The Role of Institutional Repositories in addressing Higher Education Challenges

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Abstract. Over the last decade, Higher Education around the world is facing a number of challenges. Challenges such as adopting new technologies, improving the quality of learning and teaching, widening participation, student retention, curriculum design/alignment, student employability, funding and the necessity to improve governance are considered particularly in many literature. To effectively operate and to survive in this globalization era, Higher Education institutions need to respond those challenges in an efficient way. This paper proposes ways in which institutional data repositories can be utilized to address the challenges found in different literature. Also we discuss which repositories can be shared across the institutions and which need not to be shared in order to address those challenges. Finally the paper discusses the barriers to sharing Higher Education repositories and how those barriers can be addressed.

Keywords: Higher Education Institutions, Higher Education Challenges, Institution Repositories.

Introduction

Higher education (HE) institutions are large, complex, adaptive social systems like all other human organizations. Over the last decade, higher education (HE) around the world is facing a number of challenges. In recent years considerable interest has focused on identifying those challenges, identifying opportunities and threats and proposing ways to address them. Recently we identified twenty higher education challenges facing 21st century's higher education based on different literature [1]. We identified curriculum design/alignment, student retention, student employability, widening participation, funding, emerging technology, new generation of staff, quality of learning and teaching, quality of research, plagiarism, assessment, accreditation of higher education institutions and programmes, compete and collaborating globally in research and talent, tenure, group formation for learning and teaching, critical thinking and argumentation, construction of personal and group knowledge, contribution to economy, integration of knowledge capital and cross-curricular initiatives, and higher education governance and management as the burning challenges in today's higher education. The details of those challenges can be found in [1]. To operate effectively in the 21st century the higher education institutions need to respond to these challenges. In [1] we also discuss about institutional repositories and how institutional repositories (IR) can help institutions to address these challenges. Institutional repositories can mostly be utilized to address most of the higher education (HE) challenges. An institutional repository (IR) is a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end-users both within and outside of the institution with few if any barriers to access. It will also house experimental and observational data captured by members of the institution that support their scholarly activities [3]. It argued that the institutional repository is a very powerful idea that can serve as an engine of change for institutions of higher education. If properly developed, it advances a surprising number of goals, and addresses an impressive range of challenges. In this paper we identified which institutions' repositories we need to address the challenges currently facing our higher education (HE) institutions. Also we discuss which repositories need to be shared outside of the institutions and which need not to be shared outside of the institutions to response those challenges. Moreover this work answers the following questions. What institutional data/repositories are required to efficiently address the higher education challenges? How do higher education institutions organize themselves to respond to the above challenges? Are there any barriers that prevent institutions to open their information to be accessible to respond these challenges? If yes then how can they solve these problems?

In the next section, we discuss the institutions repositories require to address the HE challenges as presented in various sources of literature. Following this presentation, we discuss which repositories need to be shared outside of the institutions and which need not to be shared outside of the institutions, which we believe is necessary in order to better understand of sharing repositories to address HE challenges. Subsequently we discuss what are the barriers of sharing institutional repositories and how these barriers could be addressed. The last section concludes the paper with some future research directions.

Institutional Repositories and Higher Education Challenges

An institutional repository consists of formally organized and managed collections of digital content generated by faculty, staff, and students at an institution [4]. Repositories are important for universities in helping to manage and capture intellectual assets as a part of their information strategy. Repositories can provide linking to other repositories and can also provide machine processable data to support HE institutions to address the challenges. There are a number of institutional repository initiatives underway within higher education. Most visible initiatives include MIT's DSpace and University of Southampton's EPrints. [1]MIT's DSpace is an open source software platform that enables capture and submission of works, distribution of those works, and long-term preservation of assets. DSpace' endeavors is to create a federated collection of intellectual resources from the world's leading research institutions. The University of Southampton's [2]EPrints initiative is designed to manage disciplinary or institutional print collections, rather than digital collections. Eprints software is Open Archives Initiative (OAI) compliant and freely available under a GNU license, and is in use at California Institute of Technology, the University of Queensland, and other institutions. This section provides a comprehensive summary of the information in institutional repositories that relates to the higher education challenges.

Course information: Course information institutional repository mostly contains courses/programmes information. This repository also includes aims of the programme, intended learning outcomes, syllabus, learning and teaching methods, assessment, time tables, programme fees and length of the programmes. This type of repository requires to response some of the higher education challenges. Specifically, according to [2] course information available in different institutions can be used to more efficient curriculum, programme or module design. Also in [6], [7] the authors believe courses/ programmes information needs to be made accessible across institutions to efficiently design/align the curriculum. The module designers can compare programmes or modules in different institutions and find the gap and can offer new programmes or modules [2], [29]. Moreover to attract local/international student institutions need to make courses/programmes information accessible to everyone [2], [7], [11]. Repository that contains courses/programmes information needs to be made accessible to employers (outside of the institutions) so that they can involve in job placement of students and also in course/module design to enhance the student employability [5-7], [11]. This repository also needs to be made accessible to the accreditation bodies for more efficient accreditation of the higher education institutions and programmes [8], [12-14]. Specially the programmes output that deliver the higher level skills need to accessible to funding bodies to attract funding [7].

Teaching and Learning material: These types of repositories contain teaching and learning material of an institution. According to [2], [6-9], [11], [15] enabling access to teaching and learning materials across institutions will certainly improve the quality of learning and teaching of the higher education institutions as students and teachers can access lots of learning and teaching materials available across the institutions and they can develop themselves accordingly. The authors of [10] and [16] also believe that teaching and learning materials need to be shared accross the institutions for better quality of learning and teaching activities in the institutions as teachers and learners can have more deeper understanding on any specific subjects. They can broader their knowledge having lots of information on any subject area.

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[1] http://www.dspace.org

[2] http://www.eprints.org

Student admission data: Repositories that contain students' general information for example, Personal data (name, contacts, email, homepage, URL, images), Relations to other people in the institutions, Interests, Accessibility and preferences (language preference, disability, eligibility), demographic characteristics (e.g., ethnicity/race, sex, Age), Geographic origin/Residency, Financial information, Students' living arrangements, students security feature (keys, password, credentials) etc. As per [8] and [17] this repository containing student admission data needs to be made accessible across departments (for students with common modules) in the institutions to efficiently create group for learning and teaching activities. For example if the teacher wants to build group according to students geographic origin then this repository will help them to create the group efficiently and so on. Also to efficiently support student retention institutions need to make student admission data accessible across departments in the institutions so that institutions can analyse different data to monitor students progress [15], [6], [18]-[20]. For example as per [2] institutions can analyse student interest and so on to identify the early sign of student disengagement with their study. Student admission data and contextual information of students (like academic attainment, aptitude and potential) also needs to consider in widening participation in higher education [7].

Student academic record: Repositories contain students' academic information including Goal of the learner, Achievements and learner history [performance (students' pre-college characteristics/ Academic preparedness (e.g. high school GPA, SAT score)), Certifications, Competency/Skills/Experience/Knowledge, Portfolio, Current programme's information, Transcript (grades), Activity, Involvement in campus programs (e.g., Freshman Orientation Course, Educational Opportunities Pro- gram)], Context, and extra-curricular activities etc. As per [8], [17] institutions need to be made accessible this information across departments to efficiently create group for learning and teaching activities. For example if the teacher wants to build a student group according to students GPA (e.g. who have high GPA or any order) then this repository will help them to create the group efficiently and so on. Also this repository needs to support student retention effectively and efficiently. According to [2], [6], [15], [18-20] students' academic information need for efficiently support in student retention as institutions can monitor students' progress on any subject from their grades and if there is poor grades they can find out the reason and support them accordingly. So these information needs to be made accessible across departments in the institutions to support student retention. Also some selective information from this repository needs to be made accessible outside of the institutions to enhance student employability (skills, knowledge, work experience and personal attributes need to be made accessible to employers) [5-7], [9-11], [13].

Resource information: Repository that contains institution's educational setting information need to be made accessible across departments in the institution to support student retention [22]. Educational settings are namely the classrooms, laboratories, studios of the campus, residential halls, facilities, equipments, supplies, libraries, and so on. This information can also support to attract local/international students if institutions make it accessible outside of the institutions. Also making available this information to the accreditation bodies for efficient accreditation as these resources are also considered in the accreditation process [14]. Moreover sharing this information across departments will help to minimize higher education institution cost by sharing these resources across departments [11].

Research output: According to [6], [7], [23], [24] for collaborating globally in research and to strengthen the research capacity and improve the quality of the higher education institutions, the institutional repositories that contains research output needs to be shared outside of the institution (across institutions, industries etc). So that institutions can know each others research works and can take initiative for future collaborative project with other institutions. Repositories containing research output need to make accessible to industries or funding bodies for commercialization of research to contribute to the social economy [6], [7], [11], [24]. Institutions can also attract funding bodies by visualizing their research output. Research output need to be made accessible to the accreditation bodies as research is one of the key factors to be considered in the accreditation process [11], [13-15]. Moreover to efficiently support critical thinking and argumentation research output need to be made accessible across institutions [25], [21]. We believe this repository needs to be made accessible across institutions to efficient construction of personal and group knowledge.

Institutional Repositories	Higher Education Challenges
Course information	Curriculum design/alignment, Widening participation, Student employability, Funding.
Teaching and Learning material	Quality of learning and teaching.
Student admission data	Group formation for learning and teaching, Student retention, Widening participation.
Student academic record	Group formation for learning and teaching, Student retention, Student employability.
Research output	Funding, Collaborating in research and talent, Quality of research, Critical thinking and argumentation, Personal and group knowledge construction.
Research project	Funding, Collaboration in research and talent.
Academic staff and expertise information	Cross-curricular initiatives, Accreditation, Critical thinking and argumentation, Higher education governance and management.
Research staff and expertise information	Collaboration in research and talent, Quality of research, Construction of Personal and group knowledge.
Resource information	Student retention, Widening participation, Accreditation, Funding.
Accreditation data	Accreditation.
Training information	Developing new generation of staff.
Staff facilities	Tenure

Fig. 1: Institutional repositories relate to the Higher education challenges.

Research project: Repository that contains new area of research and current research project mainly those with high market demand need to be made accessible across institutions, industries, and business to compete and collaborating globally in research [7]. If institutions know each other research they will find to make collaborative research project where they will find similar interests. Also the repository of research project needs to make accessible to industries, business or other funding bodies to attract funding [6], [7], [11]. As mostly industries are more interest to provide funding where they have interests.

Academic staff and expertise information: Repository that contains general, academic and skills information of academic staff and expertise needs to be made accessible across institutions to efficiently support critical thinking and argumentation by providing relevant information [21]. Also these information needs to be made accessible across institutions to support cross-curricular activities by matching people and resources in the emerging area [2], [13]. To manage staff (new recruitment, tenure) efficiently HE governance and management need this information available internally in the institution [10], [11], [24]. This information needs to be made accessible to the accreditation bodies for accreditation of the institutions as this information considered in the accreditation process [14].

Research staff and expertise information: Repository that contains information about research staff and expertise need to be made accessible across institutions, industries, and business for collaborating globally in research and also to strengthen the research capacity [6], [7], [11], [13]. Hence improve the overall quality of research in the institutions as the best researcher works together in the same research area in which they are expert. This information can also support in personal and group knowledge creation as people can easily find out people in the same area.

Accreditation data: Repository that contains potentially specific accreditation data need to integrate which scattered across departments and need to be made accessible to accreditation bodies for

accreditation of higher education institutions [2], [11], [15]. This repository contains information about student support services, fiscal and administrative capacity, recruitment and admission practices, record of student complaints etc.

Training information: Repository that contains available training for faculties need to make available across the departments to manage and develop new generation of staff in the institutions [11]. So that new generation of teachers will be more supportive to their students [10]. Also other staff in the institutions can develop their knowledge and skills while they find it necessary for their career.

Staff facilities: Repository that contains alternative occupation and flexible age-of-retirement scheme and other facilities for staff needs to make available across the department in the institutions to support tenure and staff management in the institutions. For example if a department shut down or if the quality evaluation of teaching and research is insufficient or senior faculty those perceived as no longer productive should take into careful consideration by providing them the alternative facilities. So that 21st century's students will not fear to pursue an academic career in future [11].

As per the above discussion we can classify institutional repositories into 2 types; *need to be shared* and *do not need to be shared*. The repositories need to be shared outside of the institutions are classified as *need to be shared* and the repositories which do not need to be shared outside of the institutions are classified as *do not need to be shared*. This classification will help institutions to understand about requirement and will be easier to take decision for sharing information. Fig. 2 shows the categorization of institutional repositories. As per our above discussion Course information, Teaching and Learning materials, Academic staff and expertise information, Research staff and expertise information, Research output, Research project, Resource information and Accreditation data need to be shared outside of the institutions; whereas Student admission data, Student academic record (some selective data need to be made accessible), Staff facilities, Training information need not to be shared outside of the institutions to efficiently response to the higher education challenges. We realise the importance of linking institutional repositories across different higher education institutions to meet the 21st century's higher education challenges. So far all parties interests to successfully enable linking among the repositories.

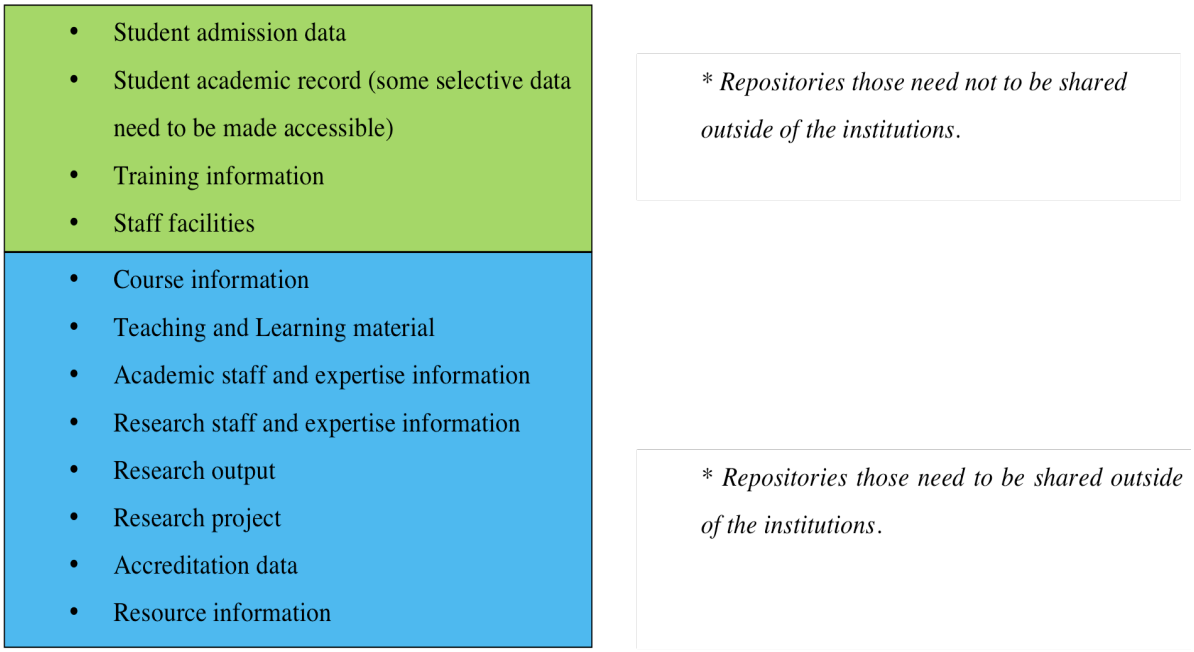

Fig. 2: Categorisation of Institutional repositories as *need to be shared* and *need not to be shared*.

Problems with Sharing Repositories

The success of institutional repositories has been somewhat spotty. As per [2] over forty universities are reported to employ repositories in UK higher education or further education to publish their research output, conference and journal articles, presentations or course material. There is a value to be gained by letting institutions have access to external repositories and by sharing their data with them. Exposing data for sharing can provide significant value in addressing higher education challenges and in supporting teaching and learning activities. At the same time, there are certain challenges that need to adequately discussed and addressed. According to [3], [26], [27] and [28] the authors provide some reasons for not using institutional repositories and also problem in open access/sharing repositories. Some of them are:

- Concern about redundancy with other modes of disseminating information.
- Confusion with copyright.
- Fear of plagiarism and having one's work scooped.
- The perception of Open Access content being of low quality while quality is big concern of reputation for any academics
- A lack of mandatory policies for depositing manuscripts
- Confusion and uncertainty about intellectual property issues
- Scholarly credit and how the material in institutional repositories would be used
- Research/ teaching materials on publicly accessible web sites are not preserved in perpetuity and also they are not maintained securely
- Publishers' policy is another factor as they do not allow posting pre-or-post refereed articles on publicly accessible web sites and
- Additional time and effort is required to make materials publicly accessible on the internet

The potentially response the higher education challenges enabled by linking and sharing institutional repositories need to be documented properly to enhance our understanding on the pedagogical potential of institutional repositories. We need to take necessary steps to solve the above concerns relating to linking or sharing institutional repositories to get the greatest benefit from these repositories in the higher education institution.

Sharing institutional repositories is a big challenge in today's higher education institutions. There are many issues related to sharing institutional repositories are discussed in the above section. Access to scientific data is hampered by structural deficits in the publication process. Data publication needs to offer authors an incentive to publish data through long-term repositories. Data publication also requires an adequate licence model that protects the intellectual property rights of the author while allowing further use of the data [30]. The [3]JISC Strategic aims include developing and providing innovative and sustainable Information and Communication Technology (ICT) infrastructure, services and practice that support institutions in meeting their mission. This can be summarised as the development, provision and use of an e-Infrastructure (Information Environment) for education and research. Also data need to be anonymized before exposed/sharing to any third party in order to protect personal information [29].

Conclusion

Institutional repositories play an important role in 21st century's higher education. Institutional repositories are now clearly and broadly being recognized as an essential infrastructure to respond the higher education challenges in the digital world. This paper provides an understanding of how institutional repositories relate to the higher education challenges and discuss on how sharing institutional repositories can add value in this respect. Sharing institutional repositories have some

[3] http://www.jisc.ac.uk/

concerns that we need to fix for greater benefit of higher education. This is an area where we believe universities need to invest aggressively, but where they also need to implement thoughtfully and carefully, with broad consultation and collaboration across the campus community and with a full understanding that if they succeed they will permanently change the landscape of 21st century's higher education. Future work will focus on implementing solutions of higher education challenges with the help of institutional repositories.

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