# Digital Repositories and Knowledge Networks

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### ABSTRACT

*Digital technologies require new values, attitudes and patterns of behavior to access information. Their existence will not be successful and viable, if the systems are not accepted, utilized effectively and shared systematically. In Malaysian IHE, the development of digital repositories is encouraging. All academic libraries are making full use of their websites to archive and post their institutional resources. Therefore, the main purpose of this paper is to highlight the importance of digitization of research output in a shareable way. The interactivity and knowledge networking environments can be accelerated through the interoperability principle in the development of digital repositories.*

### Keywords

*Digital repositories, Institutional repositories, Research output, Knowledge network, Interoperability, E-knowledge.*

## 1.0 INTRODUCTION

The work of researcher is, by its very nature, virtually unbounded. Researchers are expected to keep abreast of developments in their fields of specialization by engaging in original research and scholarship, participating in activities of one or more professional societies, and to read the latest research studies produced by their colleagues. There is always a new question to ask, further analysis to complete, or another issue to discuss.

Many researchers have been posting their intellectual output on the World Wide Web for quite some time. This was usually done as part of their personal pages or on departmental sites. This indicates their aspiration for expanding their work cost-effectively. With the establishment of digital repositories, this is no longer the only or preferred means of making scholarly output available. By creating digital institutional repositories, it means organizing the random posting of these scholarly communications into well structured, secured and attractive virtual spaces.

The concept of digital repositories has grasped the imagination of leaders in the field who had a vision of knowledge sharing through open access system. The expected benefit of digital institutional repositories includes as a supplement to the scholarly communication process and a meaningful indicator of the quantity and quality of the intellectual output of an institution, provides institutional visibility and prestige to the institution and also to serve as the basis for a new model of scholarly publishing. Therefore, in this paper, the importance of digitization of research output in a shareable way is highlighted.

### 1.1 Background Of The Research And Development In Malaysia IHE

In the Vision 2001-2010 Development Policy, MAPEN II Report 2001, as mentioned in the *Report by the Committee to Study, Review and Make Recommendations Concerning the Development and Direction of Higher Education in Malaysia* (MOHE, 2006), one of the basic strategies for human resource development is "…to encourage research in science and technology in Malaysian society in disciplines which are suitable to the country such as commercialization and the marketing of the products of education in order to be highly competitive and become forerunners in certain fields".

It is also reported that research and development (R&D) activities in Malaysia are limited in local universities and funded by the Government. They are well-equipped with the latest R&D equipment. However, R&D should not only rely on high technological equipment, the development of a culture and environment that is suitable for the growth of such activities is also necessary.

According to National Survey of R&D 2004 Report, MASTIC, taken from the same report (MOHE, 2006), the status of R&D in Institution of Higher Education (IHE) in 2002 is as follows:
- IHE spent RM360.4 million for R&D;
- The expenditure allocated to the types of R&D activities is balanced. As indicated in the form of percentage, 37.5% on Applied R&D, 31.6% on Experimental Development R&D, and 30.9% on Basic R&D;
- The research priorities of IHE were on Environmental Science, Applied Science, Technology, Engineering Science, Biology, Medicine, and Health Science which utilize 67.2% of R&D budget;

- Collaboration between IHE and industry in research activity is on the increase;
- Sources of funds for R&D in IHE come mostly from IRPA (Intensification of Research in Priority Areas) ie. 59.1%, Government (4.3%), followed by other funds in (1.8%) and outside (0.7%) Malaysia;
- The number of researchers in IHE is 10,527, that is, 59.2% out of 17,790 researchers in the country.

As of 2005, the number of researchers in IHE has increased to 19,117 (MOHE, 2007). It demonstrates the extent of their contributions to the development and advancement of our nation through R&D activities. The establishment of a knowledge society depends on the creating of new knowledge, delivered through education and training, distributed through ICT application, and utilized through the process of creating the products, services and new industries. IHE plays a vital role in producing and handling the intellectual capital of academic communities.

However, the Committee of the Report found that constraints in resources were the main obstacles to progress in R&D in IHE (MOHE, 2006).

Since education and research is dependant upon information, the role of libraries in supplying the needed information is well established. Libraries should collaborate and work closely with the researchers due to their specific responsibility to preserve information. The development of digital repositories in Malaysian IHE libraries is encouraging. All academic libraries are making full use of their websites to archive and post their institutional resources. Some of them choose to adopt open source software from other universities or international organizations such as Universiti Teknologi Malaysia adopts EPrints, developed by University of Southampton, England. In doing so, they would ensure that information resources remain permanently accessible for free, in working condition and authentic.

Government funding for higher education, and subsequently its libraries, will at best remain level or increase only modestly for the foreseeable future. The situation becomes worrying as most academic libraries are non-profit making organizations. On the other hands, demands for service continue to escalate as more diverse population seeks higher education. Universities and their libraries will need to seek alternative sources of funding and reallocate resources to best meet these demands.

Scholarly literature continues to proliferate in a variety of formats while, at the same time, costs for library materials, particularly journal subscriptions, are likely experienced double digit inflation. While information technology is becoming less expensive, the type of interactive electronic knowledge creation and transfer process will require reallocation and perhaps additional funding.

With the inception of open access scholarly communication movement, it created an excitement in not only the library and information services arena but also in post secondary institutions. Digital institutional repositories were seen as the antithesis to the existing model of scholarly communication that tends to inhibit the availability of scholarly communications. This lack of accessibility is intensified by a continuous annual increase rate of inflation, and the price of scholarly journals. With this regard, digital repositories can be seen as a weapon to counter the lack of access for financial reasons.

The development of digital repositories in Malaysia IHE has entered its post-production phase. However, there is not much data and information about its progress, in terms of the acceptance and usability of digital repositories. In the researcher's "investigation", Malaysia IHE libraries have created and maintained their own institutional repositories. Only, in 2005, PERPUN (The Conference of University Libraries and National Library of Malaysia) has initiated a one-stop-centre for academic resources or portal, known as MyUniNet Portal (Malaysian University Libraries and National Library Network) which would become the catalyst to collaboration and networking among academic libraries in Malaysia. The researchers including postgraduate students will now have an avenue to guarantee the originality of their ideas. It is also expected to foster knowledge and expertise sharing among Malaysian academia.

## 2.0 DIGITAL REPOSITORIES: AN OVERVIEW

Sharing of academic publications among scholars or scientists has become a vital process. By doing so, they could help to build new knowledge on old ones. The scholars routinely contribute articles to journals or other scholarly publications, and serve as peer reviewers and editors with little or without monetary reward. Therefore, in order to have a sustainable scholarly communication, preservation of all research data is required. The research data should be archived and managed in such a way that allows easily accessible and retrievable. Today, the process of sharing is getting easier with the rapid evolution of online technologies. One of the new alternatives is a digital repository.

### 2.1 Digital Repositories

In a paper, prepared by Raym Crow (2002), the Scholarly Publishing and Academic Resources Coalition (SPARC) Senior Consultant, institutional repositories are defined as "digital collections that capture and preserve the intellectual output of university communities".

Clifford Lynch (2003) defines institutional repositories as: "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."

## 2.2 Level of Awareness and Usage

The diffusion of institutional repositories (IR's) among faculty can be gauged to some extent by statistics reported at the Berlin 3 meeting on Open Access held February 28 – March 01, 2005 in Southampton (Heery and Anderson, 2005). At this meeting it was reported that although faculty are still ill informed about Open Access 25% were already providing Open Access to their scholarly output. Furthermore 79% indicated their willingness to self-archive provided their institutions require them to do so (Heery and Anderson, 2005). This could serve as evidence to argue that IR's are begun receiving support from the faculty members who are themselves researchers.

In terms of characteristics, IR's are not just collections of data but offer functionality and features that distinguish them from other digital collections (Rogers, 1995; Institutional Archives Registry, 2005):

a) Repositories must provide permanent storage for scholarship.
b) IRs offer a set of basic services such as access control and search capability.
c) IR software manages metadata and content.
d) IRs are sustainable and trusted.
e) IRs are generally designed to grow in content through self-archiving by the creator of the item, though this is sometimes done on a departmental level (Suber, 2005).
f) IRs provide open access to its content and metadata for harvesting.

In the November 07, 2003 issue of the *Chronicle of Higher Education,* Atkinson encourages universities to establish IRs: "…giving faculty members the necessary tools to make their publications more accessible. Universities should shoulder the costs of developing, managing, and publicizing research -- including peer review of scholarly papers -- and build the online capacity to distribute those works worldwide. The costs, though not insignificant, pale in comparison to those that libraries must bear to buy access to our faculty members' publications." (Atkinson, 2003)

Taking into account the situation around IR's, it is clear that IR's is no longer a start-up technology. The estimate is that it has made modest but significant progress in this phase but that the degree of progress and adoption differs from country to country and even from institution to institution.

According to Van Westrienen and Lynch (2005), as of mid 2005, the number, as well as the percentage of total academics involvement in institutional repositories, is still very low, with two exceptions: in the Netherlands it is estimated that at least one record from around 40% of all academics is deposited in an IR at this moment. They also witness an exception for a specific type of material: dissertations. In Germany, for example, it is estimated that, depending upon the discipline, between 2% and 62%

of all academic dissertations have been deposited to the IR.

In Malaysia, there are probably not many studies on the development of digital repositories. From a few research literature that the researcher managed to get, most are discussing the setting up of digital libraries. With the predominant trend continues to be the digitization of information, hopefully, it could help to explain the state-of-art of digital repositories in Malaysia.

Aminah, Fatimah Syam and Kamal (2006) have presented a paper entitled "Collaboration and Networking from A New Perspective" discussed about the need for collaboration and networks among information professionals, the latest trends, and particularly about our (Malaysia) progress and readiness to be a part of the trends in modern collaborations. Among the achievements are PERPUN (The Conference of University Libraries and National Library of Malaysia) has come up with a portal, known as MyUninet Portal (Malaysian University Libraries and National Library Network). This can be a headstart towards collaboration and networking among academic libraries in Malaysia. MyUninet Portal consists of the following digital repositories such as MYTO, MURC, MGIR, and ULSI.

a) MYTO is an abbreviation for Malaysian Theses Online. It lists the theses collection compiled from public universities and university colleges as well as three main selected private universities, with more than 17,000 citations and made available in the form of citations, abstracts, 24-page preview, and full-text.
b) MURC is a Malaysian Universities Repository Collection. The repositories include published and unpublished resources produced by universities, academicians and personnel such as books, conference and seminar papers, journal articles, working papers, magazines newsletters, newspapers, statistics, brochures, pamphlets, prospectus, etc.
c) MGIR is a Malaysian Gateway to the Internet Resources. The resources are arranged by subject categories of the university, linked to informative websites and accurate sources to support the process of teaching, learning and research.
d) ULSI is an abbreviation for Union List of Serials IPTA/IPTS. It is a portal that lists the titles of all serial publications subscribed by all university libraries in Malaysia.

## 2.3 Personal and Subjective Perception

Van Westrienen and Lynch (2005) further identified several reasons for non-participation from faculty, including:

a) Difficulties informing faculty and convincing them to participate,
b) Confusion and uncertainty about intellectual property issues,
c) Scholarly credit and how the material in IRs would be used,

d) The perception of Open Access content being of low quality, and

e) A lack of mandatory policies for depositing manuscripts.

**2.4 Information Productivity**

Van Westrienen and Lynch (2005) also came up with estimates of the national coverage of yearly research output by broad discipline that was going into the national collection of IRs. Only a few nations attempted to provide such estimates, among them are; The Netherlands estimates about 25% of the national research output, across a wide range of disciplines, is now going into its institutional repositories; the French institutions in Belgium also give large estimates – 33% in Humanities and Social Sciences, 39% in Life Sciences, 16% in Natural Sciences, and 11% in Engineering. With the exception of a 10% estimate for Natural Sciences in Germany and a 15% estimate for Engineering and Computer Science in the UK.

## 3.0 DEVELOPING DIGITAL REPOSITORIES FOR KNOWLEDGE NETWORKS

Knowledge is seen as a social structure. People can understand information individually and in group. However, knowledge – even as simple as 1 + 1 – can hardly be understood, unless it is interacted and communicated with others. Therefore, interactivity and knowledge sharing are integral to the evolution of knowledge to new plateaus of meaning.

Norris, Mason, Robson, Lefrere, and Collier (2003) have revealed their knowledge view from different lenses and one of the lenses is "know how". Know how views knowledge to "networking, consulting, collaborating, sharing, researching, reflecting, developing, testing, maintaining, doing, learning, educating, training, innovating, managing, navigating".

The principle of interoperability should be fundamental to networking, and thus the development of digital repositories. From a systems perspective, there are four points of enterprise interoperability needed by Malaysian IHE to share their research outputs:

- Content description, discovery and exchange must be in standardized and interoperable ways.
- Interaction with and tracking of content must be in a way that are independent of the technology platform being used.
- Application system must have standardized interfaces.
- Infrastructure must use industry-standard methods to interface and interoperate with institutional IT infrastructure. (Norris, Mason, Robson, Lefrere, and Collier, 2003)

Looking at the development of digital research repositories in IHE today, many efforts are underway to capture digital research assets in a shareable way. These efforts will lead to the demand of e-knowledge and for reliance on knowledge networks. They will further boost the demand for e-knowledge commerce.

## 4.0 CONCLUSION

The Internet has transformed the way information is being transmitted. The nature of information resources is changing fast. In fact, at the moment, it is in flux with more information being migrated to digital format and more made available in digital format, because it is born digital. It is, therefore, not surprising that information in electronic format represents the prime and fastest growing collection in academic libraries today. These and other developments, such as the open access movement have increased the interest in institutional digital repositories.

Many researchers have put themselves in the pipeline. They have posted their scholarly information output on the Web in order to articulate and share their ideas and mind. However, there are a lot more who are not yet recognized or used the web's power to maximize the visibility, accessibility, usage and hence the impact of their work. They need to be motivated to self-archiving their intellectual output free for all on the Web. The readiness to change from the traditional method to new model of scholarly communication could determine the increment in access and impact of scholarly information.

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