DEPLOYMENT AND USABILITY EVALUATION OF MOBILE ACCESS TO INSTITUTIONAL REPOSITORY

By

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CERTIFICATION

It is hereby certified that this dissertation written by **Adewole Oluwasegun Adewumi** was supervised and submitted to the Department of Computer and Information Sciences, College of Science and Technology, Covenant University, Ota.

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ABSTRACT

An Institutional Repository is essentially a web application that is capable of capturing, preserving and disseminating the intellectual output of a University or research institution in digital formats. The advent of the Mobile Web has ushered in a new wave of mobile devices - with multi-touch facilities and thus there has been a shift from Web access to Mobile Web access. This has brought about the need to make web applications accessible via mobile devices. This study investigated the usability of the core functionalities of an Institutional Repository on various mobile devices. The work did not try to create a mobile version of the repository but rather test the existing web application on various mobile platforms. To achieve this, the core functionalities of the repository were modelled using Unified Modelling Language (UML). In addition, an Institutional Repository was built and deployed for Covenant University by leveraging on open source repository software – EPrints. Furthermore, the core functionalities of the Institutional Repository were tested on five different mobile devices. Finally, the usability of the Institutional Repository on the various mobile devices used was evaluated by identifying the usability attributes; designing a questionnaire based on those attributes and then analyzing the results with SPSS software. The results showed that overall the current web version of the repository had a good usability score on the mobile devices used.

Keywords EPrints, Institutional Repository, Mobile Devices, Mobile Web, Usability

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND INFORMATION

The Mobile Web refers to browser-based access to the Internet from a mobile device, such as a smart phone or tablet computer, connected to a wireless network (What is the Mobile Web, 2008).

Traditionally, access to the Web has been via fixed-line services. However, the Web is becoming more accessible by portable and wireless devices and in 2008 mobile access to the Internet exceeded desktop computer-based access for the first time (Mair, 2009). The shift to Mobile Web access has been accelerating with the rise since 2007 of larger multi-touch smart phones, and of multi-touch tablet computers since 2010. Both platforms provide better Internet access and browser/application-based user Web experiences than previous generations of mobile devices have done. It is this trend that has also brought about the need to make web applications accessible via mobile devices.

Two main approaches have been explored to make web applications accessible to the new wave of smart mobile devices and phones. The first approach is to build a mobile version of each web application. For an organisation or an institution, this means there will be duplication of efforts as they would need to maintain two distinct sites. Also, since the manner in which mobile applications display differs from one mobile device to another (Wong et al., 2002), this implies that a mobile application would have to be built for each mobile device. Another approach is to create the content once and adapt it to different devices. Extensible Mark-up Language (XML) helps to facilitate this.

Adaptation can be categorised into three broad categories namely (Butler et al., 2002): intermediate adaption, client-side adaptation and server-side adaptation.

Intermediate Adaptation: To avoid having to change either the server that provides content or the client that consumes it, intermediaries in the content delivery chain can offer limited adaptation (Butler et al., 2002). Intermediate adaptation can help reduce origin server loads, but it is only fully successful when it is based on both knowledge of target device capabilities and author-provided metadata and adaptation hints.

Client-side adaptation: This is when adaptation occurs in the content delivery device (typically the Web browser). The advantage here is that the adaptation code usually has direct access to the device's capabilities. Client-side adaptation occurs based on directives within the content. An example of such is the use of Cascading Style Sheets (CSS), which authors often use to style HTML elements, XHTML or plain XML content.

Server-side adaptation: This offers maximum author control over the delivered content. In order to produce the most appropriate adaptation however, the server must have sufficient information about the delivery context, including the delivery device's capabilities.

A third approach that is also being explored for making web applications accessible via mobile devices is the use of W3C Web standards such as XHTML, CSS, Ajax, XML, XSLT. Many web applications are currently being built using these standards and one of such is the Institutional Repository (Adewumi and Ikhu-Omoregbe, 2011).

An Institutional Repository (IR) is a specialized Digital Library (DL) that is tailored to capture, preserve and disseminate the intellectual output of a University or research institution in digital formats (Crow, 2006; Candela et al., 2007; Lynch, 2003).

According to Lynch (2003), IRs emerged as a new strategy that allows universities to apply serious systematic leverage to accelerate changes taking place in scholarship and scholarly communication. He further stated that many technology trends and development efforts such as: the significant drop in online storage costs, the affordability of repositories and the establishment of standards like Open

Archives Meta-data Harvesting Protocol (OAI-PMH) came together to make the strategy possible.

Institutional Repositories do not have to be built from the scratch. There exists a wide range of institutional repository software platforms to choose from and build upon. However, any institution intending to set up an institutional repository must consider the following factors in choosing a software platform (Barton and Waters, 2004): software product model (open source software, proprietary software or software service model); features of the software (file formats supported, interoperability – OAI compliance, end-user access to content, API for customising the software and persistence of item locator); and technology cost considerations (hardware and servers, operations staff, programming staff, backup and recovery as well as preservation).

Sale (2005) asserts that of all the institutional repository software platforms that exist, three are most popular. They include: DSpace, EPrints and Fedora. These three share some attributes. The first is that they are all open source and secondly they were built by research universities. For instance, DSpace was developed by Massachusetts Institute of Technology (MIT) Libraries in collaboration with HP Research Labs, EPrints was developed solely by the University of Southampton and Fedora was built through the joint efforts of Cornell University and the University of Virginia. Of the three platforms, EPrints was the first to emerge in the year 2000. DSpace and Fedora emerged afterwards in the year 2002.

Since IRs are essentially web applications, research efforts are beginning to focus on deploying DLs (IRs inclusive) to the mobile web (DELOS, 2001) and (DELOS, 2004).

1.2 STATEMENT OF THE PROBLEM

Since the introduction of mobile phones in 2001 to the African market, its use has sky-rocketed with people using it for various things including browsing the Internet. However, it has not been the same story with Institutional Repositories. Since inception, institutional repositories have fast gained grounds and acceptance among Universities and research institutions in developed countries of Europe and America as shown in the Directory of Open Access Repositories (OpenDOAR, 2011). Africa, however, still lags behind in terms of its adoption of institutional repositories.

Nigeria, a prominent nation in the continent of Africa has only three higher institutions that currently have institutional repositories. The obstacles to the low adoption include: low awareness, poor or inadequate funding as well as inadequate advocacy for open access repositories (Christian, 2008).

The issue of awareness may be tackled if the mobile platform is exploited as a medium for accessing such repositories especially owing to the fact that they are web-based and several mobile devices in the Nigerian market are now web-enabled.

Although, mobile access to the Web is not without challenges and limitations, the promise they hold for popularising Institutional Repositories, makes it a worthwhile venture to provide answers to the usability issues surrounding mobile access to institutional repositories. This dissertation therefore, provides answers to usability issues around accessibility of repositories through various mobile devices.

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this research work is to investigate the usability of the core functionalities of an Institutional Repository on mobile devices using Covenant University Repository as Case Study.

In order to achieve this aim, the following objectives were formulated

1. To model the core functionalities of an Institutional Repository
2. To build and deploy an Institutional Repository for Covenant University
3. To test the core functionalities of the Institutional Repository on various mobile devices.
4. To evaluate the usability of the Institutional Repository on various mobile devices

Table 1.1 Research Objectives

S/N	OBJECTIVES	METHODOLOGY
1	To model the core functionalities of an Institutional Repository	Modelling using the Unified Modelling Language
2	To build and deploy an Institutional Repository for Covenant University	Leveraging on open source repository software - EPrints
3	To test the core functionalities of the Institutional Repository on various mobile devices.	Function Testing
4	To evaluate the usability of the Institutional Repository on various mobile devices	Identify usability attributes. Design questionnaires based on the attributes Analyze results with SPSS software

1.4 RESEARCH METHODOLOGY

In order to realise the set objectives for this dissertation, we first identified and modelled the core functionalities of an Institutional Repository with the Unified Modelling Language. This involved drawing use cases, collaboration and sequence diagrams.

Next, an Institutional Repository which formed the framework upon which our research was based was built and deployed using EPrints – open source institutional repository software. EPrints was built using Perl programming language. Its interface is built using Extensible Hypertext Mark-up Language (XHTML); the database server used was MySQL. It is robust, open source and able to handle transactions over the Web. The repository was hosted on a Linux server with its domain name as (http://eprints.covenantuniversity.edu.ng).

Having put up the repository, its core functionalities were tested out on various mobile devices. These mobile devices included those that were Symbian-enabled, Android-enabled, iOS-enabled and Blackberry-enabled.

Finally, the usability of the repository when accessed through mobile devices was evaluated. This was achieved by designing and administering a questionnaire to the would-be users of the repository based on the usability attributes deduced from (IS&T, 2012).

1.5 SIGNIFICANCE OF THE STUDY

The significance of this research includes among others:

1. Raising the level of awareness of institutional repositories.
2. Providing greater access to institutional repositories by leveraging on the ubiquitous nature of web-enabled mobile devices.
3. Helping to improve the visibility of scholarly articles from Covenant University over the Internet.
4. Providing a platform through which scholarly articles can be stored and preserved for the long term.
5. Provision of a system that indicates how possible it is to use mobile devices to interact with institutional repositories.

1.6 MOTIVATION FOR THE STUDY

At the present stage of development, institutional repositories which are fast becoming the core of any vision and mission-driven research institution are being adopted by only few higher institutions of learning in Nigeria (Christian, 2008).

The motivations for this dissertation are as follows:

- **Take Advantage of Trends in Devices to Improve Accessibility to Institutional Repository**: With the increase in capabilities, compactness and ubiquity of mobile devices, as well as their support for Internet access, Covenant University can leverage on this to improve accessibility to its repository. The success of this is hinged on the usability of the repository when accessed on such mobile devices.

- **Create an Environment for a Paperless University**: Items such as question papers, student answer booklets which are often stored away and often get destroyed in storage can be better preserved on the Covenant University Repository.

- **Real-Time Data Access**: Members of the university can browse and search for materials such as research papers, thesis and other scholarly items stored on the repository from anywhere and at anytime using their web-enabled mobile devices.

- **Availability of Platform**: With the availability of wireless Internet in most parts of the Covenant University campus, members of the university can access the repository from various mobile devices which include: laptops, iPods, iPads, android-enabled devices and Blackberry phones.

- **Making the University visible on a Global scale**: With the fact that universities can now be ranked based on the size of the content in their repositories, Covenant University's scholarly articles can better be seen on a global scale through the repository.

1.7 CONTRIBUTION TO KNOWLEDGE

The contribution of this work is that it presents a case study of mobile access to Institutional Repositories in an elegant and repeatable way. To the best of our knowledge, the approach adopted in this study is not yet common in the literature; hence it is valuable for the advancement of literature.

1.8 LIMITATION OF THE STUDY

Covenant University Repository was the case study of this research. The repository runs on EPrints. This is without bias to other institutional repository software platforms.

1.9 OUTLINE

The rest of this dissertation is organised as follows: Chapter Two explores relevant literature to determine the level of progress made since the emergence of Institutional Repositories. In addition, the state-of-the-art features, architecture, design rationale and implementation technologies of Institutional Repositories are investigated. Chapter Three models an Institutional Repository and extends the existing architecture of IRs to include support for mobile user interfaces. In Chapter Four, the core functionalities of Covenant University Repository were tested out on an Android tablet, an iPad and a Blackberry phone. Chapter Five summarises the work and gives recommendations and a scope for further work.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The Directory of Open Access Repositories (OpenDOAR, 2011) lists all registered Open Access Repositories in the world. There were about 2,161 registered repositories as at the time of this writing. Statistics from the Directory of Open Access Repositories shows that organisations and institutions across the globe continue to adopt IRs for use in archiving items such as research papers, electronic thesis and dissertations and even organisational documents that need to be preserved for the long-term. In the same vein, new features continue to emerge on all the known IR software platforms. In this chapter therefore, the level of progress made since the emergence of IRs till date will be highlighted and discussed. In addition, state-of-the-art features, architecture, design and implementation technologies of IRs will be explored.

2.2 DEFINING AN INSTITUTIONAL REPOSITORY

The Merriam-Webster's dictionary defines *repository* as a place, room or container where something is deposited or stored. It adds that a repository contains or stores something nonmaterial. This is a useful starting point to understanding what a repository truly means. It is essentially a container storing nonmaterial (intangible) items. The word *nonmaterial* describes what a repository should contain – things without matter. To fully grasp the concept, we introduce the term, *institutional*. By doing this we are saying a repository should contain immaterial things relating to an institution. The institution could be academic/educational, religious, or medical. For this research however, when we refer to institution, we mean, an academic institution such as a university or research institute.

The nonmaterial content of an academic (institutional) repository refers to the intellectual output of the members of that institution put in electronic form which includes: journal articles, books and book chapters, theses, patents, technical reports, conference materials, works of art, photographs, video recordings, data resulting from research projects and learning and teaching materials. Depending on an institution's policies, an institutional repository may contain some or all of the items listed (Jones, 2007). This understanding has brought about some of the definitions we have today on what an institutional repository is.

Crow (**2006**) for instance defines an institutional repository as a 'digital collection capturing and preserving the intellectual output of a single or multi-university community.

Lynch (Lynch, 2003) defines a university-based institutional repository 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.

Institutional Repositories should not be confused with similar terms such as electronic document and record management systems (EDRMS); learning object repositories (LORs); and collections of exam paper questions. The focus of EDRMS is on keeping, and removing as appropriate, the organisations corporate record so that decision making rather than intellectual output can be traced (Jones, 2007). LORs though very much like Institutional Repositories are distinct in terms of their audience (Jones, 2007). An LOR is meant to serve the members within a particular institution while an Institutional Repository mostly serves persons that are without the institution. This is also true of exam paper repositories as they are by their nature not open to the general public in the same way that institutional repositories are expected to be (Jones, 2007).

2.3 INSTITUTIONAL REPOSITORY VERSUS DIGITAL LIBRARY

The terms *institutional repository* and *digital library* are often used interchangeably. It is however important to distinguish between the two.

A working definition of digital library currently been adopted by the Digital Library Federation is given as follows:

> Digital libraries are organisations that provide resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Digital Libraries Federation, 1998).

From this definition, we can see some similarities to institutional repositories. The striking contrast is the persons populating the system. In institutional repositories, it is ideal for the authors to be the ones entering the information about their scholarly work into the system, as it is in their interest to disseminate it as widely as possible, even though they may have no interest in adding their work to a wider structured collection with internal consistency rules (Jones, 2007). For digital libraries, information is likely to be added by specialist cataloguers with a professional interest in accurately and consistently describing works to aid retrieval (Jones, 2007).

2.4 ORIGINS OF INSTITUTIONAL REPOSITORY

The first seeds of the institutional repository can be traced back as far as the seminal articles by William Gardner and Stevan Harnad in 1990, when networked electronic communication was starting to become a viable tool for the dissemination of scholarly literature (Jones, 2006). In his article "Scholarly Skywriting and the Prepublications Continuum of Scientific Enquiry", Harnad states that:

> "The whole process of scholarly communication is currently undergoing a revolution comparable to the one occasioned by the invention of printing." (Harnad, 1990)

Institutional Repositories began to operate before the World Wide Web (Cartwright, 2008). The first online repository was arXiv – pronounced archive. It started out life in 1991 as *xxx.lanl.gov,* a server created by Paul Ginsparg, then at Los Alamos National Laboratory in New Mexico. It was meant to share preprints among a small number of high energy physicists. It was a simple yet surprisingly popular idea, receiving some 400 subscriptions in its first six months alone. By 1999 when *xxx.lanl.gov* had changed its name to arXiv, the repository was accumulating almost two thousand new articles every month. In 2001, when Ginsparg headed to Cornell University, arXiv went too, and continued to grow.

Since the establishment of arXiv, it has expanded to include most other areas of physics, as well as mathematics and computer science. Its success led to the establishment of other institutional repositories, such as Research Papers in Economics (RePec), CogPrints and Education Line for the fields of Economics, Cognitive/Computer Science and Education respectively (Cartwright, 2008). These were all initiated in 1997. They eventually led to the Open Archives Initiative in 1999, which enables institutional repositories to operate together, a phenomenon known as interoperability.

Software to support the creation of e-print archives really started to become available in 2001 with the release of EPrints and later in 2002 the release of DSpace (Jones, 2006). They are both the most dominant open source repository packages.

In 2002, the history of the institutional repository received a further boost with the publication by Raym Crow, senior consultant for the Scholarly Publishing and Academic Resources Coalition (SPARC) based in Washington, D.C., of a groundbreaking paper titled “The Case for Institutional Repositories.” In it, Crow made the important point that, in addition to academic and scientific institutions, non academic institutions such as governments might benefit from the maintenance of institutional repositories.

2.5 FEATURES OF INSTITUTIONAL REPOSITORIES

There exists a large number of software that can be used to build institutional repositories. We will refer to them as institutional repository software platforms. An in exhaustive list is given as follows (Barton and Waters, 2004):

- Archimede
- Bepress
- CDSware

- CONTENTdm
- DSpace
- EPrints
- Fedora
- Greenstone
- Open Repository

The prominent features of all known institutional repository software are highlighted and discussed in the sub-sections that follow.

2.5.1 Open Source or Proprietary

All existing institutional repository software platforms fall under the category of either open source or proprietary. Open source institutional repository platforms have features such as being: flexible, responsive, customisable, innovative, inclusive and un-owned – open to all to improve (Jones, 2009). Proprietary institutional repository platforms on the other hand, are flexible, responsive, customisable, innovative, and owned by a particular organisation. The distinction between the two categories therefore is ownership. Statistics from the Directory of Open Access Repositories (OpenDOAR, 2011) shows that over 50% of all known institutional repositories make use of open source institutional repository software platforms such as DSpace (37%), EPrints (16%), and Greenstone (1%).

2.5.2 Software or Hosted Service

Institutional repository software platforms can be packaged as software or rendered as a hosted service. As software, institutional repository platforms can easily be downloaded and customised to suit an institutions goal (especially in the case of open source). As a hosted service however, a client wanting to use the platform will subscribe to the service provider (usually the proprietor) at a fee. The client will also give the service provider specifications on the look and feel, as well as the desired features of the institutional repository. The provider compiles the specifications and creates the desired institutional repository solution. The service provider is charged with the responsibility of administering the institutional repository while the client concentrates on populating the institutional repository. There are two prominent institutional repository software platforms that run as a hosted service namely: Digital Commons and Open Repository, other platforms are packaged as software.

2.5.3 Support

Support refers to help rendered to users of a particular institutional repository software platform which may be free of charge or at a cost. Support that is free of charge can be sub-divided into two namely: direct support and community support. In direct support, users can get help directly from the proprietors of the institutional repository platform without having to pay for it. This is what obtains in Open Repository and Zentity. In community support, users get help by joining an institutional repository software platform's community mailing list. Afterwards, they can then post questions to members of the community through emails. The email messages will then be visible to all registered members of the mailing list and as such any member with answers to the question can respond to the emails. Examples of institutional repository software platforms that provide this kind of support include: DSpace, EPrints, and Islandora Fedora.

In the case of support that involves cost, help is rendered as a service that is to be paid for. Some institutional repository software platforms that engage in this kind of support include: CONTENTdm, Digital Commons, DigiTool, and intraLibrary. It should be noted that some institutional repository software platforms provide a combination of free and fee-based support. Examples include: DSpace, EPrints and Islandora Fedora.

2.5.4 Content

Institutional repository software platforms have continued to evolve and can now store documents of a wide range of formats which include: audio, video, images and print.

2.5.5 Metadata Formats

Heery (1996) defines metadata as records that refer to digital resources available across a network. In the context of institutional repositories, they can be referred to as data that help to describe the items archived in an institutional repository. Metadata formats are the various forms in which metadata can be presented. Dublin Core (DC), Qualified Dublin Core (QDC), METS, and MARC are some of the standard metadata formats supported by IRs. Of the four standard formats, DC is the one that is supported across most institutional repository software platforms (Adewumi and Ikhu-Omoregbe, 2011).

2.5.6 User Interface Functions

The interface of an institutional repository is the medium through which users interact with the repository. According to Adewumi and Ikhu-Omoregbe (Adewumi and Ikhu-Omoregbe, 2011), a typical institutional repository user interface provides two basic functionalities namely: an End-user Deposition Interface and Multilingual support. An End-user Deposition interface allows a repository user to submit items to the repository while multilingual support function allows an institutional repository to support more than one language especially for non-English speaking users.

2.5.7 Advanced Searching/Information Retrieval

Institutional Repositories tend to have large number of items deposited within them and as such a search (information retrieval) facility comes with every typical institutional repository software platform. Searching in institutional repositories is of two types namely: basic search and advanced search. A basic search can also be referred to as keyword search. It is field-specific. In this case a user searched for items by simply typing in keywords. Advanced searching involves the use of Boolean logic. Here, the user can type in more than one keyword and through the help of Boolean operators (AND / OR) retrieve relevant items from the repository.

2.5.8 Default Subject Classes

This refers to how items in institutional repositories are classified. It is similar to how books are catalogued in a library. Most institutional repository software platforms leave classification of items to repository managers while a few use standard library classifications such as the Library of Congress Classification and Dewey decimal classification. EPrints for instance makes use of the Library of Congress Classification while intraLibrary uses both the Library of Congress Classification and the Dewey decimal classification.

2.5.9 Syndication

This refers to the controlled placement of the same content on multiple partnering sites (ICSC, 2008). There are two types of syndicated content namely: RSS or Atom feeds and Full Content. Institutional repository software platforms support either of RSS or Atom. Some IRs such as EPrints support both RSS and Atom.

2.5.10 User Validation

Depending on the kind of restriction placed on institutional repository content, it is possible to download most materials in an institutional repository. This is the case especially in open access repositories. However, in order to submit an item to a repository, the concerned user will have to be registered in that particular institutional repository. This can be achieved by filling and submitting an electronic form. In the form, the user specifies a desired username and password. After submitting and completing the registration process, the user can then login with the username and password to deposit items. Users can also login and be authenticated through LDAP, Shibboleth and Athens. LDAP is however, the most widely support authentication protocol in IRs (Adewumi and Ikhu-Omoregbe, 2011).

2.5.11 Web 2.0

The web has evolved from being just an information source to becoming a participatory Web where users engage actively in generating content (Decrem, 2006). As an information source, the web (Web 1.0) consisted of text, images and hyperlinks. The web as we know it today now includes: wikis, blogs, bookmarking tools and the likes. With Web 2.0 come concepts like: tagging, commenting, ratings, reviews, bookmarking and the share-this functionality. These features are gradually beginning to appear in institutional repository software platforms. For instance, institutional repository software platforms such as DigiTool, Equella Repository and Islandora Fedora have fully implemented these features. Other institutional repository software platforms have one or more of these features implemented.

2.5.12 Statistical Reporting

Among the motivations for submitting items to an institutional repository is the wide visibility it gives to the author of the content. As such faculty and university staffs who deposit items in an IR want to know how relevant their materials are to the external context. This can typically be known by the citation count (i.e. the number of times the material has been cited by other authors). In institutional repositories, the author can know the relevance of their deposited items by checking the download statistics of the item. This shows the number of times the material has been downloaded and the location (country) where it was downloaded. Also, for first timers or repository managers who want to know the number of records in an institutional repository, there is a count functionality that counts the number of items in any particular institutional repository.

2.5.13 Machine-to-Machine Interoperability

This deals with the interaction that takes place between heterogeneous machines. Institutional repositories are now being built to interact and share information with each other. In other to achieve this, institutional repositories must adhere to certain standards which include: OAI-PMH, OAI-ORE, SWORD, SWAP, RDF and RoMEO Integration. Institutional repositories typically support OAI-PMH (Adewumi and Ikhu-Omoregbe, 2011). OAI-PMH helps to quicken the information retrieval process in institutional repositories as it searches many systems concurrently.

2.5.14 Administrator Functions

Some of the functions that can be carried out by an institutional repository manager/administrator include: bulk imports, bulk exports and workflow customisations. Bulk imports involve bringing in items en-masse from an external location into an institutional repository. Bulk exports involve sending out items en-masse from an institutional repository to an external location. Workflow customisation deals with modifying the order in which items are deposited in an institutional repository.

2.6 ARCHITECTURE OF INSTITUTIONAL REPOSITORIES

The architecture of institutional repository software platforms can be classified into two broad types (Adewumi and Ikhu-Omoregbe, 2011). They are: Open and Closed architectures.

2.6.1 Open Architecture

This is essentially an architecture that is open to modification by members of the public. The features of such a framework includes: flexibility, modularity and extensibility. This architecture is common to open source institutional repository software platforms. Adewumi and Ikhu-Omoregbe (2011) in their survey mentioned that this architectural framework can be further sub-divided into two namely: the three-tier architecture and the plug-in architecture. According to them, most institutional repository software platforms possess the three-tier architectural framework with the exception of EPrints. The architectural frameworks of the two most popular institutional repository software platforms (DSpace and EPrints) will now be used to describe the two categories of open architecture.

DSpace has a three-tier architecture comprising of storage, business and presentation layers. Each layer comes with a documented API to allow for future enhancements and customisations (Smith et al., 2003). The DSpace architecture is shown in Figure 2.1.

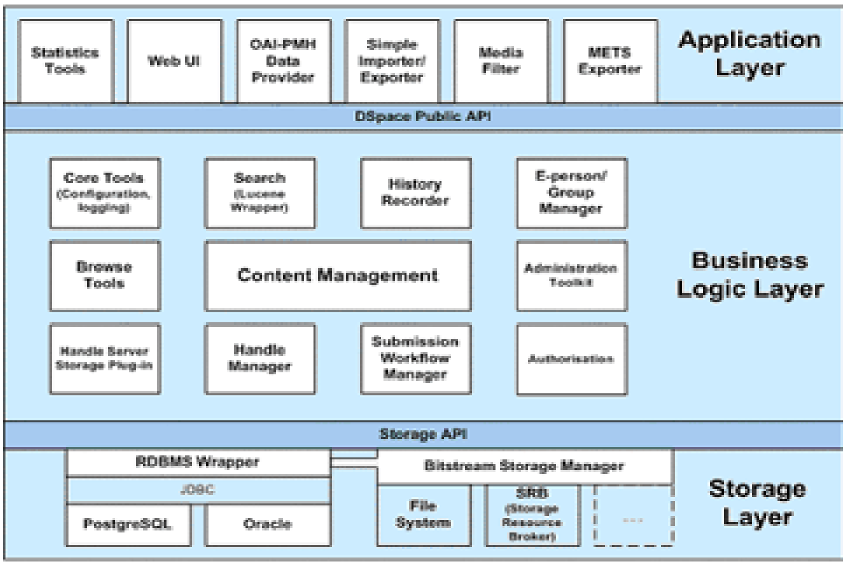


Figure 2.1: DSpace 3-tier architecture (DSpace@MIT, 2012)

EPrints has a flexible plug-in architecture that makes it suitable for developing extensions on it (EPrints, 2010). Most major repository functions in EPrints are implemented as plug-ins. Some of these repository functions include: import/export of items and metadata, dynamic web page displays and the input components in a deposit workflow. Figure 2.2 shows the EPrints architectural framework.

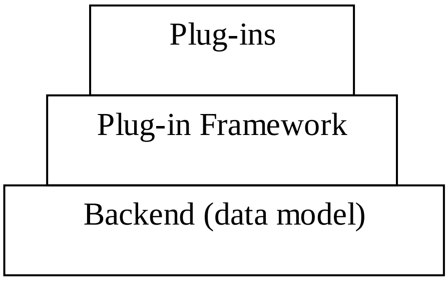


Figure 2.2: EPrints Architectural Framework (EPrints, 2010).

2.6.2 Closed Architecture

A closed architecture is one that is not made available to members of the public. As a result, it is not easily modified or extended by anyone except the proprietors of the platforms.

2.7 DESIGN RATIONALE OF INSTITUTIONAL REPOSITORIES

In developing institutional repository software platforms, the developers/proprietors factor in a number of things. Among these include: flexibility, accessibility, interoperability, adherence to standards and security.

2.7.1 Flexibility

Institutional repositories should be capable of storing items of various formats. They should for instance, be able store audio, video and image files. Among other things, they should be capable of handling future changes in functionality. The survey carried out by (Adewumi and Ikhu-Omoregbe, 2011) showed that most institutional repository software platforms are built to be flexible and are able to handle items of various formats.

2.7.2 Accessibility

In order to be accessible by a large audience, items stored in an institutional repository should be accessible from scholarly search engines such as Google Scholar and Scirus. Materials in an EPrints Repository for instance can be indexed in the Google Scholar search engine.

2.7.3 Interoperability

Institutional repositories built using any of the various institutional repository software platforms should be able to interact and share information.

2.7.4 Standards-Based

Strict adherence to standards especially those that are widely accepted help to foster interoperability. One of such standards that must be adhered to in institutional repositories is the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

2.7.5 Security Options

Institutional repositories emerged to promote open access to scholarly materials.

However, not all materials placed in an institutional repository can be made publicly available. For instance, commercial journals may not permit their authors to place published articles in an institutional repository for a certain period of time. In such situations, institutional repositories should enable the authors submit such articles with an embargo date after which the article becomes freely accessible.

2.8 IMPLEMENTATION TECHNOLOGIES OF INSTITUTIONAL REPOSITORIES

The implementation technologies behind the development of institutional repositories can be classified as follows: the operating systems on which they can be run, the scripting languages used to develop them and the type of databases they work with.

2.8.1 Operating Systems

The operating systems on which institutional repositories can run include: Linux, UNIX, Solaris, Windows and Mac OS X. Some institutional repository software platforms are able to run on only one of these while some others are able to run on one or more of the platforms. Zentity and Digital Commons are examples of institutional repositories that run on only one of the operating systems mentioned. Zentity runs on Windows while Digital Commons runs on Linux. Adewumi and Ikhu-Omoregbe (2011) noted in their survey conducted on a sample of eleven institutional repository software platforms that most platforms that supported two or more platforms were built using the Java programming language.

2.8.2 Scripting Languages

Some of the scripting languages used in the development of institutional repositories include (Adewumi and Ikhu-Omoregbe, 2011): Java, PHP, Perl, .NET, JavaScript, AJAX, and Extensible Stylesheet Language Transformation (XSLT). Some institutional repositories are written entirely in one scripting language while others are written using a combination of two or more of the scripting languages. For instance, CONTENTdm and Digital Commons are written in PHP and Perl respectively. Zentity is yet another institutional repository software platform developed by Microsoft using .NET. Other institutional repository software platforms such as: DigiTool, DSpace, EQUELLA Repository, Greenstone, Islandora Fedora and intraLibrary were developed using Java but combine some of the other scripting languages such as JavaScript.

2.8.3 Databases

The major database systems that serve as data stores for institutional repository software platforms include: MySQL, Oracle, PostgreSQL and Microsoft SQL Server. Some institutional repository software platforms are compatible with only one of these while some others are compatible with two or more of the database systems. For instance, DSpace is compatible with PostgreSQL and Oracle while Zentity is compatible with only Microsoft SQL Server.

2.9 RESEARCH OPPORTUNITY

From the features highlighted and discussed above, it was observed that institutional repositories were evolving constantly. Like any other web application, the trend was now towards deploying to the Mobile Web (Ragon, 2009). It is believed in this research work; therefore that one theme that can offer research opportunities is deploying institutional repositories on the Mobile Web.

2.10 THE MOBILE WEB

The Mobile Web can be simply described as the World Wide Web accessed through a mobile device (What is the Mobile Web, 2008). Mobile device in this context can range from a cellular phone to a smart phone with touch-screen capability. Any mobile device with web capabilities can be used to search and browse the Internet from any location where cellular signal is available. Web applications that are made especially for the small screen appear as scaled-down versions when compared to their desktop counterparts, often with a numbered menu system for quick access to content. On the other hand, web applications without mobile versions appear as if they were squeezed to the tiny screen. This poses usability challenges to a user trying to browse or search for information in an IR. Usability challenges posed by web applications without a mobile version are identified and discussed in subsequent sections of this chapter. Furthermore, strategies for addressing the identified challenges were also discussed.

2.11 USABILITY CHALLENGES OF THE MOBILE WEB

Despite the benefits of mobile Web there are some clear challenges especially as it relates to its usability. The challenges are outlined as follows:

2.11.1 Navigability

This refers to how easy it is to access relevant information from a web site (Mair, 2009). Mobile web pages should be designed in such a way that a user will not have to scroll repeatedly to access the needed information. Navigability can also refer to how easy it is to move between pages and backtrack - go back – when it becomes necessary (Charland and Leroux, 2011). Different mobile platforms implement the "go back" function in different ways. For instance, iPhone Operating System (iOS) satisfies this with a virtual button. Android and BlackBerry devices on the other hand rely on physical hardware back button as shown in Figure 2.3.

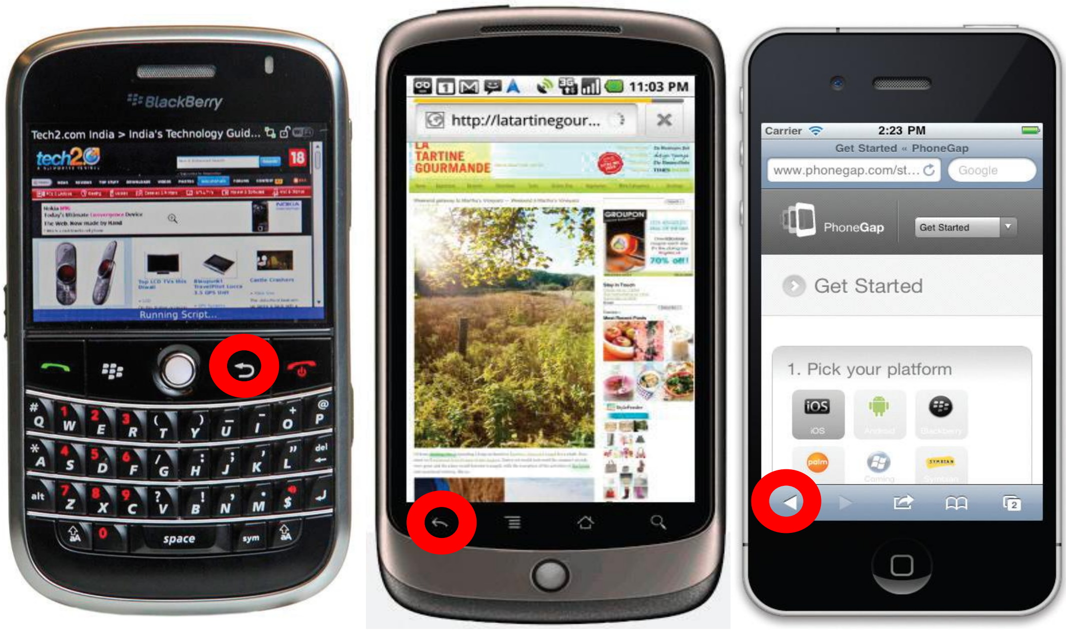


Figure 2.3: Pictorial representation of how the "go back" function is implemented in various mobile platforms

2.11.2 Multiple Screen Sizes

Simply creating mobile web pages formatted for a particular device is not enough. This is because similar content can display differently on mobile devices (Ragon, 2009). For instance, Android phones have different screen resolutions therefore content created for Android devices will appear differently on each device based on its screen resolution. A user whose screen size is not catered for may encounter difficulty when trying to browse web pages.

2.11.3 Content Formats

Different devices support different content formats. For instance, Adobe Flash is not currently supported by the iPhone/iPod Touch (Ragon, 2009). For the BlackBerry platform, it supports Windows Media Video (WMV) and h.263 files but not Quicktime MOV files. Android on the other hand, has no official documents on its developer's Web site concerning CSS or HTML. It only focuses on developing software apps for the device.

2.11.4 Latency

In the mobile world, latency is an issue to be taken seriously. It refers to the delay experienced by users when trying to load/start a mobile Web application. The lesser it takes for an application to load; the better its popularity would be among users. One obvious factor that brings about such delay is frequent server fetch. This is a situation in which a mobile application makes a fetch to its resources in the server anytime it receives requests.

2.12 ADDRESSING THE USABILITY CHALLENGES OF THE MOBILE WEB

Strategies for addressing each of the challenges outlined in the previous section are outlined as follows:

2.12.1 Addressing the Issue of Navigability

The site should be designed in such a way that the most important content should be placed at the top of the mobile screen and unnecessary navigation elements pushed to the bottom of the column. Skip links can also be employed to allow quick access to navigation elements thereby improving browsing experience of all users (Mair, 2009).

2.12.2 Addressing the Issue of Multiple Screen Sizes and Content Formats

There are powerful open source and for-fee tools and services that can aid in developing mobile content (Ragon, 2009). The Wireless Universal Resource File (WURFL) is a dataset containing device information on the most common wireless devices used. It is open source and has an Application Programming Interface (API). WURFL contains information about supported file formats, screen resolution, and capabilities of each device. Programmatically one could detect a device as it reads a Web page and then serve up content based on the devices capabilities (Ragon, 2009). For organisations without programming support, a for-fee service – DeviceAnywhere – can aid in the testing and development of mobile content (Ragon, 2009).

2.12.3 Addressing the Issue of Latency

Using JavaScript Object Notation is a way of addressing latency in mobile Web applications (Charland and Leroux, 2011). It tends to make the mobile Web applications lighter thereby resulting in faster loading time.

2.13 INSTITUTIONAL REPOSITORIES AND THE MOBILE WEB

The closest work that relates to what was undertaken in this research is the implementation of Greenstone Digital Library software on a personal media player-iPod (Bainbridge et al., 2008). The implementation is such that the archive of this DL is accessible locally on an iPod device without the need for Internet access. In this case the iPod’s storage is used to store the materials in the DL. As a result, materials are readily accessible without the need for Internet access. This approach however may not be suitable for institutional repositories since the content will usually be very large and must be accessible to a large user base.

It is also known to us (the authors) that mobile apps have been built for digital libraries like EBSCOHOST which are targeted at specific devices. However there is no concrete documentation (literature) for this. In addition, mobile apps may be a good initiative but they may not be the best solution in the long term as several devices continue to flood the mobile device market.

In essence, our literature search has shown little (if any) work done in accessing Institutional Repositories from the mobile web. This is the motivation for embarking on this research.

2.14 CASE STUDY: COVENANT UNIVERSITY REPOSITORY

Covenant University Repository is the institutional repository of Covenant University. It was launched in late 2010, as one of the first institutional repositories based on EPrints in Nigeria. The technical and administrative base at inception was resident in the Department of Computer and Information Sciences under the Software Engineering and Intelligent Systems (SEIS) Research cluster. At present however, the library has been incorporated to handle the administrative aspect of the library thereby freeing the Computer Science Department to focus on the technical aspects of the repository.

The repository has helped to improve the visibility of Covenant University on the web, placing her among the top 100 universities in Africa in the July 2011 web ranking of universities. This was only a few months after the repository was set up.

At present, the repository contains PhD theses, journal and conference papers of the University’s faculty.

2.15 SUMMARY

In this chapter, we started out by defining the concept of institutional repositories and showing how they differ from LORs, EDRMs as well as digital libraries. We went on to discuss the origin of institutional repositories. We also highlighted the features common to institutional repositories; the various architectures of institutional repositories; the rationale behind the design of repositories as well as the technologies employed in building institutional repositories. Putting all of these things together, we identified a research opportunity – accessing institutional repositories on the mobile web. A closer investigation showed that little work had been done in this area. The next chapter will now take the knowledge gleaned so far and use it to model the activities of a typical institutional repository using UML diagrams.

CHAPTER THREE

SYSTEM MODELLING

3.1 INTRODUCTION

In this chapter, the core activities that take place in an institutional repository were modelled using Unified Modelling Language. Also, a conceptual framework for mobile access in institutional repositories was modelled.

3.2 USE CASE DIAGRAM

A use case diagram is one that captures the functional aspects of a system by visually representing what happens when an actor interacts with the system (Aggarwal and Singh, 2008). In Figure 3.1 the use case diagram for an institutional repository is shown.

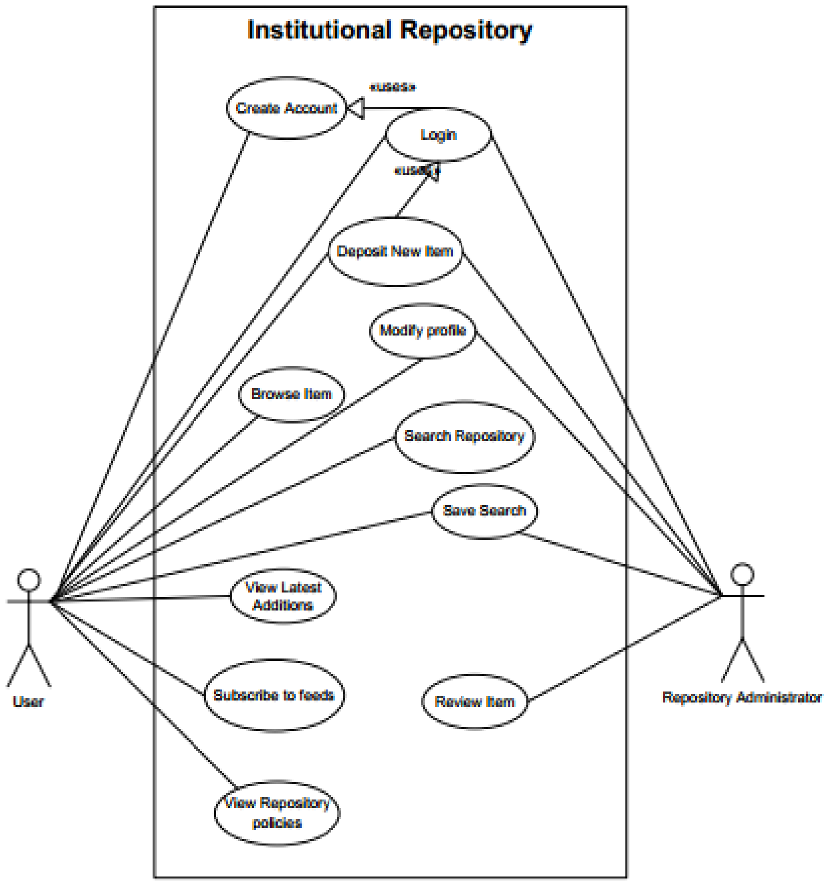


Figure 3.1: An Institutional Repository Use Case Diagram

The diagram in Figure 3.1 shows that there are two actors and eleven (11) use cases. The first actor (User) can be a visitor to the repository, a Covenant University faculty or postgraduate students wanting to check out the repository's content or deposit an item. The second actor (Repository Administrator) is one with the right to review items before they are accepted into the repository to ensure that such items comply with the repository's policy. There is a third actor (Editor) although this is not shown in Figure 3.1 to reduce clutter in the diagram. This actor can carry out all the actions of Repository Administrator to a limited extent. The next section describes the eleven use cases in detail.

3.3 USE CASES

The use cases in Figure 3.1 will be described in detail here using structured templates.

Table 3.1: Create Account Use Case

3.3.1	**Create Account**
Brief Description	This use case describes how a user creates an account on the Covenant University Repository.
Actors	The User is the one that interacts with this use case. User here can be a visitor to the repository, a faculty or a postgraduate student of Covenant University.
Flow of Events	***Basic Flow*** The use case starts when the actor wishes to create an account on the Covenant University Repository. 1. The user clicks on the Create Account link on the repository home page. 2. An electronic form is loaded so that the user can supply a valid email address, and desired login details consisting of username and password. 3. On clicking the Register button, an email is sent to the supplied email address. 4. By clicking on the link contained in the email, the user's account is activated. ***Alternative Flow*** If in the Basic Flow, the actor clicks the Register button without having filled out the compulsory fields, an error message will be flagged.
Special Requirements	None

Pre-Conditions	None
Post-Conditions	If the use case was successful, the actor is logged into the repository and can begin to deposit items. Otherwise, the repository state is unchanged.
Extension Points	None

Table 3.2: Login Use Case

3.3.2	**Login**
Brief Description	This use case describes how a user logs into the Covenant University Repository.
Actors	User, Repository Administrator
Flow of Events	***Basic Flow*** This use case starts when the actor wishes to login to Covenant University Repository. 1. The actor clicks the Login hyperlink on the repository homepage and a login page appears. 2. The actor enters his/her username and password. 3. The system validates the supplied username and password and logs the user into the repository. ***Alternative Flow*** If in the Basic Flow, the actor enters an invalid username or password or fails to enter anything in the provided textbox, an error message will be displayed on the page.

Special Requirements	None
Pre-Conditions	All users must have a User account (i.e. Username and Password) prior to executing the use case.
Post-Conditions	If the use case was successful, the actor is logged into the system. If not, the repository state is unchanged. If the actor has the role 'User' he/she will have be able to deposit items into the repository and manage those deposits. Furthermore, he/she will be able modify his/her profile on the repository. In addition, he/she will be able to save searches made in the repository for reference purposes. If the actor has the role 'Editor' he/she will have all the privileges of 'User' and in addition will be able to vet all items submitted to the repository to ensure that they align with the repository's purpose before they are finally accepted into the repository. If the actor has the role 'Repository Administrator' he/she will have all the privileges of an 'Editor' and in addition will be able to create and manage users of the repository.
Extension Points	None

Table 3.3: Deposit New Item Use Case

3.3.3	**Deposit New Item**
Brief Description	This use case describes how an actor deposits items into the Covenant University Repository.
Actors	User, Repository Administrator
Flow of Events	***Basic Flow*** This use case starts when an actor wishes to deposit items into the Covenant University Repository. 1. The actor logs into his/her account by supplying username and password at the login page. 2. The actor clicks the ‘New Item’ button. 3. Actor selects the type of item to be deposited. This can be an article, book section, thesis/dissertation video or audio file and clicks ‘Next’ button. 4. Actor now selects and uploads the file(s) and clicks the ‘Next’ button. 5. Actor attaches metadata to describe the items being deposited such as title, abstract, year of publication etc. 6. Material is now submitted for review by an editor. ***Alternative Flow*** If the actor leaves out a required field while filling the metadata for an item that is to be deposited into the repository, an error message will be displayed on the page.
Special Requirements	None

Pre-Conditions	The actor must possess an account on the repository.
Post-Conditions	After the item is deposited, an editor must review the submitted item and can then do one of three things: Move to the Repository: By clicking this button, the reviewer has accepted the item into the repository. Destroy Item with Notification: By clicking this button, the item is deleted and a notice sent to the author(s) concerned. Return Item with Notification: By clicking this button, the item is returned to the depositing user along with notification for necessary corrections that should be made.
Extension Points	None

Table 3.4: Modify Profile Use Case

3.3.4	**Modify Profile**
Brief Description	This use case describes how an actor can modify his/her profile
Actors	User, Repository Administrator
Flow of Events	***Basic Flow*** The use case starts when the actor has logged into the repository and wishes to modify his/her profile. 1. Actor clicks the ‘Profile’ hyperlink. 2. Actor proceeds to fill the desired fields (not leaving out the required fields) in the profile page and then clicks the ‘Save’ button. ***Alternative Flow*** If the actor in the Basic Flow leaves out a required field, an error message will be displayed on the page.
Special Requirements	None
Pre-Conditions	The actor must possess an account (Username/Password).
Post-Conditions	When the ‘Save’ button is clicked the changes take effect.
Extension Points	None

Table 3.5: Browse Item Use Case

3.3.5	**Browse Item**
Brief Description	This use case describes how an actor can browse the Covenant University Repository in search of an item.
Actors	User
Flow of Events	***Basic Flow*** The use case starts when an actor clicks the 'Browse Repository' hyperlink on the repository Home Page. 1. An ordered, hyperlinked list of the repository's content (based on the subject of the content) is displayed. 2. Actor can click on a subject of interest to see the items they contain. This is act is called 'Browse by Subject'. ***Alternative Flow*** In the Basic Flow, the actor can 'Browse by Subject' but the repository allows an actor to also 'Browse by Year', 'Browse by Division' and 'Browse by Author'.
Special Requirements	None
Pre-Conditions	None
Post-Conditions	Once a desired item has been found, it can then be downloaded by clicking on the 'Download' link.
Extension Points	None

Table 3.6: Search Repository Use Case

3.3.6	**Search Repository**
Brief Description	This use case describes how an actor can search the Covenant University Repository for items of interest.
Actors	User
Flow of Events	***Basic Flow*** 1. Actor clicks the 'Search Repository' hyperlink and a search form is displayed that helps the actor describe the kind of content being searched for. 2. Once the specifications have been given, the actor can click the 'Search' button to perform the search. ***Alternative Flow*** If the actor does not specify anything in the Basic Flow, an error message will be displayed on the page.
Special Requirements	None
Pre-Conditions	None
Post-Conditions	A list of items will be displayed with hyperlinks. If any hyperlink is clicked, it will lead to the Download page of the full material.
Extension Points	None

Table 3.7: Save Search Use Case

3.3.7	**Save Search**
Brief Description	This use case describes how an actor can save a search that is performed in the Covenant University Repository. Save search is a kind of tagging or bookmarking in an EPrints repository.
Actors	User, Repository Administrator
Flow of Events	***Basic Flow*** 1. Actor performs a search by typing a search term in the search field. If relevant items are found. 2. Actor can then save the search term for future reference by clicking the 'Save search' hyperlink found above the displayed results. 3. Actor can decide whether or not to make the search term available to other actors. ***Alternative Flow***
Special Requirements	None
Pre-Conditions	The actor must have an account and be logged into that account. In addition, a search must be carried out using a search term.
Post-Conditions	The search is saved and can be used by the actor or others to retrieve same results during future searches.
Extension Points	None

Table 3.8: View Latest Additions Use Case

3.3.8	**View Latest Additions**
Brief Description	This use case describes how an actor can check for latest additions to the Covenant University Repository.
Actors	User
Flow of Events	***Basic Flow*** 1. Actor clicks the 'Latest Additions' hyperlink on the repository Home Page to see recently deposited items. 2. Actor can click on any of the item titles to proceed to the download page. ***Alternate Flow***
Special Requirements	None
Pre-Conditions	None
Post-Conditions	In the download page, the actor can click the Download hyperlink to download the desired item.
Extension Points	None

Table 3.9: View Repository Policies Use Case

3.3.9	**View Repository Policies**
Brief Description	This use case describes how an actor can view Covenant University Repository Policies
Actors	User
Flow of Events	***Basic Flow*** 1. Actor clicks the 'Repository Policies' hyperlink on the repository Home Page. ***Alternate Flow***
Special Requirements	None
Pre-Conditions	None
Post-Conditions	When the 'Repository Policies' hyperlink is clicked, an HTML page showing the repository policies comes up.
Extension Points	None

Table 3.10: Subscribe to Feeds Use Case

3.3.10	**Subscribe to Feeds**
Brief Description	This use case describes how an author can subscribe to feeds on the Covenant University Repository.
Actors	User
Flow of Events	***Basic Flow*** 1. Actor clicks any of Atom, RSS 1.0 or RSS 2.0 to subscribe 2. Actor then has the option of subscribing via Live Bookmarks, Microsoft Office Outlook, Bloglines, My Yahoo or Google. ***Alternate Flow***
Special Requirements	None
Pre-Conditions	None
Post-Conditions	By subscribing via Live Bookmarks, actor will be able to see latest additions to the Covenant University Repository from a folder called Live Bookmarks on his/her web browser. Otherwise, the actor will receive notification via Microsoft Outlook, Bloglines, My Yahoo or Google as messages.
Extension Points	None

Table 3.11: Review Item Use Case

3.3.11	**Review Item**
Brief Description	This use case describes how an actor reviews items submitted to the Covenant University Repository.
Actors	Repository Administrator/Editor
Flow of Events	***Basic Flow*** 1. Actor logs in to his/her account. 2. From the list of hyperlinks available, the user clicks 'Review'. 3. If there are any pending items to be reviewed, they will appear in the actor's work area. 4. Actor can then choose whether to move the item to the repository, return the item to the depositor with a notification or delete the item and send a notification to the depositor. ***Alternate Flow***
Special Requirements	None
Pre-Conditions	Actor must be logged in to his/her account.

Post-Conditions	If the item to be deposited satisfies the expectation of the actor (reviewer/editor), he/she moves it to the repository. If the item has flaws in it the actor sends it back to the depositor with a note on what the flaws are. If the item does not satisfy the expectations of the actor and the purpose of the Covenant University Repository, the item is deleted and a notification sent to the item depositor.
Extension Points	None

3.4 COLLABORATION DIAGRAMS

Collaboration diagram and sequence diagram fall under the category of Interaction Diagrams in UML. A distinguishing feature of a Collaboration diagram is that it shows the objects and their association with other objects in the system apart from how they interact with each other. The association between objects is not represented in a Sequence diagram. Collaboration diagrams for eight of the use cases in the use case diagram are shown as follows:

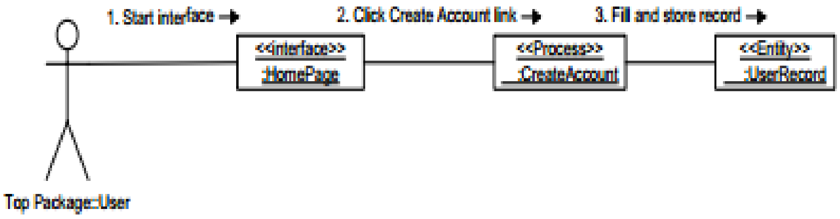


Figure 3.2: Collaboration Diagram for the Create Account use case

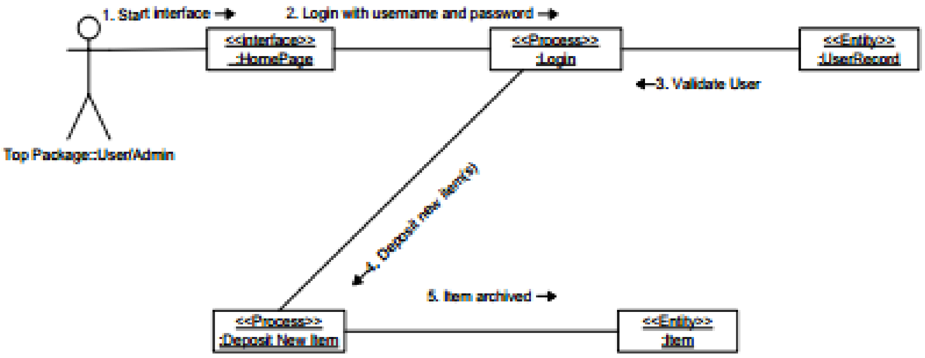


Figure 3.3: Collaboration Diagram for the Deposit New Item use case

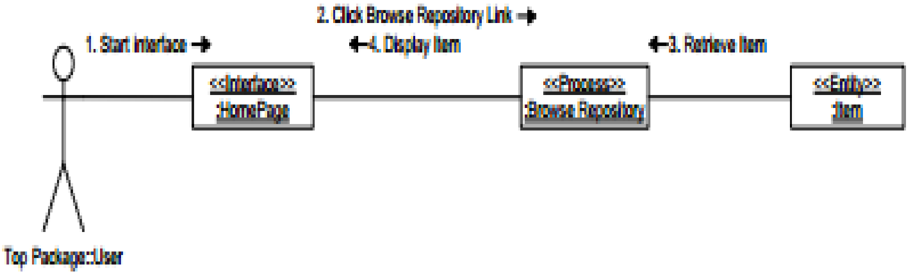


Figure 3.4: Collaboration Diagram showing the Browse Item use case

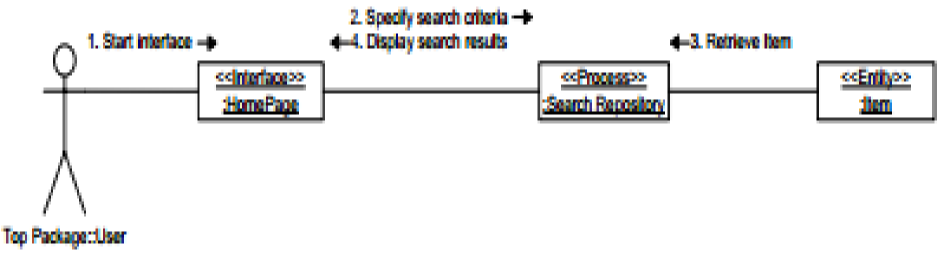


Figure 3.5: Collaboration Diagram showing the Search Repository use case

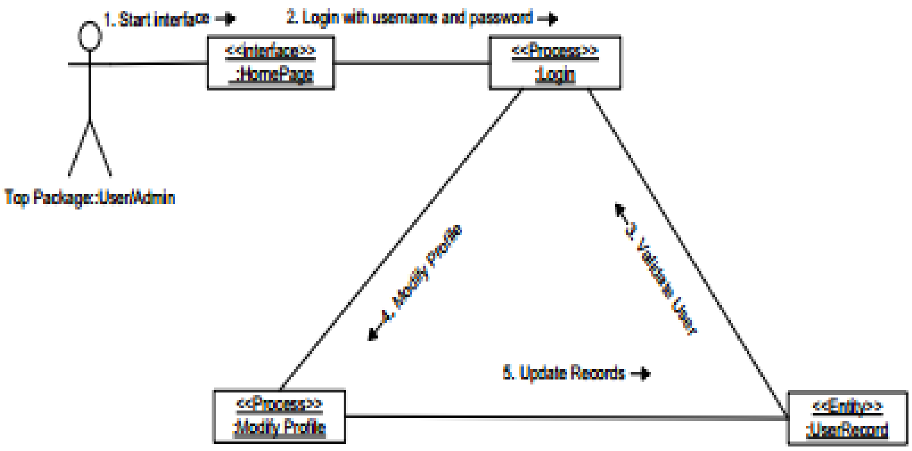


Figure 3.6: Collaboration Diagram showing the Modify Profile use case

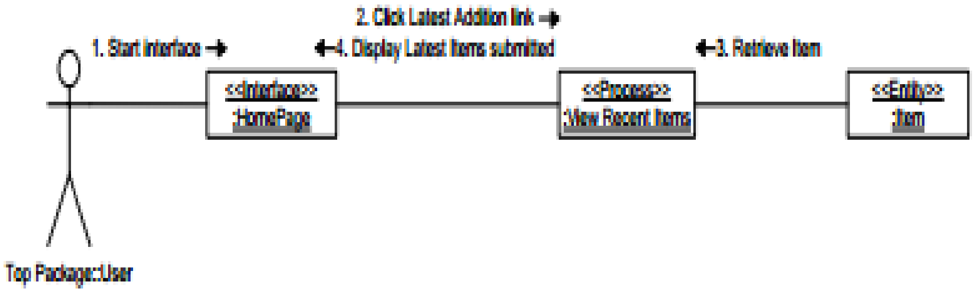


Figure 3.7: Collaboration Diagram showing the View Latest Additions use case

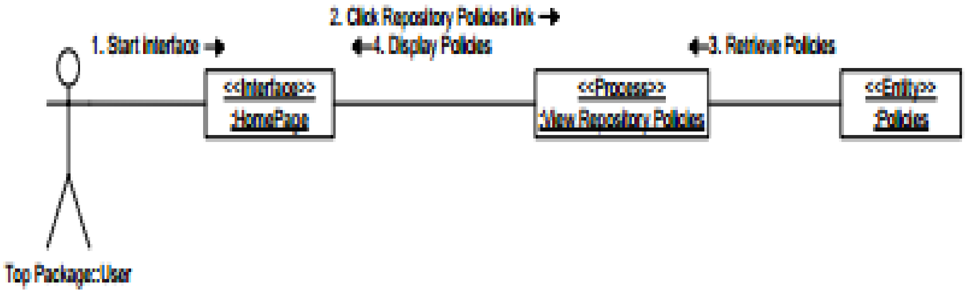


Figure 3.8: Collaboration Diagram showing the View Repository Policies use case

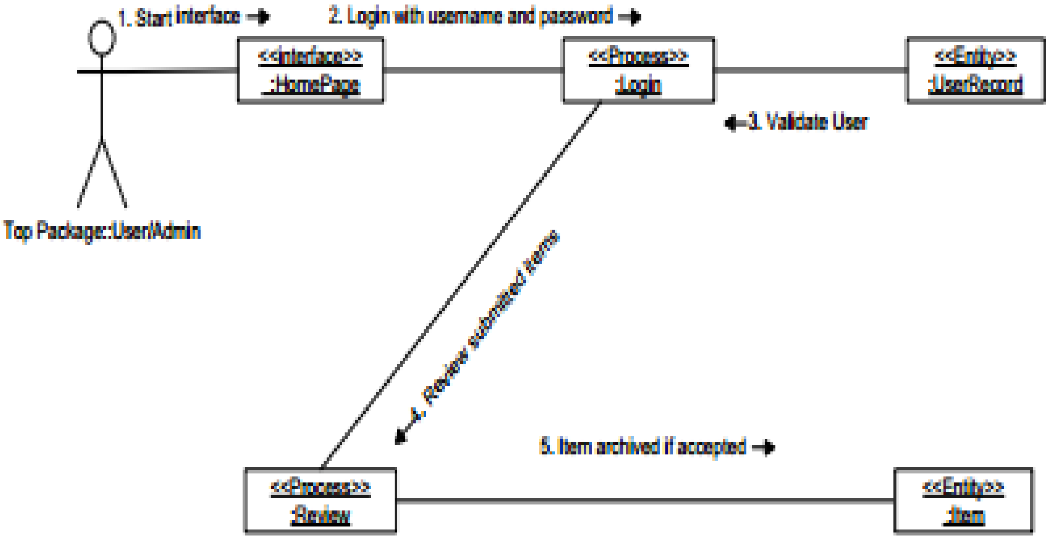


Figure 3.9: Collaboration Diagram showing the Review Item use case

3.5 SEQUENCE DIAGRAM

Sequence diagrams contain the same information as collaboration diagrams, but emphasize the sequence of the messages instead of the relationships between the objects (Martin, 1998).

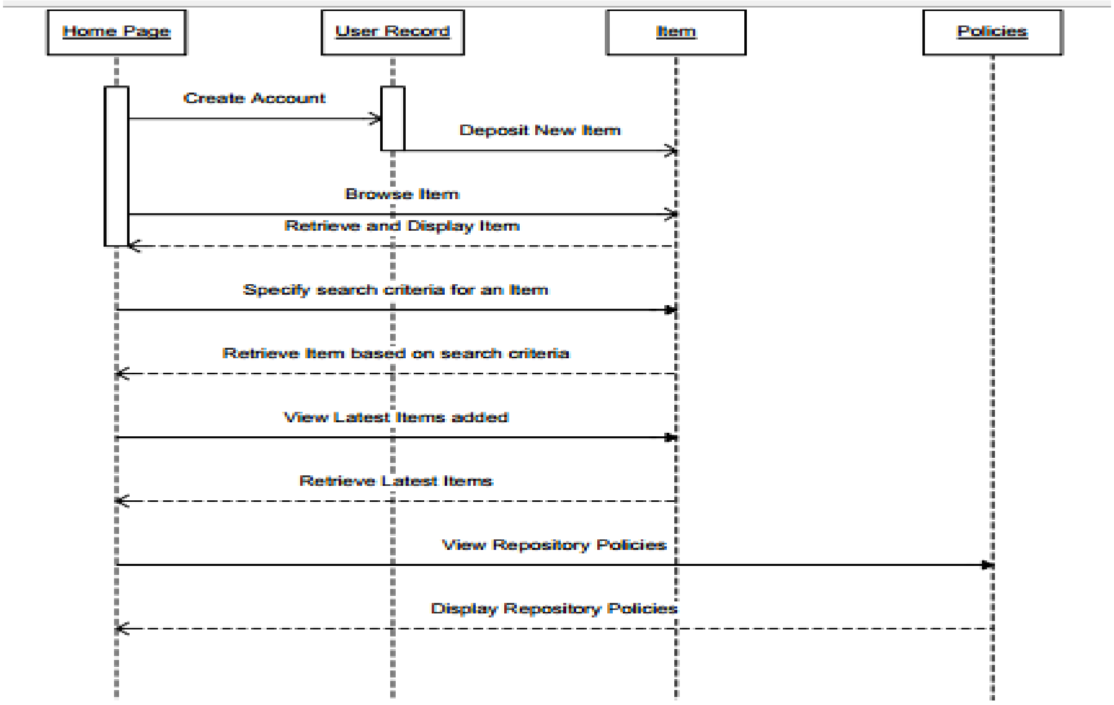


Figure 3.10: Sequence Diagram showing the Repository use case entities

3.6 CLASS DIAGRAM

A class diagram shows the classes within a model. Every class has a name, attributes and operations that can be performed on them. They also have relationship with other classes in a model. The class diagram for the repository is depicted in Figure 3.11.

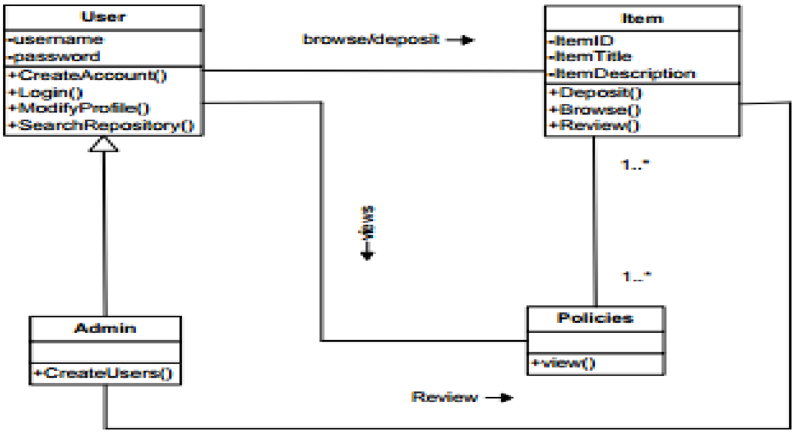


Figure 3.11: Class Diagram showing the main classes and the interaction between each

3. 7 DEPLOYMENT DIAGRAM

The way and manner in which the Covenant University Repository was deployed is depicted in Figure 3.12

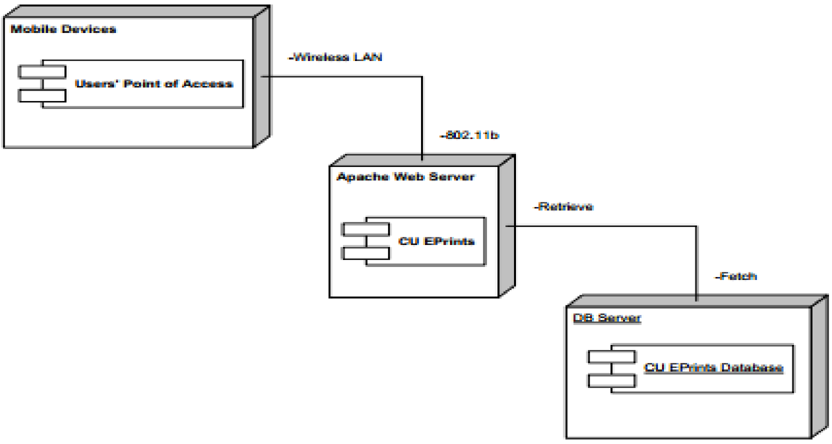


Figure 3.12: Deployment Diagram for the Covenant University Repository

3. 8 SYSTEMS ARCHITECTURE

The systems architecture for the Covenant University Repository include the architecture for the software (logical) implementation and deployment as well the hardware architecture. The two architectures are depicted by Figure 3.13 and Figure 3.14 respectively.

3. 8. 1 The Software Architecture

Figure 3.13 gives an overall logical (software) view of the Covenant University Repository. It is a 3-tiered client-server which consists of the client interface, middleware and database repository. The database is separated from the client through the middleware. The middleware helps to resolve issues around scalability, load balancing, transactional processing and interoperability (Ikhu-Omoregbe, 2007).

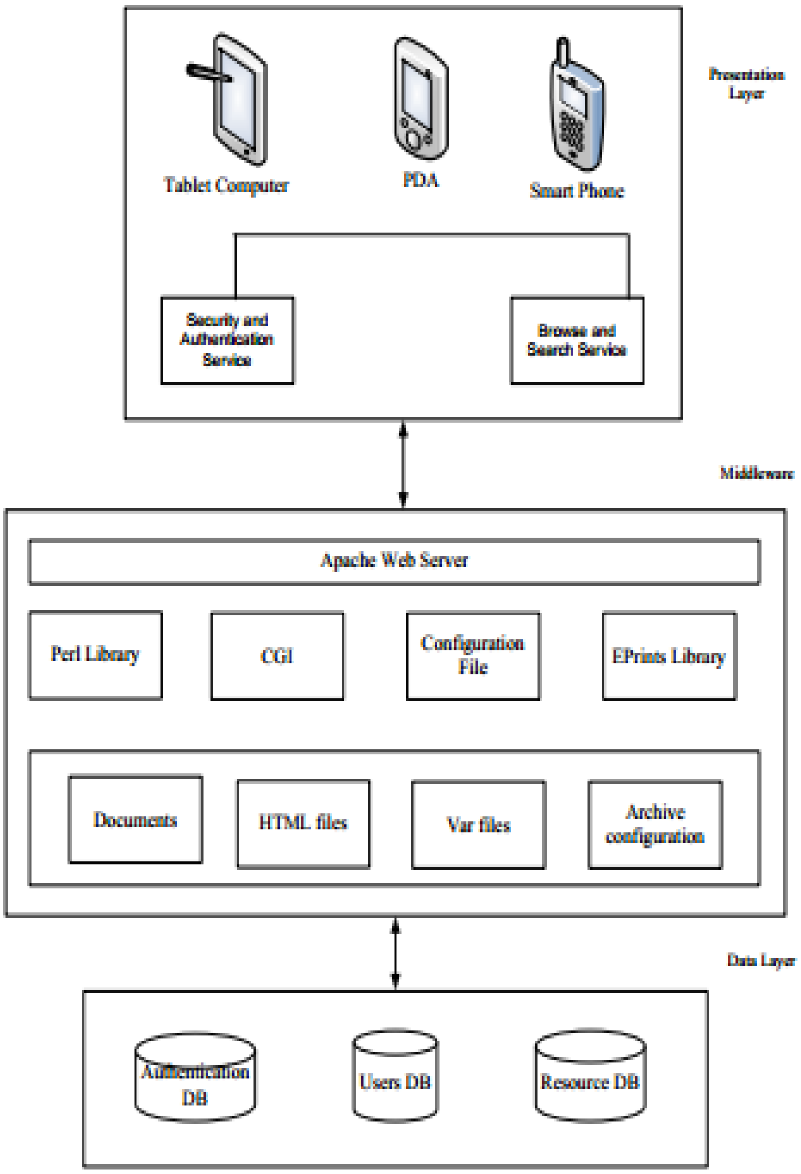


Figure 3.13: Software Architecture for the Covenant University Repository

3. 8. 1. 1 The Client

The mobile client is a thin client – having no application code layer on it. The client has as its component the Security and Authentication Support Service as well as the Browse and Search Service. These support services do not store any form of data. They only provide an interface for the middleware and data layer.

3.8.1.2 The Middleware

The Apache Web server houses the EPrints software and its application code. The EPrints software consists of a Perl library, CGI, configuration file and EPrints Library. The Perl library consists of Perl routines – since EPrints was built using Perl programming language. The CGI module helps to generate all the dynamic EPrints web pages. The configuration file is the Apache configuration for the whole site – Covenant University Repository. The EPrints library consists of the following sub modules - the citation module, repository themes and repository workflows.

In addition, the EPrints software consists of an Archive module. Inside the Archive module we have four main sub-modules which include: the Documents module, the HTML module the Var module and the Archive configuration file.

The documents module deals with uploaded files. The HTML module deals with static files for the repository. The Var module handles the various repository dependent files while the Archive configuration module handles every detail pertaining to an archive – this includes the archives' workflow, static pages, and citations.

The middleware is an intermediary between the client and the data layer.

3.8.1.3 The Data Layer

The data layer is responsible for the storage, retrieval, maintenance and integrity of the data manipulation within the system.

3.8.2 Hardware Architecture

This architecture consists of a broad range of client and server platforms.

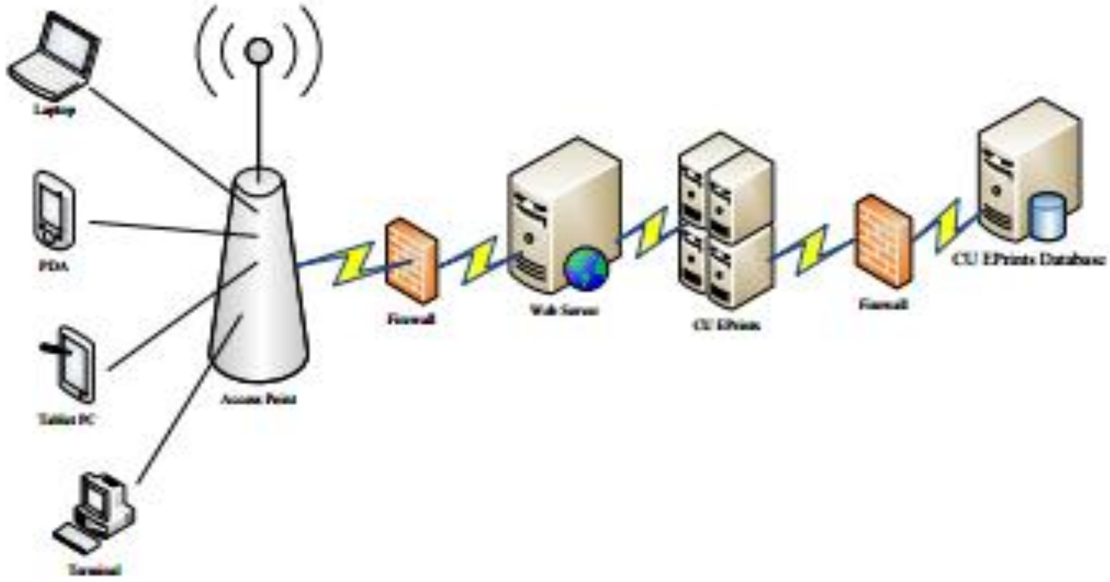


Figure 3.14: Hardware Architecture for Covenant University Repository

The client systems include PDA, Tablet PC, computer terminals and laptop computers. These client devices have features that enable them to connect to enterprise resources and application over wired LAN or 802.11 based wireless LAN. The servers (Web, CU EPrints) are used to maintain connectivity to enterprise resources for the repository. The firewalls are set up to filter all network traffic moving in and out of the repository system.

A major benefit of the multi-tier architecture proposed is that it increases application scalability and performance.

CHAPTER FOUR

IMPLEMENTATION

4.1 THE PLATFORMS USED FOR EXPERIMENT

It is important to stress at this point that a mobile version of the repository was not built in this work. The goal of the work was to test the Covenant University Repository (web application) functionalities on some selected mobile platforms. The platforms include:

- A Symbian phone (Nokia)
- An Android device
- An iPad
- An iPod Touch
- A Blackberry phone

4.1.1 The Symbian Device

Research shows that this is the most ubiquitous type of mobile device used in Nigeria. Its popularity has informed our choice to include it among the mobile platforms considered on which to test out the repository. The device used in this case was a Nokia Xpress Music phone which was capable of Internet connectivity.

4.1.2 The Android Device

The Android device used was a Coby Kyros MID 7024 tablet. It runs Google Android v2.2. It has a 1GHz processor, 512MB RAM, 7-inch resistive touch screen LCD display. The resolution of the display screen is 800 x 480 pixels. It comes with an integrated 4GB memory space and micro SD memory card is also available.

Android is the operating system that runs on the Android tablet/phone. It differs from other mobile operating system platforms possessing some unique features that make it popular among growing numbers of phone manufacturers, users and developers. Some of these features are discussed as follows (Darcey and Conder, 2011):

- **It is free and open source**: The term ‘free’ signifies that developers and phone manufacturers do not have to pay license fees to develop for the platform.

- **Freely available software development kit**: The Android software development tools are freely available for download by developers by simply agreeing to the terms of use.

- **Familiar development environments**: Several IDEs exist that can be used in Android application development. However, many developers choose the popular and freely available Eclipse IDE to design and develop Android applications (Darcey and Conder, 2011). There is an Android plug-in available for facilitating Android development on Eclipse.

- **Reasonable learning curve for developers**: All Android applications are written Java programming language.

- **Enabling development of powerful applications**: There is no distinction between native and third-party applications on the Android platform as they both have unprecedented access to the underlying hardware. This allows developers to write more powerful applications.

- **Rich and secure application integration**: Android provides all the tools necessary to build a comprehensive application by allowing developers to write applications that seamlessly leverage core functionality. An example of such includes: web browsing, mapping, contact management and messaging. In addition, Android’s vigorous application security model helps protect the user and the system from malicious software (Darcey and Conder, 2011).

- **No costly obstacles to publication**: Unlike BREW and Symbian, Android applications do not have any costly, time-intensive testing and certification programs.

- **A "free market" for applications**: With Android, developers can write and successfully publish any kind of application they want. This can include: freeware, shareware, ad-driven, and paid applications.

The architecture of Android is shown in Figure 4.1. Each layer uses the services provided by Android.

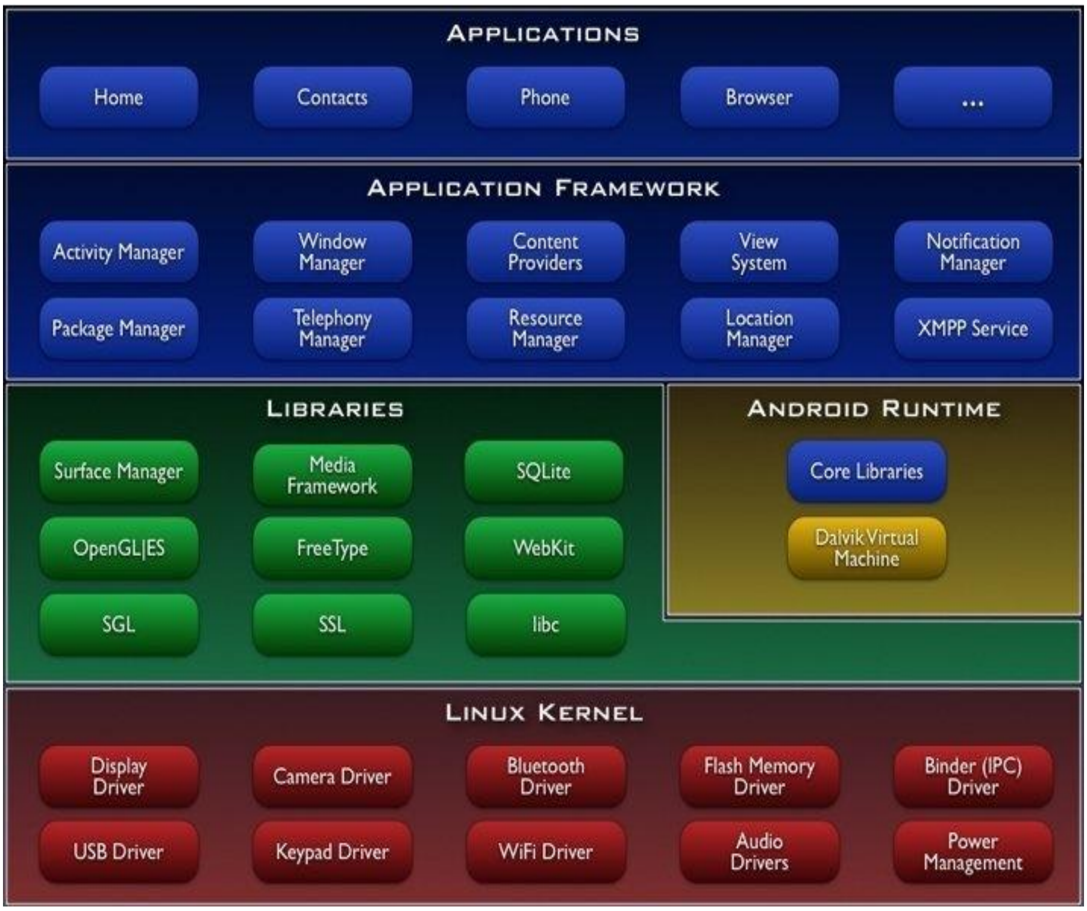


Figure 4.1: The Android Platform Architecture (Burnette, 2010)

Linux kernel: Android is built on the Linux kernel. Linux provides the hardware abstraction layer for Android, allowing Android to be ported to a wide variety of platforms in the future (Burnette, 2010).

Native Libraries: This architecture layer contains the Android native libraries. These shared libraries are all written in C or C++, compiled for the particular hardware architecture used by the phone, and preinstalled by the phone vendor.

Android Runtime: This is another layer sitting on top of the kernel. It includes the Dalvik virtual machine (VM) and the core Java Libraries. Dalvik VM is Google's implementation of Java, optimised for mobile devices (Burnette, 2010).

Application Framework: This layer contains the high-level building blocks used to create applications.

Applications: This layer is visible to end-users. Applications here are programs that can take over the whole screen and interact with the user.

Among the reasons for choosing to test on an Android-enabled device is the fact that most smart phones in 2011 shipped with Android and market share of the platform has been steadily rising.

4.1.3 The iPad

It is a tablet computer designed by Apple Inc., primarily as a platform for audio-visual media including books, periodicals, movies, music, games, and web content. Its size and weight fall between those of contemporary smart phones and laptop computers. It runs the same operating system as iPod Touch and iPhone. The iPad can run only programs approved by Apple and distributed via the Apple App Store. It also uses a Wi-Fi connection to access local area networks and the Internet.

The iPad device used runs iOS v5. Its screen resolution is 1024 x 768 pixels with a capacitive multi-touch screen. The processor is single core, 1000MHz with 256MB RAM. It also has a built-in storage of 16000 MB.

4.1.4 The iPod Touch

It is a device designed by Apple Inc., primarily as a platform for audio-visual media including books, periodicals, movies, music, games, and web content. Its size and weight fall between those of contemporary smart phones. It runs the same operating system as iPad and iPhone. The iPod Touch can run only programs approved by

Apple and distributed via the Apple App Store. It also uses a Wi-Fi connection to access local area networks and the Internet.

The iPod Touch used runs iOS v5. Its screen resolution is 960 x 640 pixels with a 3.5-inch multi-touch screen. It has a built-in storage capacity of 64000 MB.

4.1.5 The Blackberry Phone

This is a type of mobile email and smart phone device developed and designed by Research in Motion since 1999 (Davis, 1999). Blackberry devices are smart phones and are capable of functioning as personal digital assistants (PDAs), portable media players and Internet browsers. They are primarily known for their ability to send and receive email and instant messages while maintaining a high level of security through on-device message encryption. Blackberry devices support a large variety of instant messaging features, including Blackberry Messenger.

Blackberry commands 11.7% share of worldwide smart phone sales, making it the fourth most popular device manufacturer after Google, Sony Ericsson, and Apple (Gartner, 2011). The consumer Blackberry Internet Service is available in 91 countries worldwide on over 500 mobile service operators using various mobile technologies (Blackberry, 2011). As of October 2011, there are seventy million subscribers worldwide to Blackberry (Calapinto, 2011).

The Blackberry phone used was a Curve 2 with a screen resolution of 320 x 240 pixels. It has a touch-sensitive optical track pad, a microSD card slot of up to 32GB and 256MB internal memory. The phone runs on Blackberry OS 6.0 with a processing speed of 512MHz.

4.2 SYSTEM REQUIREMENTS

The hardware and software requirements for setting up the repository in this work are detailed in Table 4.1. In addition, the mobile devices used to access the repository after it was set up are also mentioned.

Table 4.1 Hardware and Software Requirements for setting up the Repository

Requirements	***Specification***
Operating System	Microsoft Windows 7, Linux Fedora, Symbian OS, Android, Blackberry and iOS
Repository Software	EPrints version 3.2.4
Database Management System	MySQL version 5+
Model Design Tools (UML Modelling)	Microsoft Office Visio 2007
Linux Server Machine	With a capacity of 250GB and running Linux Fedora
Nokia Phone	Symbian OS
Android device (Coby Kyros MID 7024 tablet)	Google Android v2.2 1GHz processor 512MB RAM 7-inch resistive touch screen LCD display 800 x 480 pixels 4GB memory space microSD memory card
iPad	iOS v5 1000MHz 256MB RAM Capacitive multi-touch screen 1024 x 768 pixels 16000 MB storage

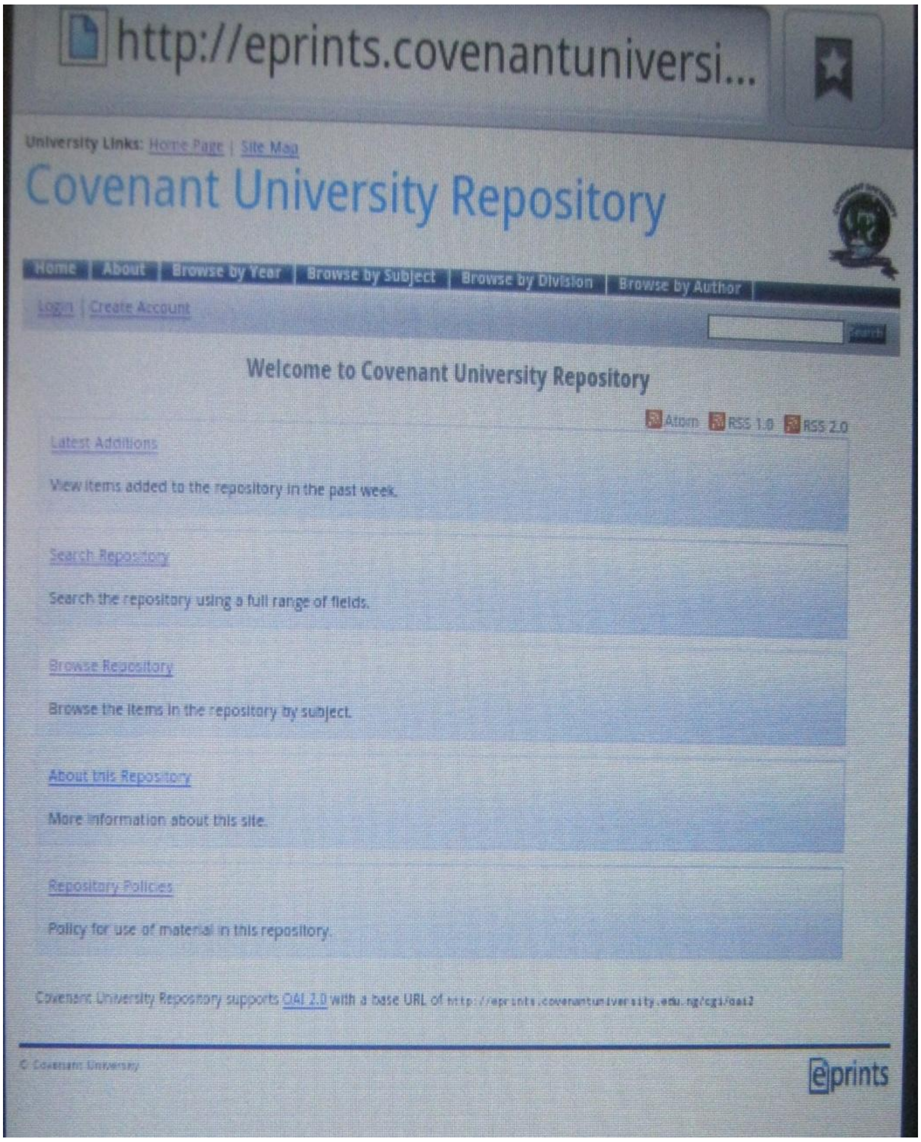
iPod	iOS v5 3.5-inch multi-touch screen 960 x 640 pixels 64000 MB storage
Blackberry phone (Curve 2)	Blackberry OS 6.0 512 MHz 256MB internal memory Touch-sensitive optical track pad 320 x 240 pixels microSD card slot of up to 32GB

4.3 THE REPOSITORY USER INTERFACE ON VARIOUS MOBILE BROWSERS

This section describes the user interfaces of the Covenant University Repository and how well they display on the experimentation platforms.

4.3.1 The Repository Homepage

This is the first page that a user will encounter when the address of the repository is entered into the address bar of a browser. On this page there are several interesting links. *Latest Additions* link allows a user to view items that have been recently submitted to the repository. *Search Repository* link allows a user to search through the repository for specific items using a full range of fields. *Browse Repository* is yet another link that allows a user to browse the repository by Year, Subject, Division or Author. New users can be created using the *Create Account* hyperlink. Subsequently, registered users can login using the *Login* hyperlink. The mobile versions of the repository home page are shown in Figures 4.2, 4.3 and 4.4 respectively.



Welcome to Covenant University Repository

Latest Additions

View items added to the repository in the past week.

Search Repository

Search the repository using a full range of fields.

Browse Repository

Browse the items in the repository by subject.

About this Repository

More information about this site.

Repository Policies

Policy for use of material in this repository.

Covenant University Repository supports OAI 2.0 with a base URL of http://eprints.covenantuniversity.edu.ng/cgi/oai2

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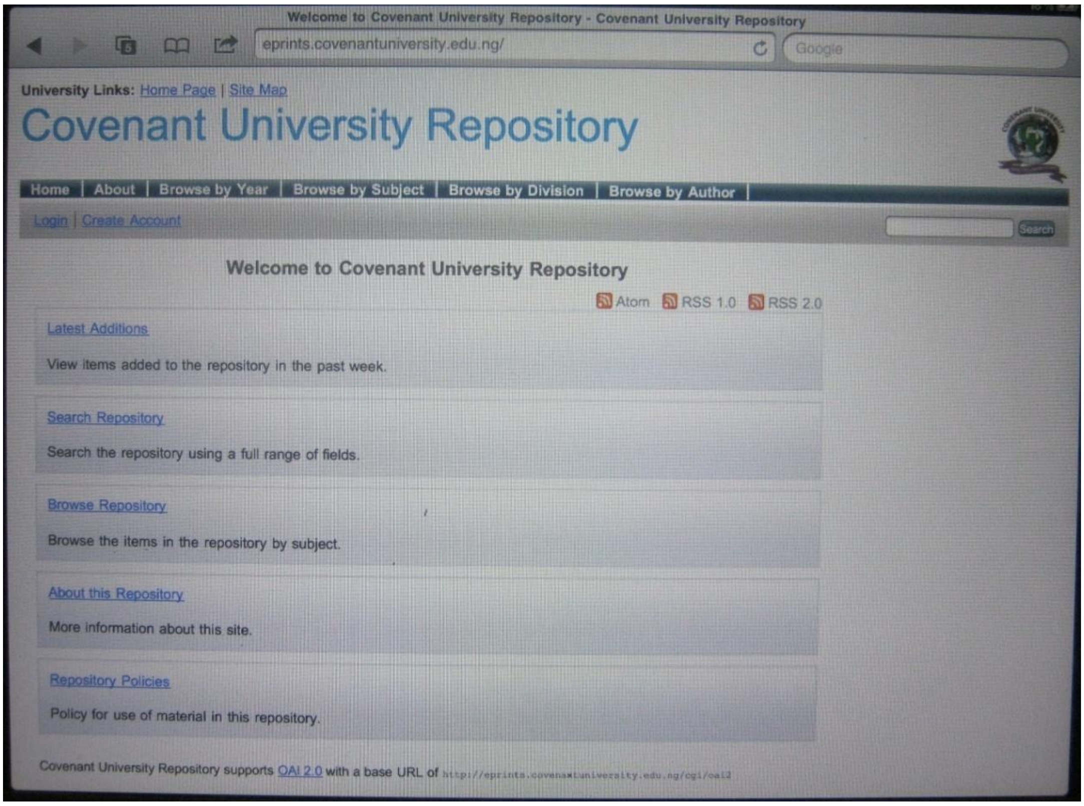
Figure 4.2: Repository Homepage on Android Tablet


Welcome to Covenant University Repository - Covenant University Repository
eprints.covenantuniversity.edu.ng/
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Login | Create Account
Search
Atom
RSS 1.0
RSS 2.0

Welcome to Covenant University Repository

Latest Additions

View items added to the repository in the past week.

Search Repository

Search the repository using a full range of fields.

Browse Repository

Browse the items in the repository by subject.

About this Repository

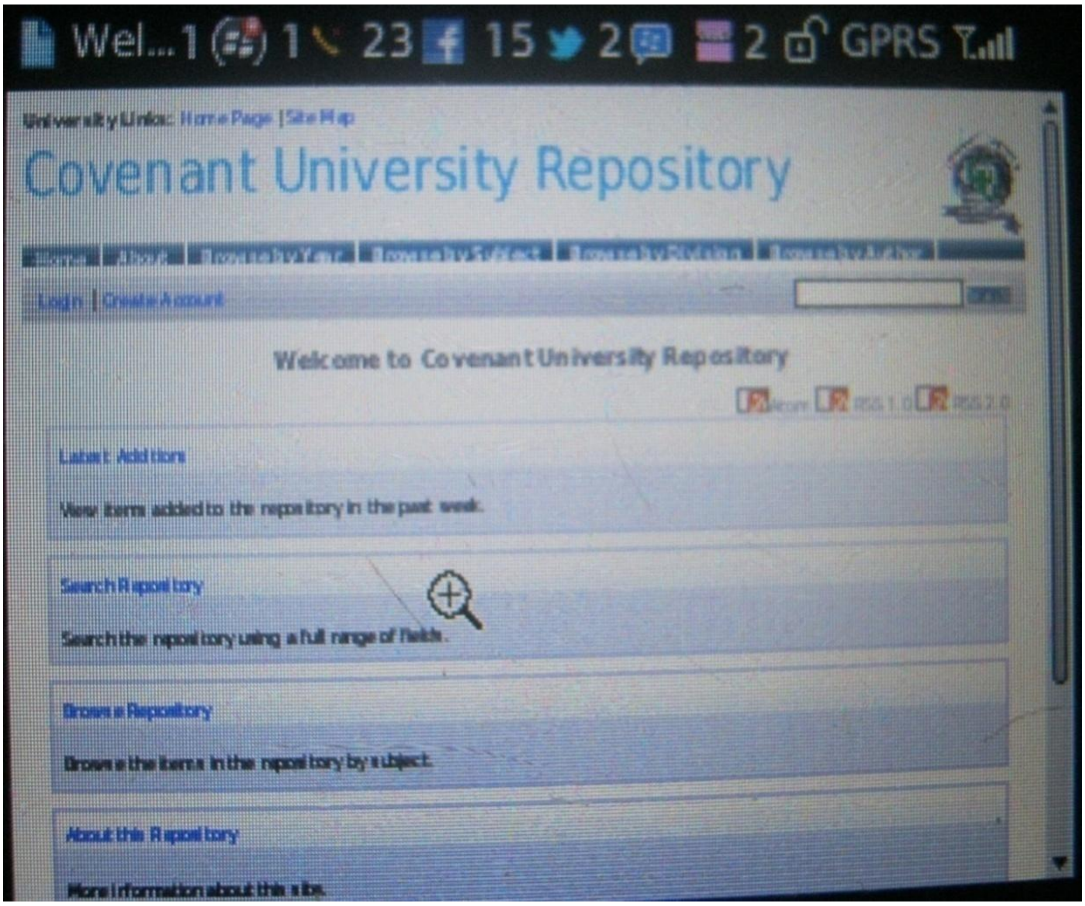
More information about this site.

Repository Policies

Policy for use of material in this repository.

Covenant University Repository supports OAI 2.0 with a base URL of http://eprints.covenantuniversity.edu.ng/cgi/oai2

Figure 4.3: Repository Homepage on iPad



Covenant University Repository

Welcome to Covenant University Repository

Latest Additions

View items added to the repository in the past week.

Search Repository

Search the repository using a full range of fields.

Browse Repository

Browse the items in the repository by subject.

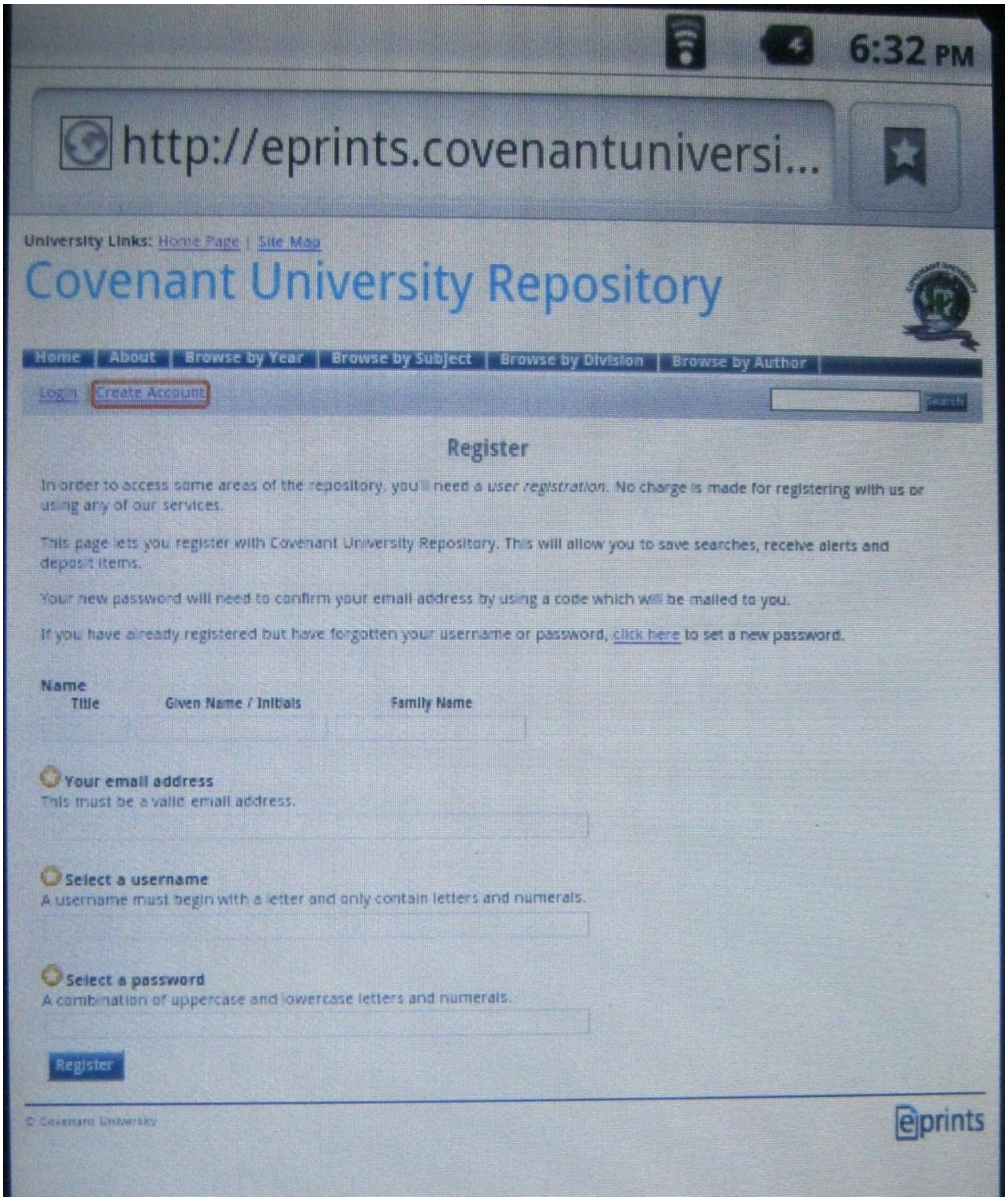
About this Repository

More information about this site.

Figure 4.4: Repository Homepage on Blackberry phone

4.3.2 Create Account

In other to be able to login and deposit items, a user must first be registered on the repository. This can be achieved by clicking on the *Create Account* hyperlink on the home page. This will take the user to a registration form. The form has some compulsory fields which include: user’s email address, preferred username and password. On clicking the register button, an email is sent to the supplied email address. In the sent email, the user is expected to click on a provided link to activate the password and complete the registration process. When this process is completed, the user is logged in and can subsequently log in and out of the repository. The Registration form as viewed from the mobile platforms is as shown in Figure 4.5 and 4.6.



Register

In order to access some areas of the repository, you'll need a *user registration*. No charge is made for registering with us or using any of our services.

This page lets you register with Covenant University Repository. This will allow you to save searches, receive alerts and deposit items.

Your new password will need to confirm your email address by using a code which will be mailed to you.

If you have already registered but have forgotten your username or password, click here to set a new password.

Name

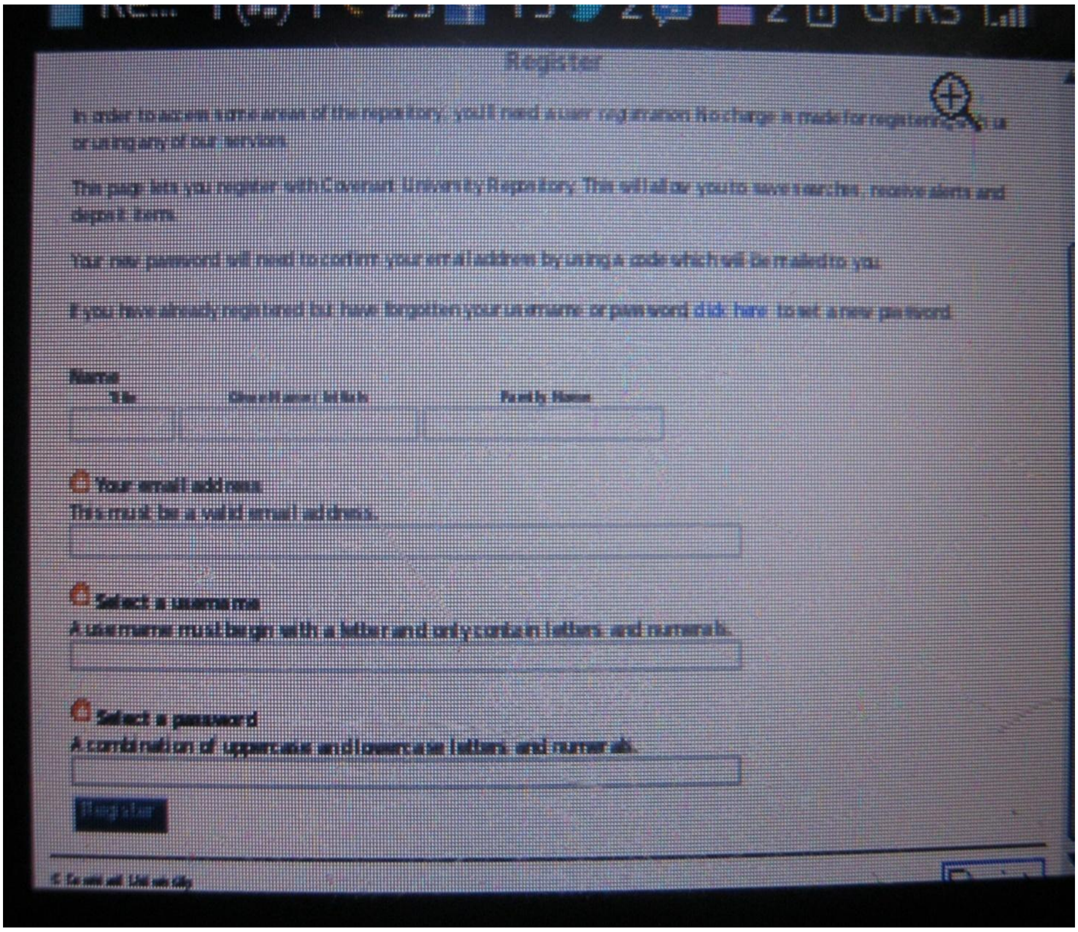
Title	Given Name / Initials	Family Name

Your email address
This must be a valid email address.

Select a username
A username must begin with a letter and only contain letters and numerals.

Select a password
A combination of uppercase and lowercase letters and numerals.

Figure 4.5: Register form on Android Tablet



Register

In order to access some areas of the repository, you'll need a user registration. No charge is made for registering [illegible] or using any of our services.

This page lets you register with Covenant University Repository. This will allow you to save searches, receive alerts and deposit items.

Your new password will need to confirm your email address by using a code which will be mailed to you.

If you have already registered but have forgotten your username or password click here to set a new password.

Name
Title Given Name / Initials Family Name

Your email address
This must be a valid email address.

Select a username
A username must begin with a letter and only contain letters and numerals.

Select a password
A combination of uppercase and lowercase letters and numerals.

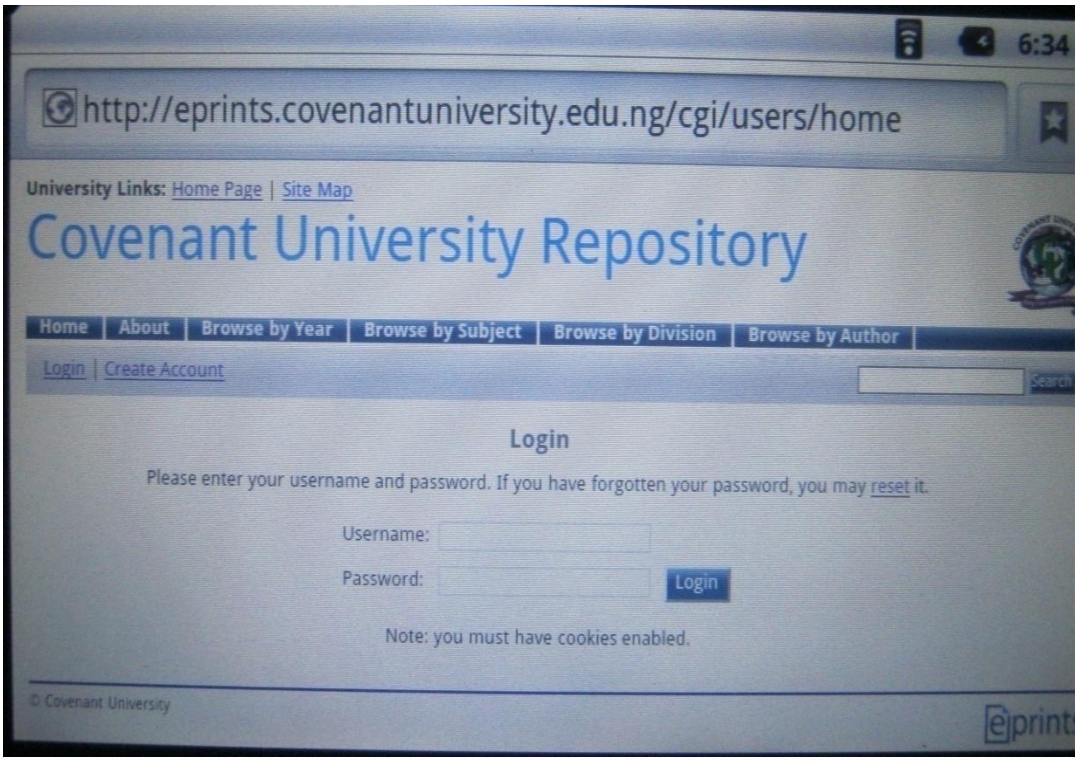
Register

© Covenant University

Figure 4.6: Register form on Blackberry phone

4.3.3 Login

The login user interface can be reached by clicking the *Login* hyperlink on the home page of the repository. Only registered persons on the repository can gain access to the repository through this interface. Its appearance on the mobile platforms is as shown in Figure 4.7 and 4.8. For some unclear reason, we were unable to access the Login page on the Blackberry phone. It gave an error message as shown in Figure 4.9.



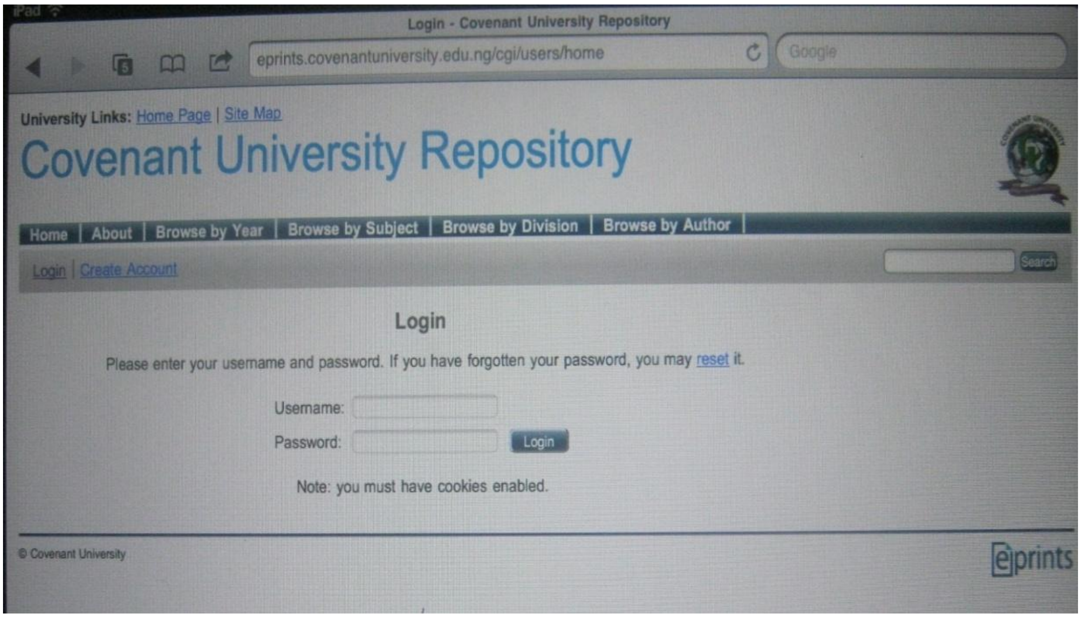
Please enter your username and password. If you have forgotten your password, you may reset it.

Username:

Password: Login

Note: you must have cookies enabled.

Figure 4.7: Login page on Android Tablet


iPad
Login - Covenant University Repository
eprints.covenantuniversity.edu.ng/cgi/users/home
Google
University Links: Home Page | Site Map
Covenant University Repository
Home
About
Browse by Year
Browse by Subject
Browse by Division
Browse by Author
Login | Create Account
Search
Login
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eprints

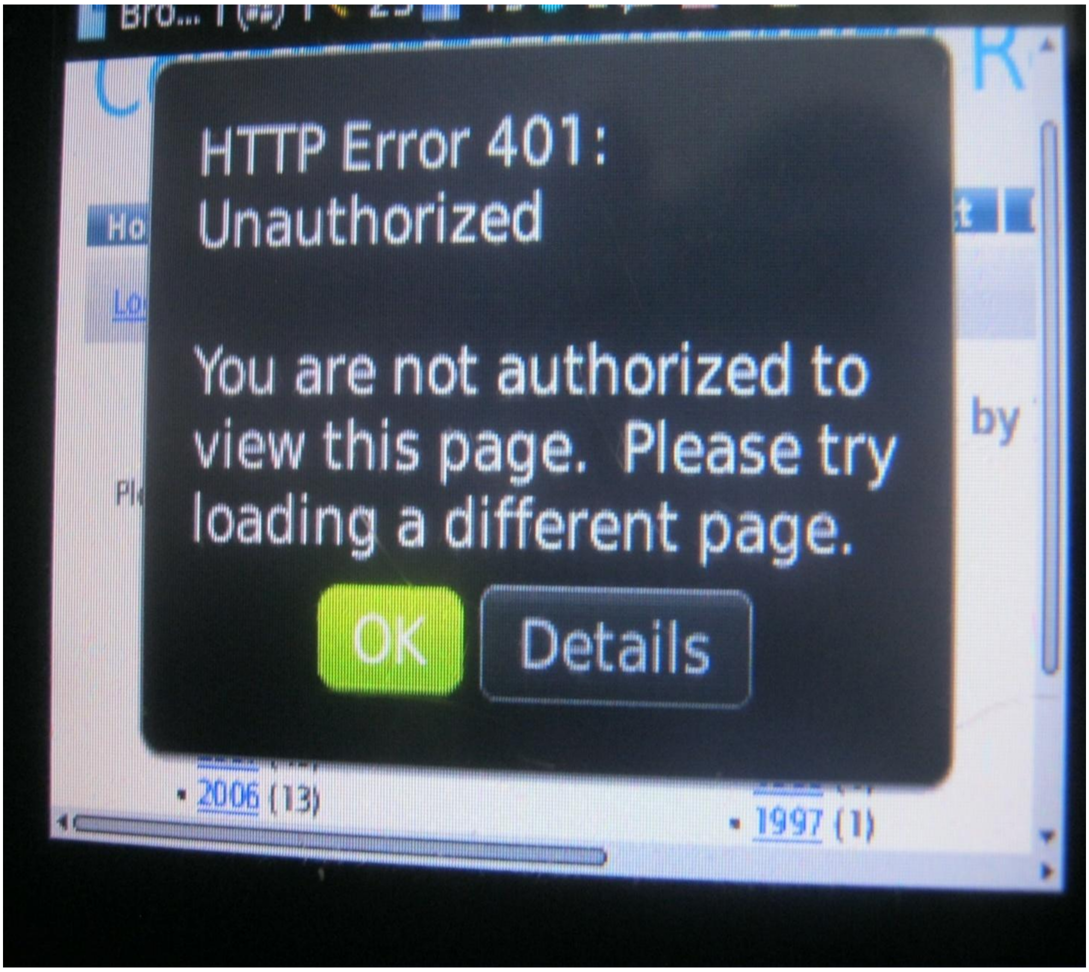
Please enter your username and password. If you have forgotten your password, you may reset it.

Username:

Password: Login

Note: you must have cookies enabled.

Figure 4.8: Login page on iPad



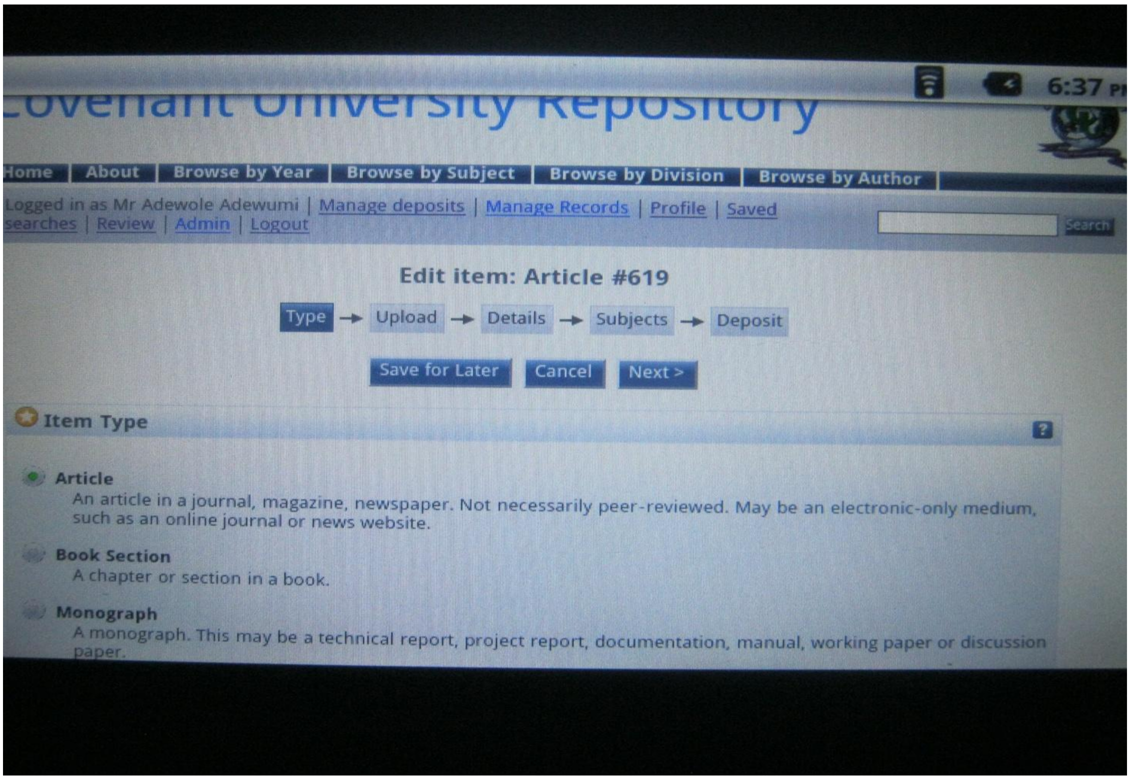
HTTP Error 401: Unauthorized

You are not authorized to view this page. Please try loading a different page.

Figure 4.9: Unable to access the Login page on Blackberry phone

4.3.4 Depositing Items

To deposit items (i.e. papers, theses, etc.) to the repository a user must have registered as discussed in section 4.2.2. Subsequently, the user logs in and follows a five step process/workflow to deposit the material. The first step involves identifying the kind of material (article, thesis, conference paper, teaching resource, etc.) to be uploaded. The second step involves uploading the actual file from its location on a local machine or a mobile device. The third step is where metadata information for the material is keyed-in. In the fourth step, the Library of Congress Classification for the material is determined and in the fifth step the item is submitted. However, that an item has been submitted does not guarantee that it will be deposited until it has been checked by some editor. The editor will assess the material and determine whether or not it befits the repository. It is only after the editor approves it that it becomes deposited in the repository and can hence be viewed by all or sundry depending on the kind of restriction placed on it. Screen shots of the five phases on a mobile platform are as shown in Figure 4.10 through to 4.16.



Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Edit item: Article #619

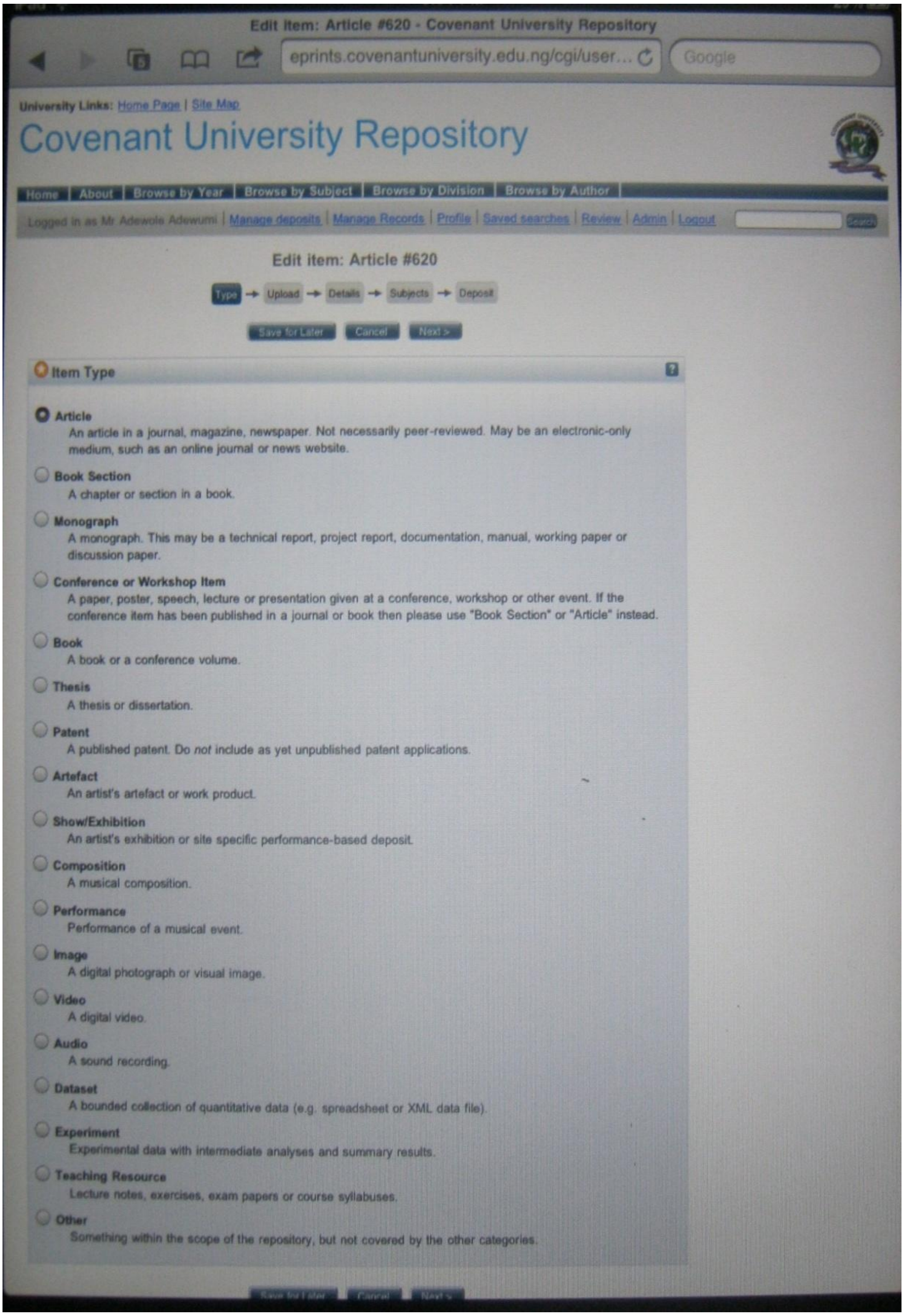
Item Type

● Article
An article in a journal, magazine, newspaper. Not necessarily peer-reviewed. May be an electronic-only medium, such as an online journal or news website.

○ Book Section
A chapter or section in a book.

○ Monograph
A monograph. This may be a technical report, project report, documentation, manual, working paper or discussion paper.

Figure 4.10: Stage 1 of depositing to the Repository (Android Tablet)



Edit Item: Article #620 - Covenant University Repository
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Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Type → Upload → Details → Subjects → Deposit
Save for Later
Cancel
Next >
?
Save for Later
Cancel
Next >

Edit item: Article #620

Item Type

● **Article**
An article in a journal, magazine, newspaper. Not necessarily peer-reviewed. May be an electronic-only medium, such as an online journal or news website.

○ **Book Section**
A chapter or section in a book.

○ **Monograph**
A monograph. This may be a technical report, project report, documentation, manual, working paper or discussion paper.

○ **Conference or Workshop Item**
A paper, poster, speech, lecture or presentation given at a conference, workshop or other event. If the conference item has been published in a journal or book then please use "Book Section" or "Article" instead.

○ **Book**
A book or a conference volume.

○ **Thesis**
A thesis or dissertation.

○ **Patent**
A published patent. Do *not* include as yet unpublished patent applications.

○ **Artefact**
An artist's artefact or work product.

○ **Show/Exhibition**
An artist's exhibition or site specific performance-based deposit.

○ **Composition**
A musical composition.

○ **Performance**
Performance of a musical event.

○ **Image**
A digital photograph or visual image.

○ **Video**
A digital video.

○ **Audio**
A sound recording.

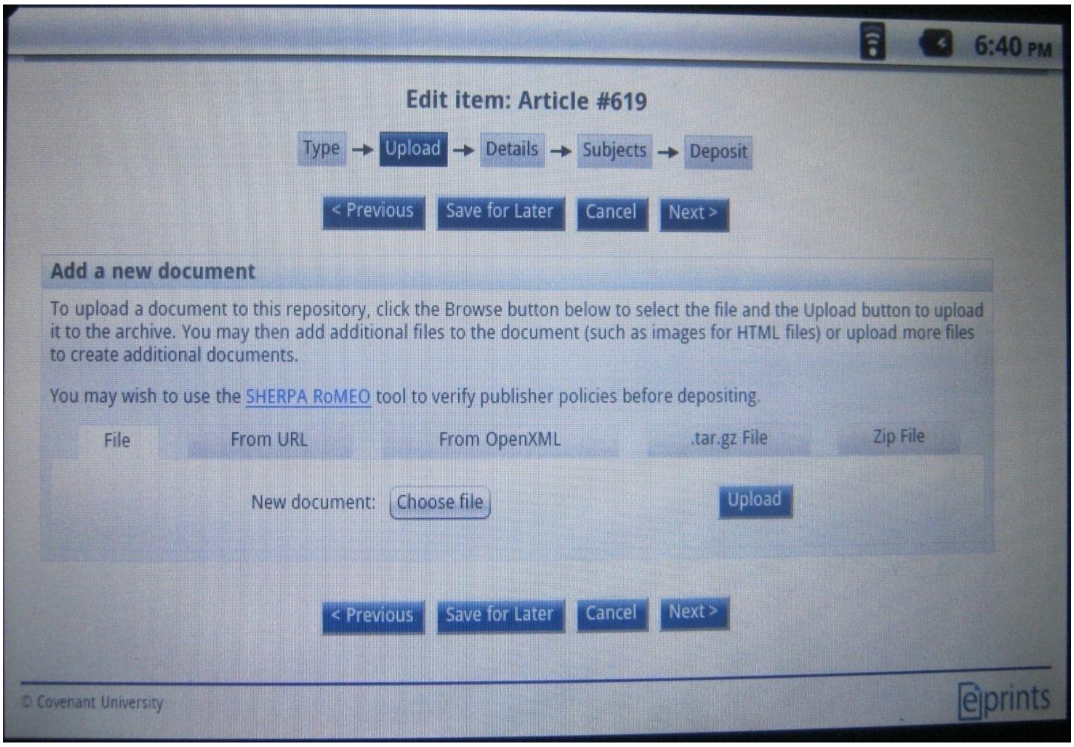
○ **Dataset**
A bounded collection of quantitative data (e.g. spreadsheet or XML data file).

○ **Experiment**
Experimental data with intermediate analyses and summary results.

○ **Teaching Resource**
Lecture notes, exercises, exam papers or course syllabuses.

○ **Other**
Something within the scope of the repository, but not covered by the other categories.

Figure 4.11: Stage 1 of depositing to the Repository (iPad)



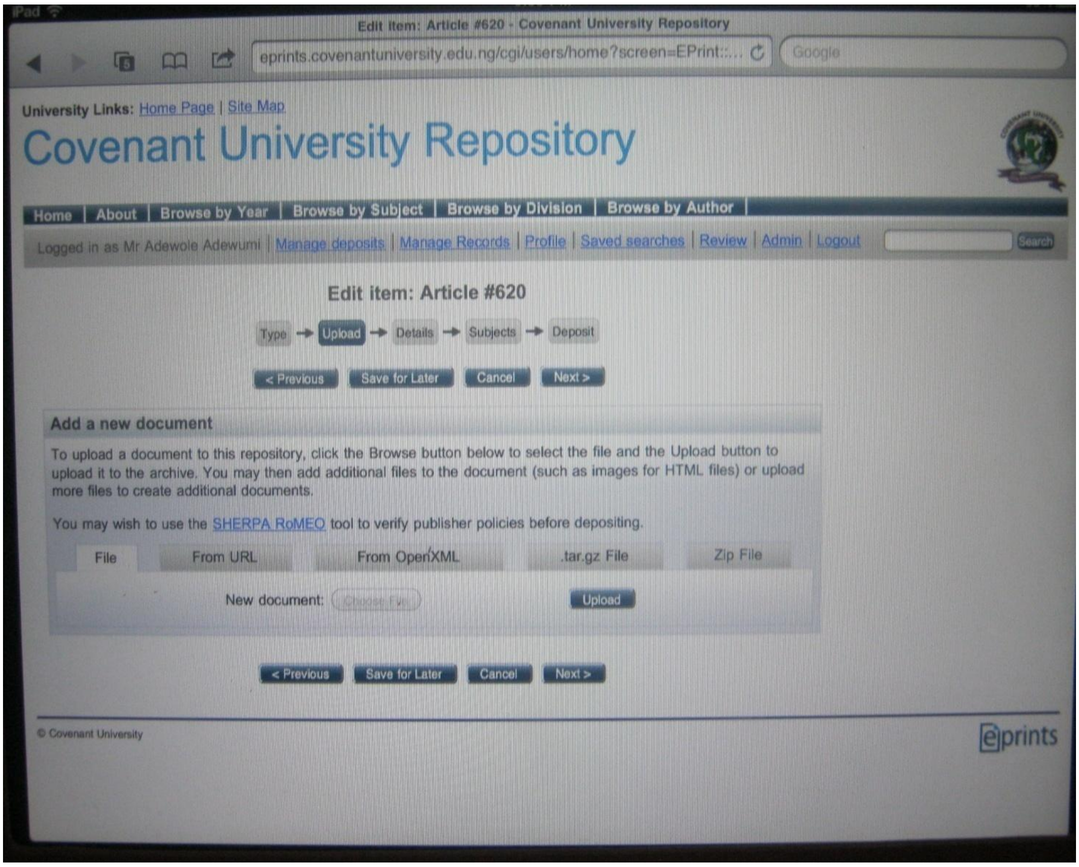
Edit item: Article #619

Add a new document

To upload a document to this repository, click the Browse button below to select the file and the Upload button to upload it to the archive. You may then add additional files to the document (such as images for HTML files) or upload more files to create additional documents.

You may wish to use the SHERPA RoMEO tool to verify publisher policies before depositing.

Figure 4.12: Stage 2 of depositing to the Repository (Android Tablet)


iPad
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Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Type → Upload → Details → Subjects → Deposit
< Previous
Save for Later
Cancel
Next >
File
From URL
From OpenXML
.tar.gz File
Zip File
Choose File
Upload
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Edit item: Article #620

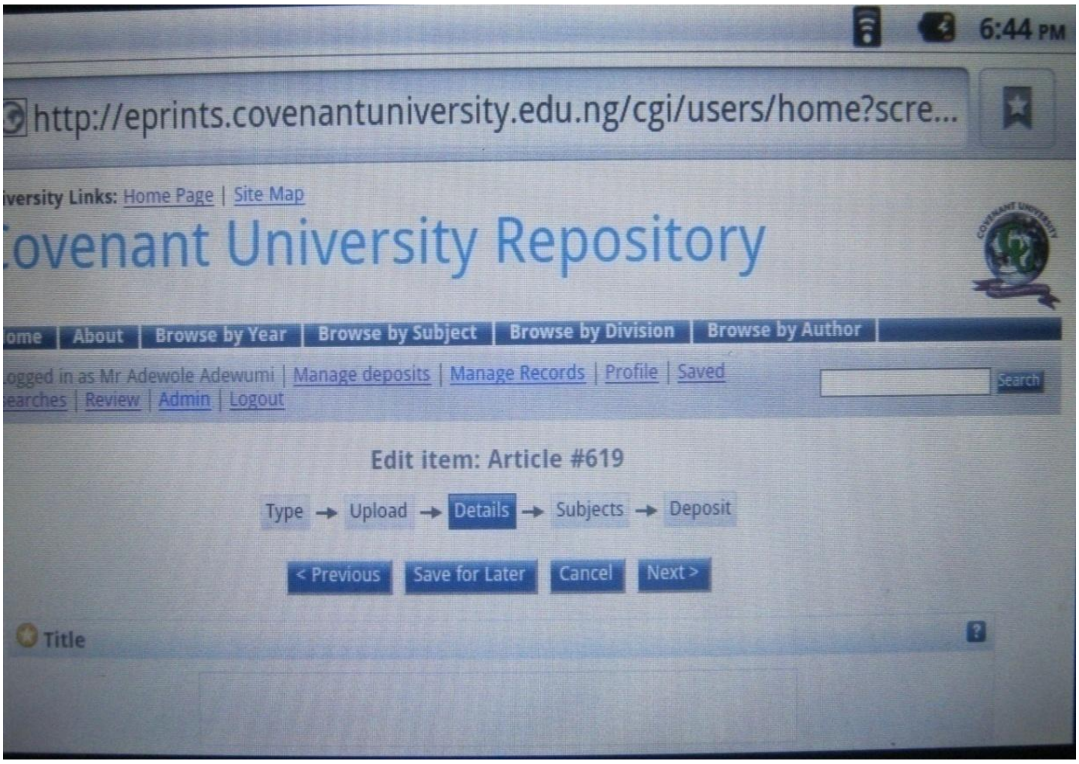
Add a new document

To upload a document to this repository, click the Browse button below to select the file and the Upload button to upload it to the archive. You may then add additional files to the document (such as images for HTML files) or upload more files to create additional documents.

You may wish to use the SHERPA RoMEO tool to verify publisher policies before depositing.

New document:

Figure 4.13: Stage 2 of depositing to the Repository (iPad)



6:44 PM

http://eprints.covenantuniversity.edu.ng/cgi/users/home?scre...

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ogged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved earches | Review | Admin | Logout

Search

Edit item: Article #619

Type → Upload → Details → Subjects → Deposit

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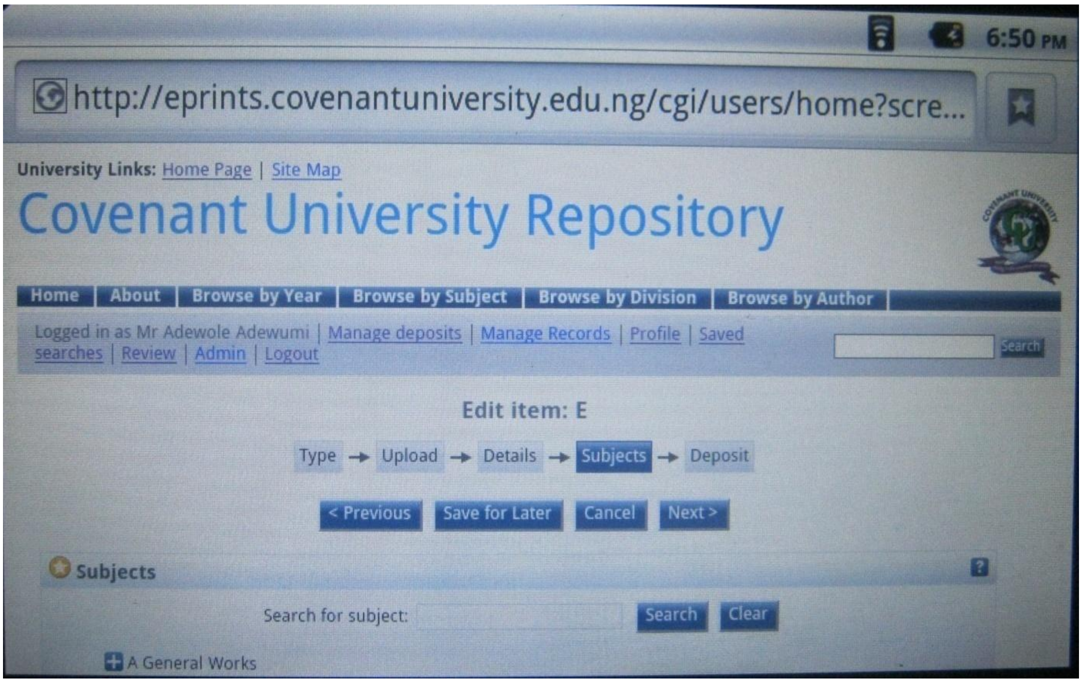
Title

Figure 4.14: Stage 3 of depositing to the Repository (Android Tablet)



6:50 PM

http://eprints.covenantuniversity.edu.ng/cgi/users/home?scre...

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Covenant University Repository

Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Search

Edit item: E

Type → Upload → Details → Subjects → Deposit

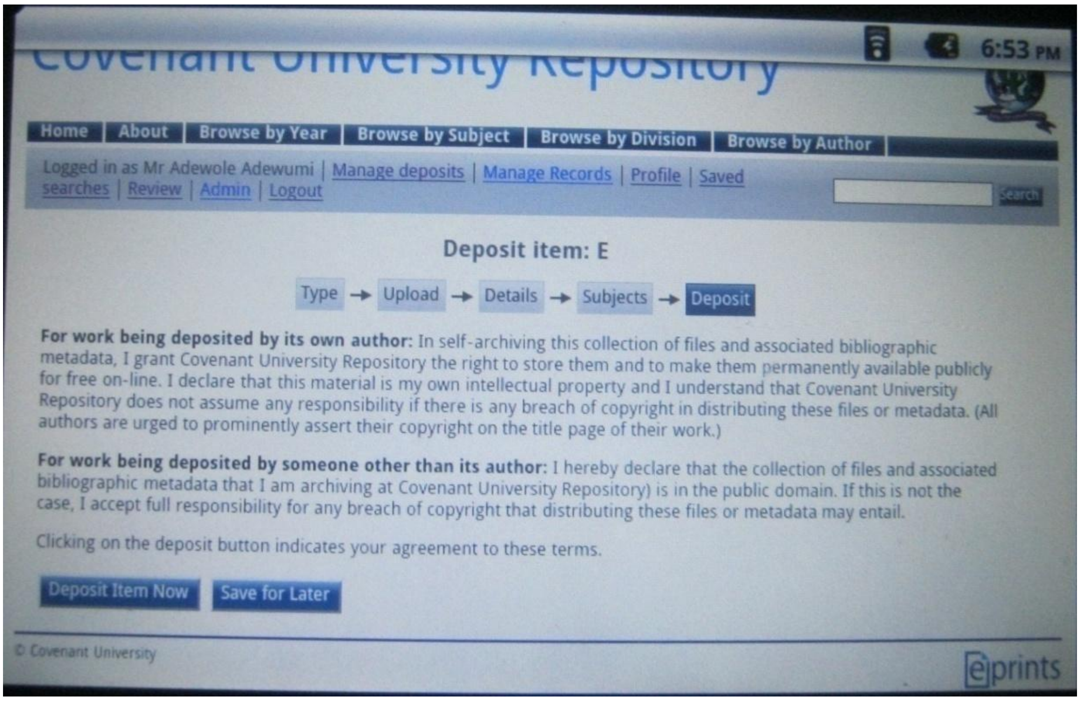
< Previous | Save for Later | Cancel | Next >

Subjects

Search for subject: Search Clear

A General Works

Figure 4.15: Stage 4 of depositing to the Repository (Android Tablet)



Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Deposit item: E

For work being deposited by its own author: In self-archiving this collection of files and associated bibliographic metadata, I grant Covenant University Repository the right to store them and to make them permanently available publicly for free on-line. I declare that this material is my own intellectual property and I understand that Covenant University Repository does not assume any responsibility if there is any breach of copyright in distributing these files or metadata. (All authors are urged to prominently assert their copyright on the title page of their work.)

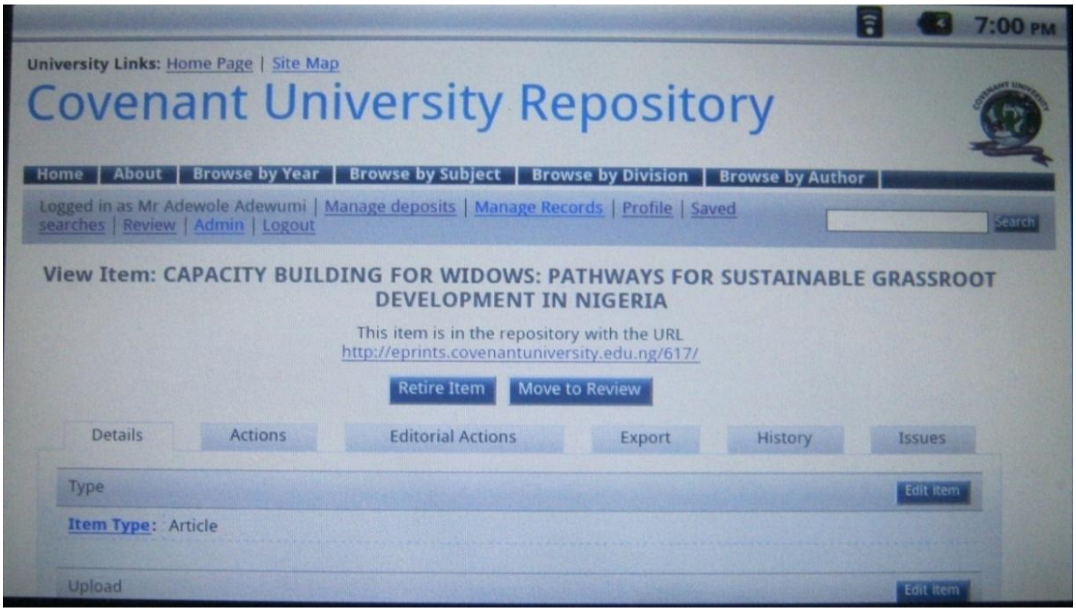
For work being deposited by someone other than its author: I hereby declare that the collection of files and associated bibliographic metadata that I am archiving at Covenant University Repository) is in the public domain. If this is not the case, I accept full responsibility for any breach of copyright that distributing these files or metadata may entail.

Clicking on the deposit button indicates your agreement to these terms.

Figure 4.16: Stage 5 of depositing to the Repository (Android Tablet)

4.3.5 View Deposited Items

This feature is only available after logging into the repository. It allows a user to view metadata about any content of the repository. To gain access to the content's metadata this 🔍 icon is clicked. The mobile versions of the metadata page are as shown in Figure 4.17 and 4.18.



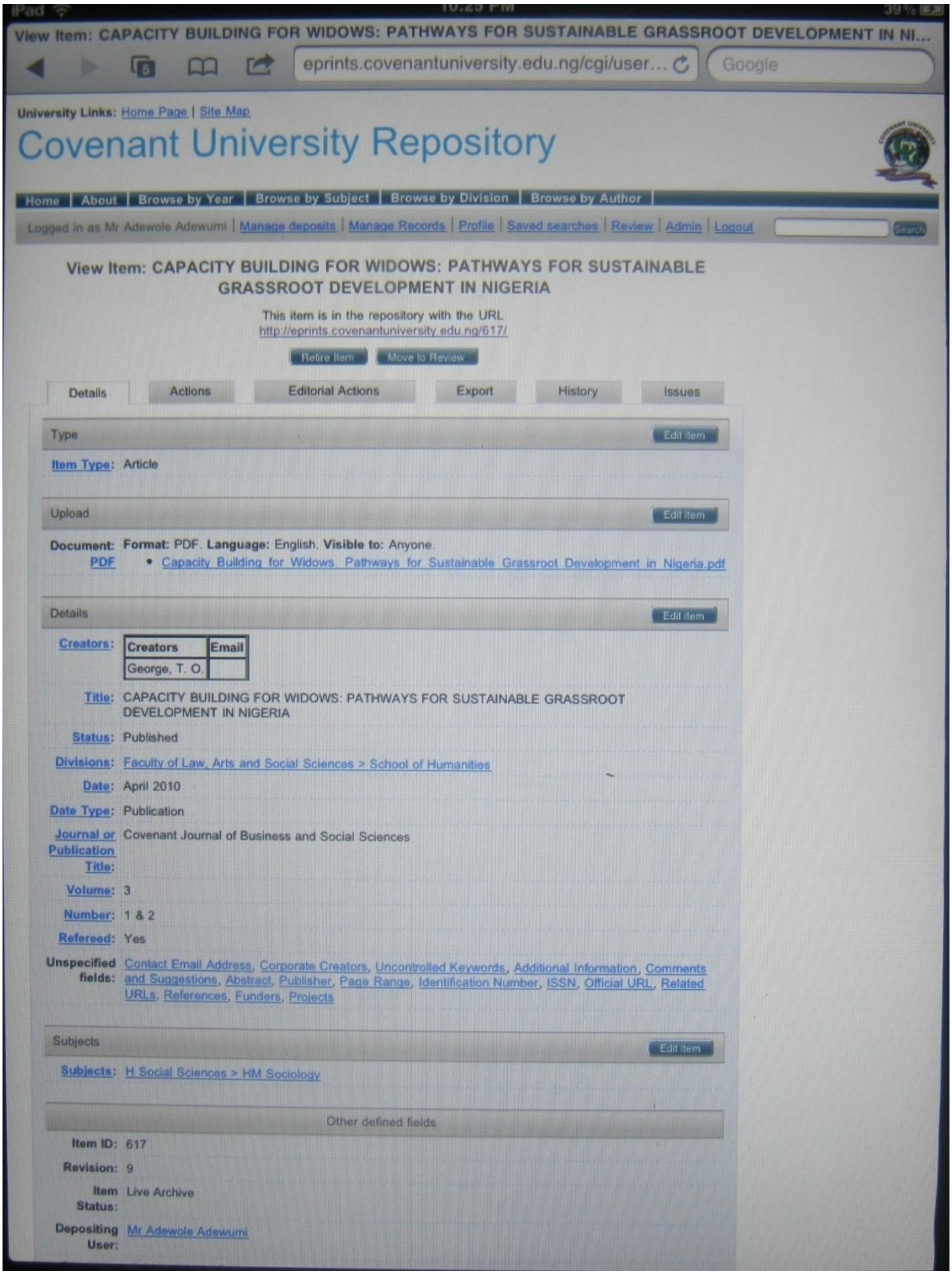
7:00 PM
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Retire Item
Move to Review
Details
Actions
Editorial Actions
Export
History
Issues
Type
Edit item
Upload
Edit item

View Item: CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA

This item is in the repository with the URL http://eprints.covenantuniversity.edu.ng/617/

Item Type: Article

Figure 4.17: Viewing an Item deposited in the Repository (Android Tablet)


iPad
10:25 PM
39%
View Item: CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NI...
eprints.covenantuniversity.edu.ng/cgi/user...
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Retire Item
Move to Review
Details
Actions
Editorial Actions
Export
History
Issues
Edit item

View Item: CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA

This item is in the repository with the URL
http://eprints.covenantuniversity.edu.ng/617/

Type

Item Type: Article

Upload

Document: **Format:** PDF. **Language:** English. **Visible to:** Anyone.
PDF
- Capacity Building for Widows. Pathways for Sustainable Grassroot Development in Nigeria.pdf

Details

Creators:

Creators	Email
George, T. O.	

Title:	CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA
Status:	Published
Divisions:	Faculty of Law, Arts and Social Sciences > School of Humanities
Date:	April 2010
Date Type:	Publication
Journal or Publication Title:	Covenant Journal of Business and Social Sciences
Volume:	3
Number:	1 & 2
Refereed:	Yes
Unspecified fields:	Contact Email Address, Corporate Creators, Uncontrolled Keywords, Additional Information, Comments and Suggestions, Abstract, Publisher, Page Range, Identification Number, ISSN, Official URL, Related URLs, References, Funders, Projects

Subjects

Subjects: H Social Sciences > HM Sociology

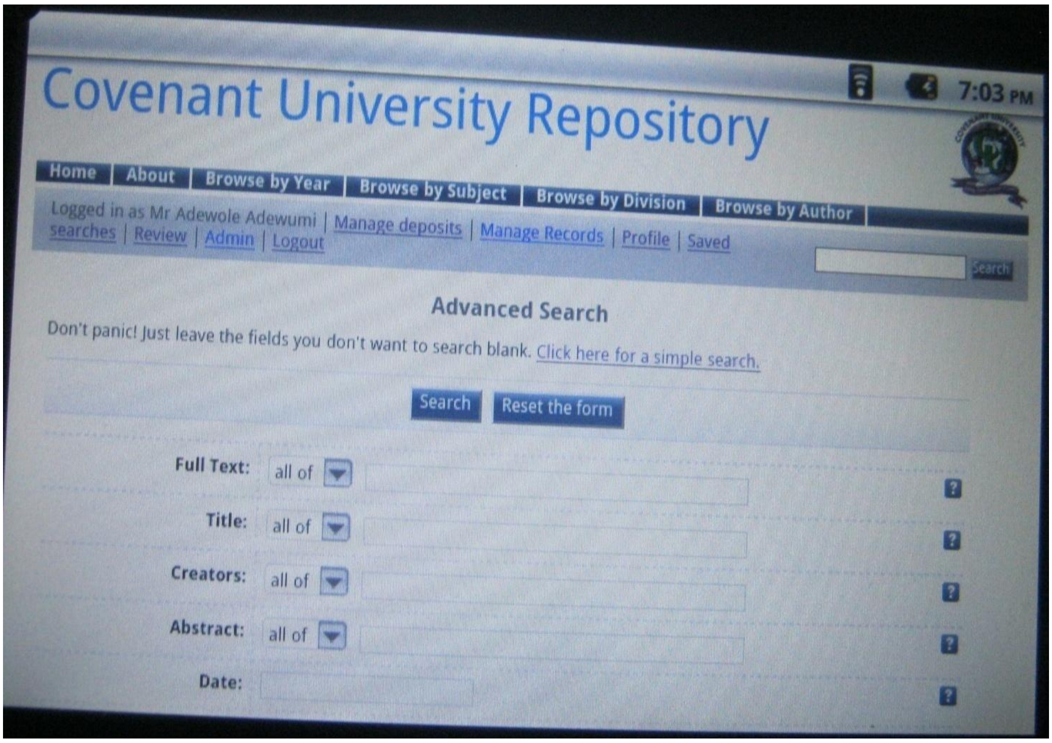
Other defined fields

Item ID:	617
Revision:	9
Item Status:	Live Archive
Depositing User:	Mr Adewole Adewumi

Figure 4.18: Viewing an Item deposited in the Repository (iPad)

4.3.6 Search an Item

To search for an item in the repository one can search using the search tab on the home page (top-right position of the page). A more refined search can be conducted by clicking on the *Search Repository* hyperlink. This opens an advanced search page that allows a user give detailed description of the item to be downloaded. The user can also opt for the simple search which contains fewer search fields. The advanced search page as it appears on the mobile platforms is as shown in Figure 4.19 – 4.21.



Covenant University Repository

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Advanced Search

Don't panic! Just leave the fields you don't want to search blank. Click here for a simple search.

Full Text: all of

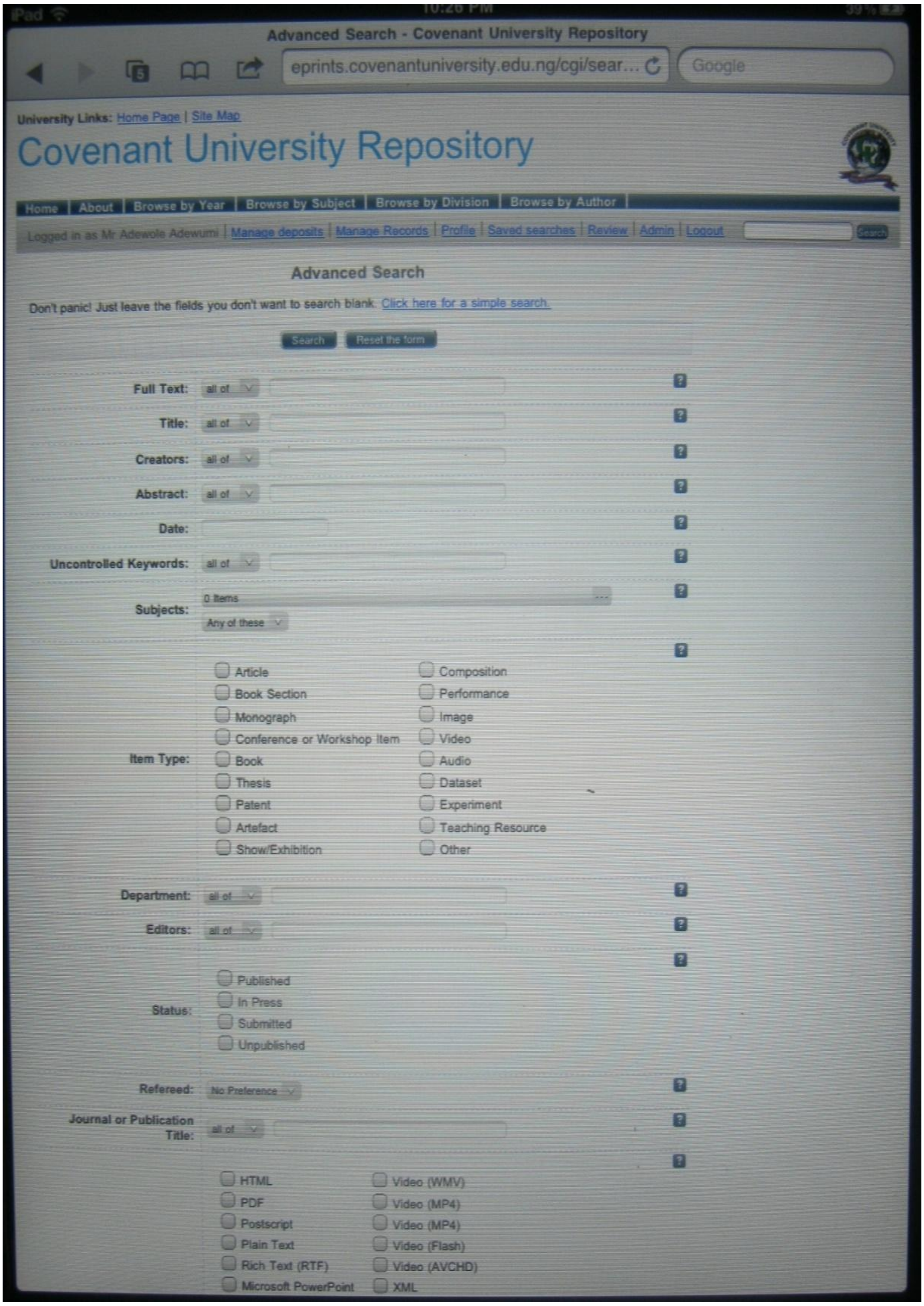
Title: all of

Creators: all of

Abstract: all of

Date:

Figure 4.19: Viewing an Item deposited in the Repository (Android Tablet)



Advanced Search - Covenant University Repository

eprints.covenantuniversity.edu.ng/cgi/sear...

University Links: Home Page | Site Map

Covenant University Repository

Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Advanced Search

Don't panic! Just leave the fields you don't want to search blank. Click here for a simple search.

Full Text: all of

Title: all of

Creators: all of

Abstract: all of

Date:

Uncontrolled Keywords: all of

Subjects: 0 items
Any of these

Item Type:

- □ Article
- □ Book Section
- □ Monograph
- □ Conference or Workshop Item
- □ Book
- □ Thesis
- □ Patent
- □ Artefact
- □ Show/Exhibition
- □ Composition
- □ Performance
- □ Image
- □ Video
- □ Audio
- □ Dataset
- □ Experiment
- □ Teaching Resource
- □ Other

Department: all of

Editors: all of

Status:

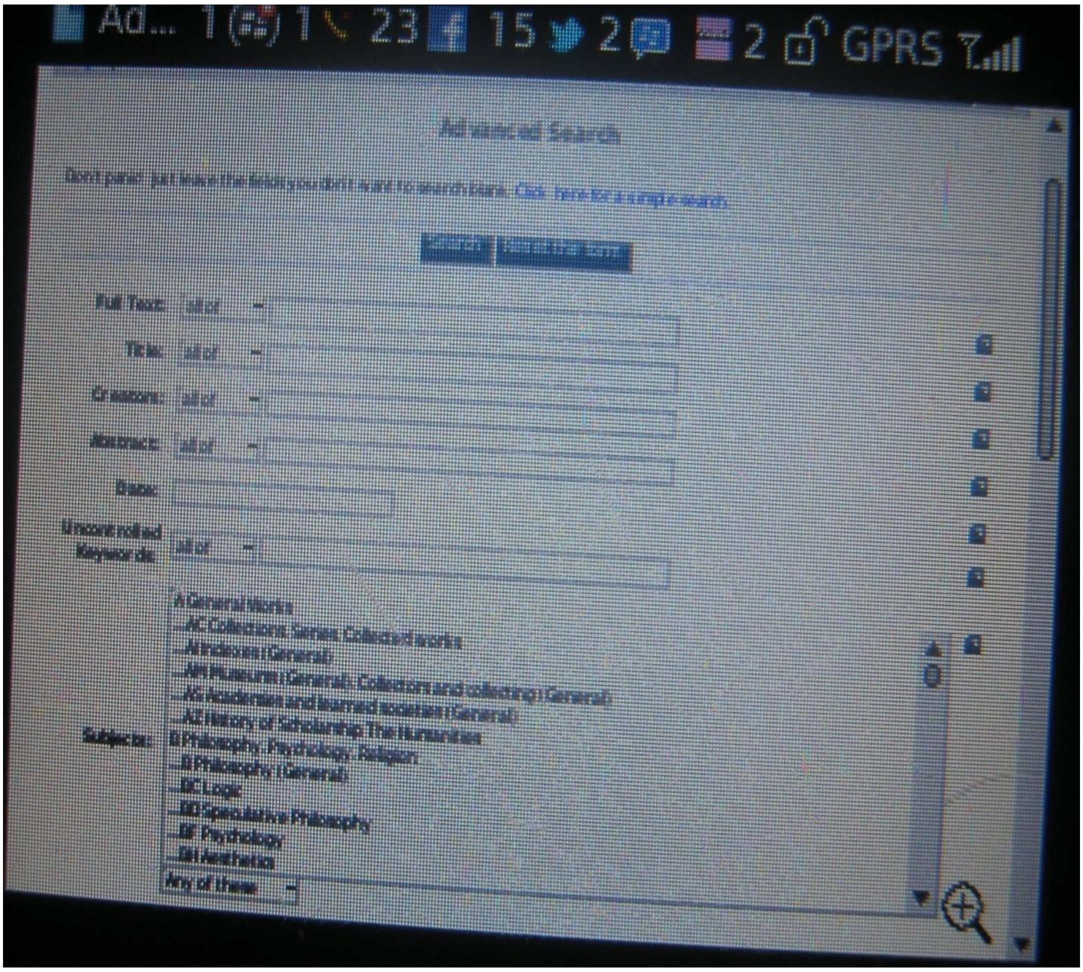
- □ Published
- □ In Press
- □ Submitted
- □ Unpublished

Refereed: No Preference

Journal or Publication Title: all of

- □ HTML
- □ PDF
- □ Postscript
- □ Plain Text
- □ Rich Text (RTF)
- □ Microsoft PowerPoint
- □ Video (WMV)
- □ Video (MP4)
- □ Video (MP4)
- □ Video (Flash)
- □ Video (AVCHD)
- □ XML

Figure 4.20: Viewing an Item deposited in the Repository (iPad)



Advanced Search

Don't panic! Just leave the fields you don't want to search blank. Click here for a simple search.

Full Text: all of

Title: all of

Creators: all of

Abstract: all of

Date:

Uncontrolled Keywords: all of

Subjects:
A General Works
--AC Collections. Series. Collected works
--AI Indexes (General)
--AM Museums (General). Collectors and collecting (General)
--AS Academies and learned societies (General)
--AZ History of Scholarship The Humanities
B Philosophy. Psychology. Religion
--B Philosophy (General)
--BC Logic
--BD Speculative Philosophy
--BF Psychology
--BH Aesthetics

Any of these

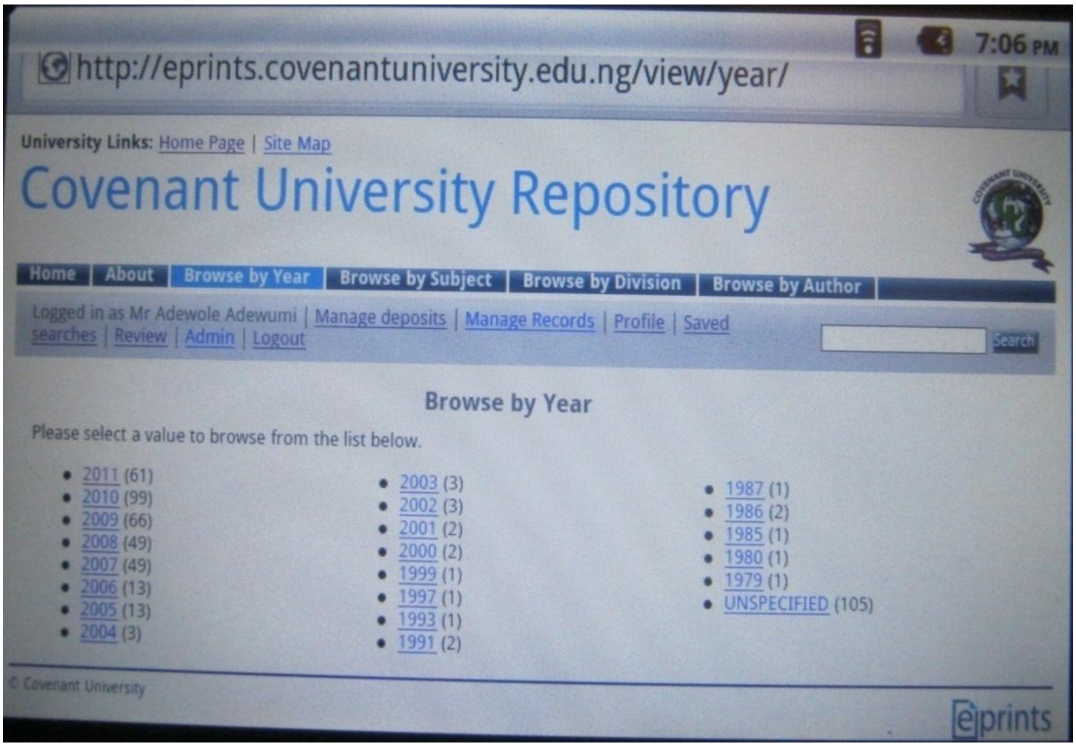
Figure 4.21: Viewing an Item deposited in the Repository (Blackberry phone)

4.3.7 Browse Item

The browse buttons are situated at the top of the repository interface. With the browse functionality a user can locate and retrieve content based on any of the following criteria:

- The year it was deposited,
- The subject area of the material
- The division (category) to which the material belongs
- The author of the material

The browse interface as it displays on the experimental platforms is as shown in Figure 4.22 to 4.30.



http://eprints.covenantuniversity.edu.ng/view/year/

University Links: Home Page | Site Map

Covenant University Repository

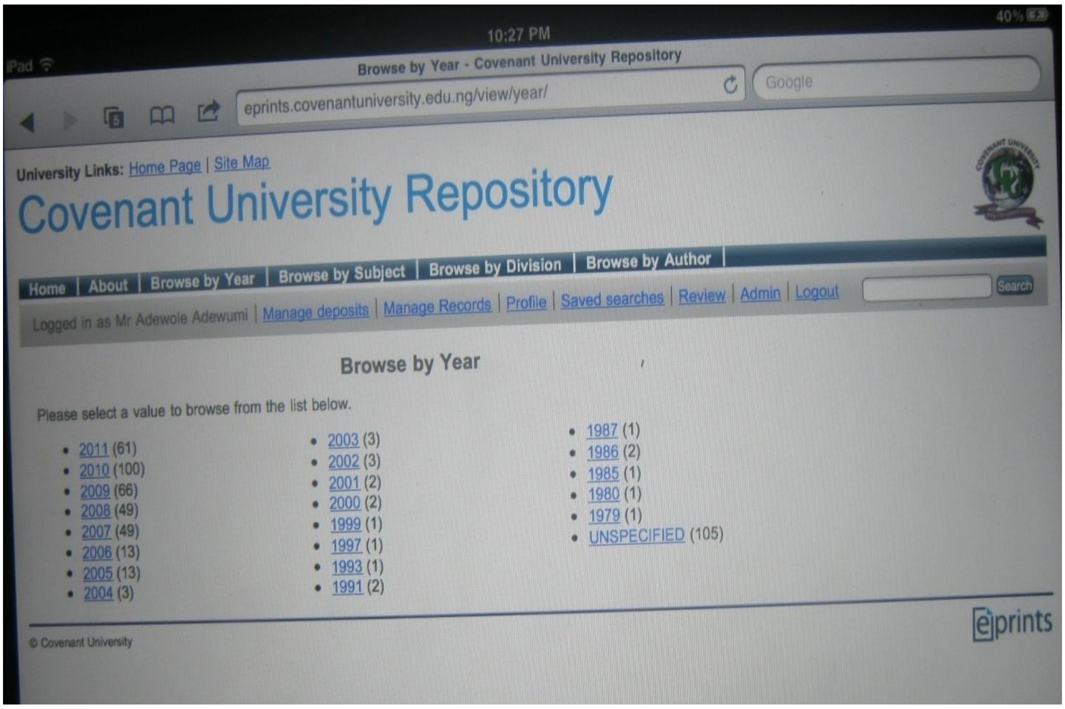
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Browse by Year

Please select a value to browse from the list below.

- 2011 (61)
- 2010 (99)
- 2009 (66)
- 2008 (49)
- 2007 (49)
- 2006 (13)
- 2005 (13)
- 2004 (3)
- 2003 (3)
- 2002 (3)
- 2001 (2)
- 2000 (2)
- 1999 (1)
- 1997 (1)
- 1993 (1)
- 1991 (2)
- 1987 (1)
- 1986 (2)
- 1985 (1)
- 1980 (1)
- 1979 (1)
- UNSPECIFIED (105)

Figure 4.22: Browsing an Item deposited in the Repository by Year (Android Tablet)



Browse by Year - Covenant University Repository

eprints.covenantuniversity.edu.ng/view/year/

University Links: Home Page | Site Map

Covenant University Repository

Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Search

Browse by Year

Please select a value to browse from the list below.

- 2011 (61)
- 2010 (100)
- 2009 (66)
- 2008 (49)
- 2007 (49)
- 2006 (13)
- 2005 (13)
- 2004 (3)
- 2003 (3)
- 2002 (3)
- 2001 (2)
- 2000 (2)
- 1999 (1)
- 1997 (1)
- 1993 (1)
- 1991 (2)
- 1987 (1)
- 1986 (2)
- 1985 (1)
- 1980 (1)
- 1979 (1)
- UNSPECIFIED (105)

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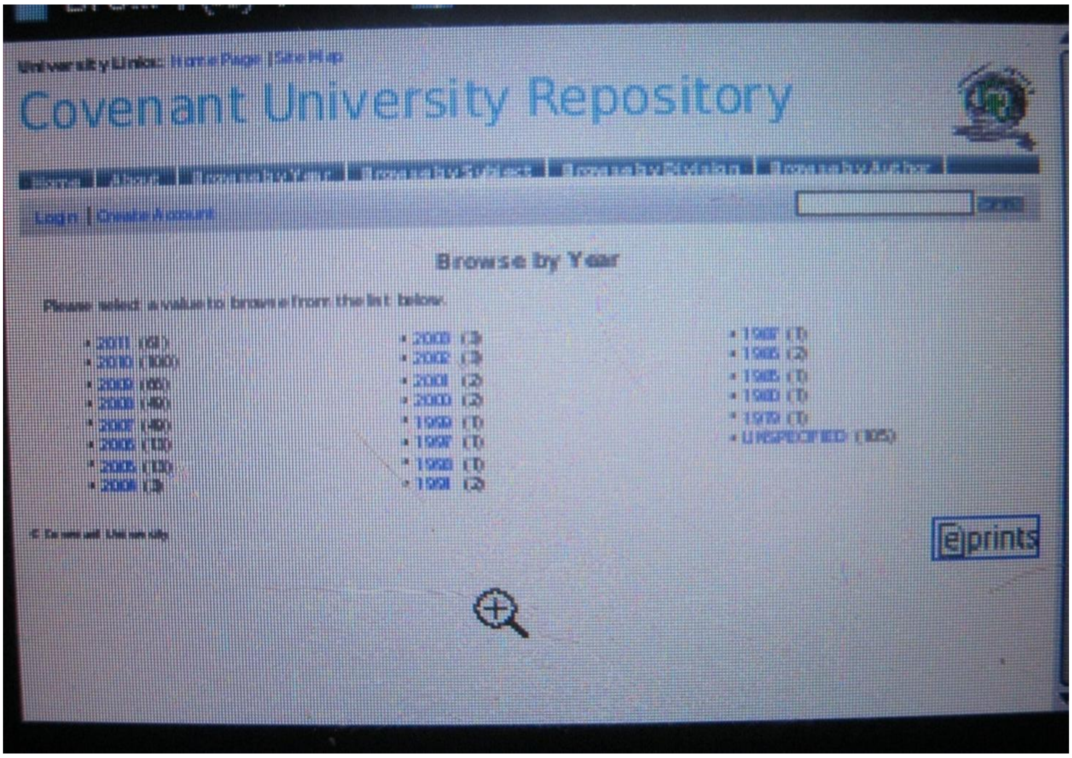
eprints

Figure 4.23: Browsing an Item deposited in the Repository by Year (iPad)



University Links: Home Page | Site Map

Covenant University Repository

Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author

Login | Create Account

Browse by Year

Please select a value to browse from the list below.

- 2011 (61)
- 2010 (100)
- 2009 (66)
- 2008 (49)
- 2007 (49)
- 2006 (13)
- 2005 (13)
- 2004 (3)
- 2003 (3)
- 2002 (3)
- 2001 (2)
- 2000 (2)
- 1999 (1)
- 1997 (1)
- 1993 (1)
- 1991 (2)
- 1987 (1)
- 1986 (2)
- 1985 (1)
- 1980 (1)
- 1979 (1)
- UNSPECIFIED (105)

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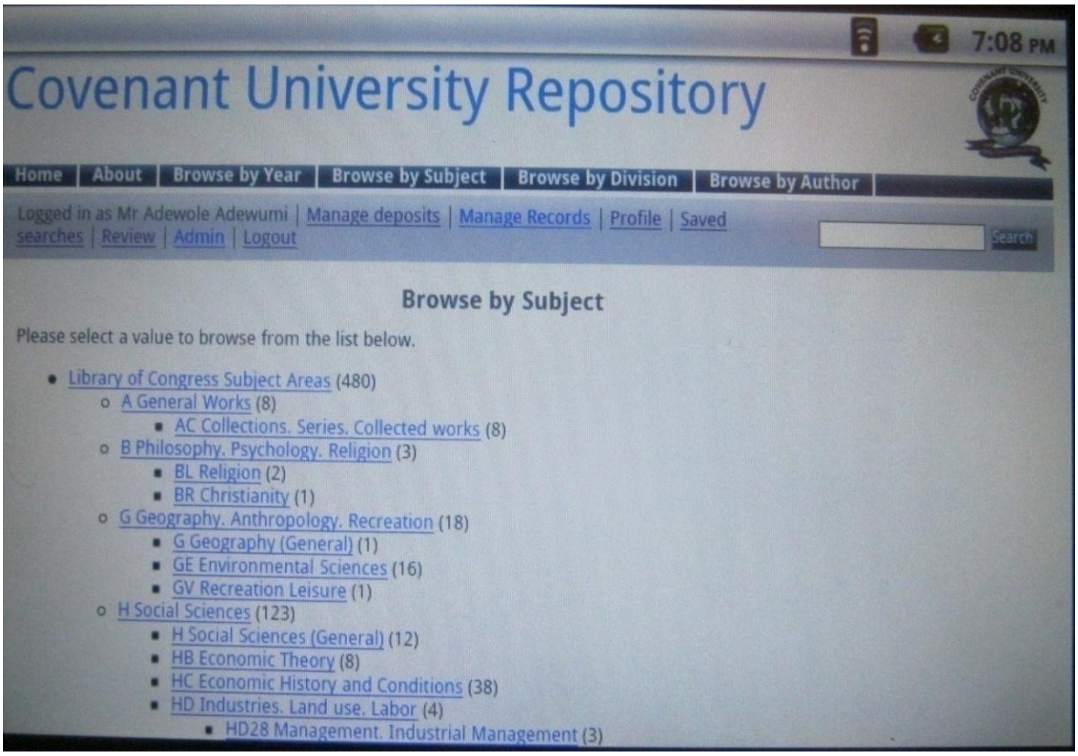
eprints

Figure 4.24: Browsing an Item deposited in the Repository by Year (Blackberry phone)



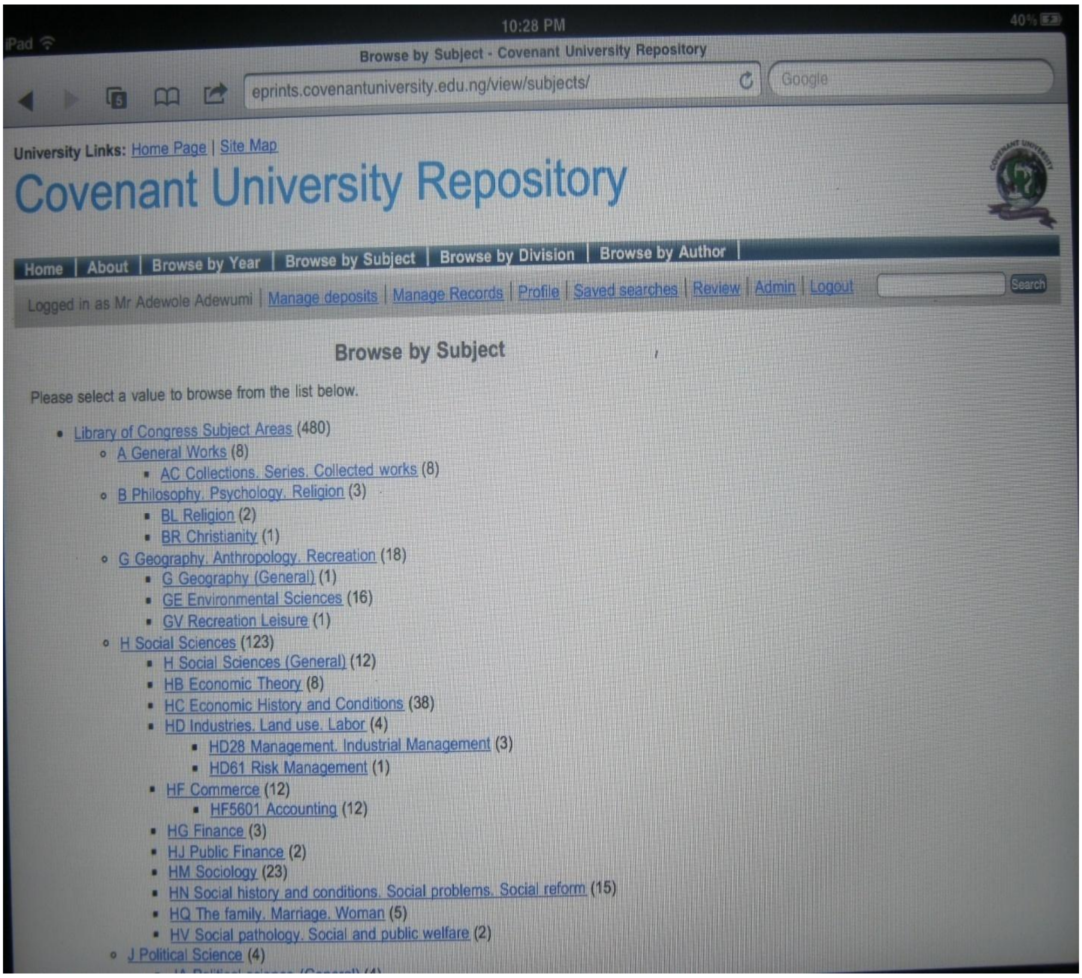
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Browse by Subject

Please select a value to browse from the list below.

- Library of Congress Subject Areas (480)
  - A General Works (8)
    - AC Collections. Series. Collected works (8)
  - B Philosophy. Psychology. Religion (3)
    - BL Religion (2)
    - BR Christianity (1)
  - G Geography. Anthropology. Recreation (18)
    - G Geography (General) (1)
    - GE Environmental Sciences (16)
    - GV Recreation Leisure (1)
  - H Social Sciences (123)
    - H Social Sciences (General) (12)
    - HB Economic Theory (8)
    - HC Economic History and Conditions (38)
    - HD Industries. Land use. Labor (4)
      - HD28 Management. Industrial Management (3)

Figure 4.25: Browsing an Item deposited in the Repository by Subject (Android Tablet)

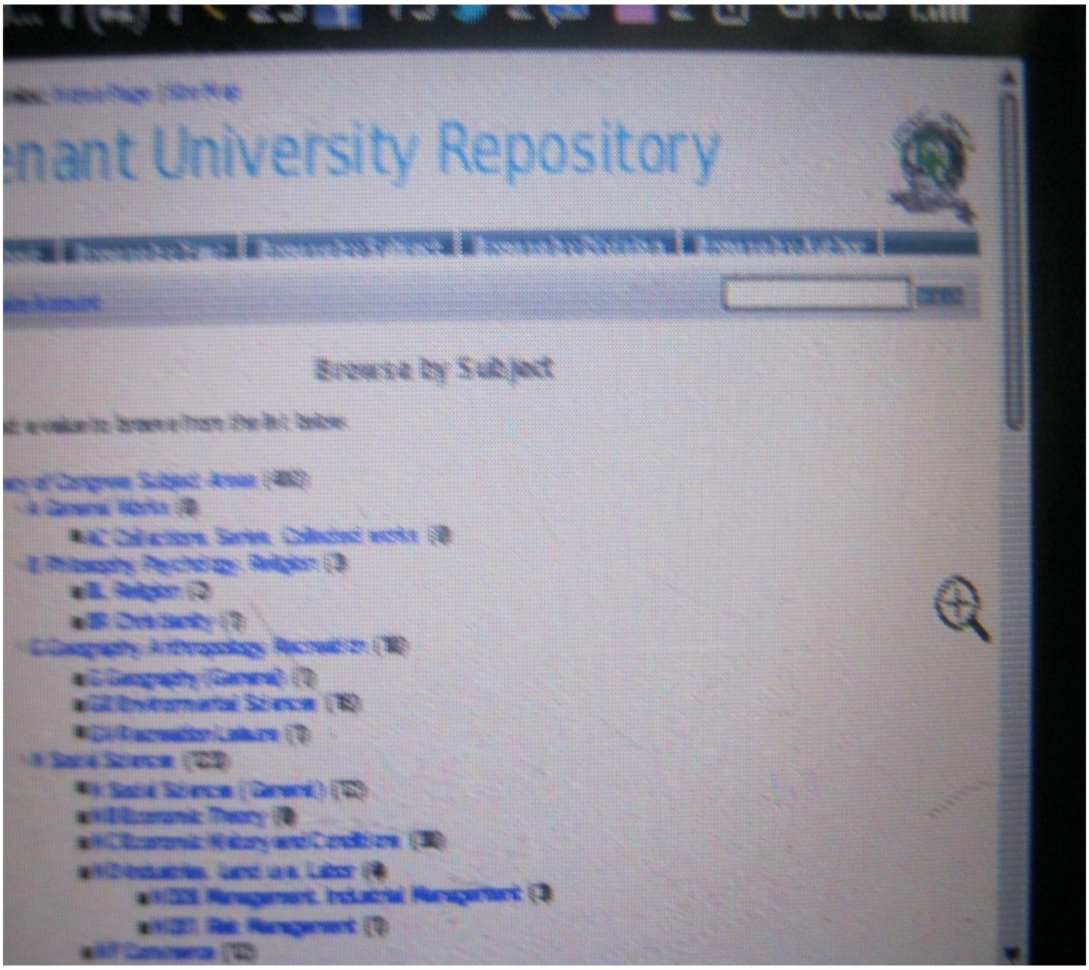

iPad
10:28 PM
40%
Browse by Subject - Covenant University Repository
eprints.covenantuniversity.edu.ng/view/subjects/
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Browse by Subject

Please select a value to browse from the list below.

- Library of Congress Subject Areas (480)
  - A General Works (8)
    - AC Collections. Series. Collected works (8)
  - B Philosophy. Psychology. Religion (3)
    - BL Religion (2)
    - BR Christianity (1)
  - G Geography. Anthropology. Recreation (18)
    - G Geography (General) (1)
    - GE Environmental Sciences (16)
    - GV Recreation Leisure (1)
  - H Social Sciences (123)
    - H Social Sciences (General) (12)
    - HB Economic Theory (8)
    - HC Economic History and Conditions (38)
    - HD Industries. Land use. Labor (4)
      - HD28 Management. Industrial Management (3)
      - HD61 Risk Management (1)
    - HF Commerce (12)
      - HF5601 Accounting (12)
    - HG Finance (3)
    - HJ Public Finance (2)
    - HM Sociology (23)
    - HN Social history and conditions. Social problems. Social reform (15)
    - HQ The family. Marriage. Woman (5)
    - HV Social pathology. Social and public welfare (2)
  - J Political Science (4)
    - JA Political science (General) (4)

Figure 4.26: Browsing an Item deposited in the Repository by Subject (iPad)



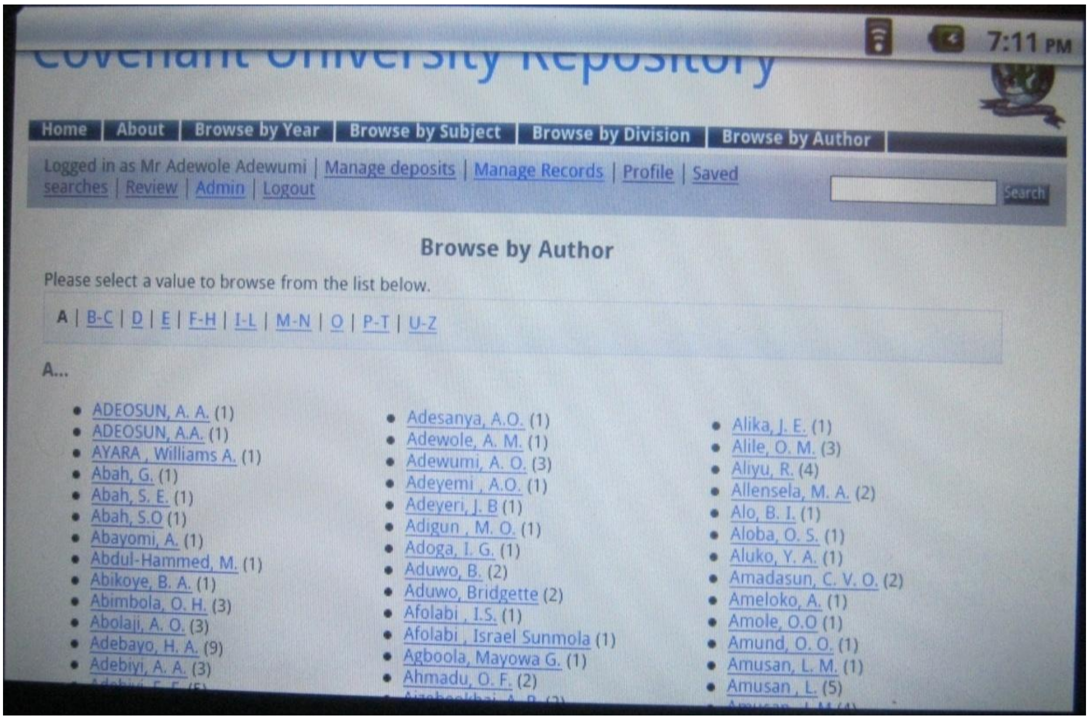
nant University Repository

Browse by Subject

t a value to browse from the list below:

- ary of Congress Subject Areas ([illegible])
  - A General Works ([illegible])
    - AC Collections. Series. Collected works ([illegible])
  - B Philosophy. Psychology. Religion ([illegible])
    - BL Religion ([illegible])
    - BR Christianity ([illegible])
  - G Geography. Anthropology. Recreation ([illegible])
    - G Geography (General) ([illegible])
    - GE Environmental Sciences ([illegible])
    - GV Recreation Leisure ([illegible])
  - H Social Sciences ([illegible])
    - H Social Sciences (General) ([illegible])
    - HB Economic Theory ([illegible])
    - HC Economic History and Conditions ([illegible])
    - HD Industries. Land use. Labor ([illegible])
      - HD28 Management. Industrial Management ([illegible])
      - HD61 Risk Management ([illegible])
    - HF Commerce ([illegible])

Figure 4.27: Browsing an Item deposited in the Repository by Subject (Blackberry phone)



7:11 PM

Covenant University Repository

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Browse by Author

Please select a value to browse from the list below.

A | B-C | D | E | F-H | I-L | M-N | O | P-T | U-Z

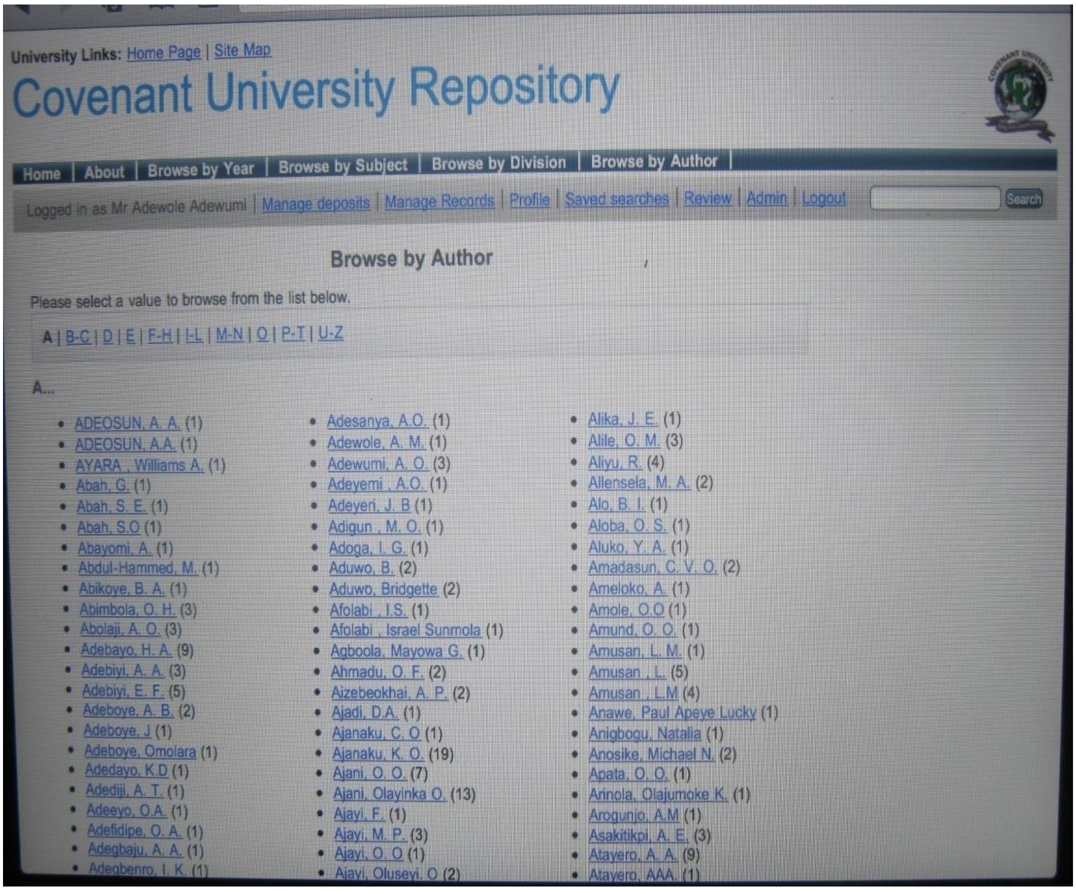
A...

- ADEOSUN, A. A. (1)
- ADEOSUN, A.A. (1)
- AYARA , Williams A. (1)
- Abah, G. (1)
- Abah, S. E. (1)
- Abah, S.O (1)
- Abayomi, A. (1)
- Abdul-Hammed, M. (1)
- Abikoye, B. A. (1)
- Abimbola, O. H. (3)
- Abolaji, A. O. (3)
- Adebayo, H. A. (9)
- Adebiyi, A. A. (3)

- Adesanya, A.O. (1)
- Adewole, A. M. (1)
- Adewumi, A. O. (3)
- Adeyemi , A.O. (1)
- Adeyeri, J. B (1)
- Adigun , M. O. (1)
- Adoga, I. G. (1)
- Aduwo, B. (2)
- Aduwo, Bridgette (2)
- Afolabi , I.S. (1)
- Afolabi , Israel Sunmola (1)
- Agboola, Mayowa G. (1)
- Ahmadu, O. F. (2)

- Alika, J. E. (1)
- Alile, O. M. (3)
- Aliyu, R. (4)
- Allensela, M. A. (2)
- Alo, B. I. (1)
- Aloba, O. S. (1)
- Aluko, Y. A. (1)
- Amadasun, C. V. O. (2)
- Ameloko, A. (1)
- Amole, O.O (1)
- Amund, O. O. (1)
- Amusan, L. M. (1)
- Amusan , L. (5)

Figure 4.28: Browsing an Item deposited in the Repository by Author (Android Tablet)



University Links: Home Page | Site Map

Covenant University Repository

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Browse by Author

Please select a value to browse from the list below.

A | B-C | D | E | F-H | I-L | M-N | O | P-T | U-Z

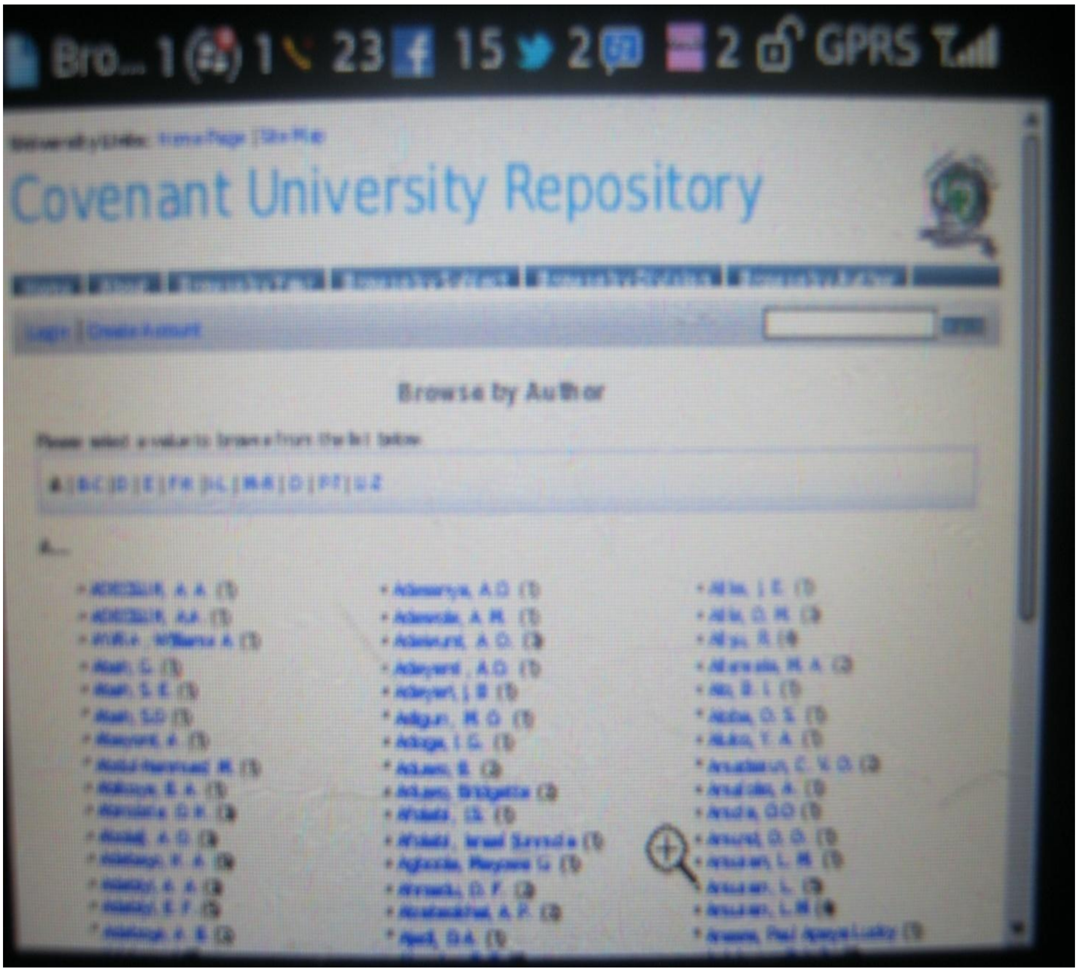
A...

- ADEOSUN, A. A. (1)
- ADEOSUN, A.A. (1)
- AYARA , Williams A. (1)
- Abah, G. (1)
- Abah, S. E. (1)
- Abah, S.O (1)
- Abayomi, A. (1)
- Abdul-Hammed, M. (1)
- Abikoye, B. A. (1)
- Abimbola, O. H. (3)
- Abolaji, A. O. (3)
- Adebayo, H. A. (9)
- Adebiyi, A. A. (3)
- Adebiyi, E. F. (5)
- Adeboye, A. B. (2)
- Adeboye, J (1)
- Adeboye, Omolara (1)
- Adedayo, K.D (1)
- Adediji, A. T. (1)
- Adeeyo, O.A. (1)
- Adefidipe, O. A. (1)
- Adegbaju, A. A. (1)
- Adegbenro, I. K. (1)

- Adesanya, A.O. (1)
- Adewole, A. M. (1)
- Adewumi, A. O. (3)
- Adeyemi , A.O. (1)
- Adeyeri, J. B (1)
- Adigun , M. O. (1)
- Adoga, I. G. (1)
- Aduwo, B. (2)
- Aduwo, Bridgette (2)
- Afolabi , I.S. (1)
- Afolabi , Israel Sunmola (1)
- Agboola, Mayowa G. (1)
- Ahmadu, O. F. (2)
- Aizebeokhai, A. P. (2)
- Ajadi, D.A. (1)
- Ajanaku, C. O (1)
- Ajanaku, K. O. (19)
- Ajani, O. O. (7)
- Ajani, Olayinka O. (13)
- Ajayi, F. (1)
- Ajayi, M. P. (3)
- Ajayi, O. O (1)
- Ajayi, Oluseyi. O (2)

- Alika, J. E. (1)
- Alile, O. M. (3)
- Aliyu, R. (4)
- Allensela, M. A. (2)
- Alo, B. I. (1)
- Aloba, O. S. (1)
- Aluko, Y. A. (1)
- Amadasun, C. V. O. (2)
- Ameloko, A. (1)
- Amole, O.O (1)
- Amund, O. O. (1)
- Amusan, L. M. (1)
- Amusan , L. (5)
- Amusan , L.M (4)
- Anawe, Paul Apeye Lucky (1)
- Anigbogu, Natalia (1)
- Anosike, Michael N. (2)
- Apata, O. O. (1)
- Arinola, Olajumoke K. (1)
- Arogunjo, A.M (1)
- Asakitikpi, A. E. (3)
- Atayero, A. A. (9)
- Atayero, AAA. (1)

Figure 4.29: Browsing an Item deposited in the Repository by Author (iPad)



Covenant University Repository

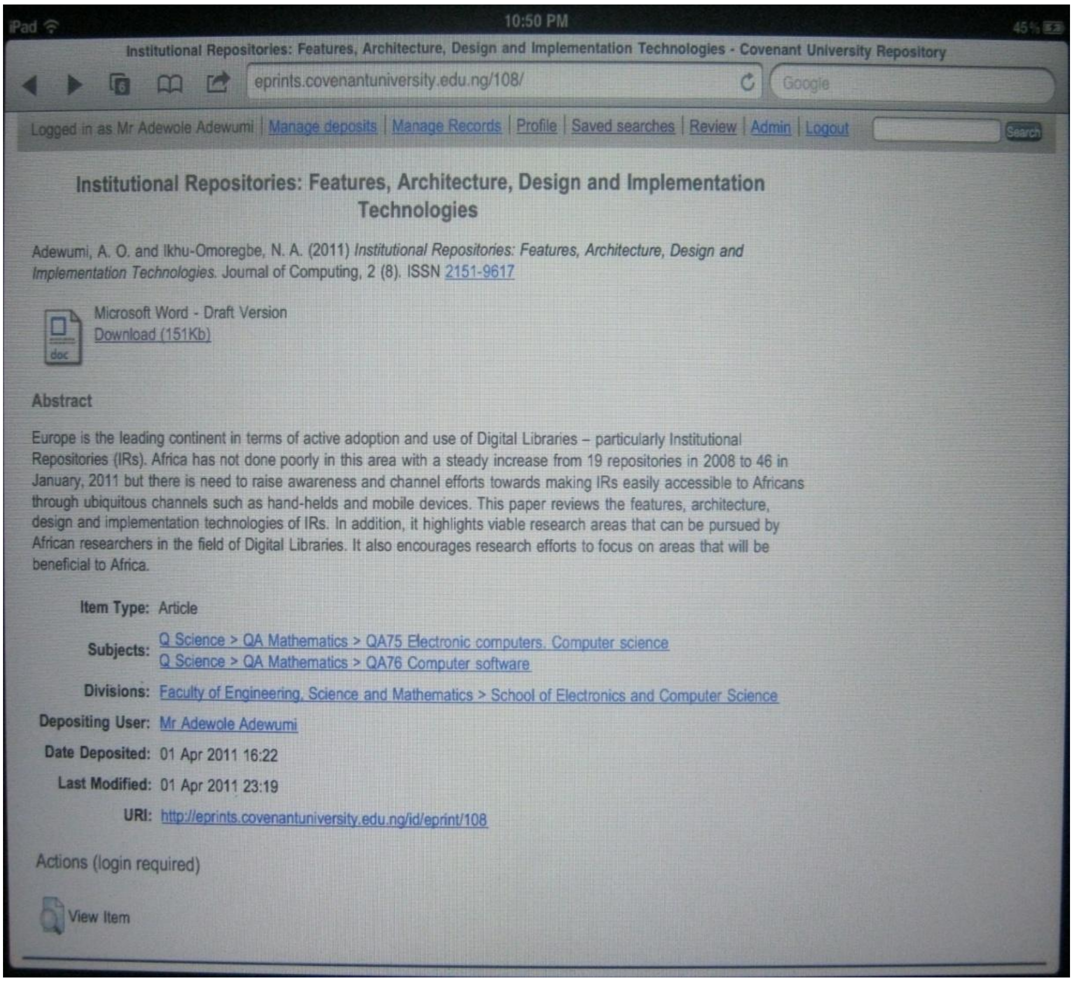
Browse by Author

Please select a value to browse from the list below.

Figure 4.30: Browsing an Item deposited in the Repository by Author (Blackberry phone)

4.3.8 Downloading an Item

After performing a search or using the browse functionality to locate a desired material; a download PDF icon appears beside the document which on clicking begins to download the document to a system or mobile device as the case may be. This feature was observed to take too much time to download on the Blackberry phone and the Android tablet. The iPad device however was able to download and display documents in the repository.


iPad
10:50 PM
45%
Institutional Repositories: Features, Architecture, Design and Implementation Technologies - Covenant University Repository
eprints.covenantuniversity.edu.ng/108/
Google
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Institutional Repositories: Features, Architecture, Design and Implementation Technologies

Adewumi, A. O. and Ikhu-Omoregbe, N. A. (2011) *Institutional Repositories: Features, Architecture, Design and Implementation Technologies.* Journal of Computing, 2 (8). ISSN 2151-9617

Microsoft Word - Draft Version
Download (151Kb)

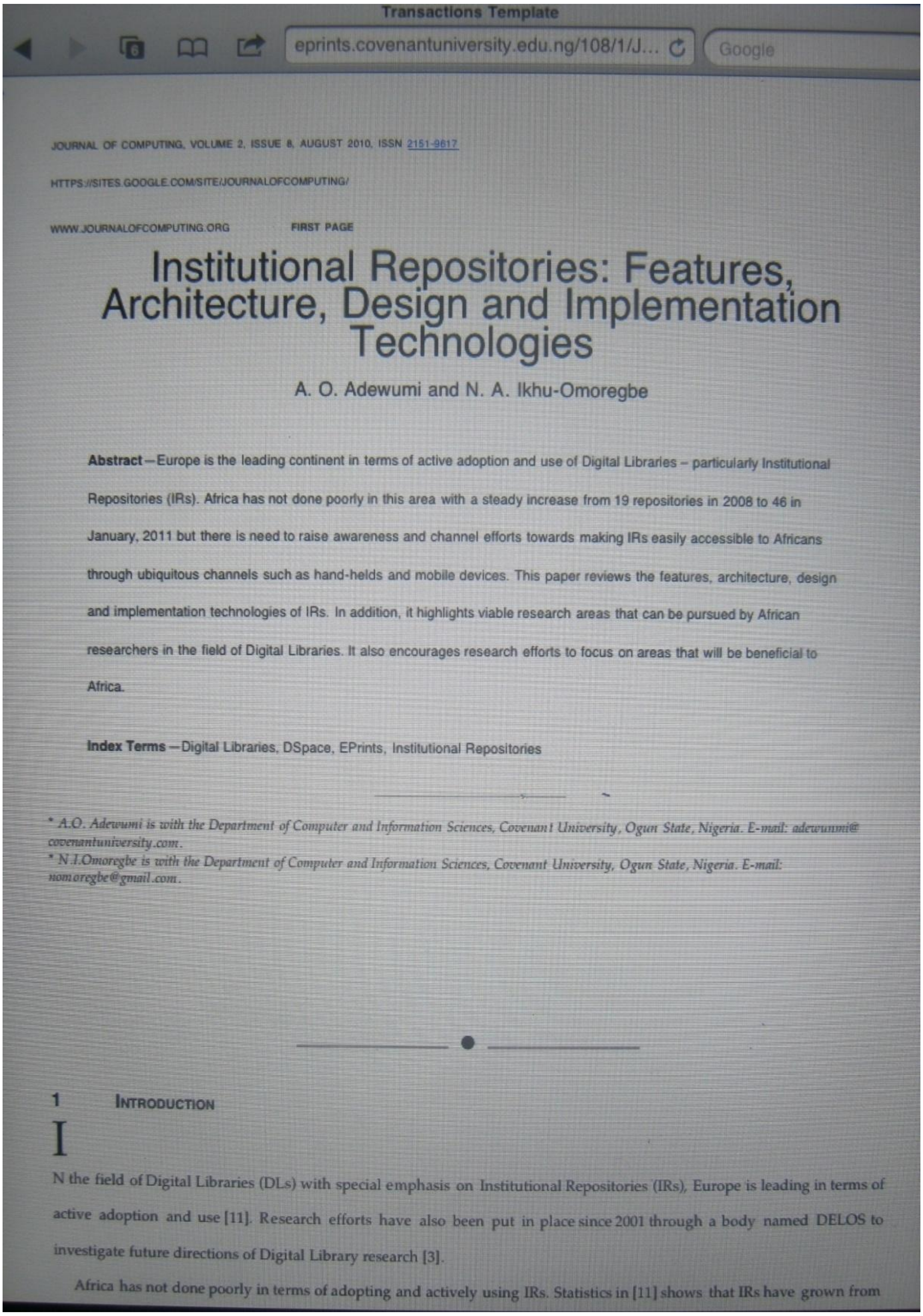
Abstract

Europe is the leading continent in terms of active adoption and use of Digital Libraries – particularly Institutional Repositories (IRs). Africa has not done poorly in this area with a steady increase from 19 repositories in 2008 to 46 in January, 2011 but there is need to raise awareness and channel efforts towards making IRs easily accessible to Africans through ubiquitous channels such as hand-helds and mobile devices. This paper reviews the features, architecture, design and implementation technologies of IRs. In addition, it highlights viable research areas that can be pursued by African researchers in the field of Digital Libraries. It also encourages research efforts to focus on areas that will be beneficial to Africa.

Item Type:	Article
Subjects:	Q Science > QA Mathematics > QA75 Electronic computers. Computer science Q Science > QA Mathematics > QA76 Computer software
Divisions:	Faculty of Engineering, Science and Mathematics > School of Electronics and Computer Science
Depositing User:	Mr Adewole Adewumi
Date Deposited:	01 Apr 2011 16:22
Last Modified:	01 Apr 2011 23:19
URI:	http://eprints.covenantuniversity.edu.ng/id/eprint/108

Actions (login required)

Figure 4.31: Download page of a Repository Item



JOURNAL OF COMPUTING, VOLUME 2, ISSUE 8, AUGUST 2010, ISSN 2151-9617

HTTPS://SITES.GOOGLE.COM/SITE/JOURNALOFCOMPUTING/

WWW.JOURNALOFCOMPUTING.ORG FIRST PAGE

Institutional Repositories: Features, Architecture, Design and Implementation Technologies

A. O. Adewumi and N. A. Ikhu-Omoregbe

Abstract—Europe is the leading continent in terms of active adoption and use of Digital Libraries – particularly Institutional Repositories (IRs). Africa has not done poorly in this area with a steady increase from 19 repositories in 2008 to 46 in January, 2011 but there is need to raise awareness and channel efforts towards making IRs easily accessible to Africans through ubiquitous channels such as hand-helds and mobile devices. This paper reviews the features, architecture, design and implementation technologies of IRs. In addition, it highlights viable research areas that can be pursued by African researchers in the field of Digital Libraries. It also encourages research efforts to focus on areas that will be beneficial to Africa.

Index Terms—Digital Libraries, DSpace, EPrints, Institutional Repositories

A.O. Adewumi is with the Department of Computer and Information Sciences, Covenant University, Ogun State, Nigeria. E-mail: adewumi@covenantuniversity.com.

** N.I.Omoregbe is with the Department of Computer and Information Sciences, Covenant University, Ogun State, Nigeria. E-mail: nomoregbe@gmail.com.*

1 INTRODUCTION

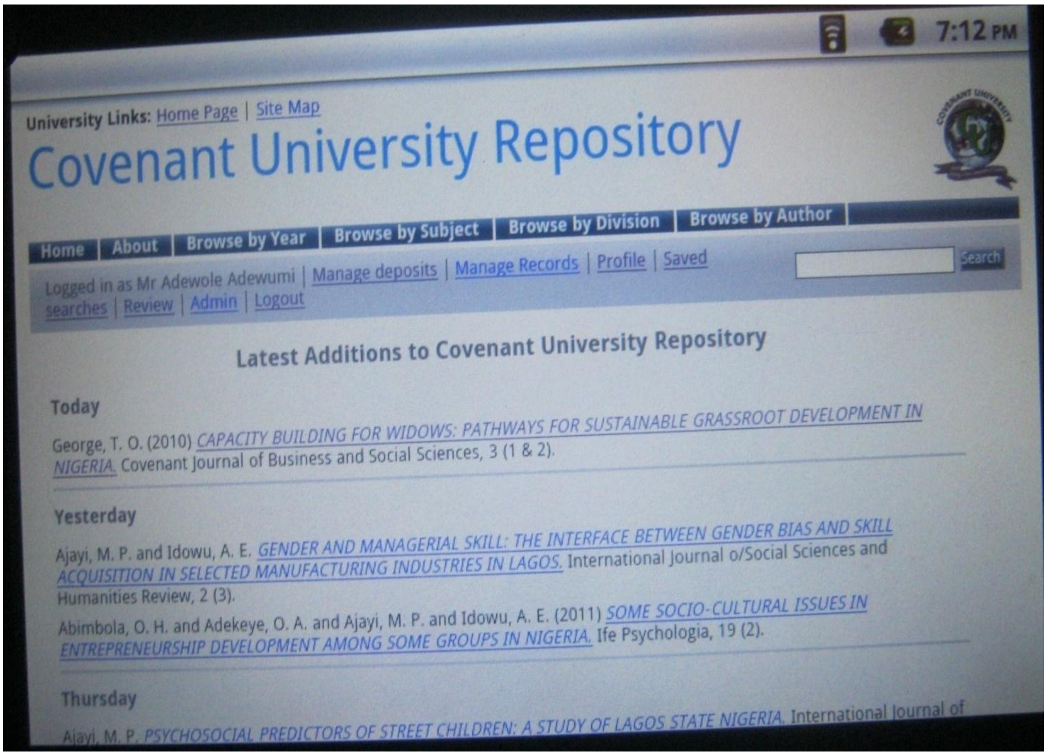
IN the field of Digital Libraries (DLs) with special emphasis on Institutional Repositories (IRs), Europe is leading in terms of active adoption and use [11]. Research efforts have also been put in place since 2001 through a body named DELOS to investigate future directions of Digital Library research [3].

Africa has not done poorly in terms of adopting and actively using IRs. Statistics in [11] shows that IRs have grown from

Figure 4.32: Screen Display when the download button is clicked in iPad

4.3.9 View Latest Additions

This is a link that can be found on the home page of the repository. It allows a user to view items that have just been recently deposited into the repository. The way it looks on the mobile platforms is as shown in Figure 4.33 – 4.35.


7:12 PM
University Links: Home Page | Site Map
Covenant University Repository
Home
About
Browse by Year
Browse by Subject
Browse by Division
Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Latest Additions to Covenant University Repository

Today

George, T. O. (2010) CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA. Covenant Journal of Business and Social Sciences, 3 (1 & 2).

Yesterday

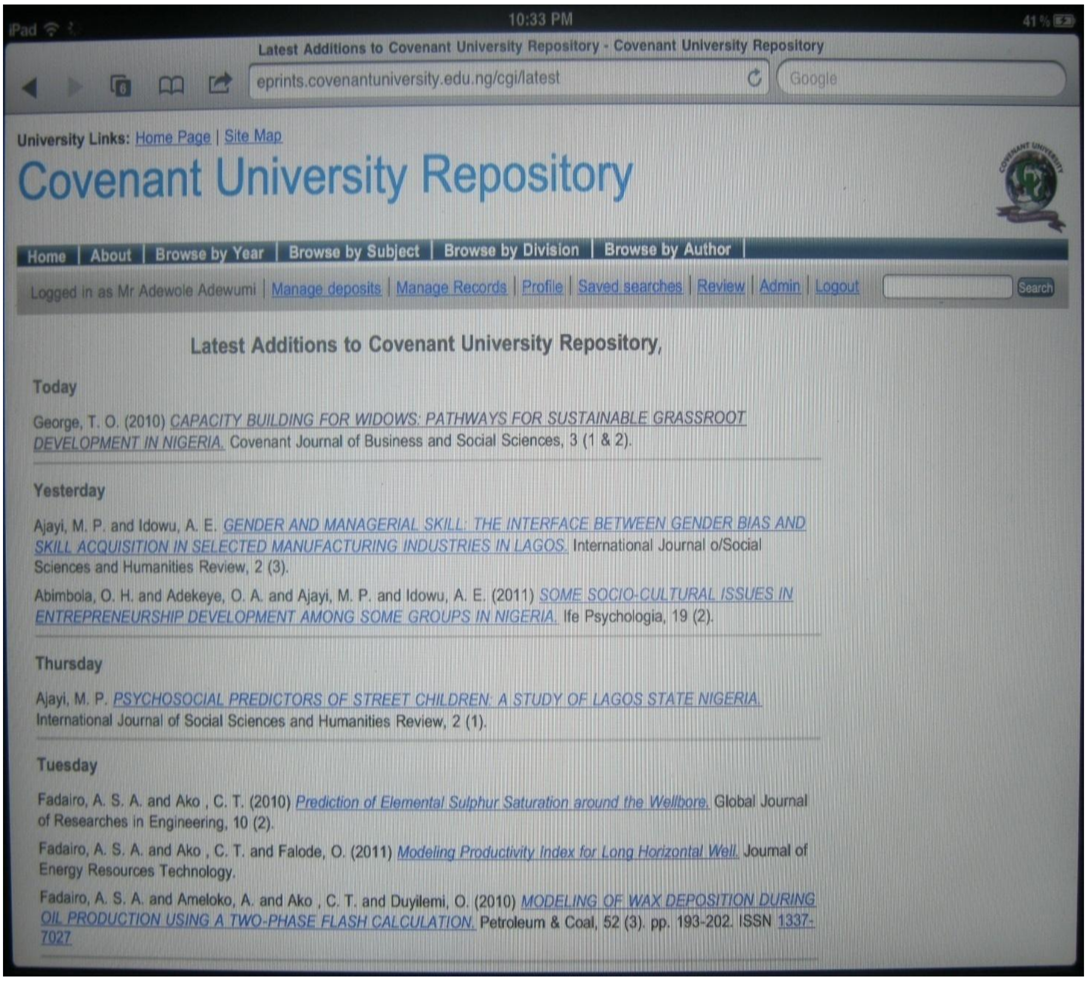
Ajayi, M. P. and Idowu, A. E. GENDER AND MANAGERIAL SKILL: THE INTERFACE BETWEEN GENDER BIAS AND SKILL ACQUISITION IN SELECTED MANUFACTURING INDUSTRIES IN LAGOS. International Journal o/Social Sciences and Humanities Review, 2 (3).

Abimbola, O. H. and Adekeye, O. A. and Ajayi, M. P. and Idowu, A. E. (2011) SOME SOCIO-CULTURAL ISSUES IN ENTREPRENEURSHIP DEVELOPMENT AMONG SOME GROUPS IN NIGERIA. Ife Psychologia, 19 (2).

Thursday

Ajayi, M. P. PSYCHOSOCIAL PREDICTORS OF STREET CHILDREN: A STUDY OF LAGOS STATE NIGERIA. International Journal of

Figure 4.33: Checking the Latest Additions to the Repository (Android Tablet)


iPad
10:33 PM
41 %
Latest Additions to Covenant University Repository - Covenant University Repository
eprints.covenantuniversity.edu.ng/cgi/latest
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Latest Additions to Covenant University Repository,

Today

George, T. O. (2010) CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA. Covenant Journal of Business and Social Sciences, 3 (1 & 2).

Yesterday

Ajayi, M. P. and Idowu, A. E. GENDER AND MANAGERIAL SKILL: THE INTERFACE BETWEEN GENDER BIAS AND SKILL ACQUISITION IN SELECTED MANUFACTURING INDUSTRIES IN LAGOS. International Journal o/Social Sciences and Humanities Review, 2 (3).

Abimbola, O. H. and Adekeye, O. A. and Ajayi, M. P. and Idowu, A. E. (2011) SOME SOCIO-CULTURAL ISSUES IN ENTREPRENEURSHIP DEVELOPMENT AMONG SOME GROUPS IN NIGERIA. Ife Psychologia, 19 (2).

Thursday

Ajayi, M. P. PSYCHOSOCIAL PREDICTORS OF STREET CHILDREN: A STUDY OF LAGOS STATE NIGERIA. International Journal of Social Sciences and Humanities Review, 2 (1).

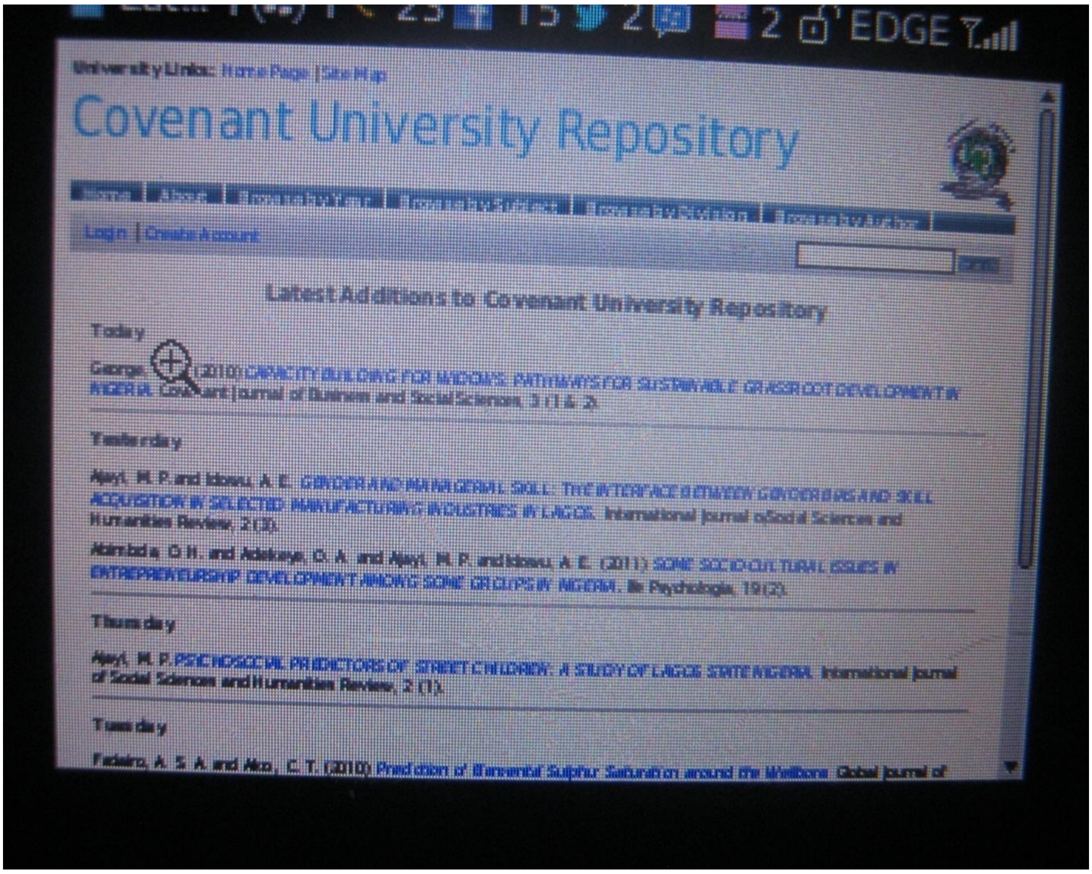
Tuesday

Fadairo, A. S. A. and Ako , C. T. (2010) Prediction of Elemental Sulphur Saturation around the Wellbore. Global Journal of Researches in Engineering, 10 (2).

Fadairo, A. S. A. and Ako , C. T. and Falode, O. (2011) Modeling Productivity Index for Long Horizontal Well. Journal of Energy Resources Technology.

Fadairo, A. S. A. and Ameloko, A. and Ako , C. T. and Duyilemi, O. (2010) MODELING OF WAX DEPOSITION DURING OIL PRODUCTION USING A TWO-PHASE FLASH CALCULATION. Petroleum & Coal, 52 (3). pp. 193-202. ISSN 1337-7027

Figure 4.34: Checking the Latest Additions to the Repository (iPad)



University Links: Home Page | Site Map

Covenant University Repository

Login | Create Account

Latest Additions to Covenant University Repository

Today

George, (2010) CAPACITY BUILDING FOR WIDOWS: PATHWAYS FOR SUSTAINABLE GRASSROOT DEVELOPMENT IN NIGERIA. Covenant Journal of Business and Social Sciences, 3 (1 & 2).

Yesterday

Ajayi, M. P. and Idowu, A. E. GENDER AND MANAGERIAL SKILL: THE INTERFACE BETWEEN GENDER BIAS AND SKILL ACQUISITION IN SELECTED MANUFACTURING INDUSTRIES IN LAGOS. International Journal oSocial Sciences and Humanities Review, 2 (3).

Akinbola, O. H. and Adekeye, O. A. and Ajayi, M. P. and Idowu, A. E. (2011) SOME SOCIO-CULTURAL ISSUES IN ENTREPRENEURSHIP DEVELOPMENT AMONG SOME GROUPS IN NIGERIA. Ife Psychologia, 19 (2).

Thursday

Ajayi, M. P. PSYCHOSOCIAL PREDICTORS OF STREET CHILDREN: A STUDY OF LAGOS STATE NIGERIA. International Journal of Social Sciences and Humanities Review, 2 (1).

Tuesday

Fadairo, A. S. A. and Ako, C. T. (2010) Prediction of Elemental Sulphur Saturation around the Wellbore. Global Journal of

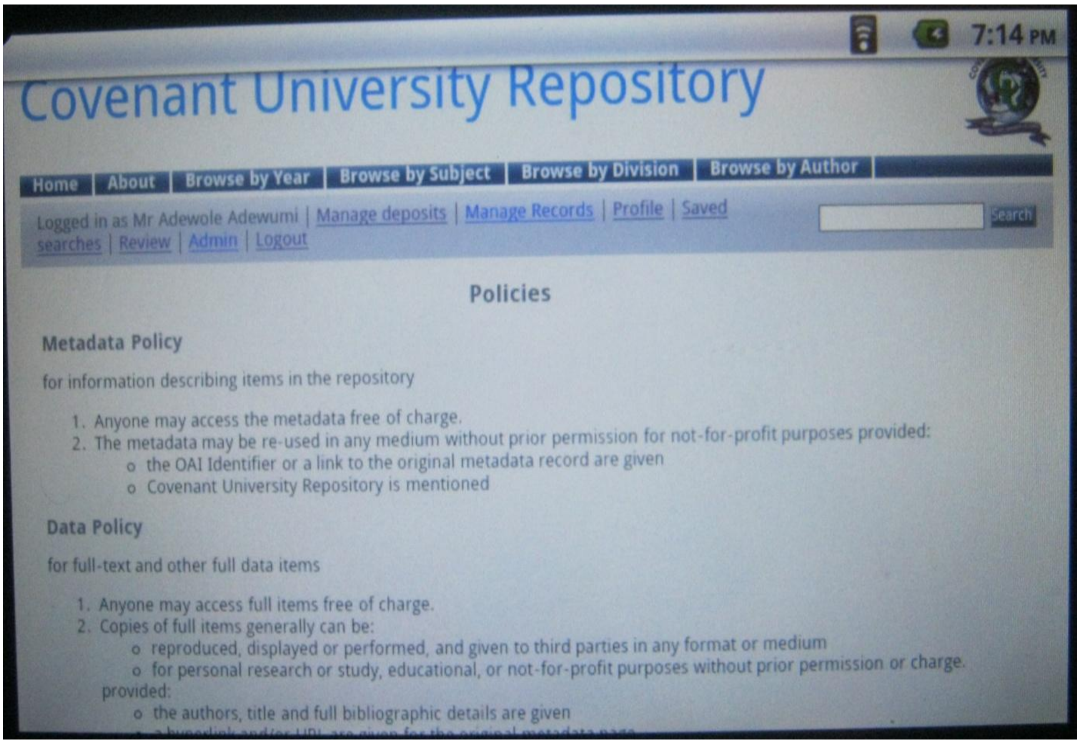
Figure 4.35: Checking the Latest Additions to the Repository (Blackberry phone)

4.3.10 Subscribe to feeds

This allows a user to subscribe to feeds from the repository. It is such that notification is sent to the user every time a new item is deposited into the repository.

4.3.11 View Repository Policies

The Repository Policy clearly states the institutions position on issues such as metadata, data, content, submission and preservation of content. When viewed from mobile devices, it is as shown in Figure 4.36 – 4.38.



7:14 PM
Covenant University Repository
Home
About
Browse by Year
Browse by Subject
Browse by Division
Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Policies

Metadata Policy

for information describing items in the repository

1. Anyone may access the metadata free of charge.
2. The metadata may be re-used in any medium without prior permission for not-for-profit purposes provided:
   - the OAI Identifier or a link to the original metadata record are given
   - Covenant University Repository is mentioned

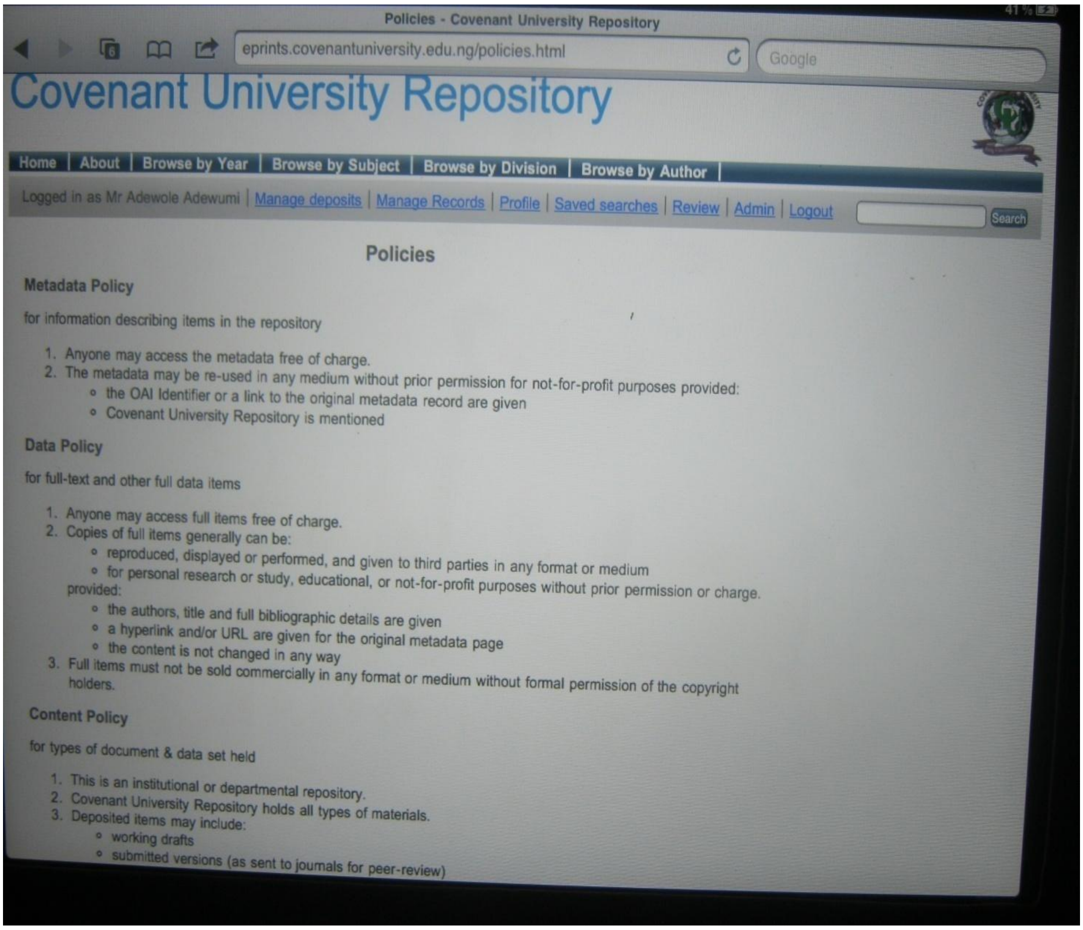
Data Policy

for full-text and other full data items

1. Anyone may access full items free of charge.
2. Copies of full items generally can be:
   - reproduced, displayed or performed, and given to third parties in any format or medium
   - for personal research or study, educational, or not-for-profit purposes without prior permission or charge.

   provided:
   - the authors, title and full bibliographic details are given
   - a hyperlink and/or URL are given for the original metadata page

Figure 4.36: Viewing the Repository Policies (Android Tablet)


Policies - Covenant University Repository
eprints.covenantuniversity.edu.ng/policies.html
Google
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search

Policies

Metadata Policy

for information describing items in the repository

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Data Policy

for full-text and other full data items

1. Anyone may access full items free of charge.
2. Copies of full items generally can be:
   - reproduced, displayed or performed, and given to third parties in any format or medium
   - for personal research or study, educational, or not-for-profit purposes without prior permission or charge.

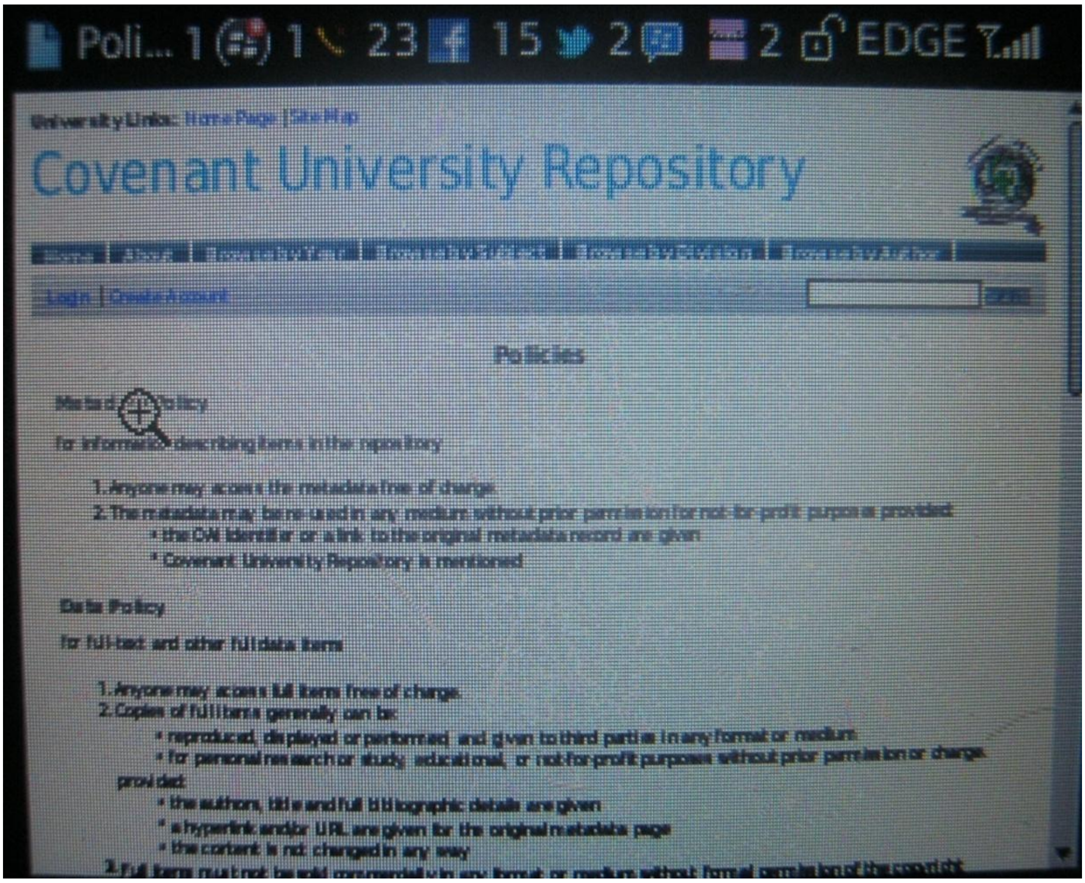
   provided:
   - the authors, title and full bibliographic details are given
   - a hyperlink and/or URL are given for the original metadata page
   - the content is not changed in any way
3. Full items must not be sold commercially in any format or medium without formal permission of the copyright holders.

Content Policy

for types of document & data set held

1. This is an institutional or departmental repository.
2. Covenant University Repository holds all types of materials.
3. Deposited items may include:
   - working drafts
   - submitted versions (as sent to journals for peer-review)

Figure 4.37: Viewing the Repository Policies (iPad)


Poli... 1 1 23 15 2 2 EDGE
University Links: Home Page | Site Map
Covenant University Repository
Login | Create Account

Policies

Metadata Policy

for information describing items in the repository

1. Anyone may access the metadata free of charge.
2. The metadata may be re-used in any medium without prior permission for not-for-profit purposes provided:
   - the OAI Identifier or a link to the original metadata record are given
   - Covenant University Repository is mentioned

Data Policy

for full-text and other full data items

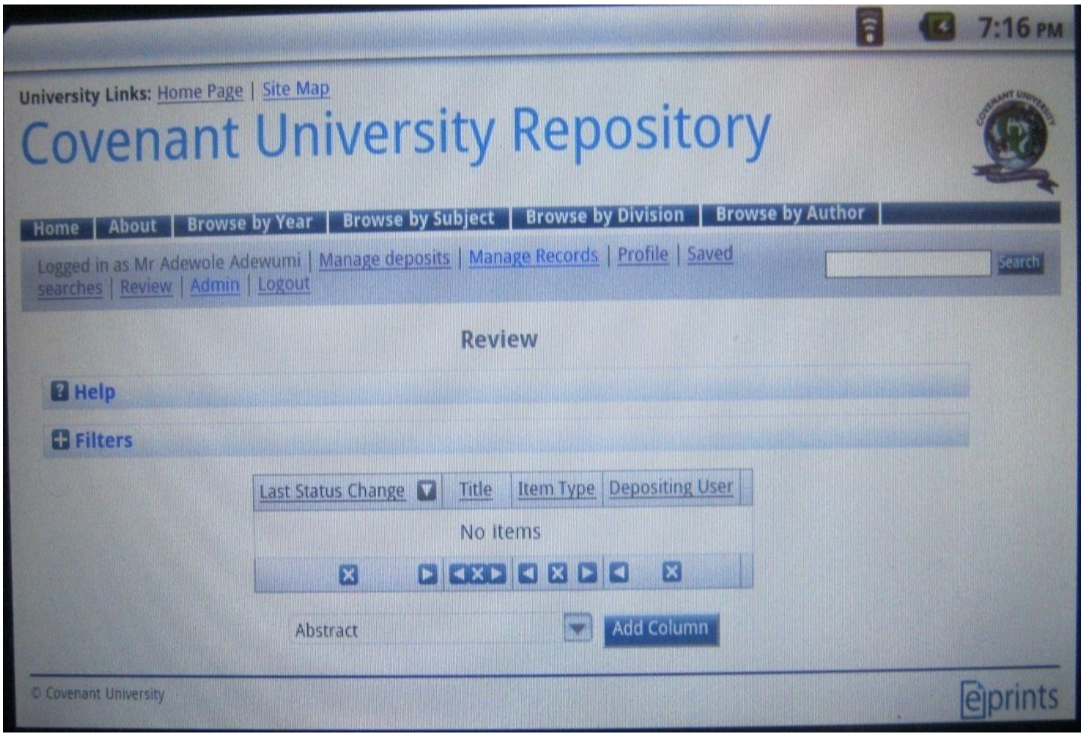
1. Anyone may access full items free of charge.
2. Copies of full items generally can be:
   - reproduced, displayed or performed, and given to third parties in any format or medium
   - for personal research or study, educational, or not-for-profit purposes without prior permission or charge.

   provided:
   - the authors, title and full bibliographic details are given
   - a hyperlink and/or URL are given for the original metadata page
   - the content is not changed in any way
3. Full items must not be sold commercially in any format or medium without formal permission of the copyright

Figure 4.38: Viewing the Repository Policies (Blackberry phone)

4.3.12 Review an Item

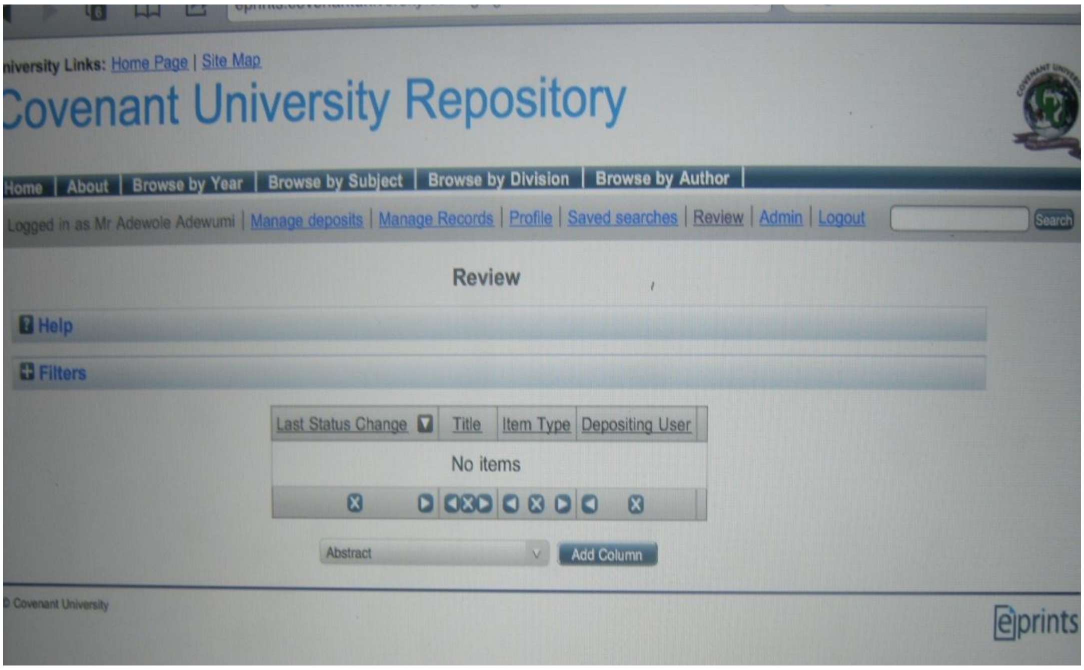
Only users with *editor* privilege are allowed to review items before they are finally accepted into the repository. The review page as viewed on mobile browsers is as shown in Figure 4.39 and 4.40.


7:16 PM
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Review
Help
Filters
Abstract
Add Column
© Covenant University
eprints

Logged in as Mr Adewole Adewumi

Last Status Change	Title	Item Type	Depositing User
No Items			

Figure 4.39: Reviewing an Item in the Repository (Android Tablet)


niversity Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Review
Help
Filters
Abstract
Add Column
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eprints

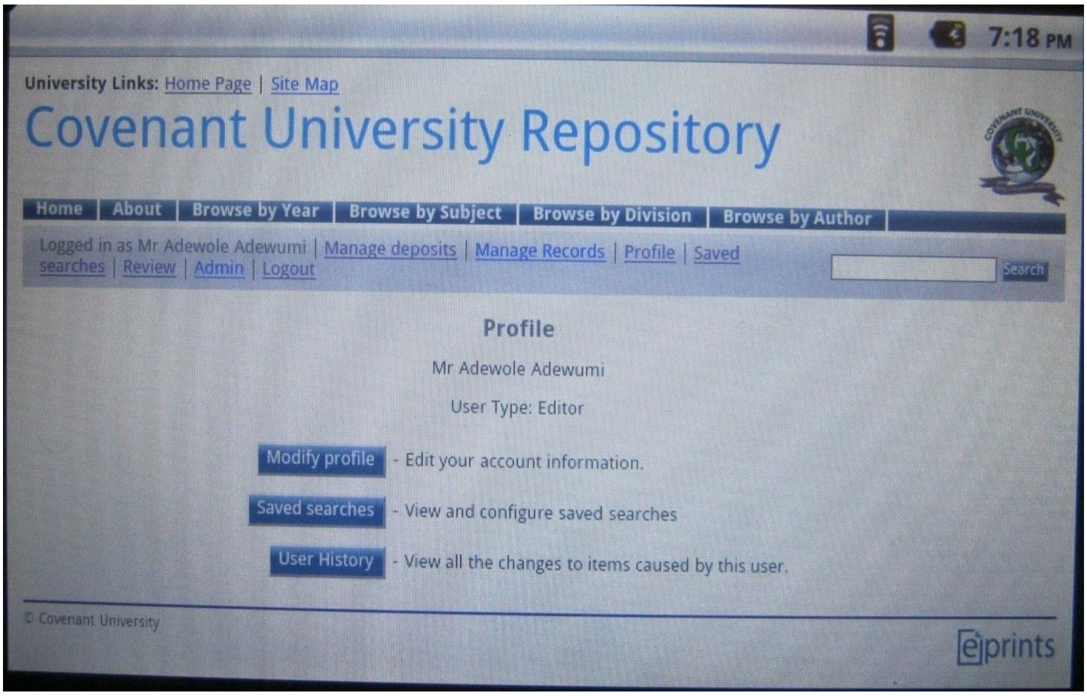
Logged in as Mr Adewole Adewumi

Last Status Change	Title	Item Type	Depositing User
No items			

Figure 4.40: Reviewing an Item in the Repository (iPad)

4.3.13 Modify Profile

This functionality allows a user to modify his/her profile on the repository. The sections under this include the account details, personal details and editorial alerts.



Covenant University Repository

Logged in as Mr Adewole Adewumi

Profile

Mr Adewole Adewumi

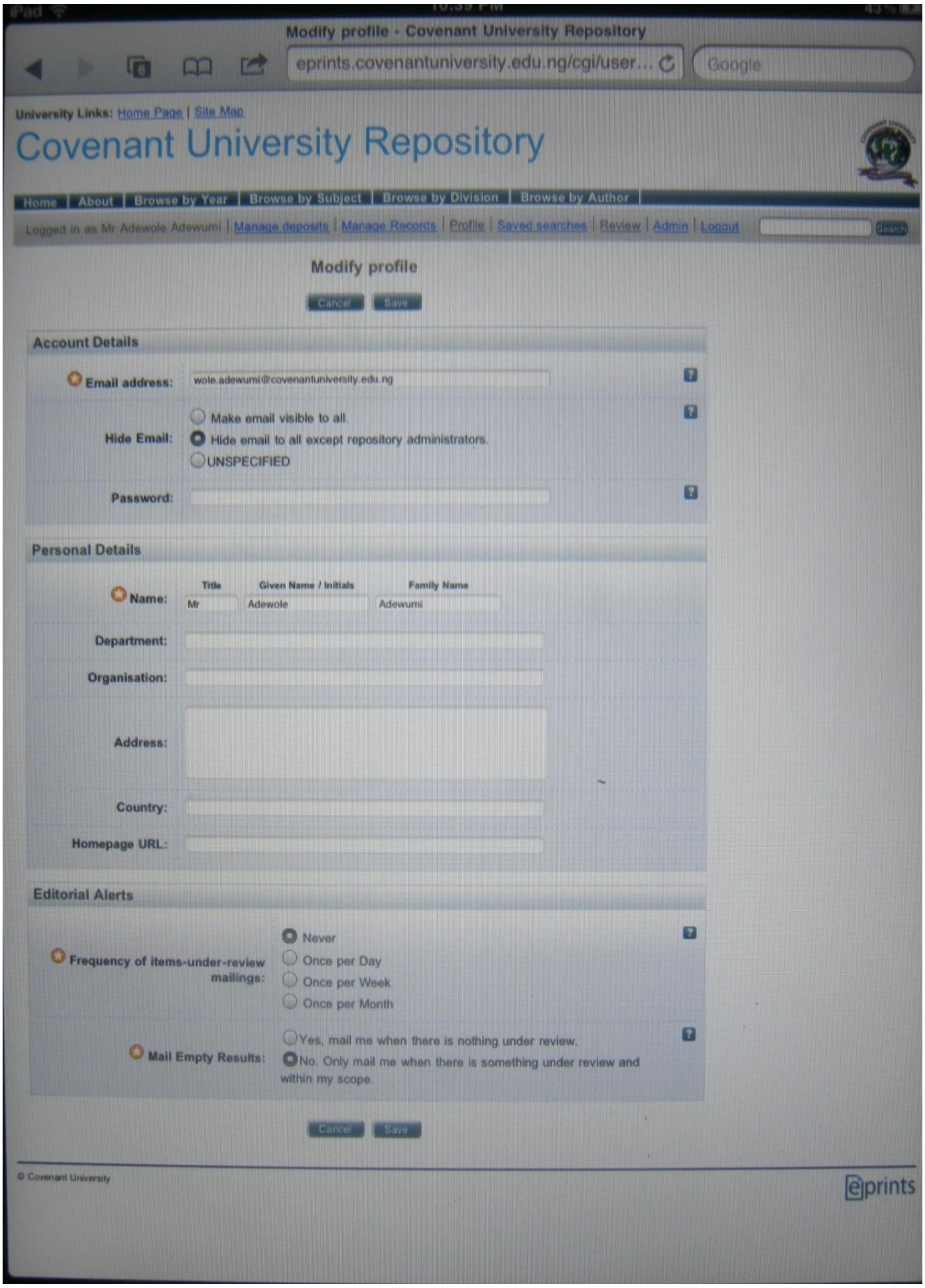
User Type: Editor

Modify profile - Edit your account information.

Saved searches - View and configure saved searches

User History - View all the changes to items caused by this user.

Figure 4.41: Modifying a user profile in the Repository (Android Tablet)


iPad
Modify profile - Covenant University Repository
eprints.covenantuniversity.edu.ng/cgi/user...
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout
Search
Cancel
Save
Cancel
Save
© Covenant University
eprints

Modify profile

Account Details

Email address: wole.adewumi@covenantuniversity.edu.ng

Hide Email: ○ Make email visible to all. ● Hide email to all except repository administrators. ○ UNSPECIFIED

Password:

Personal Details

	Title	Given Name / Initials	Family Name
Name:	Mr	Adewole	Adewumi

Department:

Organisation:

Address:

Country:

Homepage URL:

Editorial Alerts

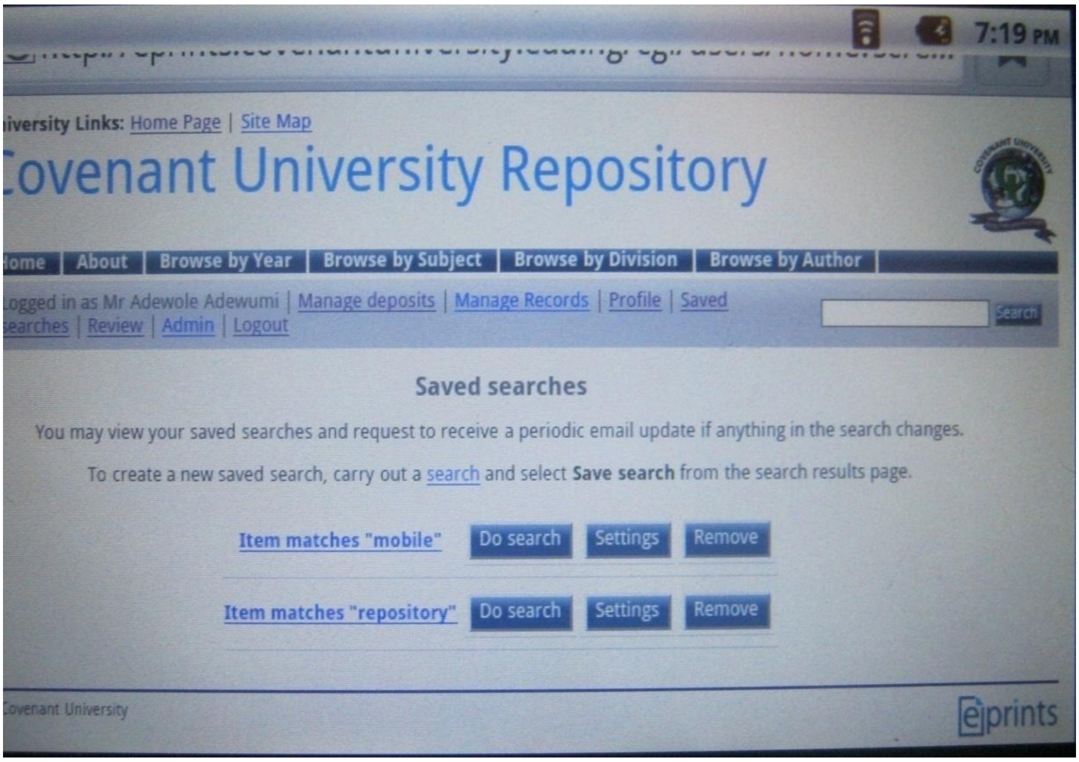
Frequency of items-under-review mailings: ● Never ○ Once per Day ○ Once per Week ○ Once per Month

Mail Empty Results: ○ Yes, mail me when there is nothing under review. ● No. Only mail me when there is something under review and within my scope.

Figure 4.42: Modifying a user profile in the Repository (iPad)

4.3.14 Saved Search

This allows a user to save a search keyword that returned results that the user finds interesting and may want to return to.


7:19 PM
iversity Links: Home Page | Site Map
ovenant University Repository
ome | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Search
Do search
Settings
Remove
eprints

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Saved searches

You may view your saved searches and request to receive a periodic email update if anything in the search changes.

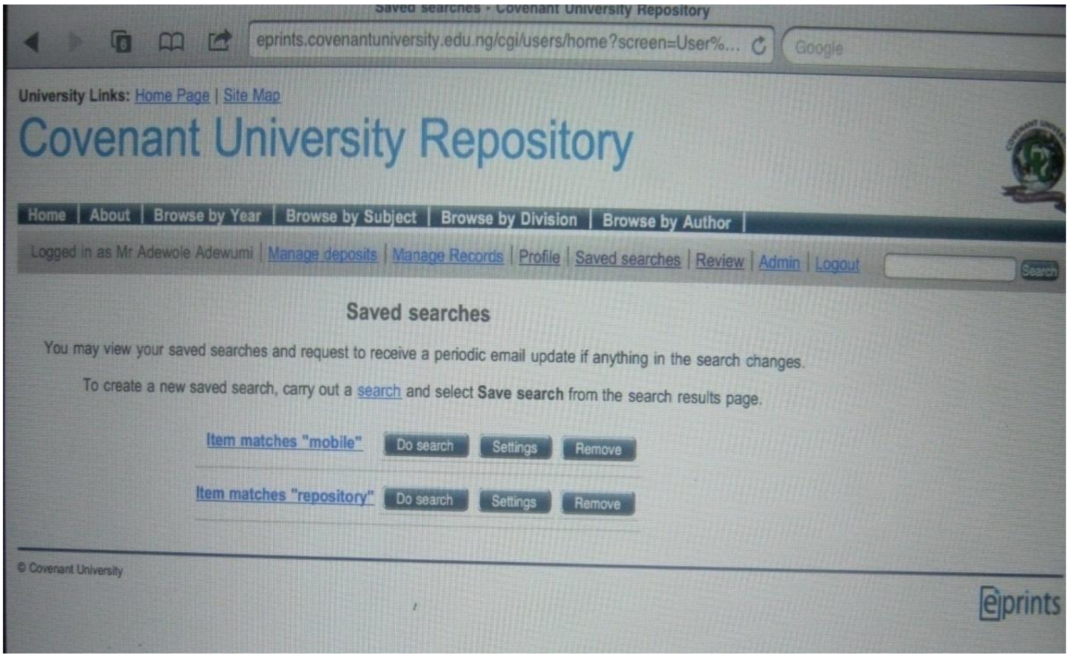
To create a new saved search, carry out a search and select **Save search** from the search results page.

Item matches "mobile" Do search Settings Remove

Item matches "repository" Do search Settings Remove

ovenant University

Figure 4.43: Viewing saved searches in the Repository (Android Tablet)


Saved searches - Covenant University Repository
eprints.covenantuniversity.edu.ng/cgi/users/home?screen=User%...
Google
University Links: Home Page | Site Map
Covenant University Repository
Home | About | Browse by Year | Browse by Subject | Browse by Division | Browse by Author
Search
Do search
Settings
Remove
eprints

Logged in as Mr Adewole Adewumi | Manage deposits | Manage Records | Profile | Saved searches | Review | Admin | Logout

Saved searches

You may view your saved searches and request to receive a periodic email update if anything in the search changes.

To create a new saved search, carry out a search and select **Save search** from the search results page.

Item matches "mobile" Do search Settings Remove

Item matches "repository" Do search Settings Remove

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Figure 4.44: Viewing saved searches in the Repository (iPad)

4.4 EXPERIMENT FINDINGS

After testing the repository's functionality on the mobile platforms mentioned, the findings are summarised in Table 4.2:

Table 4.2 Summary of Experimental Results

Repository Functionality	Nokia Phone	Android Tablet/Phone	iPad	iPod Touch	Blackberry Phone
Create Account	√	√	√	√	√
Login	X	√	√	√	X
Deposit Item	X	√	X	√	X
Download Item	√	X	√	√	X
Search an Item	√	√	√	√	√
Browse Item	√	√	√	√	√
View Latest Additions	√	√	√	√	√
View Repository Policies	√	√	√	√	√
Review an Item	X	√	√	√	X
Modify Profile	X	√	√	√	X
Save Search	X	√	√	√	X

Legend

√ - Functionality can be accessed via a mobile device

X - Functionality cannot be accessed via a mobile device

4.5 USABILITY EVALUATION OF THE REPOSITORY ON MOBILE PLATFORMS

According to the ISO 9241-11 standard, usability refers to “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ITU, 2005).

4.5.1 Usability Evaluation Attributes

In order to evaluate the usability of the Covenant University Repository, some usability factors were considered as given in (Ikhu-Omoregbe, 2007) (IS&T, 2012) (Odusote, 2011). They are as follows:

- Simplicity: How easy it is for users to understand and use the repository
- Navigation: How easy it is to navigate the repository
- Memorability: When users return to the design after a period of not using it, how easily can they re-establish proficiency?
- Hypertext Structure: How well structured information about the repository’s features are
- Satisfaction: The satisfaction of its users in its ability to complete tasks in a few steps thereby saving time
- Consistency: The extent to which the layout remains unchanged when navigating from one page to another
- Completeness: The extent to which users are satisfied with the basic features of the repository and the appropriateness of the error messages prompted during errors
- Self Evidence: The level to which the repository tabs and links are descriptive and self informing to a user

The questionnaire consists of two parts. The first part captured the category of the would-be participants (staff and students) and their experience with mobile devices. The second section captured information on the participants' perception of the repository based on each of the usability factors earlier highlighted. The questionnaire asked participants to indicate the degree of agreement with each item. Participants interacted with the repository via web capable mobile devices. The administrator of the questionnaire only intervened when a participant indicated s/he was done or could not follow the process to conclusion. The questionnaires were administered immediately after each task to improve the accuracy.

All data were collected using a five point scale from "1", being "Strongly Disagree" to "5" being "Strongly Agree".

Participants

An institutional repository as the name implies is limited in scope to an institution - in this case a University, Covenant University. A total of 20 persons participated in the usability study. This is the prescribed number of participants required for such a study as given by (Faulkner, 2003). The participants comprise of staff and students of Covenant University.

4.5.2 Data Analysis

The statistics showing the rate of experience/skill of the participants in the use of computer software is given in Table 4.3. It reveals that the would-be users of the repository have at least average experience/skill in the use of computer software.

Table 4.3: Skill of Participants in the use of software

	No. of Participants	Novice	Average	Good	Expert
Level of experience/skill in the use of computer software	19	0%	5.26%	52.63%	42.12%

The statistics showing the devices used by the participants to enhance their work is given in Table 4.4. By interpretation, none of the respondents used a Personal Digital Assistant and/or a Mobile Phone in enhancing their work. In addition, most of the respondents use a laptop to enhance their work.

Table 4.4: Devices used by the Participants to enhance their work

	No. of Participants	Laptop/Notebook	Personal Digital Assistant/Mobile Phone	Tablet PC	Desktop PC	iPod
Devices used to enhance work	19	94.74%	5.26%	10.53%	10.53%	5.26%

The statistics showing the kind of device used by users to access the repository is given in Table 4.5.

Table 4.5: Devices used to access the repository

	No. of participants	Android	Blackberry	iPad	iPod	Laptop
Devices used to access the repository	19	10	3	1	1	5
		52.63%	15.79%	5.26%	5.26%	26.32%

For all the participants, an overall score was computed for each of the usability dimension by averaging all the ratings on the questionnaire that was used. The Statistical Package for Social Sciences (SPSS) was used to generate the frequency distribution, mean and standard deviations and all the relevant charts for all the ratings.

Table 4.6: Descriptive Statistical Analysis of Questionnaire Data

Usability Attributes	Mean Rating	Standard Deviation	Variance
Simplicity	4.55	.484	.234
Navigation	4.30	.616	.379
Memorability	4.40	.447	.200
Hypertext Structure	4.40	.503	.253
Satisfaction	4.18	.694	.481
Consistency	4.40	.575	.332
Completeness	4.25	.618	.382
Self Evidence	4.45	.484	.234

Reliability Test

The reliability estimates from the data bank were calculated. Reliability and convergent validity was estimated by Cronbach's alpha and produced a result of 0.771 which is above 0.7 recommended by (Sauro and Kindlund, 2005). This is an indication of the questionnaire's reliability. Cronbach's Alpha coefficient theoretical maximum is usually defined as 1.0. The reliability statistics and the Cronbach's alpha value are shown in Table 4.7 and Table 4.8 respectively.

Reliability Statistics

Table 4.7: SPSS Test Cases

	N	%
Valid	20	100.0
Excluded(a)	0	.0
Total	20	100.0

Table 4.8: Cronbach's Alpha

Cronbach's Alpha	N of Items
.771	8

4.5.3 Discussion

The score of the usability attributes as collected from the respondents is discussed as follows:

a) Simplicity

The mean rating for this attribute was 4.55. This indicates that the users found the repository easy to use and understand. The frequency graph is as shown in Figure 4.45.

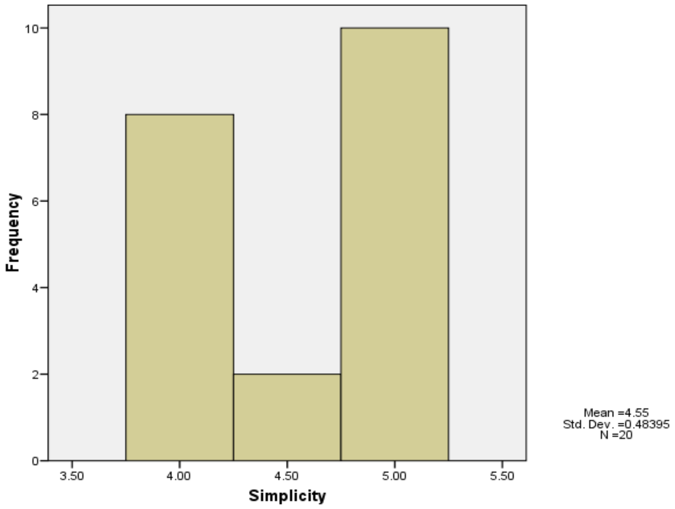

Figure 4.45: Simplicity Analysis

b) Navigation

The rating for "Navigation" indicates that, many of the users did not have difficulties with navigating the repository as indicated in Figure 4.46 with a mean rating of 4.30.

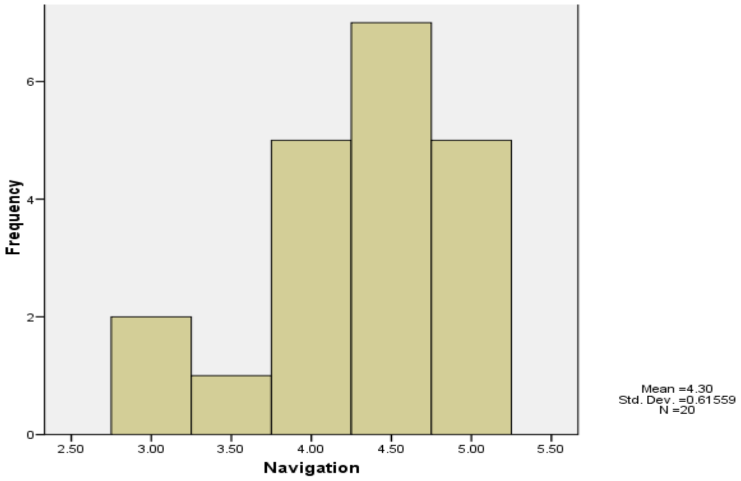

Figure 4.46: Navigation Analysis

c) Memorability

Memorability is an attribute that could be influenced by the frequency of visits to the repository. It was measured by asking the participants to revisit the repository and try to recall how to perform the basic functions in the repository after a period of one week. Its mean rating of 4.40 is shown in Figure 4.47

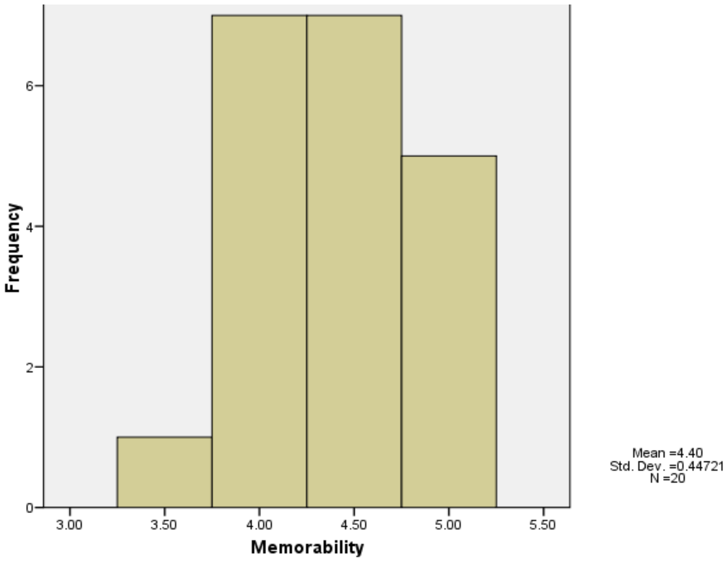

Figure 4.47: Memorability Analysis

d） Hypertext Structure

The mean rating of 4.40 for “Hypertext Structure” shows that most of the respondents found the repository to be well structured and that there were active links to the various repository functions and features. This is shown in Figure 4.48.

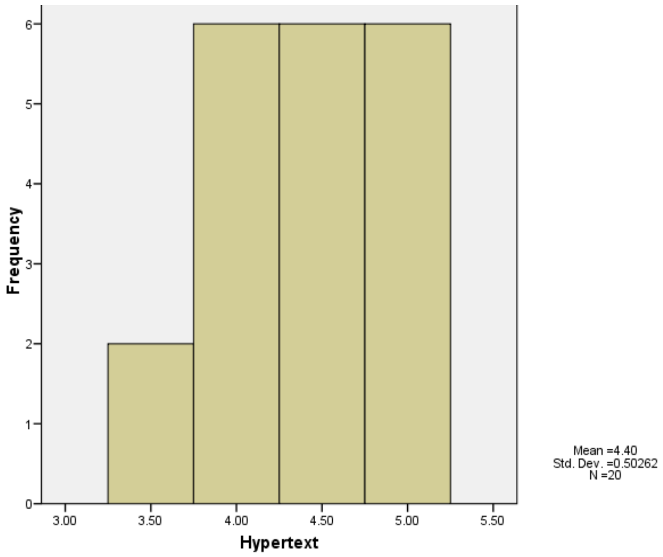

Figure 4.48: Hypertext Structure Analysis

e）Satisfaction

Most of the respondents were of the opinion that the repository required few steps to complete any task thereby saving time. The mean rating was 4.18 and this is shown in Figure 4.49.

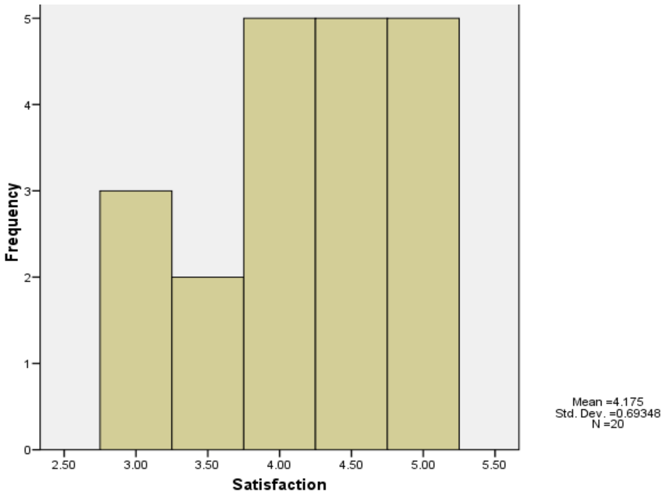

Figure 4.49: Satisfaction Analysis

f）Consistency

A number of the respondents were of the opinion that the repository had a good layout that was consistent as they navigated from one page to the other. The mean rating is given as 4.40. This is as shown in Figure 4.50.

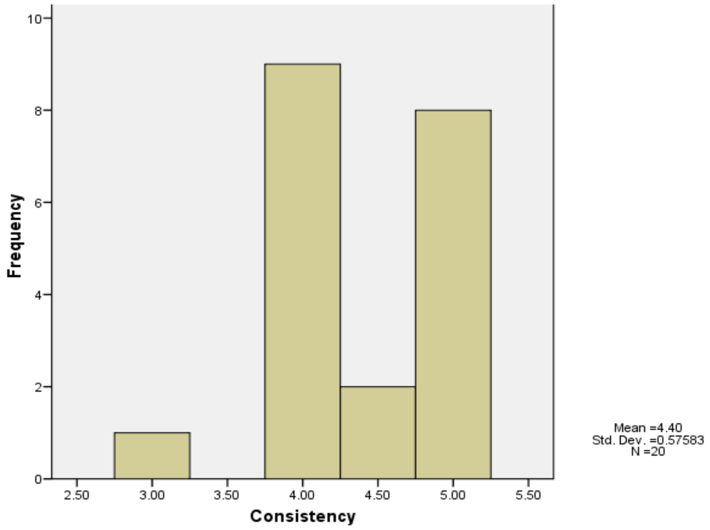

Figure 4.50: Consistency Analysis

g）Completeness

The mean rating for "Completeness" attribute was 4.25. This indicates that a number of the respondents were satisfied with the basic features of the repository. This is shown in Figure 4.51

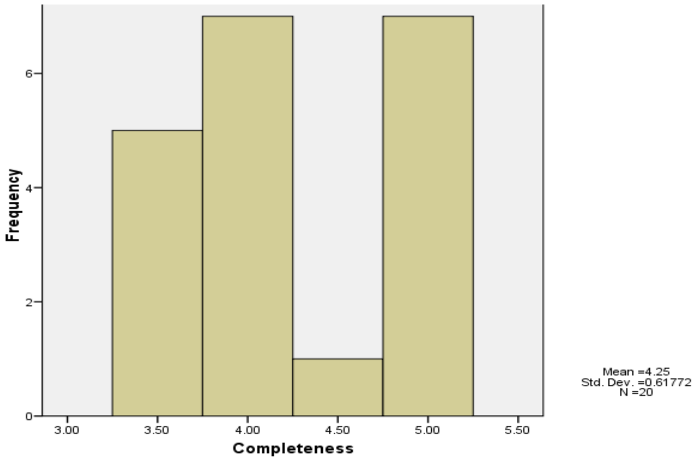

Figure 4.51: Completeness Analysis

h） Self-Evidence

The mean rating for “Self Evidence” was 4.45. This indicates that the repository was found to contain tabs and links to important information and pages. Such tabs, buttons and links on the repository were self informing. This is shown in Figure 4.52.

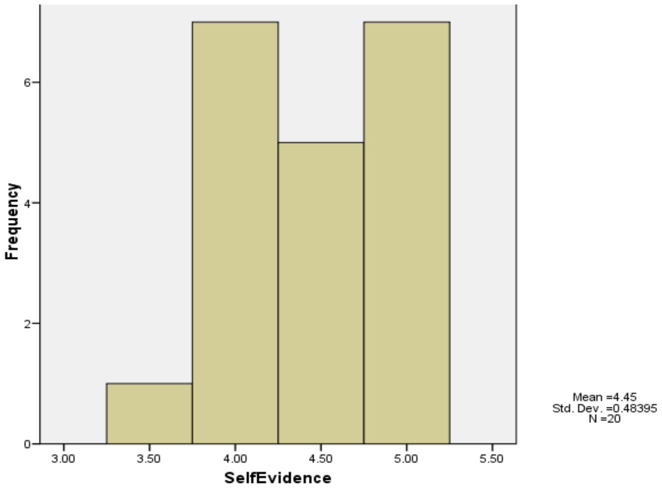

Figure 4.52: Self Evidence Analysis

Numerous usability studies suggest that system with “Good Usability” should have a mean rating of 4 on a 1-5 scale and 5.6 on a 1-7 scale (Sauro and Kindlund, 2005). We adopted the approach of a 1-5 scale, and conclude that the repository had a "Good Usability" on mobile devices based on the following mean ratings of the given usability attributes, shown in Table 4.9.

Table 4.9: Usability Attribute Ratings

Usability Attributes	**Mean Rating**
Simplicity	4.55
Navigation	4.30
Memorability	4.40
Hypertext Structure	4.40
Satisfaction	4.18
Consistency	4.40
Completeness	4.25
Self Evidence	4.45

CHAPTER FIVE

SUMMARY AND CONCLUSION

This chapter summarizes the contributions of this dissertation and highlights some areas for future study. The dissertation investigated usability of Covenant University Repository on mobile devices.

5.1 SUMMARY

Through this research we have been able to:

1. Model the core functionalities of an institutional repository using the Unified Modelling Language. Specifically, use cases, collaboration diagrams, sequence diagrams, class diagrams were used to achieve this.

2. Build and deploy an institutional repository for Covenant University by leveraging on open source institutional repository software – EPrints.

3. Test the core functionalities of the institutional repository on various mobile devices.

4. Evaluate the usability of the institutional repository on various mobile devices. It was found out that the repository had a good usability on mobile devices.

5.2 CONCLUSION

This research work has succeeded in demonstrating the usability of the core functionalities of an Institutional Repository on mobile devices taking Covenant University Repository as case study.

The repository’s core functionalities which include: content upload, content download, content searching and content browsing were formally analyzed and measured using the usability dimensions given by (IS&T, 2012) and found to have a “good usability” by the would-be users of the repository.

5.3 SCOPE FOR FURTHER WORK

This research was able to show that usability of Institutional Repository on mobile devices had a good score but to extend the work further some areas of future research are discussed in the paragraph that follows:

A mobile version of the repository can be developed for the array of mobile devices available. Furthermore, the Covenant University Repository does not implement single-sign-on and so users are burdened with the task of remembering too many passwords which include the Covenant University email password, the Covenant University Website profile password, Face book profile account to mention a few. Single-sign-on could be implemented to help reduce the number of passwords that need to be memorized. In addition, since members of the Covenant University community often have their papers placed on their profile pages in the Covenant University website, a procedure in which the repository can harvest papers from this location as well as all relevant metadata can be explored and implemented. Finally, another area of further studies is the use of fuzzy logic to analyze the degree of usability of the repository by using the usability attributes as linguistic variables for the member function.

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APPENDIX

Questionnaire for Evaluating Use of Institutional Repositories via Mobile Devices

This questionnaire aims at obtaining information from faculty, staff and students of Covenant University in order to measure the usability of Covenant University Repository on mobile devices (such as Blackberry phones, iPads/iPods and Android phones).

For each question, where applicable please tick (√) the answer that best expresses your view. Also, please answer the questions honestly and concisely as possible in the spaces provided.

SECTION A: Experience with Mobile Devices

a.) Are you a staff or student?

Staff [ ] Student [ ]

b.) How would you rate your experience/skill in the use of computer software?

Novice [ ] Average [ ] Good [ ] Expert [ ]

c.) Which of the following device(s) do you use to enhance your work?

Laptop/Notebook [ ] Personal Digital Assistance/Mobile Phone [ ]
Tablet PC [ ] Desktop PC [ ] Others (Please Specify)
[______________________]

SECTION B: User's Experience/Perception with the Repository

Please answer the following questions after visiting Covenant University Repository on a mobile device. The table below provides the meaning for each of the option to be ticked.

1. Indicate the type of mobile device you used to access the repository

Android [ ] Blackberry [ ] iPad [ ] iPod [ ]

[Others? (Please specify_______________________]

2. Indicate the task(s) you performed in the repository

Content Upload [ ] Content Search [ ] Content Browsing [ ] Content Download [ ] All the above [ ]

S/N	Questions	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1.	**Simplicity**					
i.	The repository is understandable and very easy to use					
ii.	The repository generally is simple to browse without any difficulty					
2.	**Navigation**					
iii.	The repository has well designed pages easy to navigate					
iv.	The repository highlights the most important features on the home page					
3.	**Memorability**					

v.	How to use the repository can be easily remembered					
vi.	I would like to revisit the repository as often as I could					
4.	**Hypertext Structure**					
vii.	Information about the repository’s features is well structured					
viii.	There are active links to various repository functions and features					
5.	**Satisfaction**					
ix.	The repository requires few steps to complete any task					
x.	The repository saves my time in accomplishing any task					
6.	**Consistency**					
xi.	The repository has a good layout and it is consistent when navigating from one page to another.					
xii.	The repository is properly structured and laid out in a consistent manner					
7.	**Completeness**					
xiii.	I am satisfied with the basic features of the repository					
xiv.	The repository prompts the appropriate message in case of errors					
8.	**Self Evidence**					

xv.	The repository has properly placed tabs and links to important information and pages.					
xvi.	The Tabs, Buttons and Links on the repository are self informing					