledge Sharing Issues

Positive attitudes towards knowledge sharing are crucial when it comes to the sustainability of a repository. Figure 7 presents the relevance that knowledge sharing issues have on the usage of repositories, according to the interviewees of this study. Barriers related to knowledge sharing such as unwillingness to share, knowledge hoarding and preference for own ideas were identified in the answers of the interviewees. European managers' answers showed more concern than Latin American's.
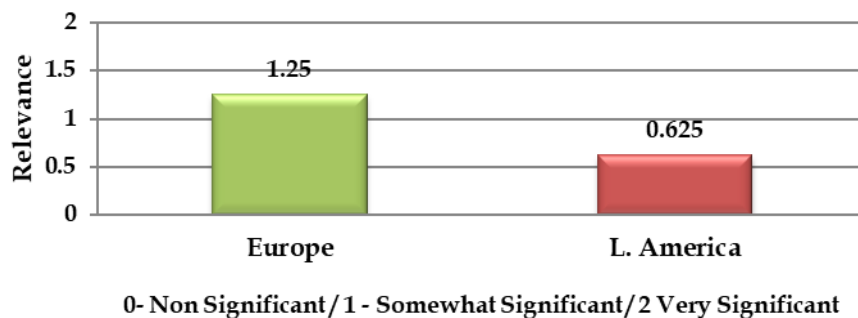

FIGURE 7 Graph: Descriptive Analysis – Relevance of Knowledge Sharing Issues

6.2.1 Europe

Most of the respondents of these interviews do find that there are issues associated to knowledge sharing. Regarding the willingness to share, which was expected to be one of the major aspects did not result as crutial as the capacity of builing a community around the repositories. However, here are some quotations that reflect unwillingness to share as a barrier.

> "Definitely, I think the biggest barrier could be knowledge sharing if it is about your own course material. Some might be very cautious about sharing; they feel they will be judged, or their material will be judged... I don't know if it is the Finnish culture, because at least what I have discussed with some foreign teachers, and they see that it is very similar. Maybe the younger generation, younger people are more open and more transparent in sharing things in general on the web. So maybe it is kind of a generation issue as well. That the things that you learned previously you somehow adopt; the younger generation might adopt this more open transparent way of working and living. They feel more natural to start with these sharing issues. I cannot say that it is something cultural." (Henri Pirkkalainen, Finnish, Open Scout Resources).

> "For us there are different kinds of users, we have like the contributors, I think that here maybe the main problem is that there is no enthusiasm to make some material and put them there. There is also this skill problem, which was mentioned, and the knowledge sharing, the fear that somebody will steal the work. So, I think these are the main reasons why we don't get so many materials as we could." (Renata Šimunko, Croatian, Croatian National Schools Repositories).

Knowledge sharing is also about using and re-using materials made by others. One issue with this is that some are reluctant to use ofther's materials because they don't trust in other people's capacities, or because of preference for their own ideas.

> "Of course, let's say that in all Europe, even if there are countries that are more advance, the teachers have a little bit of attitude that they do not want a lot to use the resources that are not their own, that's a huge problem, every say that '*no, I want my resources!*', but when you are asking what you do in this direction, they say: '*ah, not very much!*'. So, I think that at this point the main problem is the teachers, in every school, for instance something like the 10 to 30 percent they want to use the resources, the others just watch." (Delia Oprea, Rumanian, EduTubeplus Video Library & SIVECO's ASPECT Repository).

In order to get users to share it is necessary to make clear what the benefits are to themselves and to the teaching community. Clarification is also needed about what to share and under what conditions (refering to IPR, mainly). One problem is that even if people share, the contents still don't have meaningful and relevant content.

> "And then, of course, there were teachers and, I think also, the universities were encouraged to open the material and just upload it, or link to it from Organic Edunet repositories. I think it worked quite well because there was never a discussion about:

'I don't want to publish my material'. I don't think that anyone said that. There was more a discussion about: *'Ok, I'm not very sure whether I am allowed to publish my material, because I reused pictures from other sources, where it is unclear how the IPR look like'*. So, I think it was more of an IPR question, not a question of being willing to contribute. I think everybody was very keen on contributing, but IPR added some uncertainty to the whole thing." (Hannes Ebner, Austrian, Organic-Edunet).

"Sharing has one technical obstacle, which was a challenge within the platform, but that technical obstacle is kind of the least, sharing just URLs is very easy. Where it becomes an obstacle is sharing when something is ready to be used by someone else. Sharing itself is not an obstacle, sharing so that it is used, and think of others can use it successfully is the thing that has not being progressing enough, which of course is related to how it is shared, which of course is related to how people can play, how can they use all the things." (Paul Libbrecht, German, I2G Intergeo Repository).

The interviewees stated that when there exists a community and a sense of "belonging" users are more prone to provide contents and get involved in knowledge sharing activities. The social aspect of repositories is particularly important, and is enhanced through features like commenting, rating, flagging, discussions, etc. Sharing the events occurring in the repositories through networks like Facebook or Twitter was also mentioned as a way to make users be more engaged in their repository communities.

"This could be done with teachers even from the old school, because if they are in a nice light community, not very heavy and official, but a light and happy community, it would really motivate the teachers to actually communicate. It's just a matter of how you share the food, it not just about how tasty it is. If we give them something that they feel comfortable using, because in some cases they feel afraid that they'll be criticized about what they wrote." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

Another dilemma that arises around this knowledge sharing issue is the motivation for the users to contribute. It is debated if financial retribution should be provided in order to get teachers to provide their materials. However, not all of the interviewees agree that this is a healthy solution, and managers are more inclined towards retributions that would provide recognition and reputation such as trusted user status, badges, tokens, gifts (virtual), competitions, etc.

"We had this issue of having contributors with different *karmas*, to say: highly praised contributors, less praised contributors. That was one point and one issue that we had to face during the project was how to aggregate these first contributors which had very large wealth of resources and we saw that actually putting money in the game didn't help sometimes. Being supported by paying some people really deters some other contributors from joining the project. They didn't want the money themselves, but if others had money for contribute, they didn't want to take part in it. They did want some retribution in symbolic terms, so we had to come up with this token of exchange in the Intergeo platform, sort of formulize: *'What is the currency in the platform? What do we really trade on the platform?'* So, some contributors are trading resources in which they put a lot of their knowledge and enthusiasm, and they want in return users to actually validate their work, or to make critics on their work. That's

one point. But I think we missed opportunities to retribute good contributors, for example by awarding some chocolate medals to some good authors, and this could have been done just by better editorial work on the platform, by really changing the resource of the day, or the week, for example, and having this be recognized with token of recognition, from the project to the authors and to the users. It could be a good point if you could, in your project, do such things." (Christian Mercat, French, I2G Intergeo Repository).

6.2.2 Latin America

As shown in the graph there is a large difference between the relevance that the knowledge sharing issues have in Europe vs. Latin America. One fact to consider, though, is that only one of the repositories studied in Latin America directly accepts contributions from users through a Wiki. Four out of eight repositories elaborate and provide their own contents, and the rest work in a federation-like fashion. The interviewees were however asked about the attitudes towards knowledge sharing amongst teachers in their countries.

The interviewees have quite a good sensation about knowledge sharing amongst teachers. The "knowledge is power" position is changing towards a more open-minded attitude. The two positions can still be found, and some of the interviewees relate it with the generation divide.

> "Right now, there are two classes of teachers. One type is relatively young, they really try to implement the use of new technology in class. Older generation teachers are really hard to change their mind. That kind of things needs to change…. Here, at least in the university there is no other professor doing anything similar because they don't want to be shown as someone who makes mistakes, if you see my videos, I have made mistakes, but I think that if you don't make them you don't learn, if you worry about making mistakes you are never going to do anything. So, what I do is that I do the videos, and if I make a mistake someone will let me know, and I will correct it with a note, or something." (Carlos Zelada, Guatemalan, Wikimatematica & Academatica).

As can be drawn from the last quotation, the idea that others will judge their materials is also an impediment to knowledge sharing. Some teachers fear that their materials are not going to be good enough or are not fully finished.

The topic of motivation was also commented. On one hand, there is a necessity to create higher awareness, and on the other a system of retribution or rewards is also required to make users want to contribute. Financial retribution however is not a good option with the limited budgets that most repositories have. Visibility and recognition, on the other hand are probably more affordable rewards to offer.

> "The motivation for sure [is lacking]. They don't have any pay-back, or any feedback, most of the times about what is developed. They don't know even if someone is us-

ing or cheering them for their developments. The feedback is second after the motivation. But that is the two main factors why I believe people don't develop so many learning objects." (Luiz Rossi, Brazilian, Federação de Repositórios Educa Brazil).

"…It matters because you will see the possibility of having your content being seen in schools and communities in Brazil and South America and all over the world, then people will start looking for ways to share their material." (José Eduardo Nogueira, Brazilian, Duda Library).

What can be derived from these answers is that also more channels for publication are required, as well as more policies to promote the use of LOR, such as the provision of more infrastructure, more trainings to enhance the ICT skills of teachers and more time that the teachers can devote to the creation of digital resources. The creation of communities and social features around the repositories is also necessary to make the teachers both more engaged in the use of LOR, as well as to raise more awareness about the existence of the repositories and the resources.

6.2.3 Summary and discussion

It would have been predicted that the attitudes towards knowledge sharing would have scored much higher, it was not the case however, and most managers interviewed agreed that the teaching community has a tradition of sharing. The sharing hostilities expressed by Husted and Michailova (2002) were mentioned by only a few managers. More than unwillingness to share, the interviewees expressed the fear of judgment, which has also been found by previous studies.

The fact that preparing materials is so time consuming, and thus a detractor in the contributions to repositories, was mentioned highly relevant by all the interviewees. This agrees with the theories and findings of so many authors both in the knowledge sharing arena (Agarwal, Tan, & Poo, 2007), (Riege, 2007). Table 8 provides a summary of the main findings in the category of knowledge sharing issues.

TABLE 8 Category: Knowledge Sharing

Region	Findings	State-of-the-Art	Future Development
Europe	• The teaching community has positive attitudes towards knowledge sharing. • Community building is needed to support the repositories. • Lack of clarification about what to share and conditions. • Lack of retribution systems. • Lack of time detracts teachers from engaging in sharing activities.	• Awareness rising in workshops and trainings. • Providing options to share, rate and comment both on the repository and on social networks. • Trusted user status (karma, etc.). • Financial retributions for collaborations (Estonia, only case).	• Virtual gifts.
Latin America	• The interviewees consider that the teaching community is very willing to share knowledge. • Fear of judgment detracts teachers from sharing materials. • Teachers do not receive enough motivation to participate in LOR creation. • Lack of time detracts teachers from engaging in sharing activities.	• Raise awareness through trainings and courses. • Policies of some universities that the teachers must share their materials.	• Creating more channels for the publishing of teacher's materials.

6.3 Differences in Curricula

Generally speaking, this barrier scored somewhat significant. Figure 8 presents a graph showing the general relevance of differences in curricula, as well as the relevance per region . What was wanted to know was if the fact that the plans of study vary across different countries and regions affects the usability of LOR. Aspects such as the relevance of the contents and the quantity of objects

available go into this category as well. This barrier for each of the regions will be explained next.
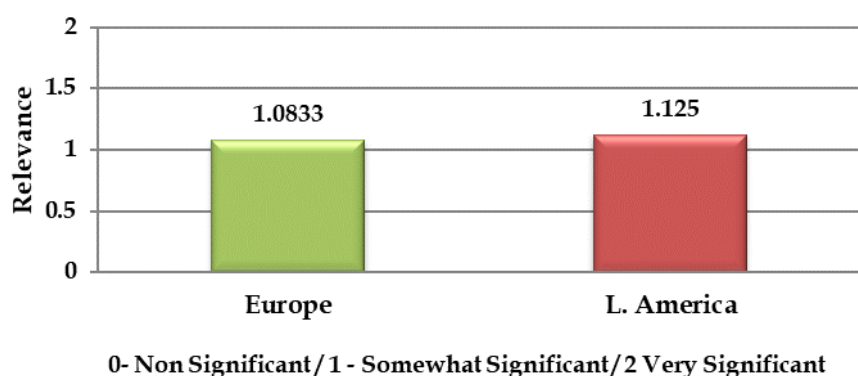

FIGURE 8 Graph: Descriptive Analysis – Relevance of Differences in Curricula

6.3.1 Europe

The differences amongst the various curricula is, as stated previously, considered an impediment to the usage of LOR by most of the participants. Only one of them responded that he didn't see this differences as harmful to the usage of the repository, though it should also be stated that this repository is rather based on competences than on curricula. Some other interviewees state that it is indeed a barrier, but that the reusability of the contents and the adaptations done by the users also play an important role in aligning to particular curricula, as well as the flexibility of the Education system.

> "Definitely the curricula have a big part to play in that, but even then, some main principles are present in all curricula, so the thing is that most of the teachers when they search online, they get ideas, and they make their own adaptation. So basically, it serves more like a pool of ideas for them. The teacher knows the curricula, so it is very easy for them to align, to find something they want. They go on and see from the classification. They know what they are looking for, so it is basically easy." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

> "But we of course see still the barrier that people don't really take it when it is from a different country because of the curricula barrier. But in principle, again in Finland, the curriculum is very flexible, so teachers are quite free to incorporate things if they want to and if they see it as useful." (Jan Pawlowski, German, LaProf Repository).

The language barrier will be discussed in a separate section, but let it just be said that the differences in curricula are also related to the language barrier. Even if a teacher is fluent in a foreigner language, and they find a high quality resource, translating is just not a valid option for most teachers. There is a need for materials that adapt to the local curricula in the local language.

"Of course there will be lessons that fit the curricula, because in every school in Serbia there are 1, 2 or 5 teachers who know Moodle but that school hasn't a Website, and hasn't an administrator for Moodle, and we want to give all the teachers in Serbia free Moodle like it's on the Internet a lot of Moodle platforms free, free Moodle platforms like this but on English, on German, etc.… this will be on Serbian, for Serbian teachers and for materials that fit our curricula." (Snežana Marković, Serbian, Metropolitan University of Belgrade's e-Learning Content).

There is also the aspect of relevance. How important are the contents to different users, and how do the contents fit in the diverse curricula. Mathematics contents are relevant to all basic curricula, specific country history is probably not so. In this sense, it also comes to having a large enough pool of resources that can provide for the particular needs of users.

"The problem is not the translation, the problem is that most of these subjects are interesting specifically for Bulgarians, of course there are different subjects, but you in Finland have different history for instance, what is your idea of a real monastery? You say ok, these are nice pictures, but this is not relevant for our history. So, at the same time, there are some resources that have, let's say, world recognition like some natural sightseeing places or some, and so on… might be interesting for a much broader audience. And of course, some of these resources could be put in a special division and be prioritized." (Orlin Kouzov, Bulgarian, Bulgarian National Educational repository, Virtual Bulgaria Educational Portal Repository & Znam.bg Collection).

One recurrent topic was that of the curricula mapping. This means that given that a topic that is on the curricula for the second grade in France might be on the curricula for the fourth grade of Spain, for instance. The solutions to this issue are diverse. Some repository managers stated that they handled this directly through mapping specifically to national curricula. Classification by subject is another solution, as well as offering helpful search engines and metadata.

"The idea here is to prepare an object and software not really for some definite year, and the texts of one subject can be really localized for one, or for different levels. Because I'm not so sure that there are different levels, in different countries, meaning that in one country there are lesser hours for a subject, or well, there are differences, that is for sure. Sometimes it is difficult to do. That's why maybe when we choose the resources it is better to choose, let's say chapters that are all over Europe learned, and then the teachers' appreciation of the text they are going to use." (Delia Oprea, Rumanian, EduTubeplus Video Library & SIVECO's ASPECT Repository).

6.3.2 Latin America

Even if most countries in Latin America share a common language and a somewhat common history, there are still many differences amongst the curricula of the diverse countries. Regardless of this, cooperation is going on in

Latin America, even between Brazil and Spanish speaking countries. Managers do consider that the differences in curricula are an issue, but they seem to manage well with the different systems of indexation that they have come up with as solutions to this.

It should also be said that regarding the particular curricula, in most countries there is a national curriculum that all schools within each should follow. In Brazil, however, each state dictates its own curriculum. Some interviewees considered that the impediments due to differences in curricula were non-existent.

> "I believe this barrier doesn't exist in fact, because our system tries to find the material according to the subject, and not according to the grade. You would try to find material according to the grade, only if you try to make an advanced search, so we try to force the people to find the material using the subject, and if the curricula would be different, so it would match if you try the words for the subject that you need, and also the grade, you would be making a combination factor, and it would disappear because of this. I believe we force to try the subject, not the grade." (Luiz Rossi, Brazilian, Federação de Repositórios Educa Brazil).

The availability of resources is also an issue regarding the aspect of curricula. Even if the repository follows a curricular structure, it is if relevant content is lacking.

> "We cannot warrant though, that there are resources for each topic within the curriculum, because, as I have stated, already, that is what we are lacking. But as we get the resources, we classify them, and the categories and the taxonomy exist already for that, it is just a matter of uploading it into the right section." (Sofía Medina, Panamanian, Educa Panamá).

A *state-of-the-art* solution to the issue of mapping contents to curricula was implemented by the Secretary of Education of Río de Janeiro through the Educopédia portal. It is better explained by its manager:

> "In Educopédia, when you go inside, first you have to select your year. If you select the first year, you will have a course that teaches the kids how to read and write and very basic courses of mathematics. If you go to the second year, there are more subjects. And if you go to the eight year then you have a whole range of different subjects including arts, Spanish, Science, Portuguese, Mathematics. It is not really a repository; it is something that is ready and in the correct order for teachers. If they want, it really can work as a substitute of a textbook, because it is like a book that has chapters. But in Educopédia instead of chapters you have classes, you have 32 digital classes, and they have different themes, and the activities in these digital classes are explored with different qualities of activities, ranging from videos and games, to tests and texts, pictures, podcasts, so there are very different activities." (Rafael Parente, Brazilian, Educopédia).

The topic of the search engines and the inclination of users towards "Google-like" search engines was also mentioned as a solution. The indexes provided by the repositories are not as popular amongst the users.

"I have two ways [of organizing the objects]. The first one is by course name: Math 1, Math 2... because I teach at the university and I want my students to be able to search by course. But I organize it by subject too: Single variable calculus, integrals, differential equations, statistics... and so on. What I can tell you is that almost no body uses my own index, they use the Google search that I have. They search the topic they want, and they can find it with a Google search, they can find it easily, in some countries the same topic has different names, so I try to have keywords to help them find what they need." (Carlos Zelada, Guatemalan, Wikimatematica & Academatica).

Finally, the following quotation provides an idea for solving the multiple curricula issue:

"One thing I will try to do, and that is already developed, the idea is to create an interface that would allow the resource manager to create different curricula, they can have multiple curricula for first grade mathematics, biology, history, and also, on the same instance, have another curriculum, and import that for two different states, both custom-made. When you import these curricula, you could get all the resources that fit it." (José Eduardo Nogueira, Brazilian, Duda Library).

6.3.3 Summary and Discussion

One main issue about differences in curricula is, as predicted by the previous findings, the ability to adapt the materials to make them usable for different courses (Hatakka, 2009). Another aspect concerning differences in curricula is that of relevance, which was confirmed by the interviewees, especially those from Europe. Necessity of content mapping was confirmed in both regions, as it difficult to match the materials to the curricula of different institutions (Chen, 2010). Finally, low mass of contents was also expressed as an important issue in Latin America, which was also a concern found in previous studies. Please refer to the next table to see a summary of the main findings of this research in this category.

TABLE 9 Category: Differences in Curricula

Region	Findings	State-of-the-Art	Future Development
Europe	• This was considered a relevant issue. • Language differences play a role in this category as well. • There is a need for more relevant materials. • The organization of materials and the mapping to different curricula is challenging.	• Organizing objects according to subjects, rather than grades. • Organizing objects following the order of textbooks.	• Providing services for intelligent mapping, and more intuitive workflow support through decision support systems.

Region	Findings	State-of-the-Art	Future Development
Latin America	• This is a relevant issue in Latin America. • There is a lack of critical mass of content.	• Providing a classification by subjects. • Mapping of contents directly to curricula (substitution of textbooks).	• Interface that would allow for the creation of different curricula, as if it were profiles. When the curricula are imported, all the resources relevant to it would display.

6.4 Pedagogical Practices

The methods used by teachers around the world vary greatly. With the insertion of technology in Education, not only can teachers find more materials, but they can also make use of different devices and programs to assist them in their teaching profession. Depending on the flexibility of the Education System, teachers can find ways to introduce the digital resources that are available. The LOR movement is concerned with the use of innovative teaching practices, as these are associated to the willingness of the teachers to use digital materials, as well as the available technological infrastructure. Figure 9 presents a graph with the results of the numerical analysis.

0- Non Significant / 1 - Somewhat Significant / 2 Very Significant
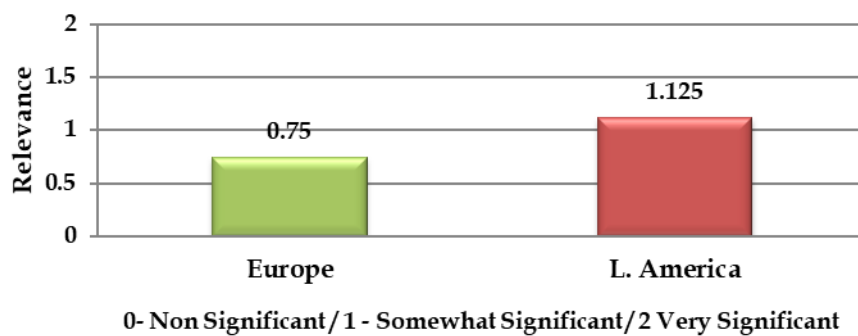
FIGURE 9 Graph: Descriptive Analysis – Relevance of Differences in Pedagogical Practices

6.4.1 Europe

Amongst the participants, the significance of the differences in pedagogical practices lays just halfway between *non-relevant* to *somewhat relevant*. As a matter of fact, most of the interviewees said that they did not consider that this was a relevant barrier. This barrier is more associated to the willingness of teachers to use LOR, and in this sense, if a teacher wants to use the materials, they will find the ways to introduce it in their lessons, at least to some extent. Within the

willingness aspect, there is also the issue of the old-school/new-school teacher, which also offers resistance to the LOR movement.

> "First of all, our teachers are quite conservative, most of them are actually… maybe 50 years is the average age of our teachers. These people are not very innovative, they are afraid to use new technologies, they are afraid to put innovation in their lessons, and most of the time they just need a textbook, and just say what's in the textbook and they are happy. They have been doing this for the last 100 years… The conservative teachers are the most important problem, because if I'm an innovative teacher I just tell the kids how to learn this and make intellectual lesson and don't care what is in the textbooks. I just want to make sure they understand what should be in the lesson, but not the way this is put in the lesson. For me is important not to know but to understand, because knowledge itself is not, you know, there is not big value in this." (Orlin Kouzov, Bulgarian, Bulgarian National Educational repository, Virtual Bulgaria Educational Portal Repository & Znam.bg Collection).

The ease of using the materials available in a repository also has to do with the type of repository. While materials of subjects as math, geometry, chemistry, and such are pretty straight forward to use, materials for languages or history might be more difficult, as these need more context in order to be taught.

> "Absolutely [the pedagogical approach is a relevant barrier], I'm not 100% how much this is a country or geographical issue. But of course, there are many approaches to language learning in general. So, it is more about the language learning approach or paradigm that you would be following, not that much about the country where it is from... Many of the materials were rather specific and embedded in the context. So, when the context is about, for example in Rumania, we were focusing on emigrants in agriculture, the agriculture sector. This means that the context is quite clear. People moved from Rumania to Greece at that point. So, the contextual embedding is very strong, and it is not that easy to take the language learning units and put them, let's say to people who move and want to teach in schools or in a kindergarten, so the context in very strong, but not only the country, but also on the subject area." (Jan Pawlowski, German, LaProf Repository).

For most of the LOR, there are no learning scenarios or educational pathways. Some interviewees stated that, having these educational instructions around the resources are indeed helpful, but that there are different levels of usage. The level of usage is highly dependent on the pedagogical approaches of the users. They might take the scenario and apply it, or they might just use the resource as such, and adapt it to their needs.

> "Most of the core chapters down to the source can be pretty flexible in terms of pedagogy, so this was not always carried long. Sometimes it did, sometimes not. I don't think there were big issues there. However, some resources which are more tech resources with handouts and with all the instructions are more difficult to cross the language. So, you see different levels of reuse. For example, the use at the core of interactive geometry is potentially something that could have been very high, but the reuse of bigger things is likely to be, scenarios in a sense, much more topic specific." (Paul Libbrecht, German, I2G Intergeo Repository).

"I think they adapt it anyways. The Austrian teachers, they would never use the original resources as far as I know. They take the resource and look if they can pick out something and then they adapt it for their own needs." (Monica Moses, Austrian, Bildung.at Repository).

The following quotations refer to the ideas that the interviewees provided to give solutions to the issue of differences in pedagogical approaches. The interviewees referred to the necessity of providing ways of making personalized pathways, as well as creating and implementing good practices.

"You can have, for special cases, creating services around this kind of intelligent mapping, and things like that… It should be much better kind of a workflow support: what is your need? Do you want to build material from scratch? A decision support system that gives you alternatives: What is the starting point? Do you have any materials that you have selected already? It should always give alternatives that you could use. I think something like that would be quite excellent for OpenScout." (Henri Pirkkalainen, Finnish, Open Scout Resources).

"We are still not speaking about revolution; we are speaking about evolution. So, it takes a couple of more years' time, to set the foundation for the new learning style. So, for example, classes where already all the pupils use either whatever electronic devices or will be using electronic worksheets. I think that is currently quite some enthusiasm in this regard. We are quite actively working to make this kind of pilot projects in Estonia." (Mihkel Pilv, Estonian, Miksike's LearningFolders.net).

6.4.2 Latin America

Six out of the eight interviewees from the region answered that they did consider that the pedagogical methods are an impediment to the use of LOR. The difference with Europe is that the methods still used in Latin America are not too supportive of the utilization of digital resources. The barrier in the region is associated with a lack of willingness to the use of technology and innovative methods. Some managers that it is not a relevant issue, as portals are constructed in a way that allows for the utilization of the materials regardless of the methods. This, obviously, considering those teachers that do make use of the repositories.

"So, we thought that every material should be part of the class with the teachers, so our objects are not objects for the students to learn by themselves, they have to be taught by the teacher. This was a pedagogical way that we chose how to do our objects. I think there is no barrier for the teachers to use our material, because it is supposed to be an aid for the teachers themselves. And whatever the pedagogical way of using the material, the material is flexible enough to be part of several ways of teaching, so I think it is not going to be a barrier for them to use the material." (Samuel Rocha de Oliveira, Brazilian, Recursos Educacionais Multimídia para a Matemática do Ensino Médio).

"There has been a change in procedures, technology, and didactics, in what refers to the use of alternative educational resources. With the technological revolution, the

teachers are also innovating in their processes. They are incorporating digital resources and are using virtual platforms. Teachers look up for strategies to teach the use of technologies to students... In semi-urban and urban areas, teachers do innovate a lot more through digital media. I think that the attitude is open-minded towards the use of new methods." (Sofía Medina, Panamanian, Educa Panamá).

However, the lack of willingness due to the fear of technology plays an important part in the usage of LOR. When teaching methods require the use of computers teachers are reluctant and insecure to implement them. There is also a divide between students who are technologically proficient, and teachers who are very much lacking ICT skills.

"From my perception, with exceptions of course, teachers own the knowledge and everything. When you introduce some new technology, the little kids are very smart and quick, they know more than the teacher. It puts the teacher on a very insecure and out of their comfort zone area. A lot of teachers don't want to bring the students to the computer lab. First of all, they only have laboratories with few machines for 30 to 40 students, it is a mess. Second, they are not motivated to do that because they need to research more and invest time on that." (José Eduardo Nogueira, Brazilian, Duda Library).

Another aspect to mention is the "frontal" model of Education mentioned by Schiefelbein & Schiefelbein (1998), which was corroborated by the participants of the interviews. The function of the teacher is to stand in front of the students and lecture, with little or no participation of the students.

"Well, before attacking issue of re-using learning materials, there is the issue of using learning materials. We should try to educate our professors in using these materials in their classes. That is something that has to happen first. I think it is changing and in higher education it is getting easier, but if you go to, again, to primary school, secondary school, it is, I will say, 80% of the time, just the teacher standing there speaking. So, there is no room for materials there. But, again, all depends on the level of Education." (Xavier Ochoa, Ecuadorian, LACLO Repository).

This is a more complex issue than just the differences in teaching. It involves the lack of infrastructure (which also implies lack of supporting policies). Providing infrastructure would alleviate the situation, as it would make it more compelling for teachers to use technology. It is also associated with the skills, as teachers require training so that they become more comfortable with the use of LOR. Raising awareness is also in order, as well as the introduction and implementation of more innovative teaching methods. Technically speaking the ideas are towards creating adaptive learning paths.

"We can try to have some influence on the Ministry, but we can't promote the use of computers in schools, it is out of our reach, but I believe that this is the main thing that we can do. But saying hypothetically that the Federation becomes something like a Google when you need to learn something, you try to search on them. If this got that popularity, I believe the conscience of people using computers in Education can

reach another level, but it is not reachable at this point, I believe." (Luiz Rossi, Brazilian, Federação de Repositórios Educa Brazil).

6.4.3 Summary and Discussion

It could be inferred from the results that the methods used in Europe are more modern that those used in Latin America, which in the case of the use of LOR may also have to do with the lack of infrastructure and the lack of skills. Previous findings about preference for textbooks were confirmed by the interviewees, as well as the preference of teachers for their own ideas (Hatakka, 2009). In the case of Latin America, the answers also confirm the findings of Schiefelbein & Schiefelbein (1998), who state that there is a frontal type of education, but that when teachers are provided resources and trainings, they are also prone to open up to new methods. The next table (Table 10) provides a summary of the findings regarding differences in teaching.

TABLE 10 Category: Pedagogical Practices

Region	Findings	State-of-the-Art	Future Development
Europe	• This barrier was found irrelevant by 75% of respondents. • This barrier is associated with the willingness to use LOR.	• Creation of *learning scenarios* and *educational pathways*. • Organizing workshops.	
Latin America	• Teaching methods are not supporting of the use of LOR. • Associated to lack of infrastructure and lack of ICT skills.	• Providing very flexible contents that can adapt to different teaching styles.	• Adaptive learning paths, where teachers can collaborate with a sequence in which material should be learned, and students could access also materials.

6.5 Intellectual Property Rights Issues

Once again, it seems that the region of usage affects the relevance a barrier has for the repository managers. Even if Intellectual Property Rights (IPR) are indeed an issue, it seems that the Latin Americans do not feel concerned about this at all. On the other side, European managers tend to think that IPR issues are holding users back from sharing their materials on the repositories. The most used license is Creative Commons, however sometimes under different

conditions. The most mentioned solution to this barrier was creation of awareness about the property rights and clarification about licenses. Please refer to figure 10 to see the results of the descriptive analysis.
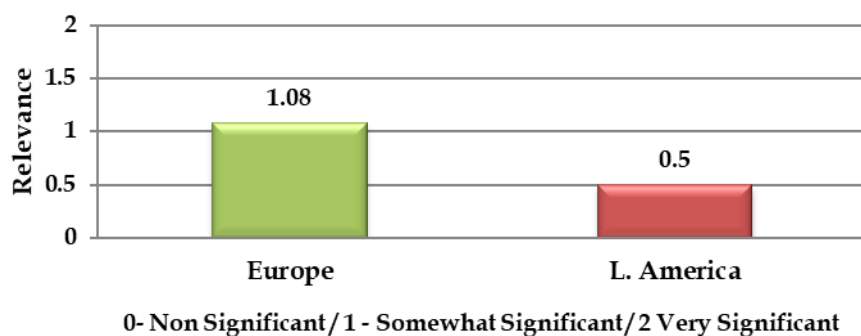

FIGURE 10 Graph: Descriptive Analysis – Relevance of IPR

6.5.1 Europe

When it comes to IPR in Europe, half of the interviewees stated that this was a relevant barrier. The other half did not see IPR as a significant barrier for their repositories. On the one hand, there is lack of awareness about IPR, and at the same time people do not care about legal issues concerning the authorship of materials. This makes it very difficult to track where the materials come from and under what conditions are the users able to utilize them, and this is true not only regarding the teaching community.

> "They are not really interested in who has created the materials as long as it is good [useful] for them." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COS-MOS Portal).

> "At the beginning users were absolutely not concerned, they had no clue. They put things on the web, they wanted to share… and *don't bother me with legal issues.*" (Paul Libbrecht, German, I2G Intergeo Repository).

> "I think the majority of users don't have high sensibility for this… awareness. I know that we have plenty of teaching material which we can't use because the IPR is not there." (Monica Moses, Austrian, Bildung.at Repository).

Some recognize that there is awareness, but not enough clarification about what licenses to use. The contributors are not only unsure about being able to use and distribute materials created by others, but also about whether they are able to make changes and under which licenses they should upload modified materials. There is also uncertainty about whether their institutions allow the publishing of materials, and under which license conditions. As a result of this lack of clarification, contributors are afraid to publish, fearing that they will get into trouble.

"It is easy if you understand what OER is and what the licenses are, but normally people don't, and even the ones that are in the consortium are very insecure about what they can share. But it then goes back to licensing, it is just about unawareness of what OER is, and the borders are not very clear always. How you should reference things, how you should put them under strict license and so on. It is simple if you know how they are, but just this awareness issue is normally where it falls. It is definitely one of the biggest barriers within the consortium, within the developers, within the teachers we have in our portal, even they don't really fully understand what the limitations are. I think that it is a very strong barrier." (Henri Pirkkalainen, Finnish, Open Scout Resources).

"There is always a grey zone in terms of copyright and IPR, so from a provider's point of view, content provider's point a view: Let's say a teacher wants to provide his materials, there needs to be some advice about what to do, and what not to do. And there is a big gap between what can be done in a repository and what is done in a school. Because in schools people basically create their materials and they use pictures from the internet, and they use a lot of pictures which are all, or in many cases protected, they are not allowed to copy it, but they do it anyway. It is ok as long... well, it is not ok, but nobody will see it when it is used in the school context. But if you reuse it and share it again, then it is a big problem." (Jan Pawlowski, German, LaProf Repository).

The Creative Commons licenses were mentioned to be in use in most of the repositories. However, Miksike's LearningFolders.net Repository's materials are not all under these licenses, as one the managers stated that this repository dates back to the mid-nineties, and that they have so much material that it would be impossible right now to mark the contents individually. Also, the Croatian National School repository indicated that since they use a Learning System based on Moodle, they also use the Moodle licensing options. In the same line it should also be pointed that most interviewees stated that the users of their repositories are mainly concerned about the protected images.

When asked about the solutions that are being currently implemented in order to overcome this issue, the concurrent answer was raising awareness both online and through during face-to-face meetings and events and providing links, FAQ sections and other types of clarification about the use of licenses. Some repositories will only accept materials that are open and that clearly state the license under which these are. For repositories that harvest materials, like Organic Edunet, they make clear to the harvested repositories under what conditions the materials can be harvested.

In terms of future development, no solutions further than clarification and awareness raise were stated by the interviewees. Providing more intuitive and clear information about licensing, even form the browsing and searching stages, was stated as a solution by Henri Pirkkalainen from the Open Scout Federation.

6.5.2 Latin America

Through conducting these interviews, it became very clear that in the case of Latin America, from the point of view of the interviewed managers, teachers (and users in general) are not too concerned about the legal issues concerning IPR. There is a great lack of awareness, but also there is a lack of concern about these issues. An illustration of this statement is provided by the following quotation.

> "We already had one issue at this University, for example. One professor downloaded a very nice PDF about something very simple, about the format of the DVDs, and he had it published in his course, which was an open course; and the people that actually created it, contacted us and said: *'ok, that's not good to publish what we have done, so take it out'*. But it would be a problem, in Latin America we don't have this, as you know, we are not really following international copyright law. But it is not an issue. Here if you ask a professor and say: *'Here, I found this photo in Google and I will use it in my course'*, they will say it is perfectly normal, it is perfectly legal; they would believe that, even if it is not. They won't see a problem with reusing material, even if it is not legal." (Xavier Ochoa, Ecuadorian, LACLO Repository).

The interviewees do not see IPR as an issue either. An answer gotten from four out of the eight repository managers is that since the materials are being used for educational purposes, then it is not a problem.

> "We try to do it, however sometimes, if during the trainings, teachers are asked to illustrate some document, and they use Google images, and then just before uploading we have to take it off, because we don't have the rights to use that. Now, taking into consideration that this portal is for Educational purposes, and not lucrative, then if somebody sees an image here, they know that we are not selling anything here. People that publish here know that as well." (Sofía Medina, Panamanian, Educa Panamá).

> "At least here in the Dominican Republic, it is widely understood that whatever resource is for Educational purposes, you shouldn't be trying to make a profit out of it. So, there are no restrictions in that sense. Here if you give credit to the author, it goes that far, people don't get all jealous about their contents, they do the opposite, they write sending us even more information." (Fermín Cruz, Dominican, EducanDo).

As pointed by both of these interviewees, this freedom to use materials for educational purposes is only valid if there is no profit derived from the publications. Actually, the only interviewee that showed higher concern about IPR issues explained that he did have some advertisements on the portals and thus in his case there are restrictions.

> "The problem that I have is that the material that is in the Wiki is not all the time uploaded by me. There have been times when people have scanned a book page and put it on the site. If they didn't create the image, they shouldn't upload it. When this SOPA was going on, I was worried because I cannot check every single image to see if there is any Copyright infringement. The Wiki uses ads to pay for the servers and

the initial investments that I did to put it up. Since I have ads, then I'm monetizing and something with Copyrights can't be used. The same happens with the videos on Academatica." (Carlos Zelada, Guatemalan, Wikimatematica & Academatica).

Most interviewees stated that they use Creative Commons licenses, even if some of them think that every now and then contributors will still upload some material including protected images. Just as in the case of the European repository managers, the main solution is to create awareness and clarify the use of different licenses. One further idea was expressed by Luiz Rossi, from Federação de Repositórios Educa Brazil, who thought that an automatic system could also restrict contributors from uploading materials whose rights field have not been filled in.

6.5.3 Summary and Discussion

For Europe the results of this study agree, at least to some extent, with the statement that the lack of clarification about IPR has an influence in the production or LOR, as well as on its usage (Larson & Murray, 2008), (Davis, et al., 2010). In both regions the managers understand that there is a lack of awareness about the IPR issues. However, for the managers in Latin America this is not a significant barrier at all. The teachers that want to share will do it carelessly of the IPR restrictions, probably because the laws in the region are not as severe in this aspect. Please refer to table 11 to see the research in terms of the IPR issues.

TABLE 11 Category: IPR Issues

Region	Findings	State-of-the-Art	Future Development
Europe	• There is awareness and fear to be punished for using other's materials. • There is a lack of clarification about the use of licenses.	• Awareness rising online and face-to-face. • Clarifications in FAQ sections. • Only accepting materials with clear licensing conditions. • Use of Creative Commons.	• Other than further awareness rising campaigns, clarifications and the development of guides, no further ideas were stated in this respect.
Latin America	• There is a lack of awareness. • There is low concern about this issue. It is not considered a barrier.	• Use of Creative Commons. • The materials can be used without a license if it is for educational, non-commercial purposes.	• Automatic mechanisms that would require statement of license conditions to publish.

As stated, there are two problems regarding this issue. The first one is when there is no awareness about IPR issues (which is the case in Latin America). In a way, this is not directly affecting the sharing of materials, because there is no consciousness. The second problem arises when there is awareness, but no thorough knowledge about how to use licensed materials or how to define licenses, as this is a major stopper for users who feel afraid of publishing reused materials.

6.6 Differences in Language

When asked about the linguistic differences as a barrier to the usage of repositories, there was a visible difference between the answers of repository developers/managers in Europe and Latin America. Figure 11 provides a graph that represents the average relevance of this barrier in both regions. Language is a barrier that has no imminent solution so far. The most that repositories can do is to offer diverse versions of the repositories in different languages, but these language versions do not imply that the users will always find material in the languages that they need them in. Some repositories offer dictionaries, glossaries, and helpful links. Next, the occurrence of Language as a barrier for repositories in Europe and Latin America will be explained in deeper detail.
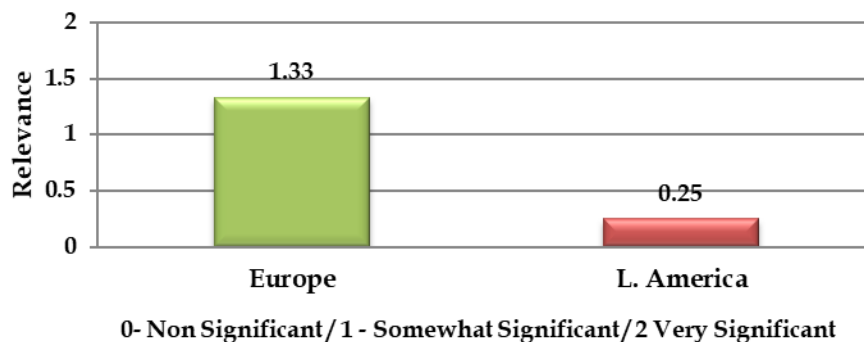
FIGURE 11 Graph: Descriptive Analysis – Relevance of Differences in Language

6.6.1 Europe

Most European interviewees answered that they found that language is a very significant barrier to the usage. Especially when it comes to repositories that aim to an international audience, the necessity for various versions of the platforms in different languages was always brought to attention. Depending on the country of origin, most repositories have a version in the native language and, at least, a version in English. For example, Miksike's LearningFolders.net, from Estonia has versions of the repository in Russian and Latvian as well. The

LaProf Repository also has versions in Finnish, Estonian, Russian, French, Greek, Rumanian and Hungarian.

Even if this fact is already well acknowledged by the world in general, it should be pointed that as per these interviews, English is considered as the bridging language. Nonetheless, the interviewees' assessment of the level of proficiency held by the teachers (in English language) varied according to the country of origin. Next are some quotations to support this statement:

> "Finnish people still don't require the native language [option] as much as some others. In Finland, English skills are quite on a good level, at least within teachers..." (Henri Pirkkalainen, Finnish, Open Scout Resources).

> "And we have a lot of teachers who don't know English, who speak Russian, or French, or German, or none. And it's a big problem." (Snežana Marković, Serbian, Metropolitan University of Belgrade's e-Learning Content).

As previously stated, the existence of multi-language versions of these repositories does not account for the availability of enough materials in a language suitable for the needs of the user. Even if a user would be skilled enough in a foreigner language, it does not mean that this person is willing to translate this material to the target language. An important issue, which also has to do with the quality of the repository, is the fact that the users can find resources that adjust to their needs. Some interviewees stated that if a user does not find what they are looking for on a first glance, it is very likely that they will discard the contents right away, or even not visit the repository in the future. For example, here are some quotations regarding the need for resources in the local language:

> "Once they see a description that they can't understand they throw it away." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

> "I think the problem here is the language problem. If you want to use material, then, I mean, you have to use the language that you actually use in Education... And it does not really help if you translate the metadata, you cannot teach with metadata. You have to have the resource, and so I think language differences would be the biggest thing here." (Hannes Ebner, Austrian, Organic-Edunet).

Translations are part of the adaptation process, and the whole concept of LOR is dependent upon reusability, however, translating a whole document is highly time-consuming. Considering that the main users of repositories are teachers, then translating is, in most cases, not the option to go for, as lack of time is one of the biggest issues faced by educators. So far electronic translators such as Google Translator are not technologically advanced enough to provide adequate translations of documents. Some repository managers also stated that some of the content was bought from a digital resource provider and translated by the repository to the local language. This is the case of the ASPECT Repository in Romania and the Croatian National Schools Repositories.

6.6.2 Latin America

Most repositories do not consider that there is a language barrier for the use of the resources, but it is mainly because the repositories are only in Spanish or Portuguese language.

Even if they know for a fact that there are far more resources in English language than there are in Spanish and/or Portuguese, repository managers/developers avoid using resources that are in a language different from the local one because they consider that the users don't have enough skills in foreign languages. Initiatives such as the Khan Academy have had great acceptance in Latin America. Videos from Khan Academy are being doubled to both Spanish and Portuguese through a joint effort of organizations such as the Inter-American Development Bank (BID), the Latin American Network of Education Portals (RELPE) and Intel. Doubling, subtitling, and translating material is however not the first option for most repositories given the high costs that these adaptations would imply.

> "If we start thinking about a teacher that could use resources maybe in English, we would be very limited. We have found videos that have been doubled by Intel, but otherwise we don't use resources in any other languages." (Fermín Cruz, Dominican, EducanDo).

> "I would avoid the situation because we don't have enough human resources to do that." (Sofía Medina, Panamanian, Educa Panamá).

The interviewees also stated that they are concerned with creating their own content, and/or finding ways in which users would be more motivated to create content in the local language and share it with the repository community. Creating materials from scratch is a time and resource consuming task, but it is necessary in order to provide resources that adapt to the local necessities in terms of language and also in terms of cultural context.

> "We do them from scratch... we've got funds for building new objects from scratch, we have like 180 videos and several software, and we are showing these so that teachers see that they have several possibilities for using in the classroom." (Samuel Rocha de Oliveira, Brazilian, Recursos Educacionais Multimídia para a Matemática do Ensino Médio).

> "It is only in Portuguese and there are some lessons in English and Spanish. All created by us..." (Rafael Parente, Brazilian, Educopédia).

There are some federated repositories and repository networks currently active in Latin America. In the cases of the LACLO repository and RELPE Network, for example, it is possible to find materials in both Spanish and Portuguese. Even if these languages have so many similarities, the resources still need some language adaptations, which are done in some cases, but the exchange is still not too smooth. The exchange of resources within Spanish speaking countries,

is pretty effortless, even if some of the words are different and if the national cultures may be different from each other.

> "We do have some people from Africa that are using the material as well, in Portuguese speaking countries. I mean, on the other hand, Portuguese is not a very widespread language; usually Spanish is widely more spoken than Portuguese. Brazil itself is the largest speaking country, so it is completely open, and people in Chile and Argentina, did have some content from our material, and they translated a part of our material, just a couple of them." (Samuel Rocha de Oliveira, Brazilian, Recursos Educacionais Multimídia para a Matemática do Ensino Médio).

> "Especially in Latin-America, fortunately, we share the same language, Spanish, but the difference with Portuguese makes it almost impossible to share primary school materials with Brazil, for example. They have a lot of material, but we cannot use it in other countries in Latin America, and they cannot use our materials. So, yeah, the language barrier is a real stopper if we are talking about basic education, and cultural adaptation, well, there are some issues, but fortunately, there is not too much problem in Latin America, because, true, I think that the main reason is television. So, we have a lot of inter-country communication, so, I don't think for example, if I say "tortillas" in Chile they would understand it, even if they don't eat tortillas too much, because of this exchange." (Xavier Ochoa, Ecuadorian, LACLO Repository).

All in all, it can be said that the main reason that the language barrier is not considered high for repositories in Latin America is the fact that it is almost non-existent. Repository managers limit themselves to not having resources in foreigner languages unless translations have already been done. It is very straightforward, most users do not have English skills, and thus they don't upload materials in English. They must create materials or reuse materials in their own languages, but so far there is no further option.

6.6.3 Summary and Discussion

The results of this category agree with findings of previous work in this field (Pallot, Martínez-Carrera, & Prinz, 2010), (Noll, Beecham, & Richardson, 2010), which state that the differences in language have a great deal of influence in the ease of sharing meaning and understandings. The fact that in the descriptive analysis (figure 11) this category scores much higher for Europe than for Latin America is clear evidence of this. The exchange of materials is more difficult in Europe where there are so many different languages, than in Latin America, where most countries share Spanish language as the mother tongue. Table 12 presents a summary of the main findings of this research in regards of language differences.

TABLE 12 Category: Differences in Language

Region	Findings	State-of-the-Art	Future Development
Europe	• A great challenge for repositories aiming an international audience. • Lack of materials in the necessary languages.	• Multi-language versions of the repositories. • Dictionaries, glossaries, etc. • Manual translations.	• Automatic translations would be used if they were good enough.
Latin America	• This barrier is almost non-existent. • The main issues for exchange due to language occur between Brazil and the rest of the countries.	• The repositories are limited to use materials only in native language. • Some doubling and/or subtitling of audiovisual materials.	• Since the language barrier is not relevant in Latin America, there were no significant ideas to overcome the issue.

6.7 Skills

There is also evidence of the digital divide when considering the skills of teachers in Europe vs. Latin America (see figure 12 for the results of the numerical analysis). In the former region, the managers of repositories do not show too much concern about the teachers having enough skills to use the resources. On the other hand, managers of repositories in Latin America are concerned about the lack of skills and computer literacy amongst the teaching community. Next this barrier in both regions will be explained in more detail.
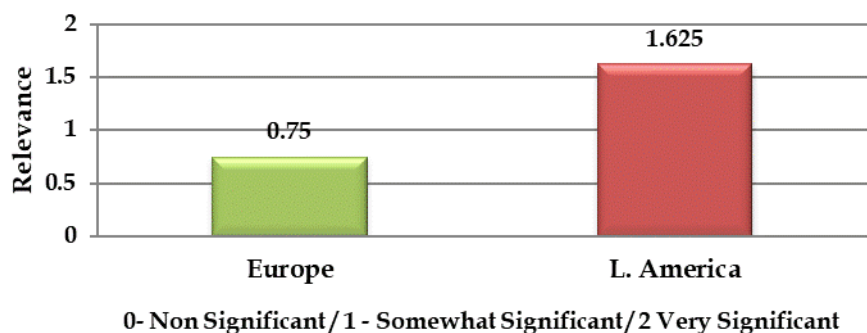

0- Non Significant / 1 - Somewhat Significant / 2 Very Significant

FIGURE 12 Graph: Descriptive Analysis – Relevance of Lack of Skills

6.7.1 Europe

More European interviewees did not consider that there is computer illiteracy amongst teachers. From the interviews, it can be deducted that ICT skills are contemplated within teachers' curricula for most countries in Europe. Also, governments and/or other organizations do conduct trainings and courses to enhance the skills of teachers. The Ministries have a lot of influence on the teaching community and teachers respond better when the authorities are involved in these programs.

> "Whenever we go to do training for the portal, the first thing they ask about is how the Ministry is involved. I was really surprised that when we did this dissemination activity in Patros, there was this lady that had come from the educational authorities. She was really impressed, and she said: 'we want to work with you, there is going to be this event in Patros.' They actually announced the workshop, and they invited the teachers. We had like 160 people. The difference in the response of the teachers was huge. I was very impressed to see how much they need the support of the authorities." (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

Then again, it is also important to mention that most repositories also try to make these very user-friendly. The portals usually include user guides, handbooks, FAQ sections and some other kinds of user support mechanisms.

> "First, we had some widget implementation for the portal, and it was quite hard to cross for some teachers, so we all the time do pilot testing to improve the ease of use for all of the portal, and the services. That is the main thing: that it would be quite effortless to use, and we would be doing it until the end of the project, so that it wouldn't be too big of an effort to use. The biggest change was this change from the Widget-based solution to a very traditional portal that is very intuitive to use. And following the basic principles of doing websites: how the navigation should be, so following quite standard ways of navigating, for example." (Henri Pirkkalainen, Finnish, Open Scout Resources).

Some respondents, though, do feel concerned about the ICT of the teachers in their countries. They consider that the teachers do not have the skills required to create materials, or to use basic editing programs. Even if there have been training programs put in place to improve teachers' skills, there still needs to be more, and probably more dissemination power is required to raise interest in the teachers.

> "There were lots of trainings, but no. I still have the idea that they need more. More and lots more, and continuous training for ICT, even if they did it last year, or two years ago, one more is more than welcome. They need a lot more." (Delia Oprea, Romanian, EduTubeplus Video Library & SIVECO's ASPECT Repository).

6.7.2 Latin America

All of the participants agreed that schoolteachers have a very poor level of ICT skills, and that this is a relevant barrier to the usage of LOR. This problem seems to be highly related to the lack of sufficient infrastructure, as well as the governments' lack of programs that would enhance the capabilities of the teachers. The curriculum of the teachers doesn't appear to include ICT training, and it shows particularly in these times when children are born already as digital natives, and their teachers are unable to understand how to use a simple device, like a mouse.

> "Our teachers in Brazil… their quality is not very good; we don't select them. Well, we don't train teachers well. They are not motivated because their working conditions are not very good. It is really tough. We have a long way to go when compared to teachers in Finland or other European countries. So, it's very challenging to deal with them. But in Rio, in general, the teacher quality is much better than the general Brazilian level." (Rafael Parente, Brazilian, Educopédia).

There are programs that have the aim of alleviating this issue through trainings and courses and through the provision of computers. For example, the interviewee from Panama stated that the "Entre Pares" program (Amongst Peers) was created to train teachers in the use of computers. They have an instructor, but they also create support networks to make sure that they keep practicing and helping each other. Through this program, the teachers can also buy a computer for a very affordable price. This is the solution they are implementing. However, even with programs like these there is still resistance from some teachers.

> "There is a great battle, though, because there are lots of teachers who feel very threatened by technologies. There's a huge problem, which has more to do, in my opinion, with a political will more than anything. Many workshops have been given by the government as well as by some private companies, but some teachers hold to what they know, because they feel safe with that. Some of them say '*I will never learn that*'. This should be treated in a different way, they are reluctant to open up to this, and need to be given other positions within Education, as advisor, or something but not teachers. Leave the way open for a new generation, which is able to speak the same language." (Fermín Cruz, Dominican, EducanDo).

Finally, the bureaucracy issue is also playing its role when it comes to the approving projects that would benefit the enhancement of the teachers' skills. This issue was already stated in the Local Institutional Policies section, but it is pointed as closely related to the skills problem in the following quotation.

> "Yes, we are doing that [pushing the government]. Writing them proposals for training, but there's no answer yet. We hope we have some kind of training in a global way, I mean, there has to be a large-scale training organized by the government. Otherwise just here and there is just not enough." (Samuel Rocha de Oliveira, Brazilian, Recursos Educacionais Multimídia para a Matemática do Ensino Médio).

6.7.3 Summary and Discussion

The lack of skills is relevant to a few countries in Europe and to all the participant countries from Latin America. The necessity for a more critical mass of resources in Latin America, confirms the previous findings that low computer literacy is linked to lesser contributions in the repositories (Davis, et al., 2010), (Humbert, Rébillard, & Rennard, 2008). This barrier is also related to the lack of policies that promote more ICT trainings and the inclusion of ICT skills in the curricula of teachers. The next table (table 13) summarizes the implications of the lack of skills category in our study.

TABLE 13 Category: Skills

Region	Findings	State-of-the-Art	Future Development
Europe	• This barrier was not found relevant in Europe.	• Organization of trainings and workshops. • ICT skills are part of the competences of teachers. • User friendly repositories.	• Development of more intuitive tools for LOR creation.
Latin America	• Teachers lack ICT skills and computer literacy. • There is a lack of support from the authorities.	• Organization of training programs.	• Creation of more user-friendly repositories.

6.8 Infrastructure

Having the sufficient infrastructure for accessing the repositories is vital to the usage. While European respondents found that this was not a great problem, it is a relevant issue for Latin American countries. There is evidence of the digital divide in the answers gotten from both set of interviewees.
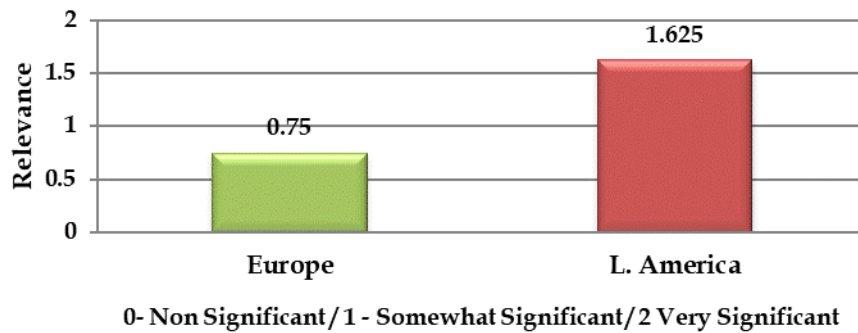
FIGURE 13 Graph: Quick Analysis – Relevance of Infrastructure

6.8.1 Europe

For most of the European interviewees, infrastructure is not an issue at all. Most answered that it is not really a concern as apparently most of the schools are well equipped and it is usually possible to use the materials on-line. Some portals, though, have printable versions of the materials, but it is not the main purpose of their systems to be used off-line. The following quotation summarizes well the general view on the infrastructure aspect.

> "Intergeo didn't deal with that at all, so we didn't ask whether they had equipment in the classroom, but the general feeling is that people who actually want to use technology in the classroom, in most countries in Europe, actually can, and that most countries do have accessible computers in the classroom. We are not in Africa, so we really can rely on equipment." (Christian Mercat, French, I2G Intergeo Repository).

There are however a few interviewees who showed concern about the lack of computer labs and the lack of internet connection.

> "From my perspective, we have very bad experience, because if a school is connected to the Internet with slow connection, and they couldn't conduct a workshop to use the materials in our repository, then we come to the conclusion that it is very slow and virtually impossible to get the computers connected to the repository because the connection is too slow. It is a problem of infrastructure, especially in rural areas, where some schools are not connected to Internet at all, only through wireless or mobile phone, or something like this. So, it not feasible to reach the materials in our repository, especially because most of the materials are not made for use in tablets, and then it requires more infrastructure." (Ivika Matotek, Croatian, Croatian National Schools Repositories).

The last quotation also brings in the issue of the remote locations and rural areas, which are difficult to reach, particularly in terms of internet connectivity. For example, one respondent from Greece considers that the problem is not on the lack of infrastructure, because even if there are enough technological resources at hand, it is sometimes not possible to use them because of the lack of technical support. Tackling such problems represents a bit of a challenge still for some

European countries.

> "I can't solve the digital divide in this interview. However, it should be possible. Well, internet access is not the problem, that is always there, but the complexity of materials needs to be organized, so people need to see when something is very complex, requiring certain amount of bandwidth or so, in contrast to simpler materials, where we would only have HTML pages that everybody can access, and most people can access nowadays through mobile phone browsers. So, it needs to be a clear way and indicators, what can be used also with simple technological devices, and what needs more ICT power." (Jan Pawlowski, German, LaProf Repository).

One feature that was mentioned by many respondents is necessity of creating versions of the sites for PDAs and Smartphone to provide more possibilities and fulfill the necessities of all groups of users.

6.8.2 Latin America

The infrastructure issue is far more relevant when it comes to Latin America. As Latin American countries struggle against poverty, they also stay behind in terms of technological accessibility. In most of Latin America the largest part of the student population lives in the rural areas. Initiatives like "One Laptop per Child" have been put in execution, in many countries in Latin America, however some schools do not even have electric power supply. There are places where they have one public phone for the whole town, and evidently no Internet access. So, bringing computers to kids that cannot recharge the battery, or download contents is not much of a solution.

> "And also, there was a project from the federal government; it was a hundred and fifty thousand small computers. But that proved to be a lot of waste of money, there were a lot of computers there in the schools and nobody knew how to install them, and they didn't have places to recharge them properly, no outlet power or anything... you cannot count on wireless Internet where you have cities this far away." (José Eduardo Nogueira, Brazilian, Duda Library).

> "It is good to point that, in Panama, the highest population of primary and middle-high school lives in the rural areas. So, it is not that easy to send technological equipment to all rural areas. We are implementing the "One Laptop per Child" in middle-high school and trying hard to break this barrier. Even if Internet connection is unavailable, we try to support them to the extent of our possibilities. Teachers look up for strategies to teach the use of technologies to students, even in places with no electricity supply, we still have that in Panama." (Sofía Medina, Panamanian, Educa Panamá).

It was also stated by the managers that the urban areas are always better equipped and there is a much better Internet access. It is also common that there is a big gap between the resources available in private schools as compared to the resources available in public schools. Usually, private schools will have at least one computer lab and will have enough computers for all students

in a class. For public schools, it depends on the government, on the management of the school, etc. The following quotation illustrates the case of Educopédia, in Rio de Janeiro, Brazil, which is an initiative of the Secretary of Education.

> "And what we did was we set up networks, and projectors, and speakers in all of the classrooms, so that these became some kind of small home theater or cinema, and the teachers project the activities, videos and games onto the screens, inside the classrooms. Instead of writing on the board, or talking in front of the students, they project videos. They learn with the students; they are more facilitators than content providers." (Rafael Parente, Brazilian, Educopédia).

However, even when the users have computers and internet access, the network speed remains many times insufficient, especially when it comes to activities that are more bandwidth consuming, like streaming videos.

> "We have the videos in two kinds of formats. One is YouTube-like, and the other one is High-Definition video, so for the High-Definition video, the files are quite large and so the internet connection becomes an issue. For the teachers to download the HD video, they must have good connection. On the other hand, if they just want to watch the video in their computer screen, the YouTube-like is enough. So, this is not a big issue, although I've heard some people say that the video freezes and that they have to wait some time." (Samuel Rocha de Oliveira, Brazilian, Federação de Repositórios Educa Brazil).

To provide content for those areas with lack of Internet connection, some portals, especially those funded by the governments, need to make more emphasis on offline usage. Some institutions have also placed internet and computer equipped locations in rural towns, as well as mobile virtual classrooms to alleviate the digital divide problem.

> "There are zones where there's no internet. We have implemented a strategy called *EducanDo Portable*, in a CD-ROM, we have put around 60% of the contents with the interface and everything, and we have brought it to those educational centers that don't have connectivity, but that do have computers. Most schools are equipped with hardware and software. There is connectivity, in very few [rural] places. I can also let you know about a program where there must be at least 90 virtual classrooms that were distributed throughout the country, which do have internet connection, and have ten computers. This started more than ten years ago. We also have some computer labs at most schools. There are digital libraries for primary schools, which are equipped with one or two computers, with resources and portable applications. A lot has been done by the government to try to enable the schools technologically." (Fermín Cruz, Dominican, EducanDo).

One solution that is proposed by one of the interviewees is also based in providing offline content to those areas where Internet connection is unavailable:

"I remember the guy who was working for the government and said: "we are here biding for computers, but we really don't need computers, we need internet access", and then he said: "no, we need access to content." And I said: '*Oh, wait, I can help with that*', and I kept figuring this out, and I started this Open-source project. The idea is that because there are tons of educational resources, but they don't have a pattern, since you have .wav, .mp3, different video formats, you have flash, and some others, which are not open. What I am trying to do is to index all those contents and be able to put that on an external hard drive and take this in those cities and put that in the system. That is the idea of the Duda Library, not only to develop the software, but to propose a whole new protocol to interoperate with those resources, and format in order to index those contents and create a pattern that would be able to interoperable, so another system would be able to import that." (Eduardo Nogueira, Brazilian, Duda Library).

6.8.3 Summary and Discussion

Such differences in the results for this category for both regions were already expected. As per Chen (2010) the users of LOR in developing countries face different kinds of issues in these respects. The answers gotten from the Latin American interviewees confirm the data from the SERCE study (LLECE, 2008). While it is true that countries like Chile, Argentina and Uruguay have well equipped schools, still only 37% of school centers in Latin America have access to computers, without considering connection to Internet.

In Europe, the developers are concerned with providing users with different options to adapt to their necessities in terms of devices (e.g., Smartphones, tables, etc.), as well as interoperability and integration of solutions. On the other hand, answers from the Latin American interviewees prove that the lack of infrastructure affects not only the usage of LOR, but the computer literacy and technological acquaintance in general. Table 14 presents the findings of the research in the aspect of infrastructure.

TABLE 14 Category: Infrastructure

Region	Findings	State-of-the-Art	Future Development
Europe	• This category is not considered an issue for 75% of the respondents. • The main problems are connectivity issues in remote areas.	• Versions of the repositories for PDAs.	• Providing versions of the repositories that would satisfy the necessity of all users (tablets, smartphones, etc.)

Region	Findings	State-of-the-Art	Future Development
Latin America	• This barrier was found highly relevant for most of the respondents, both in urban and rural areas. • The internet speeds are low.	• One Laptop per Child programs. • Providing contents in a CD-ROM for areas with no internet connection. • Small trucks with internet access.	• Development of protocol to interoperate resources, and index contents which could be copied into hard drives in remote areas.

6.9 Lack of Time

Although lack of time was already being considered one of the components of the knowledge sharing category, it kept showing as a recurrent theme throughout most of the interviews. It is one of the strongest barriers in Europe, and it is the highest in Latin America. This barrier will be explained in more detail next.
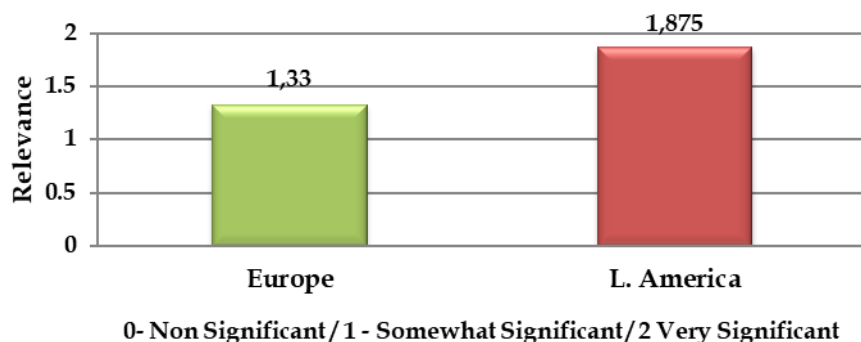
FIGURE 14 Graph: Quick Analysis – Relevance of Lack of Time

6.9.1 Europe

Almost half of the interviewed repository managers consider that time constraints are a very powerful impediment, and that even if there might be good incentives for resource creation, one of the main complaints of teachers is that they do not have enough time.

> "This kind of reward would be popular among teachers within the European community definitely. The main issue with teachers is that they always complain that they don't have enough time, so I still believe that even if you give them credit, they probably wouldn't do it anyways because they don't have the time, so…" (Eleftheria Tsourlidaki, Greek, Open Science Resources & COSMOS Portal).

Lack of time affects all the phases within the LOR resource-life including design, creation, evaluation, use and re-use. Most teachers are filled up with so much

work that they want resources that are useful and ready-to-use. It is difficult to fill up a repository with material if teachers cannot devote time to the creation of it.

> "The main problem of the teachers is that they want resources that are ready-made, because they do not have the time to search, and then to include resources found in some kind of another scenario. They prefer to find the resource and for it be exactly what they are looking for and to run it in the classroom, when it works like that the teachers, at least from Rumania, they want to use it." (Delia Oprea, Rumanian, EduTubeplus Video Library & SIVECO's ASPECT Repository).

> "Because it takes a lot of time, but our salaries are too small, and we must work another job, and if I work on my knowledge there isn't anyone who will pay me for my self-teaching" (Ivika Matotek, Croatian, Croatian National Schools Repositories).

Some other respondents were concerned about having enough time to train the teachers so that they can obtain the required skills, since they sometimes have limited training hours. Also, sometimes it is difficult to include interesting new materials as the schedules are programmed before the beginning of the school year and not create too flexible.

> "This is very simple and very easy to use. So, the only constraints are about technological barriers, and sometimes some difficulties in inserting the lessons about these things in the curricula, because there is no more time. Normally curricula are decided by schools before the year starts, there are problems to insert the keys during the school year, but then the next year they include it. The problem is when you enter during school year, everything is already scheduled." (Stefano Martellos, Italian, Key2Nature's Dryades Repositories).

6.9.2 Latin America

Lack of time also became a recurrent topic during the conversations with the interviewees from Latin America. Some interviewees stated that some teachers have such heavy workload that they are not at all willing to spend extra time in order to either obtain the necessary skills to use LOR, or, if they have the skills, search for the material online, or creating it if they didn't find anything that they could adapt.

> "There are lots of places where the contents are available, but teachers don't want to invest on that. They have a lot of problems; they have a lot of work after hours. They are not motivated in order to make better classes, to invest on that, the wages are very low. There is no incentive for that." (José Eduardo Nogueira, Brazilian, Duda Library).

> "I think this is the main problem for teachers not using new material. What happens? Here they are paid for the hour, a teacher works forty hours a week, and they have a few hours for doing everything else, so even if they have some time, they are completely exhausted. That is the main reason for changing in large scale the attitude of teachers; they don't have time or energy to care about doing some experiments with

new materials or new objects. We know that, so unless some friend or coordinator says "look, use this". Unless there is a reference for them, they don't have time to look up some new material." (Samuel Rocha de Oliveira, Brazilian, Federação de Repositórios Educa Brazil).

It was also stated by the managers that there is not enough time to provide students with useful materials. The following quotation was taken from the interview with Carlos Zelada, from Wikimatematica.org.

"Wikimatematica.org was created because I had a course that needed to have more time for the students to go online and work on their own because it was supposed to be 8 hours a week, but we created two hours that were supposed to be online. We needed to find a way to get students to work online." (Carlos Zelada, Guatemalan, Wikimatematica & Academatica).

Regarding a possible solution, one of the interviewed managers thinks that government policies should be aligned with the objectives of the organizations that are involved in the creation of tools such as LOR materials. The huge efforts devoted to this cause are sometimes lost due to the lack of follow-up and support from the corresponding institutions.

"As I said, one of the things that we regret is time for teachers to have some educational training. So, if the school prepares for four hours in a week so that they can have time to organize and understand how some things can be done. One of the things that we regret is that the Brazilian Government did not do a good job in this next part of the project, which is giving to the teachers the material right on their hands so that they can use it right away." (Samuel Rocha de Oliveira, Brazilian, Federação de Repositórios Educa Brazil).

6.9.3 Summary and Discussion

Lack of time is a barrier that both European and Latin American managers are concerned about. It can be inferred that teachers in both continents have heavy workloads. Maybe this is the most important barrier to overcome, but the solution is very much linked to a positive change in the policies. Teachers need more time, not only for devoting it to LOR, but for all their teaching chores in general. This means more teachers are required, so a better marketing of the teaching career is needed, and this implies better salaries and benefits for teachers, and so on. These kinds of changes can only come from the Education institutions and authorities.

TABLE 15 Category: Lack of Time

Region	Findings	State-of-the-Art	Future Development
Europe	• Heavy workloads keep teachers from devoting time to use LOR. • Teachers want ready to use materials. • Curricular calendar is tight.	• Including translators on the repositories so that the teachers do not have to use up their time making new materials.	
Latin America	• Teachers do not have enough time to devote to LOR creation.	• Ready to use materials (local language).	• Collaboration with authorities in order to create policies that favor the use of LOR for a better education of the children of the Latin American region.

7   DISCUSSION

This chapter will link the results to the literature review. Let it first be said that, in order to give a visual idea of the relevance that the barriers studied in this research, heat charts for the repositories in both Europe and Latin America will be displayed. The charts help summarize the results, which were explained individually for each category in the previous section. It has been stated that the present work is a qualitative research and with the provision of such numerical facts, and in no way is it pretended that the readers will consider these in a quantitative manner.

The values for these charts were derived the weigh that was given to the relevance of the barrier categories according to the answers provided by the interviewees. The weigh of the relevance goes from 0 to 2, 0 being non-relevant and 2, very relevant. Again, it is only a matter of a visual aid given the large number of repositories in the study. Refer to Heat Chart 1 for a simplified version of the analysis. (Separated heat charts for both regions will be found on the appendix).

HEAT CHART 1 Relevance of the barrier categories in Europe vs Latin America

Barriers	EUROPE (AVERAGE)	LATIN AM. (AVERAGE)
Local Institution Policies	0.333	0.5
Knowledge Sharing	1.250	0.625
Differences in Curricula	1.083	1.125
Diff. in Teaching Practices	0.750	1.125
IPR	1.083	0.5
Language	1.333	0.25
Skills	0.750	1.625
Infrastructure	0.750	1.625
Lack of Time	1.333	1.875

From the previous section, the results section, it is possible to conclude that the three main barriers affecting Europe, are: language differences, knowledge sharing issues and lack of time. On the other hand, for Latin America the main barriers are lack of skills, lack of sufficient infrastructure and lack of time. The set of barriers coincide with Pirkkalainen, Jokinen, & Pawlowski (2014) who state that "the main challenges relate to the lack of organizational support, language and culture as well as quality concerns".

In the European Union alone, there are twenty-three officially accepted languages, set aside the semi-official and minority languages. This represents a huge challenge for repositories. The mainstream approach is to have the same platform translated to at least one more language (in most cases, English). This barrier is a difficult one to overcome, and the results of the research agree with our previous assumptions about this barrier for the European region (Pallot, Martínez-Carrera, & Prinz, 2010). Actually, multilingualism not only in the contents, but also in the support is highly valued and considered a quality indicator as per Atenas and Havemann (2014).

As per language issues, it is clear that Latin America does not have this barrier, taking into consideration the fact that Spanish is spoken throughout the whole region (with the exception of Brazil). This coincides with Noll et al. (2010) finding that the differences in language greatly influence the ease of knowledge sharing. However, a lot more of collaboration and coordination amongst Latin American countries is still required to take advantage of all the potential that this unification in language offers. From the interviews it can be concluded that stronger networks can be created to support the improvement and reuse of materials.

Knowledge sharing issues also proved to be a constraint to the use of repositories in Europe, thus confirming the results of (Riege, 2007). It was expected that knowledge hoarding and preference of own ideas would be a factor directly affecting the category, but the interviewees did not find that these factors were such an important matter to be concerned about. The interviewees did mention, however, that this barrier is more related to the fear of being judged by peers or the fear of making mistakes in front of students, which confirms Agarwal et al. (2007). This relates too to Hofstede's uncertainty avoidance dimension.

Also, according to the results of this research, in Europe, the reluctancy to sharing contents is directly related by IPR issues. The lack of understanding of IPR makes teachers disinclined to re-use materials since they feel that they might easily get in trouble. This agrees with a study by Amiel & Soares (2016) who found that the poor use of open licenses bring confusion and limit the usability of LOR. Also, IPR issues are a point of difference between Europe and Latin America, where the managers do not consider that IPR is relevant at all and consider there is very little awareness, which also coincides with Amiel & Soares (2016), after studying repositories in Latin America finding that there exists a good deal of ambiguity regarding IPR in the region.

The lack of time category has already been stated by many authors to be one of the main reasons why people are reluctant to share knowledge (Pirkkalainen, Jokinen, & Pawlowski, 2014). Most interviewees agreed that within the education career, even if a teacher is willing to share their knowledge, lack of time certainly puts a limit to knowledge sharing. With all the responsibilities held by teachers, knowledge sharing activities become an extra-burden, which is, in some cases not well remunerated (Clements & Pawlowski, 2012).

The technological gap between the *Old World* and the *New World* is clearly shown in the present research. Not only do teachers in Latin America lack proper pedagogical techniques that are more suitable for the modern-day necessities, but also, many of them are lacking basic computer skills. In many cases students are much more technologically skilled than their teacher, which puts a barrier between them.

The lack of skills is not a problem that stands on its own, it is indeed very closely related to the lack of technological infrastructure. Without the proper infrastructure, teachers are unable to learn how to use a computer and consequently cannot teach how to do it. Those students who have no technological access are also left behind. This coincides with Humbert et al. (2008) and Larson et al (2008). The Education systems in the region have implemented various programmes to overcome this issue, nonetheless, much more needs to be done to put everyone on the same page.

It should be pointed that these realities are not experienced by the whole population of the Latin American countries. In fact, many students in the region go to private schools, if the family incomes permit. Private schools are better equipped, and the teachers are far better trained. This proves Osland *et al.* (1999) and Elvira *et al.* (2005) right regarding social distances. This fact is not only to point the poverty and social equality issue faced by these countries, but also to show the relationship between these barriers and the Local Institutional Policies barrier.

Even if the interviewees did not consider Local Institutional Policies to be highly relevant as barriers, it was inferred that more than restricting policies, there is a lack of policies. Chen (2010) and Husin & Hanisch (2011) mention a lack of resources devoted to the promoting LOR, and the answers from the interviewees point into that direction, when they say they need government involvement to make their LORs succeed. A more recent source, Mishra (2017), also agrees that all LOR stakeholders, including policymakers need to understand the benefits in terms of access and quality of education that can be brough by supporting LOR through national policies.

Furthermore, Local Institution Policies are related to many, if not all the researched barrier categories. Institution Policies control how much work teachers must do, how much time they dedicate to teaching, and how much time they dedicate to training to research, etc. For example, if teachers are loaded with paperwork (grading exams, etc.), they will not have time for searching the web for more interactive teaching materials, or for creating and sharing their own.

Earlier in this section, lack of proper remuneration was mentioned as a cause of unwillingness to share. Governments need to realize the importance of giving more reasonable salaries to teachers. Particularly in Latin America, many teachers complain about having to offer tutoring services to earn enough money to provide for their families. There is no motivation to devote time to knowledge sharing when time needs to be devoted to activities that could provide an extra income. In that sense, the results of this research also match with the study executed by LLECE (2008), which stated that teachers in Latin America are underpaid.

Regarding the state-of-the-art solutions for overcoming the barriers to the usage of LORs, training/workshops is a common approach to raise awareness to overcome knowledge sharing issues and help teachers understand IPR and be more confident when reusing materials. Trainings are also a popular solution for improving teacher's skills and teaching methods. A study by Karunanayaka & Naidu (2017) showed that after a series of workshops for teachers not only the usage of LOR shifted to very scarce to high usage and there was an improvement in the pedagogical thinking and practices of teachers, as well as higher awareness and knowledge regarding IPR.

Some platforms also implemented solutions similar to social media platforms to make it more user-friendly such as ability to rate, comment and giving a status to frequent users. Tools like learning scenarios and educational pathways, as well as search engines are also approaches to increase the usage. Some interviewees mentioned PDA/CD-ROM versions of the repositories for locations without internet access. However, the sense of sharing and reusing is lost with this type of solution.

The interviewees presented some ideas to overcome the issues that they were facing at the moment of the interviews. In Europe, knowledge sharing was one of the most relevant issues, and the most mentioned solution was an improved reward system. Clements & Pawlowski (2012) state that "LORs need new reward systems for contributions and publishing rate growth", and most of the interviewees agreed with that.

The lack of time issue was one of the most sensitive ones. There is no technological development that can give more time to teachers and students. In both regions some managers stated that they are trying to offer ready to use material. However, this posits a contradiction to what LOR actually is, since this brings no adaptation of the materials, only its use, with no contribution, so the sense of a strong LOR community is lost.

Solutions to other barriers are more platform-oriented. Such as providing intelligent mapping of the contents to match specific curricula or profile and even providing contents in a sequence that would match the user's learning paths. Improvement and addition of intuitive tools for creation and adaptation of materials was also mentioned as a solution that could simplify the usage of LOR and increase user engagement. This match with Çinici & Altun (2018) who found that one of the problems regarding the reusability of materials is the lack

of tools with the required features to adapt the materials according to the necessities of the users.

In a final note, the author of this work has tried to complement the discussion section to find out where the research regarding this topic has gone during these eight years. However, very few related articles were found, perhaps confirming the affirmation of Clements et. al (2014) that LOR have failed. LORs are not a topic these days as currently education materials can be accessed in a very fast way through platforms like Google and Youtube.

8 CONCLUSION

The success of a Learning Object Repository is measured according to its adoption. Since the usage of LORs is not high enough that it meets the expectations of high participation and engagement, the barriers to the usage of LORs were explored to understand what stops users from being actively involved in creating, reusing and sharing contents on LORs. Ssuspecting that even with highly fitting and functional technical infrastructure, foremost impediments to higher success are, to an important extent, human centered. One last time, research questions are posited:

- What barriers do LOR managers consider the most significant to the use of educational repositories?
- How do the barriers to LOR usage in Europe compare to those in Latin America?
- What are the main approaches that have been implemented to overcome the identified barriers?

It was decided that a qualitative approach would be the best way to obtain an in-depth understanding to answer the research questions. Barriers to knowledge sharing found in literature were mapped to the concrete LOR scenario. Based on it, a questionnaire was created for conducting the interviews. LOR managers from both Europe and Latin America were selected to discover how they feel about the relevance of these factors and regarding the acceptance and usage of LOR by teachers. The answers from the informants were analyzed to understand the relevance of each barrier, as well as the differences between these barriers as perceived by managers in Europe vs managers in Latin America.

One important finding is that, even if Local Insititutional Policies were not mentioned as a relevant barrier, many of the possible solutions to other barriers presented by the interviewees had to do with involving authorities. Barriers such as lack of skills, infrastructure, pedagogical practices and curricula can be influenced by the creation of good policies. In that sense Local Institutional

Policies are not a barrier on themselves, because in most cases there are no impediments in terms of policies. However the lack of supporting policies showed to have an impact on the usage of LORs.

The barriers to usage of LOR that are concerned with attitudes towards knowledge sharing also showed to be relevant. However, this is more due to a "generational" attitude, which also reflects the digital divide between older vs younger teachers, and also between students and teachers. Younger people have been raised in this digital environment where everyone is already sharing all kinds of contents, most of the time freely. Whereas older teachers (and older people, in general) are still not well acquainted with the digital era. Pedagogical practices are also linked to this impediment. The thought that the contents created can be assesed by peers and students, or that others can see them making mistakes, may bother some teachers.

An issue that was not considered as a barrier on itself kept recurrently appearing in the interviews with the repository manager was lack of time. In literature lack of time was found as a component of the knowledge sharing category, however attitudes like knowledge hoarding or fear of judgement are more related to the knowledge sharing category than lack of time. But it makes a lot of sense when it comes to the users of LORs, which are teachers. The teaching profession comes with very heavy workloads and the answers from all respondants confirm it. Creating, adapting, reusing and even finding materials is time consuming and most teachers find it very difficult to save a time slot to devote to LOR usage. This lack of time barrier is one that was exposed by respondents from both Europe and Latin America.

On the effects of culture when comparing the barriers of relevance in the studied regions, it is clear that the development of repositories in Europe is in a different and higher level than that of Latin America, and thus the problems affecting the use of repositories in both regions are very diverse. While the managers from Europe struggle with getting the users to overcome the attitude towards knowledge sharing and the IPR issues, Latin American LOR managers are still facing problems related to still being part of the "Global South", such as lack of infrastructure.

Regarding the approaches to overcome the barriers, the workshop/training approach is used LOR managers for improving pedagogical practices, helping overcome knowledge sharing issues, raising awareness about IPR and providing teachers with proper skills for creating contents. Some other approaches are related to the LOR platforms themselves regarding the level of interaction they provide (ratings, comments, user status), the flexibility and organization of the educational objects and the tools available to provide a better user experience.

As for the limitations of this research: The sample size used for this research might be considered a limitation, as only twenty LORs were considered. Also, the qualitative approach may have introduced too much subjectivity to the results. Even if the interviewers did their best to guide the interviews with a neutral perspective, there might have been some bias leaning towards the barri-

ers that the interviewers preconceived as the strongest. This bias may have also been present when assessing and analysing the gathered data.

Perhaps the scope of the research was also too ample for the author to be able to deeply analyze the data and cover all the perspectives initially proposed. For instance, as stated in this work, both Latin America and Europe are very diverse in terms of culture. Both regions include many nations that are diverse from one another and a limitation of this research is the fact that more information might be needed regarding the comparison between these regions. This culture diversity within regions may have resulted in bias. However, most of the repositories that were studied are international and that is the reason behind comparing and contrasting at a continental/regional level instead of at a national level. The diversity of cultures within continents/regions was not explored in this study.

The author would also like to point that given that more than eight years have passed since most of this work was conducted, and since it seems that within this time the adoption of LORs has not grown; and, in the light of the Coronavirus situation, where almost all schools worldwide have been forced into the online education, it would be interesting to find out where are the teachers currently obtaining their materials from, how are they adapting those materials to fit their needs and understand what are the current barriers to educational material usage and sharing.

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APPENDIX 1 INTERVIEW GUIDE/QUESTIONNAIRE

Barrier Category	Description	Questions
Local Institution Policies	Local Institution Policies: refers to all those impediments to the use of OER that are consequence of the policies held by a particular region, country, institution, or organization. For example: rules and/or restrictions, reward systems, bureaucracy, acceptance of hierarchy, lack of policies that support the use of OER.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How? What is your repository doing to overcome this barrier? Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.
Knowledge Sharing	Knowledge sharing: this category refers to barriers related to the willingness (or lack of -) of users to engage in knowledge sharing activities (providing or receiving). Examples: knowledge hoarding, lack of team spirit, lack of trust on the knowledge/capabilities of others.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How? What is your repository doing to overcome this barrier? Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.
Differences in curricula	The organization/contents of courses established by different institutions/teachers makes it difficult to provide material that adapts to their necessities.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How? What is your repository doing to overcome this barrier? Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.

Differences in teaching practices	The pedagogical methods used do not support the use of repositories.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How?
		What is your repository doing to overcome this barrier?
		Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.
Intellectual Property Issues	Issues associated with copyright and intellectual properties keep users from contributing with their own material/reusing material shared by others.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How?
		What is your repository doing to overcome this barrier?
		Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.
Language	Multi-language repositories need accurate, in-context, translation of material.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How?
		What is your repository doing to overcome this barrier?
		Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.

Skills	The users lack the skills necessary to use and/or contribute to the repositories.	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How?
		What is your repository doing to overcome this barrier?
		Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.
Infrastructure	Lack of infrastructure that meet the minimum requirements for the use of repositories in terms of software/hardware/broadband?	Based on your own background and culture, do you consider that this is a significant barrier for your national/regional community of users? How?
		What is your repository doing to overcome this barrier?
		Based on your experience, what else could be done? A) Within the repository. B) Within the community. C)About policies.