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Open access repositories on open educational resources: Feasibility of adopting the Japanese model for academic libraries

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Open access repositories on open educational resources

Open access
ROER

Feasibility of adopting the Japanese model for academic libraries

35

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Abstract

Purpose – Triggered by the advancement of information and communications technology, open access repositories (a variant of digital libraries) is one of the important changes impacting library services. In the context of openness to a wider community to access free resources, Wawasan Open University Library initiated a research project to build open access repositories on open educational resources. Open educational resources (OER) is an area of a multifaceted open movement in education. The purpose of this paper is to show how two web portal repositories on OER materials were developed adopting a Japanese open source software, called WEKO.

Design/methodology/approach – The design approach is based on a pull to push strategy whereby metadata of scholarly open access materials kept within the institution and network communities' digital databases were harvested using the Open Archives Initiatives Protocol for Metadata Harvesting method into another open knowledge platform for discovery by other users.

Findings – Positive results emanating from the university open access repositories development showed how it strengthen the role of the librarian as manager of institutional assets and successfully making the content freely available from this open knowledge platform for reuse in learning and teaching.

Research limitations/implications – Developing further programmes to encourage, influence faculty members and prospective stakeholders to use and contribute content to the valuable repositories is indeed a challenging task.

Originality/value – This paper provides insight for academic libraries on how open access repositories development and metadata analysis can enhance new professional challenges for information professionals in the field of data management, data quality and intricacies of supporting data repositories and build new open models of collaboration across institutions and libraries. This paper also describes future collaboration work with institutions in sharing their open access resources.

Keywords Open source software, Open educational resources, Repository, Academic library, OAI-PMH interoperability, WEKO

Paper type Technical paper

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Introduction

The sharing of knowledge and information, particularly through information and communications technology (ICT) has a significant impact on people's lives. According to UNESCO (n.d., para. 2), open access, open data and crowdsourcing (this is not an open source production but a problem-solving model, opens to an online community through the internet) platforms, and open educational resources (also referred to as OER) enable information to be freely and legally shared, providing strategic cross-cutting opportunities to improve the quality of decision making as well as facilitate policy dialogue, knowledge sharing and capacity building.

The concept of OER movement emerged in the late twentieth-century with the development of open and distance learning amidst a culture of open knowledge, open source, free sharing and peer collaboration (Karunanayaka and Naidu, 2014). OER as defined by UNESCO (n.d., para. 3), provides teachers and learners with high-quality teaching and learning materials that allow for free use, adaptation and distribution. With the advancement of ICT, it has reshaped the landscape of academic libraries as well, thus libraries really have to redefine their functions, roles and services in order to stay relevant in this new landscape of the future (Liau, 2011). Such development can be perceived as a threat whereby the traditional libraries can become redundant amid the new emergence of technologies or an opportunity to improve and fulfil users' information needs. The major impact of the advancement of ICT in this open knowledge movement has also opened up users to the world of freeware and open source software easily available from everywhere. Today, many libraries rely on freeware and open source software to manage many of the daily operations work (Corbly, 2014).

Institutional repositories can be seen as a species of digital libraries and it is also an aspect of a trend where librarians are moving into publishing to offset what is perceived as their shrinking conventional role (Adolphus, 2014). Institutional repositories is a strategic move for libraries to support educators in searching, sharing, reusing of existing contents and creating additional resources through collaboration with other institutions in a structured way.

This paper discusses the development and experience of building repositories on open educational resources (ROER), a research project carried out by the Wawasan Open University (WOU) Library in February 2014, in collaboration with the National Institute of Informatics, Japan and the Open University of Japan. The research, which was a part of the university's open educational research initiatives which started in year 2012, focused on the involvement of the library as an organisational unit, and of individual librarians and other information technology staff to set up two web portal repositories using the Japanese open source software, called WEKO. The outcome of this research project contributes to the current repositories called WOU OER Repository (<http://weko.wou.edu.my>) and OER@AsiaHub (<http://oerasia-repository.wou.edu.my>).

Being the first non-Japanese user of this open source software, the paper aims to share the experiences gained from conducting the research project. The repositories developed are far from an ideal implementation of institutional repositories, as more effort is needed to promote awareness and generate interest from prospective stakeholders in the community to contribute their institutionally produced open educational teaching or learning contents and disseminate open knowledge resources.

Current analysis of open access repositories in Asia

OpenDOAR[1], an authoritative directory of open access repositories, developed by University of Nottingham, UK, shows the contribution of top five continents worldwide from a total of 3,049 repositories (as at 30 April 2016). This is depicted in Table I.

Repositories by region

In terms of number of repositories, the results revealed that Asia, shared second ranking having 609 (20.0 per cent) repositories. A research study on open access repositories carried out by Fayaz (2014), stated that during that period Asia region share of repositories was 400 repositories out of total 2,299 and this number has increased to another 209 (52.3 per cent).

Repositories by country

In comparison of repositories by countries in the Asia region, Table II shows that Japan contributed the highest number of repositories (192, 31.5 per cent), followed by India (71, 11.7 per cent) and third Turkey (66, 10.8 per cent). The Japanese institutional repositories can be accessed either individually or collectively through a single web portal called Japanese Institutional Repositories Online (JAIRO), using JAIRO Cloud[2] computing facility. The number could be higher (Adachi, n.d.) as many of the institutional repositories in Japan have not registered with OpenDOAR. According to Yamaji (2014), current number of institutional repositories in Japan is 478, whereby 184 (38 per cent) are using JAIRO Cloud, and 294 (62 per cent) are by university own development.

Repositories by software used

The open access repositories movement has created three main players of open source software. They are Dspace (Massachusetts Institute of Technology and Hewlett Packard), Eprints (University of Southampton) and Fedora (Cornell University) (Adolphus, 2014). The most popular software being used to design and manage

Table I.
Repositories
distribution by
continent

No.	Region	No. of repositories	%
1	Europe	1,359	44.6
2	Asia	609	20.0
3	North America	577	18.9
4	South America	267	8.8
5	Africa	135	4.4

Table II.
Repositories by
country in Asia (609)

No.	Country	No. of repositories	%
1	Japan	192	31.5
2	India	71	11.7
3	Turkey	66	10.8
4	Taiwan	58	9.5
5	Indonesia	50	8.2
6	China	39	6.4
7	Republic of Korea	28	4.6
8	Malaysia	21	3.4
9	Others	84	13.8

AAOUJ
11,1

38

their contents is DSpace (371, 60.9 per cent), Eprints (85, 14.0 per cent) and WEKO (47, 7.7 per cent), as shown in Table III.

Due to the great strides made by the open access movement, Malaysia is also becoming an active contributor establishing institutional repositories and open access archives for use of academic and research communities. However the movement and visibility can be considered low. From the 21 repositories (Table II) where Malaysia is ranked at the eighth position (3.4 per cent), 15 are using Eprints software (71.4 per cent), followed by DSpace (4, 19.0 per cent), Greenstone (1, 4.8 per cent) and unknown software (1, 4.8 per cent) (Table IV). Currently there is no contributor in Malaysia using the Japanese open source software, WEKO.

Open source software WEKO infrastructure

Spurred by the progress made by ROER, developed from worldwide repository initiatives, and the realisation that the university needs to embrace open educational practices, the WOU Library initiated its own ROER development project adopting the Japanese open source software, called WEKO (a *Swahili* word meaning repository) as the platform. The creation of the OER institutional repository and the other offshoot, which function as a federated repository for OER Asia network community are aimed at promoting awareness, creation, reuse and sharing of OER among educators in the local and regional institutions, especially for institutions who do not have a repository system.

Aware of the availability of many open source softwares from the world wide web to build digital repositories, in year 2012 a study was made by the librarians to Eprints and DSpace and eventually Eprints was implemented in year 2012 to house the WOU's staff research outputs. However, after two years of implementation, the librarians and information technology staff faced problems in configuration and enhancement of Eprints user interface and editing the source codes due to lack of technical support and the programming knowledge of the application. Hence, WEKO was chosen as a replacement of Eprints for building ROER after an evaluation of several Japanese's WEKO-based repositories. As usability is the key factor, WEKO-based portals were designed on the basis of relatively simple and with necessary search capabilities and key functionalities.

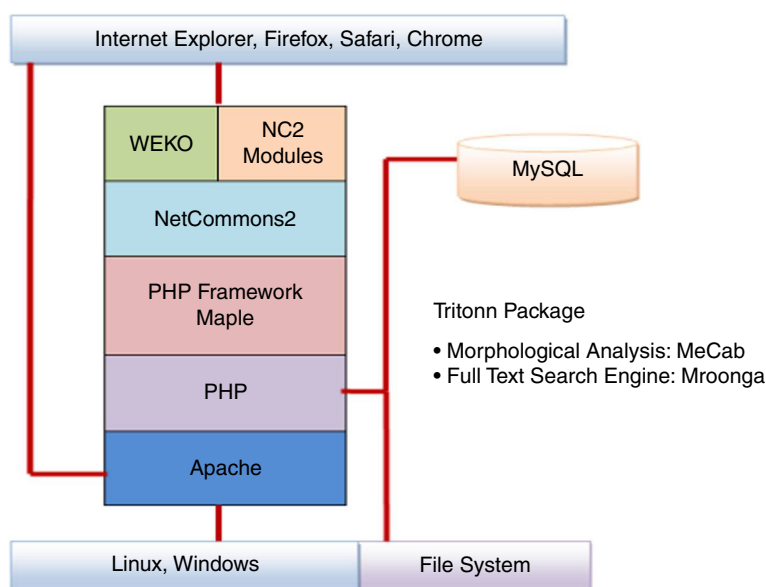
WEKO platform uses an AJAX-oriented content management system called NetCommons (NC) for effective repository web design. Figure 1 depicts the system

Table III.
Softwares used
in Asian
repositories (609)

No.	Software	No. of repositories	%
1	DSpace	371	60.9
2	Eprints	85	14.0
3	WEKO	47	7.7
4	Others	82	13.5
5	Unknown	24	3.9

Table IV.
Open source
softwares usage in
Malaysia (21)

No.	Software	No. of repositories	%
1	Eprints	15	71.4
2	DSpace	4	19.0
3	Greenstone	1	4.8
4	Unknown	1	4.8



Source: Yamaji (2014)

Figure 1.
NetCommons and
WEKO system
architecture

architecture of NC and WEKO components. The NC was developed by the National Institute of Informatics in Japan for use by educators. According to Yamaji *et al.* (2009), WEKO is an open source software under the New Berkeley Software Distribution license. The system is written in PHP scripting language, rendering it OS-independent.

The NC2 is an information sharing system which acts as a content management system, learning management system and groupware. MySQL is used as a relational database backend for storing data from NC and also WEKO. The operating system used can be Linux or Windows and for WOU, Linux CentOS platform is being used.

The following Table V depicts the minimum hardware specifications required in order to run the WEKO application. The installation information related to WEKO software can be accessible from the following website developed by the National Institute of Informatics, Japan – <https://meatwiki.nii.ac.jp/confluence/display/WEKO/Installation>

From the above Figure 1, WEKO stored contents are found in the MySQL and the tools available will create and process the stored content including via metadata harvesting complying to the Open Archives Initiatives Protocol for Metadata Harvesting (OAI-PMH). The content is the heart of WEKO repository in the overall architecture. Other end user services such as searching, repository access allow users and applications to access the stored content.

Operating system	CentOS 6.5
Memory	2 GB
CPU processor	1 x
Hard disk	50 GB

Table V.
Hardware minimum
requirements

In terms of its functionalities, WEKO supports the mechanism to define tree-structure index, identify, store, search, retrieve, import and export digital objects in the repository. The web interface allows customization according to user needs. The administrative menu includes item type modify metadata set according to OAI-PMH, edit index tree, modify and set controls for object submissions and other general settings such as ranking calculation, log analysis and copyright settings. To facilitate multiple deposits of objects, it is by means of using another application called SWORD Client for WEKO protocol and complied with the appropriate Open Archives Initiative Object Reuse and Exchange resource maps along with the index tree. Another useful feature is it supports and able to translate repository's interface headings labels into ten languages such as Bahasa Melayu, Cantonese, English, Japanese, Chinese, Hindi, Indonesia, Tagalog, Thai and Vietnamese.

Development of WEKO-based repositories of OER

Chadwell and Sutton (2014) stated that since the 1990s, the development of institutional repositories throughout the world have been monopolised by academic libraries. Among the benefits of having institutional repositories are centralised storage of scholarly output of the university, maximises visibility of output, immediate access to full-text resources, long term archiving and preservation, convenient and easy access to materials, as highlighted by Raseroka and Mutula (2012, p. 140).

The following pages of this paper briefly describe the two WEKO-based repositories of OER developed by the library.

WOU OER institutional repository

The approach used to build the content of WOU institutional repository (<http://weko.wou.edu.my>) (Figure 2) is based on a pull to push strategy whereby metadata information

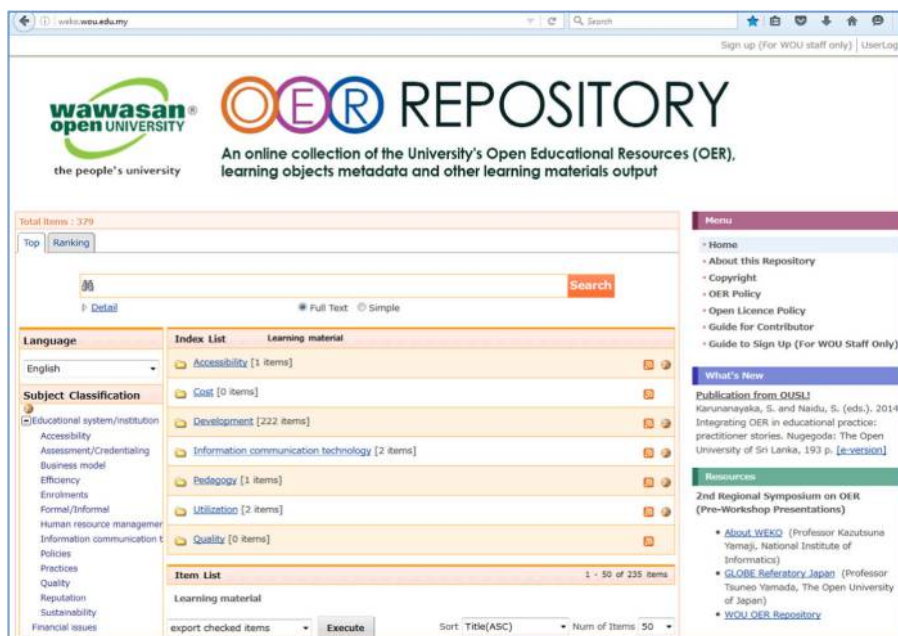


Figure 2.
WOU OER
institutional
repository

from other open access repositories are collected using the OAI-PMH method into another open knowledge platform for easy retrieval by other users. In compliance with OAI-PMH, this repository supports the interoperability issues. The URL weko.wou.edu.my provides information about the university's OER collection, learning objects metadata and other learning materials outputs. Many of the records consist of full-text materials including accompanying images to make the resources more informative and interesting. This repository not only provides an archival function for university's OER outputs but also reflects the university support and contribution to OER movement. Abiding by the university's open licence policy (WOU, 2012, p. 3), the repository scope of content is narrowed to schools and departmental scholarly output such as course materials and research papers. This includes corporate and personal authorship. The open licence model adopted is the Attribution-Non-Commercial-ShareAlike (CC BY-NC-SA)[3], which means that this licence allows others to remix, tweak, and build upon our work for non-commercial purpose, as long as they credit the author and licence their new creations under the identical terms.

The URL weko.wou.edu.my categorised its content according to several subject classification themes (parent tree) and sub-themes (child tree) to facilitate searching and retrieval of records, as shown in Figure 3. Record category tagging is done in line with the university library data classification requirement.

Figure 4 shows the web access statistics profile in terms of number of views and downloads for weko.wou.edu.my domain, the server that stores the digital local content and metadata of the WOU OER Repository. The statistics collected covered a 22-month period, from June 2014 (after the soft launching of the web portal) to April 2016.

Table VI shows the top five most popular titles downloaded from this repository.

Based from the WEKO webreport usage statistics tool in the repository's learning objects, it has showed a significant contribution that the library has made on the internet "marketing" to increase university's visibility.

Federated repository OER@AsiaHub

Another important aspect of institutional repository, which is often overlooked, is its potential to function as a collaborative platform (Liau, 2011) for open educational or open access communities. Clifford Lynch (2003), a pioneer in institutional repositories matter defines institutional repository as:

[...] a university-based institutional repository is a *set of services* that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long term preservation where appropriate, as well as organization and access or distribution (Lynch, 2003, p. 2).

Thus, the "set of services" allows the library to expand this WEKO functionality and its boundary to facilitate collaborations with other communities of practice in open access or OER both locally and regionally by collecting varieties of contents from different communities.

The set up of OER Asia (www.oerasia.org), an Asian Forum to share information, views and opinion, research studies and knowledge resources about OER was primarily the work of a small group of Asian Association of Open Universities members. The network has organised workshops, training programmes, seminars, symposiums on OER and completed mapping exercise of OER activities in a few countries in the continent. The network hopes to embark on its next task of collaboration with the Global

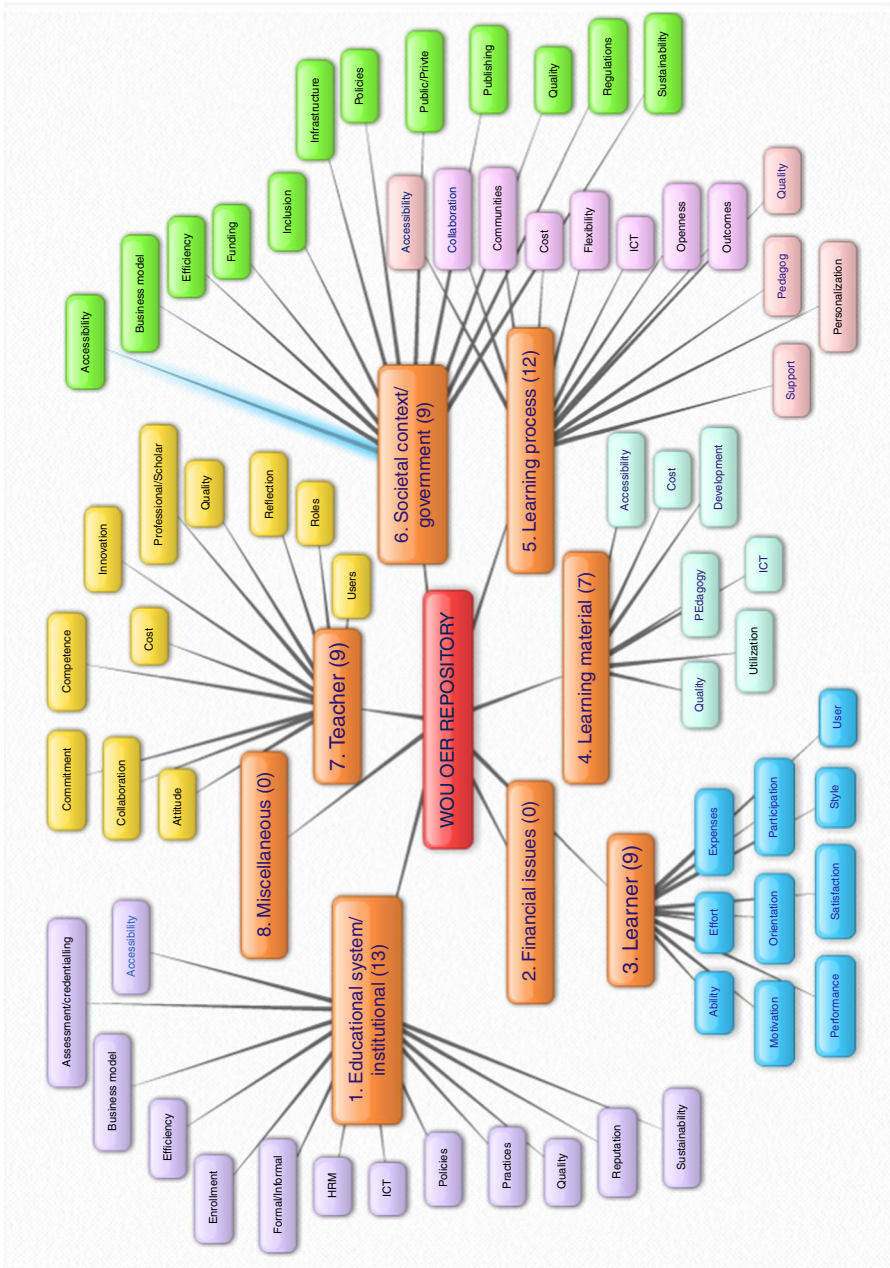


Figure 3.
WOU OER
repository collections
mapping by themes

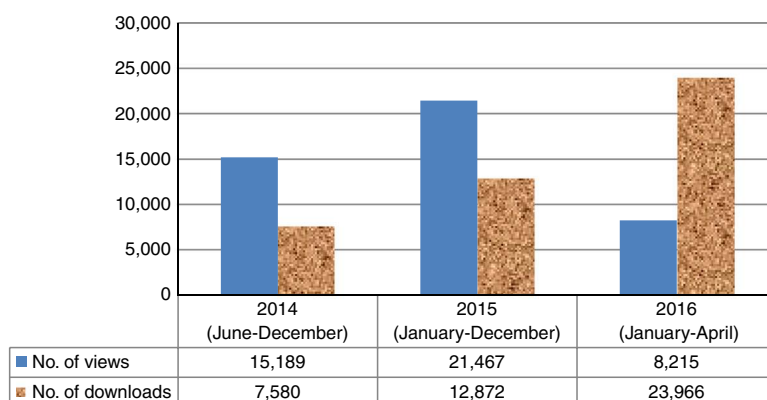


Figure 4.
Web access usage
statistics of weko.
wou.edu.my

No.	Title/author	CC license	No. of downloads
1	Investigation into what the Malaysian public wants from environment protection tax laws in Malaysia	CC-BY-NC-SA	5,191
2	Higher education and open educational resources in Asia: an overview	CC-BY-NC-SA	4,804
3	Retirement age policy analysis: a case study from HR perspective	CC-BY-NC-SA	4,644
4	Networked learning: a new paradigm of teaching and learning in ODL	CC-BY-NC-SA	2,724
5	BBM 102/05 microeconomics course guide	CC-BY-NC-SA	2,395

Table VI.
Top five
downloads from
weko.wou.edu.my

Learning Objects Brokered Exchange (GLOBE) (www.globe-info.org), in creating a federation of metadata repositories. The aim is to provide members open access to metadata description of records in member's repositories. GLOBE is a one-stop-shop for learning resource broker organisations, each of them managing and/or federating one or more learning object repositories (Dhanarajan, 2013).

With this in mind and moving towards GLOBE collaboration, the set up of another federated repository network, called OER@AsiaHub (<http://oerasia-repository.wou.edu.my>) (Figure 5) for the OER Asia communities was developed. It aimed to generate wider participation from the open access communities in contributing and making their open access resources in various academic disciplines available for sharing and reusing. Figure 6 depicts the network concept model of OER@AsiaHub repository.

The WOU librarians are actively promoting this repository and encouraging contributions from other network institutions. Universiti Putra Malaysia and the Open University of Japan learning objects are available in this repository. It is hope that the access to this open knowledge platform will support a greater exchange of content for members.

Figure 7 depicts the yearly usage analysis of this repository from the period of October 2014 to April 2016 by number of views. The download statistics are not measurable as the portal provides multimedia hyperlink to the source of the repository for the full-text access.

Table VII shows the top five most popular titles viewed for the last 15 months from the period of October 2014 to April 2016.

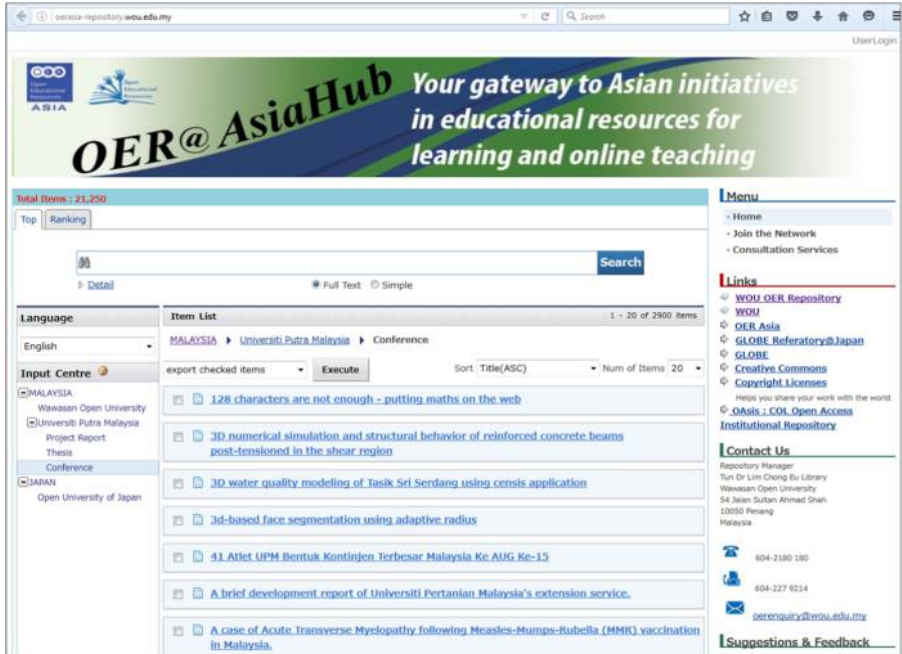


Figure 5.
Federated repository
OER@AsiaHub

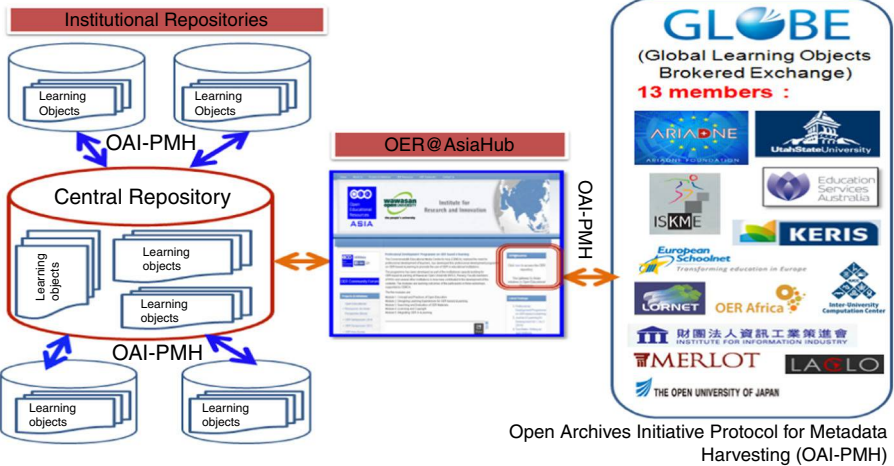


Figure 6.
OER@AsiaHub
network concept

Source: Kamsiah *et al.* (2014)

Facilitating challenges in building OER repositories using WEKO

Undoubtedly, the team faced many challenges in trying to develop the OER repositories. The main building blocks are being the library's infrastructure and expertise to fully understand the WEKO infrastructure components.

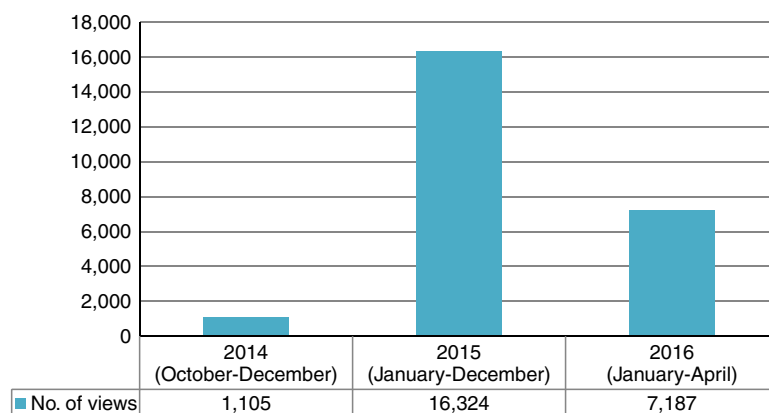


Figure 7.
Web access usage
statistics of
OER@AsiaHub
repository

No.	Learning object title	No. of views
1	Rationales of employees' perception on private colleges' internal reputation: a case study of ABC college (input centre: UPM)	1,029
2	Some aspects of the spatial unilateral autoregressive moving average model for regular grid data (input centre: UPM)	503
3	101 open educational resources workshop (input centre: WOU)	337
4	Adult learners in open distance stressors, coping strategies and social support – a study of undergraduate students at the WOU Penang learning centre: some preliminary findings (input centre: WOU)	230
5	Applying social constructionist theory of learning to improve student educational experience: an Elgg experimental study (input centre: WOU)	210

Table VII.
Top five titles
viewed from
OER@AsiaHub
repository

Application technical challenge

The creation of OER repositories initially was hampered by the team members' lack of knowledge of the WEKO system. This was mainly due to the lack of technical documentations in English language to enable the team to gain a better understanding of the content management system. Being the first academic library outside of Japan to use the WEKO application, the library was unable to turn to any community of practice. Nevertheless, many technical problems were sorted out via the use of media communication with the technical expertise from Japan. The English version of the user manual (Version 2.1 dated August 2014) (Yamaji(b), 2014) has since been published and made available online.

Content recruitment and sustainability

As for the content recruitment aspect of OER, the process of building the content started from scratch by manual depositing and harvesting existing learning objects from another open source repository using Eprints. The work involved were identifying suitable material, digitizing into PDF format and applying appropriate Creative Commons license as per university's open license policy. To increase content recruitment, authors have also been provided a simple way to self-deposit through a simple registration. An electronic copy of user guidelines is available on the web portal to facilitate easy indexing and ensure consistency of data input.

Standardised metadata interoperability

According to Sharma (2012, p. 334), OAI-PMH protocol has been used to support interoperability with other repositories to harvest bibliographic data and it is the major technological innovation of this period. Spurred by the open access movement, the interoperability of metadata level has been the most active area in digital repositories development (Aschenbrenner *et al.*, 2008). Domain specific that supports the OAI-PMH protocol to enable exchange or cross-reference of metadata must be traced correctly. Hence, OER@AsiaHub contents also relies on the OAI-PMH compliant metadata exchange acquired from other institution's existing metadata repositories. It is automatically generated from the WEKO harvesting environment using OAI-PMH base URL using appropriate metadata schema such as Dublin Core or Learning Object. Network connection problem can be a bottleneck at times during metadata harvesting. The existing default Japanese metadata schema for Dublin Core or Learning Object required further review and modifications to cater for the local needs and retain as much metadata as possible, without compromising on the value of the learning objects. Nevertheless, the library has continued to initiate efforts to establish cooperative institutional metadata exchange programme with local libraries and comply the metadata values accordingly.

Quality assurance

Quality assurance in repositories is a necessary prerequisite for its success. According to Atenas and Havemann (2013), repositories should have certain characteristics in the aspect of social and technical values. The social characteristics relate to tools which enable social interaction within the user and repository, while technical characteristic relate with the design and functionality of the interface (Atenas and Havemann, 2013). Based from the creation of the two repositories, a number of quality assurance indicators have been implemented to optimise access and participation such as featuring the resources by themes classification, searching tools, authorship, keywords, metadata information, Creative Common licenses, source code, usage statistics per learning objects and few exporting tools.

Copyright licenses

According to Kleymeer *et al.* (2010), academic librarians somehow have been acknowledged as *de facto arbiters* for copyright matters where librarians help to address policy challenges. However, not many librarians are knowledgeable on copyright licenses status of the documents deposited and the uncertainty of the copyright status is still a major concern to libraries and librarians. In order to alleviate potential copyright problems, librarians provide advisory guidelines to authors to supply copyright statement, if available, though it may be ambiguous and still does not address the copyright of the item. One of the guidelines adopted by institutional repositories librarian is that, as a matter of policy, all works created and/or developed by staff in the course of carrying out his or her work will automatically belong to the university and must be shared with others. Such work will be made open access and indexed in the institutional repository to allow other interested readers to cite the work. The rationale being the easy accessibility of a work will enable more people to cite the work, contact the author(s) and create discussion opportunities with other researchers. Such visibility will help the staff to build up his/her profile and increased the university's reputation in the international circle.

The institutional repositories librarian will normally advise staffs that have signed over the copyright of the material to a publisher not to submit those materials to the repository.

User experience and benefits from developing OER repositories

In summary, the major user benefits of developing an OER repositories using WEKO application are identified as follows:

- a more user friendly mechanism is now in place to search, capture, organise, curate and make accessible OER produced by the university which is an important component of an organisation's information and knowledge initiatives;
- newest version with well structured upgrade guidelines in English are provided online;
- enables and encourages cross-disciplinary collaboration with other academic institutions' resources;
- external software platform which supports the OAI-PMH for metadata harvesting, would be an advantage and made data exchange process much easier; and
- allowing registered users to deposit materials in an institutional repository will ease the administrative burden of reporting publications for research assessment and review exercise.

Discussion and future directions

Given the usefulness of WEKO, this paper has summarised the following important aspects of the WEKO infrastructure which has given four primary contributions in the development of the medium-scale ROERs:

- (1) managed repository and content development;
- (2) easy website development using varieties of add-ons;
- (3) metadata harvesting with OAI-PMH compliant; and
- (4) learning objects reporting usage analysis.

Creating open access repositories platform is one good effort but academic libraries must go beyond their roles of just populating their repositories content. Academic libraries do play a significant role in managing OER contents as they possess the expertise in handling activities strongly related to information science field such as system analysis, conforming to metadata standards, indexing and classification records curation, dissemination and retrieval. Despite the constraints faced, there are specific goals which the library would like to achieve over the next few years. The immediate goal is to add as much open access objects metadata from other institutions to the OER@AsiaHub federated repository and participate into the GLOBE collaboration network.

There is a need for libraries to change its traditional role and the ways services are performed to cater for the increasing availability of OER and open access content. Creating open access repositories platforms is one good effort but academic libraries must go beyond their roles of just populating their repositories content. Collaborative effort with various communities within and outside the institution will strengthen libraries roles' and help to increase institutional visibility (Liauw, 2011). The biggest obstacle in open knowledge sharing is not the technology itself, but rather the internal and external barriers to sharing information between people, institutions and network community of practice. Academic libraries must take the initiative to foster business culture to encourage information sharing and improve access to all kinds of scholarly and educational materials. Sustaining support and commitment to the repositories growth are essential for success.

Conclusion

The key findings of this research project showed that there is a clear need to promote the role of academic libraries as a partner in OER initiatives or leading the institutional OER programme. Librarians can be encouraged to assume the key role as OER advocates within and outside the institutional contributing to the OER movement. Although librarians' participation is still not widespread, librarians and libraries do play a significant role in managing OER contents as they possess the expertise in handling activities strongly related to information science field such as system analysis, conforming to metadata standards, indexing and classification, records curation, dissemination and retrieval. Undoubtedly, the challenges of producing OER by academicians, their willingness to make the materials available free of charge and the readiness of libraries to develop open access repositories for distribution of the OER will continue to be issues faced.

In summary, this research project has showed that using the Japanese open source model, WEKO indeed can be adopted by other institution libraries as it can fulfil the library's requirements, cost saving, easy to install, develop and maintain, does not require the person to be IT savvy to develop the content management system. The university can use the institutional repository as a strategy to achieve its goal of disseminating research, publicising WOU outputs and course programmes by providing open access to the work of staff. Moving forward, being the first non-Japanese user of WEKO and based from the experience gained, WEKO is useful and comparable with other open source applications. Moreover, WEKO can serve as a model for future opportunities for cross-campus digitization projects in the University.

Notes

1. OpenDOAR – directory of open access repositories, available at: <http://opendoar.org/>
2. JAIRO Cloud – <https://community.repo.nii.ac.jp/>
3. Creative Commons licenses – <http://creativecommons.org/licenses/>

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Further reading

OpenDOAR: Directory of Open Access repositories (2015), available at: <http://opendoar.org/>

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