



Concept and Technical Specifications for Innovation and Research Information Platform

Developed by

MIMIr-BAU Team

Al-Balqa Applied University,

Al Salt, Jordan

Contact Person

Dr. Eng. Naser Almanaseer

almanaseer@bau.edu.jo

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Technical Specifications for Innovation and Research Information Platform

I. Summary

This document presents technical specifications required to develop a platform capable of efficiently manage innovation and research activities within individual institutes and among partner institutions. These specifications are carefully designed and proposed to be in agreement with the MIMIr project. To be specific, it considered linked deliverables of MIMIr Project including, but not limited to, deliverable 2.4 (Handbook on European Innovation and Research Management), and deliverable 3.3 (Matching Exercise). In terms of design, these specifications support a platform with three pillars; information, hardware, and software.

The first pillar is basically the available and required information at individual institute level, and can be arranged in the form of management modules based on comprehensive system analysis to identify potential modules and list of measurable indicators. For example, in its first stage, a proto-type of the Innovation and Research Platform at Al Balqa Applied University considered five modules namely institutes, researchers, documents, projects, and events. Nevertheless, the number of modules is manageable and more modules can be added for individual partner institutes depending on their management strategies and needs. These modules are accessible and reachable within the individual institute but also across partner institutions depending on the level of user's management level. Hence, these specifications suggest different levels of user's management and their responsibilities, that are customizable and can be assigned by each partner institution.

The second pillar is the hardware. The choice of hardware specifications is very important to support system stability, reliability, functionality, and security. This document presents summary hardware specifications, and suggest a workflow as well.

The third pillar is the soft component and includes the specifications and choice of operating system such as Windows Server 2012 form Microsoft, database engine such as Microsoft SQL Server 2012, and platform development tools such as Visual Studio IDE

The specifications of the three pillars need to be harmonized and programmed in a way to allow data flow and exchange between front end and back end interfaces within individual institute but also among partner institutions. This requires each partner institution to provide a list of modules and associated indicators. A common module can be designed and activated but also unique modules can be integrated to the platform at any stage to enhance the capability of institutions in individually and jointly managing innovation and research to achieve planned objectives.

II. Platform Objectives

- 1) To document and manage existing information on research and innovation within individual institutes, and to fill in the gaps.
- 2) To improve the institution capability in innovation and research management. For example, supporting research and technology transfer offices within the institute.
- 3) To enable and facilitate efficient information-exchange among different partner institutions including industry, research institutes, and government at national level.
- 4) To disseminate regulatory information on innovation and research management, to help strengthening, coordinating, and adding value to initiatives by interested parties at international scale.

III. Platform Development

To achieve the above objectives, it is critical to study and analyze the existing innovation and research management system and identify a list of management modules, set the hardware and software specifications that is capable of supporting the planned platform. These specifications can vary among different institutions but can be harmonized to enhance data exchange. To clarify this stage, this document uses the proto-type developed by MIMIr Team at Al Balqa Applied University.

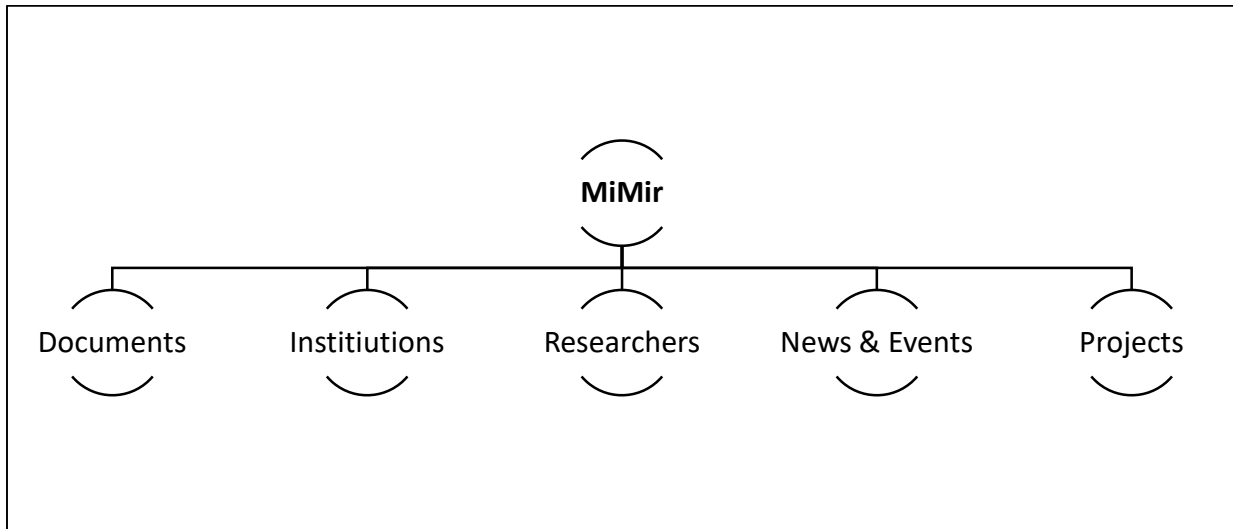
A) SYSTEM ANALYSIS

1. Modules Identification

To identify effective modules, the existing management system should be assessed and a list of modules are listed. In this document, innovation and research management system is evaluated and a list of management modules and related activities and working procedures at individual institutions are identify. These modules can be the base of documenting, managing and sharing relevant data among different levels of users within the institute and among partner institutions. To develop a platform for multiple institutions, common modules and modules components, security and user management level, and platform interface (backend and frontend) and security and user management level modules must be identified. However, priority modules vary among partner institutions. Hence, a platform with customization skills is proposed.

Following is a summary description of the five modules considered in the proto-type developed at Al Balqa Applied University through MIMIr initiative (Figure 1). These modules can be customized to fit in the needs of other institutions and can be communicated among partner institutions as well.

Figure 1: Key Modules of Innovation and Research Platform at BAU



These five modules are a web based system of multi lingual capturing and disseminating information. For example, the module “Documents” manage information on technical reports, publications and documents produced by the entire institute and other relevant sources in the country and region. This module keeps track of publications authored by the researchers. Each publication has specific attribute data such as abstract, authors, keywords etc. On the other hand, users can access the document backend only via user account with identical user name and password. The user (data entry) can add new document, edit, and delete. Publisher users can publish or reject the publication. This platform provides a backend to store and update data, and a front end to browse and search too.

Another example is the module “Projects”. This module document information including project title, location, subject, objectives, summary, duration, main findings and funding agency. This module deal with data on consortiums and project partners including title, funding agents, and objectives. Also, user can access the project backend only by his account (user name and password). The user (data entry) can add new project, edit, or delete.

2. Interface

The **back-end** components provide the data management functionalities that enable system administrators to input, update, or delete data items in the database. According to this specifications, these components are accessible by system administrators only. On the other hand, the **front-end** components provide the information retrieval and browsing functionalities and are available to all users. Figure 2 shows the users

3. Backend Security and User Management Levels

The backend has security and user management levels that control data accessing and manipulation. For example, to illustrate how the system administrators can manage Institutions module using back end interface, back end system enables system administrators to Add/Update/Delete institutions' data. In this regard, there are two users responsible for administrating *institutions*:

A. National Administrator

National Administrator is responsible for adding higher level Institutions and sub institutions, deleting Institutions, editing institutions, manage (Assign/Edit/Disable) institution administrators, and manage (Assign/Edit/Disable) document publishers. According to these platform specifications, there is only one National Administrator for Jordan who organizes institutions. The following operations are carried by the National Administrator on Institution Module: Adding Institutions, Editing Institutions, Deleting Institutions, and Export XML or View Institutions information.

B. Institution Administrator

The Institution Administrator is assigned to specific Institution and can manage this institution and all sub institutions under it. The Institution Administrator can't view institutions that are not under his/her responsibility. He/she is responsible for

1. Adding Institutions under his authority
2. Deleting Institutions.
3. Editing Institutions.
4. Assign Institution Data Entry to institutions.

The Institution Administrator is assigned by National Administrator to administrate institutions. The following operations are carried by the Institution Administrator on Institution Module: Adding Institutions under Institution Admin authority, Editing Institutions, Deleting Institutions, manage institutions users (The Institution Administrator can manage users of Institutions by Adding/Editing/Disable Data Entry to an institution), Adding Institution Data Entry to an Institution, Editing Institution Data Entry to an Institution, and Disable Institution Data Entry to an Institution.

For any user of the system (national admin, institution admin, data entry or document publisher) to change his password, just click the change password link in the upper right of the page then type his new password and click save.

4. Dynamic Workflow Back End Interfaces

Users involved in the process of data entry, approval, and publication of data entry to the web and their roles are illustrated below. In addition, the process of adding, approving or publishing data is best illustrated through a number of workflow scenarios. The backend components (Projects, Personnel, Document Repository, Institutes, News and Events) provide the data management functionalities that enable system administrators to input/update/delete data items into the database. These components are accessible by system administrators only (Figure 2). The System has several types of users; each user has his own responsibilities. These users are National Administrator, Institution Administrator, Publisher and Data Entry. Each user has his own user name and password to log on to the system with his specified authority. The responsibility of each system user is illustrated in the following table

Figure 2: Users and their capabilities with Back end components

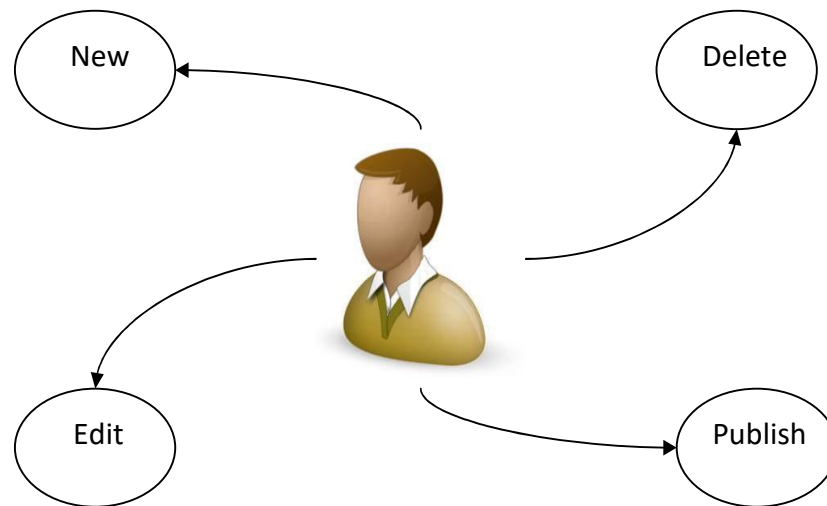


Table 1: Types of Back end users and their roles

User Name	Responsibility
<p align="center">National Administrator</p>	<p>National administrator which is responsible for:</p> <ol style="list-style-type: none"> 1- Adding/Deleting/Editing Institutions. 2- Assign Institution Administrators to institutions. 3- Assign document publishers to institutions. 4- Add/Edit/Delete News/Events/Links and Focal point.
<p align="center">Institution Admin</p>	<p>The Institution Administrator is assigned by National Administrator to administrate institutions and is responsible for:</p> <ol style="list-style-type: none"> 1- Adding/Deleting/Editing Institutions under his authority. 2- Assign Institution Data Entry to institutions. 3- Approve/Reject/Delete Documents, Projects or Researchers or News and Events sent by Institution Data Entry. 4- Edit/Delete published Researchers/Projects/ News/ Events.
<p align="center">Publisher</p>	<p>Publisher is Responsible for</p> <ol style="list-style-type: none"> 1- Accepting, Rejecting or deleting documents sent by Institution Administrator. 2- Edit/Delete published documents
<p align="center">Data Entry</p>	<p>The Data Entry is assigned by Institution administrator to institutions and is responsible for</p> <ol style="list-style-type: none"> 1- Add Projects, Personnel, News, Events and Documents. 2- Update/Delete Projects, Personnel News, Events and Documents that are added but not yet sent to Institution Administrator.

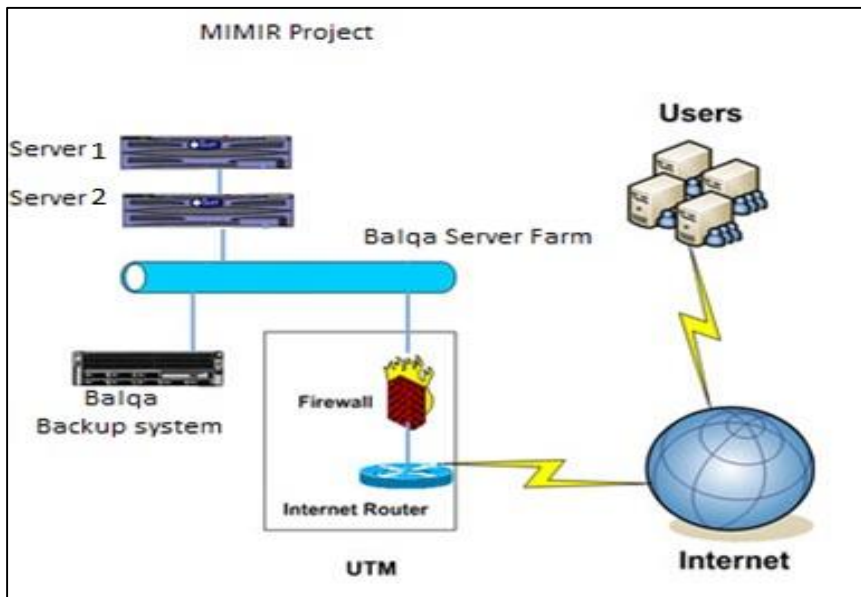
B. HARDWARE SPECIFICATIONS

Two servers are needed to support platform and database at individual institute. Functional requirements (i.e. backup) will be managed by developing a tool responsible for back up on the same servers. Proposed server's specifications are presented in **Box 1**. This hardware specification is proposed such that it supports the architectural design to ensure reliability and security of the system and to facilitate accessibility by users. **Box 2** show pictorial representation of architectural design and hardware integration to the existing management system at individual institute.

Box 1: Hardware Specifications; Server

- Processor 1X installed INTEL Xeon E5-2620v4 8C/16T 2.10 GHz or Higher, up to two processor Cache (20MB) each processor.
- Memory 96GB (6x16GB) 2Rx4 DDR4-2400 R ECC
- Storages 6 x 1.1TB 10KSAS Hot Plug not less than 10krpm. RAID Controller support RAID (0, 1, 5 and 6) (Hardware RAID). DVD Super multi drive.
- Controllers 4 x 1Gbit Ether Net Controllers Expansion &
- I/O 5 x USB 2.0 (2x rear, 1x front external, 1x USB stick, 1x USSD) 5 x USB 3.0 (2x front, 2x rear, 1x internal for backup device) PCI-Express 3.0 x16 PCI-Express 3.0 x8 VGA
- Power Fully Used & Redundant Hot-Pluggable Power supplies, 220-250 VAC/50Hz. Redundant Hot-Pluggable Cooling Fans Enough cooling dissipation designed to enable working continuously (24/7) without overheating.

Box 2 show pictorial representation of architectural design and hardware integration



C. SOFTWARE SPECIFICATIONS

1) Operating system

One consideration at this stage is to select proper **operating system** that is available and manageable within the individual institute as well as among partner institutions. In comparison

to other operating systems, Microsoft is a low-cost and common operating system. This concept proposed Windows Server 2012.

Windows Server 2012 is the sixth release of Windows Server. A developer preview and a beta version, were released during development. Various features were added or improved over Windows Server 2008 R2 (with many placing an emphasis on cloud computing), such as an updated version of Hyper-V, an IP address management role, a new version of Windows Task Manager, and ReFS, a new file system. Windows Server 2012 introduces the new Windows Runtime (WinRT) platform, which can be used to create a new type of application officially known as Windows Store apps and commonly called Metro-style apps. Such apps run within a secure sandbox and share data with other apps through common APIs.

2) Database Engine

The next step is to identify **database engine**. This concept proposes Microsoft SQL Server 2012. Box 4, provide a summary of the specifications and advantages of this database engine.

Microsoft SQL Server 2012 is a cloud-ready information platform that will help organizations unlock breakthrough insights across the organization and quickly build solutions to extend data across on-premises and public cloud, backed by mission critical confidence. SQL Server 2012 supports connections to external big-data sources for analytics. It can connect to Apache Hadoop, for example, running on a remote cluster of machines passing queries and pulling the results into SQL Server itself for further analysis. Other types of no relational data can be brought into SQL Server as well, using its built-in data connectors. SQL Server 2012 also makes it easier to build databases and applications on one server and move them to another server or to a cloud service, such as those based on Windows Azure, Microsoft's cloud platform.

3) Platform Development Tool

Visual Studio is a software development tool used for creating Windows programs and web applications. The development kit includes an integrated development environment (IDE) and testing tools for all stages of the software development process. Visual Studio includes code editor, debugger, designer, extensions. The Visual Studio IDE includes multiple built-in perspectives for accomplishing different tasks. Unique interfaces are provided for source code programming, debugging, and creating visual forms. Developers can use one of these pre-built layouts or customize their own perspectives

IV. Data Sharing and Exchange Modules among Partner Institutions

To ensure data flow among partner institutions, this platform specification involve the development of a tool to facilitate data exchange and to ensure sustainability and success of the platform. This tool includes back-end and front-end specifics.

Back-end

The system is designed to have

- 1) interoperability in the exchange and sharing of data (Import and Export as an XML file).
- 2) Ability to build unlimited/extensible tree structure for institutions at institutional and national levels.
- 3) Competences to add, delete, and modify institutions structures, publication, research, project, etc.

Front-end

The system is designed to have

- 1) Interoperability in the exchange and sharing of data (Import and Export as an XML file)
- 2) Document information is displayed in xml format through export function capability
- 3) Document information in xml format could be viewed in readable format using XSLT transform technique.
- 4) Capability to export the XML single or multi-files resulted from advanced search
- 5) Potential for advanced search with full text search features based on database engine such as Microsoft SQL.

Issues must be considered for implementation

- a) In order to exchange data between the central database and institutions all over Jordan, or other countries, web service architecture must be implemented.
- b) In the search module, a web service is implemented as a service that allow users to search and filter for a researcher, a project, problem, news and events from several institutions.
- c) Browsing and filtering are done through a web interface. However, the core service is not the display on the web but rather the availability of customized results. Of course users can create as many customized as they need.

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Haser Almanaseer