

Implementation of the Human Resources Information Systems and Comparative Study of Various Platforms

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Abstract We are living in an epoch of changes during which highly competitive advantages are always required for quick and effective reactions in any organization. It is expected that the rate of change will increase greatly in the upcoming future along with the high development rate of new technologies. Today's businesses need either to adapt to these changes or be more innovative to meet these new necessities. In this research, the Human Resources Management (HRM) has been aim to study and especially Human Resources Information System (HRIS) has been studied. In addition, the benefits and constraints of the implementation of a Human Resources Information System (HRIS) on an institution have been discussed in this study. Moreover, HRIS open source software platforms have been investigated and comparative study has been proposed. Selected open source software platform has been designed to implement HRIS to the University of Kirkuk.

Keywords Human Resources Management System (HRMS), Human Resources Information System (HRIS), Human Resources (HR), Human Resources Management (HRM), Open Source Software Platforms

1. Introduction

During the 1970s and 1980s, a new term was coined in North America, namely Human Resources Management (HRM) [1]. There have also been many attempts to work on a precise definition of the concept Human Resources Management since that time; however, the most common definition that can be found is the following: an attempt to regulate the relationship between the employee and the employer as part of a foundation [2]. Naturally, a system has several development operations from the beginning of its inception. Due to the large amount of development occurring in the Information Technology field, it went from a paper system to a fully electronic system.

HRIS outline the integration between Human Resource Management (HRM) and Information Technology (Gerardine deSanctis, 1986). The Human Resource Information System (HRIS), also known as a Human Resource Management System (HRMS), became prevalent in computer HR systems [3].

The evolution of information systems has helped in the emergence of a new term: Human Resources Information System (HRIS). Since the beginning of its emergence, there have been many attempts to make a precise definition of this concept. The first attempts were made by Walker in 1982, wherein he states that "the modern human resources information system may be defined as a computer-based method for collecting, storing, maintaining, retrieving, and validating certain data needed by an organization about its employees, applicants, and former employees" [4]. Tannenbaum (1990) states that "a human resources information system is a system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information about an organization's human resources" [5]. Moreover, Kovach & Cathcart (1999) define HRIS as "a human resources information system that is a systematic procedure for collecting, storing, maintaining, retrieving, and validating data needed by an organization about its human resources, personnel activities, and organization unit characteristics" [6].

2. Literature Review

Nagendra and Deshpande (2014) have studied HRIS in HR planning to investigate the usage of HRIS in medium to large sized corporations. Questionnaires have been used to 50 senior and junior HR managers in this research. Their research findings present that efficiency of HR planning by HRIS can be developed reducing time and cost [3].

Another study presented by Buzkan (2016) [7] indicates the literature review related to HRIS and its importance for the organizations. Definitions of HRIS, HRIS model,

historical overview have been investigated by the researcher. He says that HRIS usage can be chance according to organizations. Moreover, administrative tasks can be used or administrative and strategic tasks can be used together.

Information Technology (IT) and HRM observations have been presented by A. Mishra and I. Akman (2010) [8]. Findings of a survey with in the different sectors in Turkey have been reported.

A comparative study to find the various software packages of human resource information system (HRIS) used by organizations operating in India have been presented by Qureshi and Sajjad (2013). They have concluded that human resources and information technology should be used together in developing country such as India. In this study, questionnaire results have been analyzed [9].

S. Pande and N. Gomes (2013) point out that importance of the open source software for human resource information systems. In this study; various open source software in Human Resources, importance of open source software HRIS and cloud hosting with small and medium sized enterprises have been investigated. Orange HRM, Open Applicant, LATRIX, TimeTrex, ICeHRM and Waypoint HR which are the selected open source HR models have been studied. They describe that Cloud hosting provides cost effective infrastructure solution where the investment to purchase server hardware, internet bandwidth and hardware upgrades is eliminated to the corporations. An open source HRIS such as Time Trex or Orange HRM have been suggested as ideal combination by the researchers. In this research, computer application points of view have been studied by the authors [10].

3. Objectives of the Study

Iraq is considered to be one of the developing countries that have suffered from many problems on the political, economic and social level, which has contributed significantly to the delay in the development of several areas, especially in the service sector and in areas of information and communication technology. Despite these factors, Iraq still continues progressive to reduce this gap. Many Iraqi institutions have lacked an effective system for the management of human resources.

Moreover, none of the existing literature in Iraq, to the best of our knowledge, has studied the implementation of HRIS by comparative study of various platforms.

The objectives of the study are:

1. To study of the HRM and HRIS.
2. To investigate and compare HRIS open source software platforms.
3. To suggest a HRIS for the Kirkuk University and revision of the possibility of implementation of a HRIS there.
4. To design and implement the HRIS system, test system functionality.

5. To explore the overall contribution of HRIS open source software platforms.

4. Proposed Method

In this section, we will review the case study (University of Kirkuk). In addition, we will review the most important open source software that has been used in the construction of global Human Resources systems and we will make an effective comparison between them, including the identification of the most important advantages and weaknesses of each system. After the completion of this comparison, it will be easy for us to determine to propose the best system to fit the needs of the University of Kirkuk followed by customization of the system to meet the needs of the University of Kirkuk.

There are many reasons why choosing open source software is the good option for optimization and building a new system, including the following [15]:

1. Flexibility: Open source software requires fewer resources to work, which means that this type of software can operate on older hardware;
2. Interoperability: Open source software can work properly with other types of software, which means that it offers higher integrity;
3. Auditability: Open source software can be easily audited due to the freedom of access to its source code;
4. Cost: There is no doubt that open source software provides the best option in terms of cost;
5. Quality: While proprietary software is created by a certain group of programmers, open source software is written by specialized groups scattered around the world and it is greatly supported by a community, which helps to set up high-quality programs; and
6. Customizability: Open source software offers highly flexible customizable functions to meet any requirement, which is rarely available with proprietary software.

The process of selecting open source software is not as easy as it appears. The process needs to be a real test in order to find the best solution and application that meets the requirements of an enterprise beneficiary. With this purpose in mind, in the next section, we will select a series of open source software packages customized to work as a HRIS, test each in a virtual environment and make comparisons between them in order to know the best functional software that serves our research goals.

4.1. Electronic Human Resources (A1 eHR)

Electronic Human Resources (A1 eHR) is a Human Resources Management system provided by Alliance Technologies [11], and is design to target the large and medium-sized enterprises market. This system offers many models within same package, such as organization management, a recruitment model, a leave management

model, an employee relations model, a planning model, and a payroll system. The system is an open source application that is written in Java and uses the A1 Platform (a platform written by a cooperative company). Moreover, it uses the PostgreSQL database and it has many features, such as ease of use, high-speed information retrieval, and an extensible and cloud-ready application. Figure 3 shows the profile page.

4.2. Sentrifugo

The Sentrifugo system is considered to be one of the most important existing systems to be designed as a Human Resources Management system [12]. This is due to a wide range of electronic services offered by this software. It is designed as an open source system written in PHP and uses MySQL as a database. It is published under the GPL license and is powerful, gratis and considered to be a new age Human Resources Management system that can be effortlessly constructed to familiarize one to any administrative process. It has many features in one single package, such as the human resources management model, the performance appraisal model, the employee self-service model, powerful analytics tools, staff background checks ability, a leave management model, and a customizable service request. In addition, there are a cluster of features, including an interview schedule, easy use of the dashboard, feed forward, and time management. In fact, this system was designed for small and medium-sized enterprises and it has a streamlined HR process, and it is feature rich, intuitive and flexible to configure with an intuitive interface. Figure 4 shows the Sentrifugo system dashboard. This dashboard shows system-friendly interfaces.

4.3. Simple HRM

Simple HRM is an easy-to-use affordable open source Human Resources Management solution and intuitive system written in PHP and hosts MySQL Database. It has been published under an AGPL License since 2012 [13].

It targets the small and medium-sized enterprise market. It has several features, such as expense management, leave management, and employee information management in addition to many other features, including following, track staff information, simplify employee management, time management, and tasks management. It provides good reports and statistics.

It also supports Modular Based Design, Employee Self Service (ESS), and Manager Self Service (MSS) as well as organizational structure, centralized management of employee information, document management, employee dependency details, leave workflow, expense workflow, daily task reporting, company leave policy, and scheme, as well as the ability to manage multiple companies within the same organization. Figure 5 shows the Simple HRM welcome admin page.

4.4. Orange HRM

Orange HRM was published in 2005, and since then, it has been considered to be the most popular open source Human Resources Management (HRM) package which is intuitive, feature-rich, and robust. It has other versions, such as Orange HRM Open Source (free of charge), Orange HRM Professional and Orange HRM Enterprise. This diversity gives Orange HRM more affordability and more flexibility relative to other open source systems [14]. Orange HRM is module-based architecture, which means one can take control over one's model and work with only what is needed. This model includes the following: employee self-service (ESS), personal information management (PIM), leave management, performance evaluation and recruitment, and time and attendance tracking (PTO). In addition, it offers broad customization facilities to meet Human Resources Management requirements, and it supports a wide range of plugins [14]. Orange HRM is built on top of Apache2, PHP and MySQL databases. Since its inception, millions of users and clients have used it as a powerful management system. It is also considered to be the best solution for every size of business, such as small, medium-sized and large enterprises.

5. Comparisons of the Open Source Software

The table below presents a detailed comparison between each system. The information obtained is provided after testing each system by initially configuring and hosting in a virtual environment. Tables 4-A, 4-B and 4-C show comparisons made between the systems in terms of general characteristics, full specifications and system functionality respectively.

Table 4A. General system comparison

	A1 eHR	Sentrif-ugo	Simple HRM	OrangeHR-M
Published since	2012	2007	2012	2005
Language	Java	PHP	PHP	PHP
Operating Systems	Windows, Linux and MacOS	Windows, Linux and MacOS	Windows and Linux	Windows, Linux and MacOS
Database	PostgreSQL	MySQL	MySQL	MySQL
App-Server	J2EE	None	None	Apache Server
Web-Client	Yes	Yes	Yes	Yes
Multi-Tenant	Yes	No	Yes	Yes
Developed	Alliance Technologies	Sentrifugo Inc.	Viktor Nagorny	orangehrm.org.

Table above show general system comparison such as published date, OS used, App-server used, Web-client used, Database type and Development authors.

Table 4B. Specifications system comparison

	A1 -eHR	Sentrifu-go	Simple HRM	OrangeHRM
SaaS services (Live Cloud)	Yes	No	No	Yes
Multi Organization	Yes	No	Yes	Yes
User Profile Manager	Yes	No	Yes	Yes
Plugins Support	No	No	No	Yes
Administration Panel	Yes	Yes	Yes	Yes
Reporting	Yes	Yes	Yes	Yes
Email Notifications	Yes	No	Yes	Yes
comma separated values CSV Extraction	No	No	No	Yes
Personnel Informational Management	Yes	Yes	Yes	Yes
Flexibility	Limited	Limited	Limited	Yes
Employee Admin.	Limited	Limited	Limited	Yes
Leave/Time-Off Model	Yes	Yes	Yes	Yes
Electronic Signatures	No	No	No	Yes
Job Board Integration	Yes	Yes	Yes	Yes
Android & iOS API	No	No	No	Yes
Recruitment	Limited	Limited	Limited	Yes
Performance Monitor	Yes	Limited	Limited	Yes

Table above show specifications system comparison such as file type supported, plugins, look and feel retrieval system and many other features as shown above.

Table 4C. Functionality system comparison

	<i>AI- eHR</i>	<i>Sentrifu-go</i>	<i>Simple HRM</i>	<i>OrangeHR-M</i>
Customize Report	Yes	Limited	Limited	Yes
High-Performance	Yes	No	No	Yes
Stability	Yes	Yes	Limited	Yes
Filtering	No	No	No	Yes
Community Support	Limited	Limited	Limited	Yes
Online Capability	Yes	Yes	Yes	Yes
Disciplinary Tracking	No	No	No	Yes
Customize Lists	Limited	No	No	Yes
Customizable Look and Feel	Limited	Yes	Limited	Yes
Plug-in Support	Yes	No	No	Yes

The above results present the experience of each system separately in a virtual environment, and it is obvious that the OrangeHRM system outperforms other systems in this comparison. Moreover, the unique possibility of this system allows long-term use and customization to fit business requirements without having to pay any remuneration. This will allow us to go over a unique experience through using this system, after which we move to additional services provided by the same software such as (Live cloud) for relatively little payment.

6. Lab Implementation

After reviewing the many studies on the related subject and after making comparisons between the best open source software, we used VirtualBox tools as a virtual environment. Our lab component consisted of a main web server and one host machine. We used Linux Server Debian Linux 8, and we successfully configured OrangeHRM [14], inside it in order to meet our case study work criteria. Figure 6 shows our laboratory design, and Figure 7 shows our database main schema.

7. Experimental Results

As the Human Resources Information System, it is natural that the remainder of the system consists of inputs, processes, outputs and feedback. Figure 8 shows system components and Figure 9 shows the main system login pages. Figure 10 shows the system admin pages.

Input: Represents the input data set for individuals working in the organization (such as data on the staff), employees' names, places and dates of birth, sex, religion, marital status, places of residence, scientific eligibility,

functional degrees, experience, salaries and termination dates. Job details contain job titles, organizational positions and amendments thereto. Figure 11 shows the Employee Personal Information page.

In addition to administrative data, the system contains data related to employment policies, including laws and regulations and decisions related to human resources, salary components, emergency contacts, work experience, etc. The system allows an individual employee to extract and monitor his personal data, in separated page, data, such as competition and how organizations access people with experience, qualifications and salaries, cannot be edited by users without admin permission. Additionally, data relating to the preparation of programs and competencies which are currently available, and contacts can be edited by employees. Figure 12 shows the individual employee personal information page.

Operations: Operations denotes all the data that have been entered into the database of Human Resources through collection, storage and classification. The use of mathematical methods and statistical tests turns the data into information and reports that can be tapped. Figure 13 shows the system directory page.

Outputs: These pertain to the reports, responses and information that reflect the findings of a system of results in the light of the inputs that have been made to the database after processing. Information about staff and functions shows the movement of labor analyses for each department and functions of statistics. This helps to clarify the movement of labor in the organization in terms of recruitment, transportation, loans, delegation, and upgrades. Figure 14 shows a system sample report.

Feedback: Information carrying messages and instructions on the functioning of the system and the extent to which output is matched with the plans and carried out

through control over the previous element deviations in order to monitor and work to correct them and to serve the objectives of the organization. Figure 15 shows the performance review.

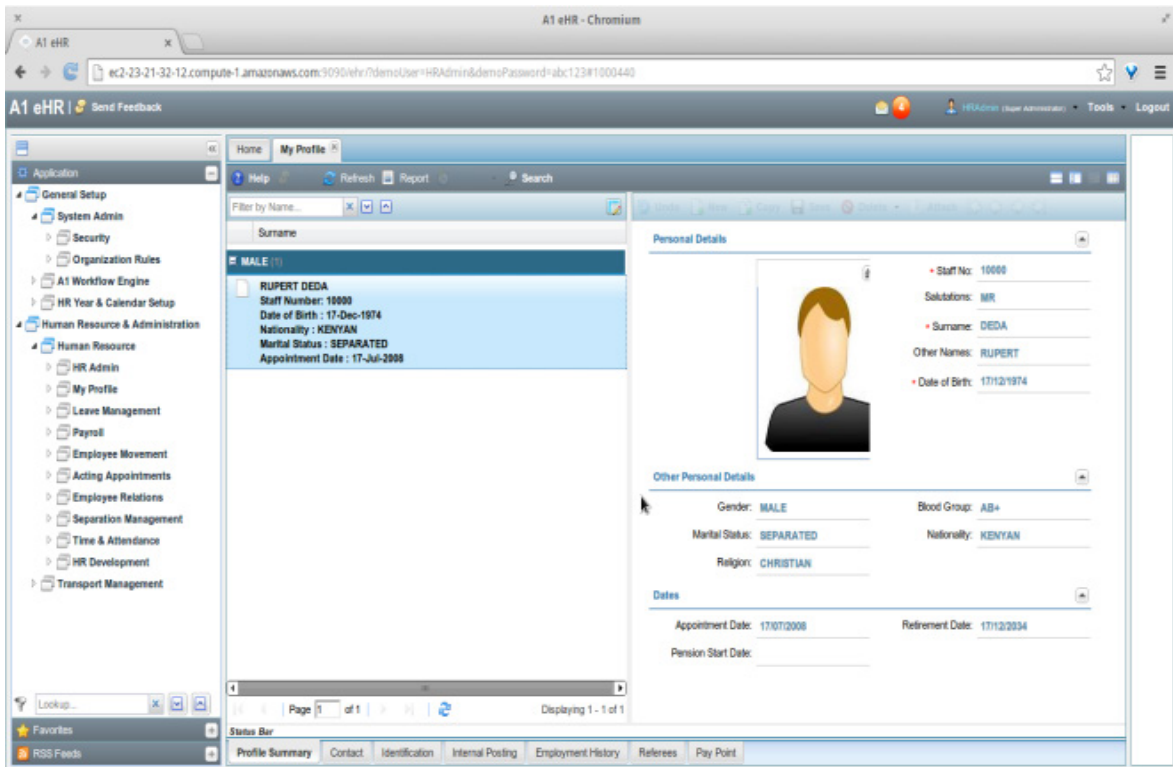


Figure 3. Profile page

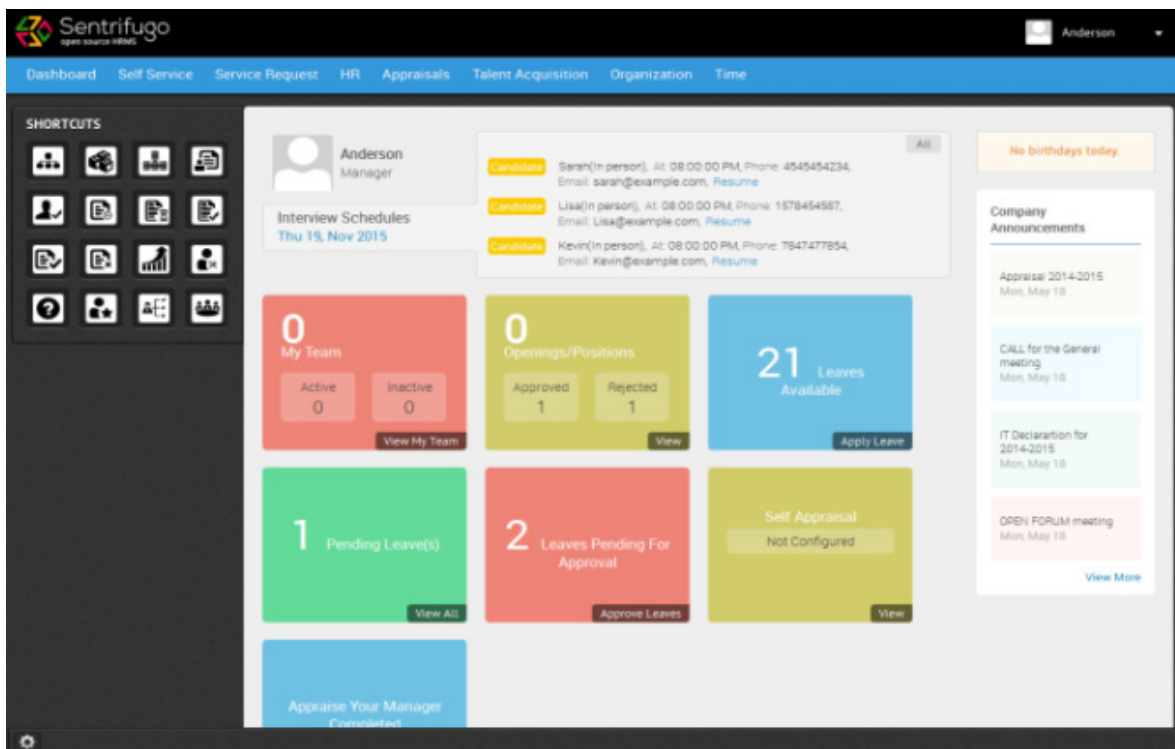


Figure 4. The sentrifugo system dashboard

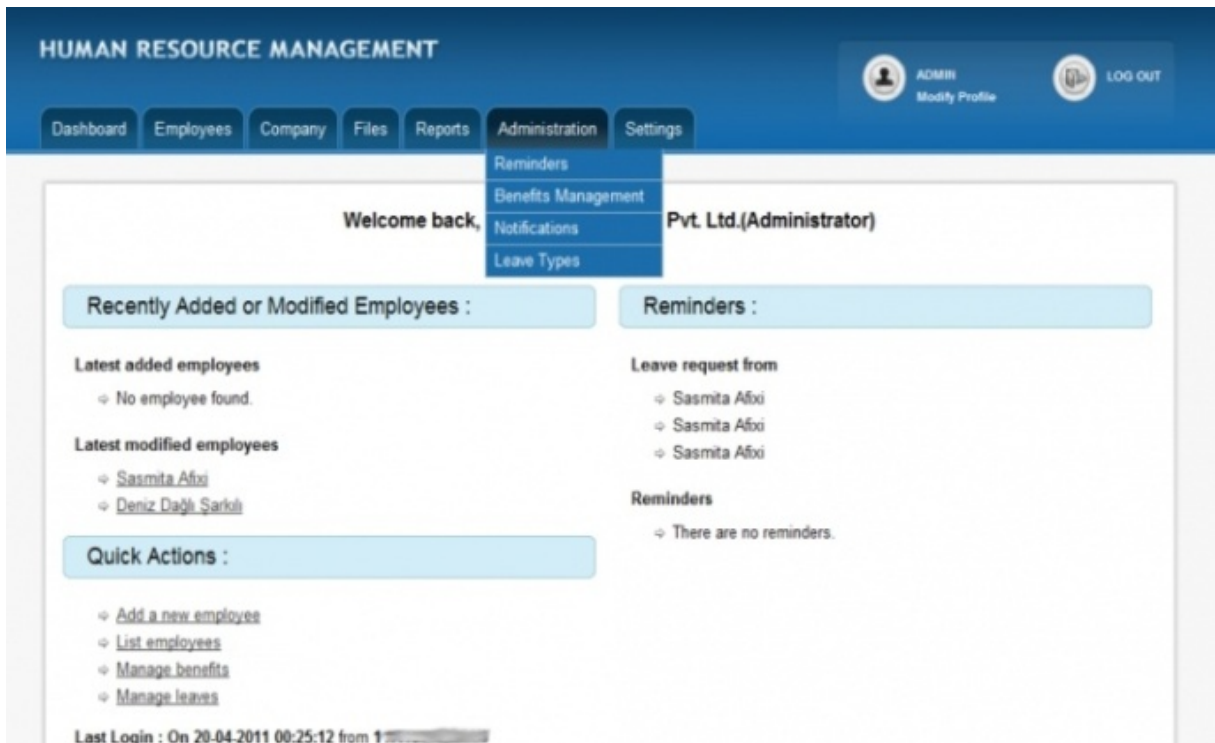


Figure 5. Simple HRM welcome admin page

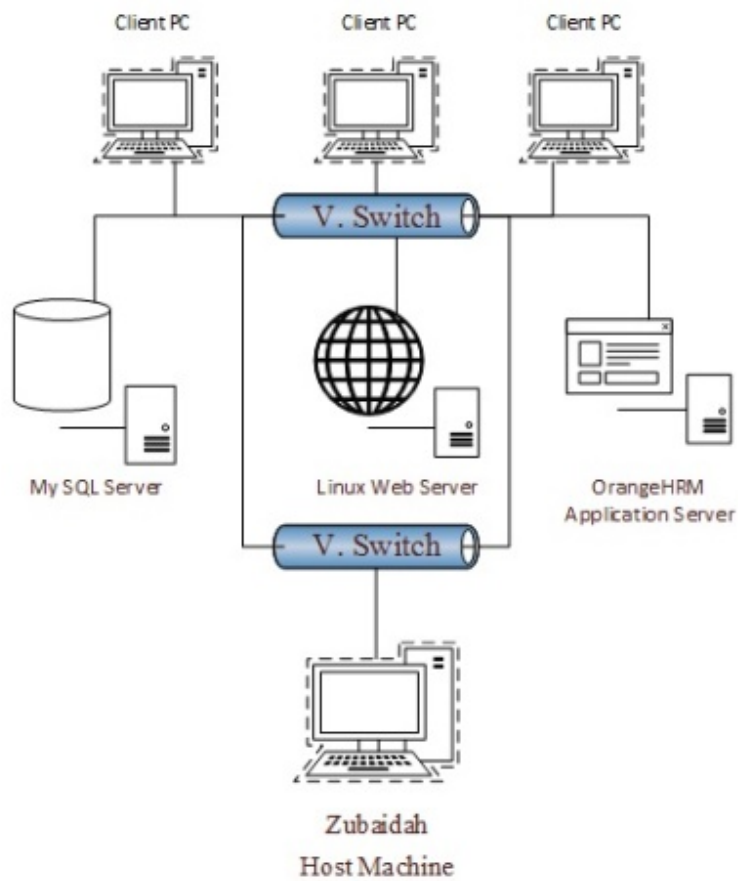


Figure 6. Laboratory design

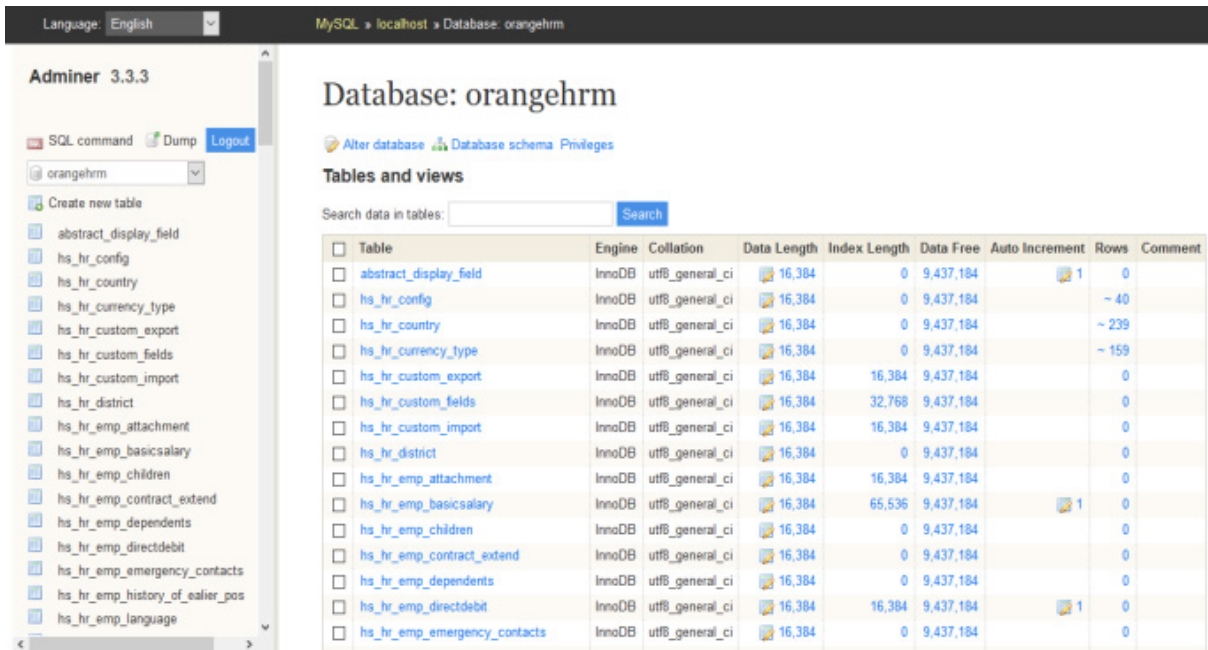


Figure 7. Database main schema

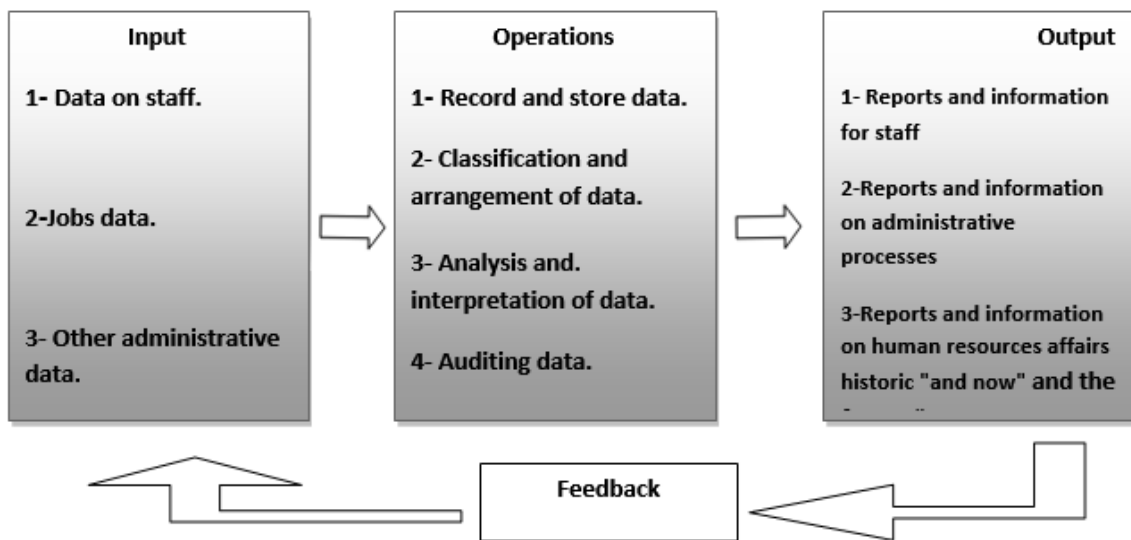


Figure 8. The components of the human resources information system

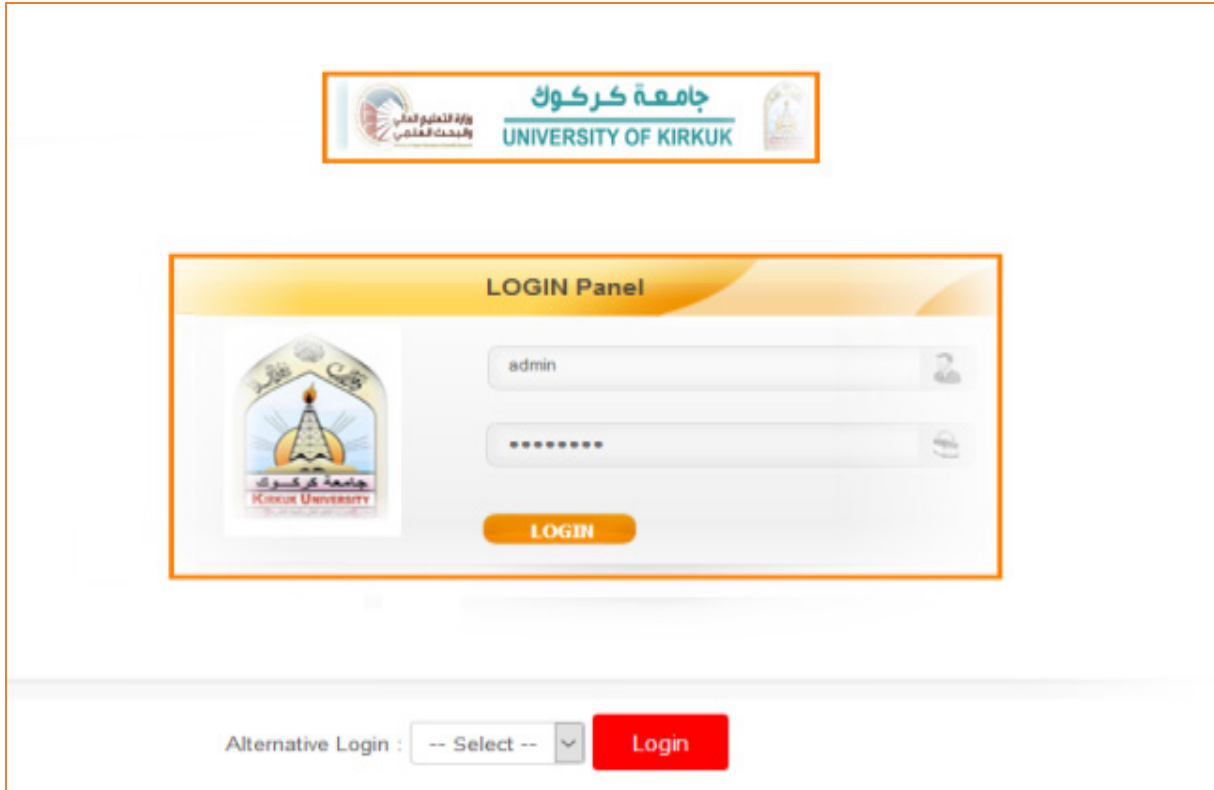


Figure 9. Main system login pages

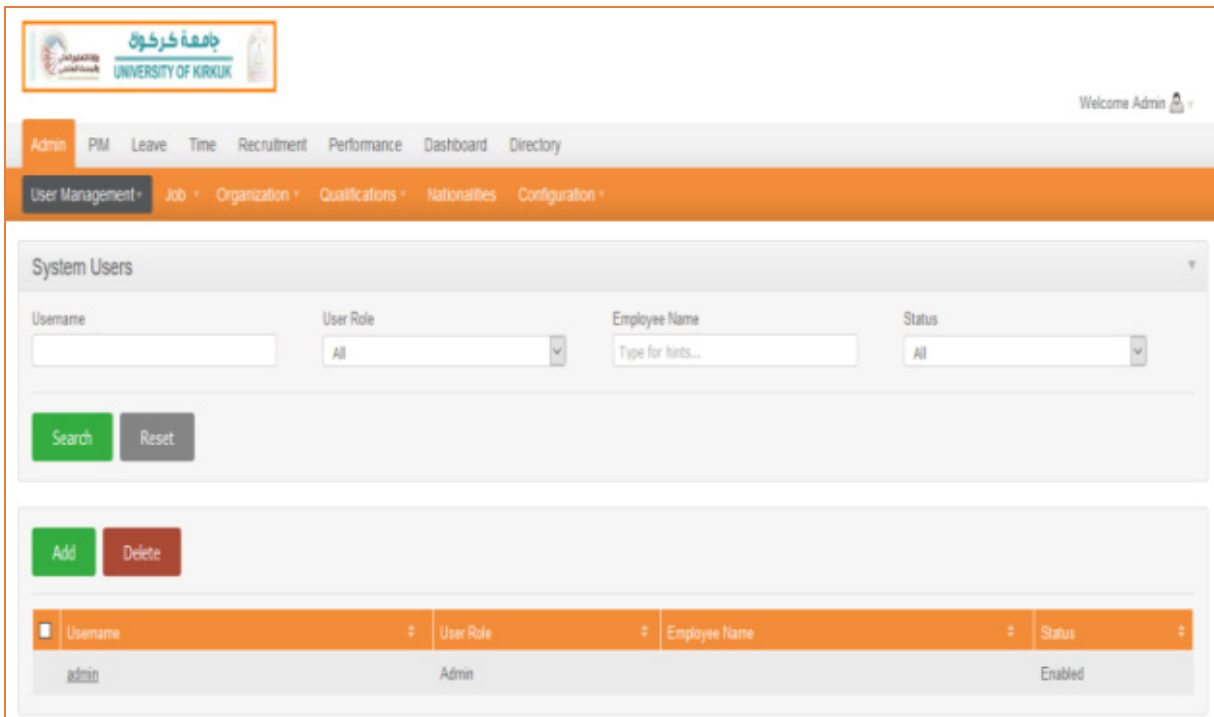


Figure 10. System admin pages

The screenshot shows the 'Employee List' page for Zubaidah ABDUHakeem Majeed. The page features a navigation menu at the top with options like Admin, PAM, Leave, Time, Recruitment, Performance, Dashboard, and Directory. Below the menu, there are tabs for Configuration, Employee List, Add Employee, and Reports. The main content area is divided into a sidebar on the left and a main form on the right. The sidebar contains a list of menu items: Personal Details, Contact Details, Emergency Contacts, Dependents, Immigration, Job, Salary, Report to, Qualifications, and Memberships. The main form is titled 'Personal Details' and contains the following fields:

- Full Name: *First Name (Zubaidah), Middle Name (ABDUHakeem), *Last Name (Majeed)
- Employee Id: 0001, Other Id: [Empty]
- Driver's License Number: [Empty], License Expiry Date: 2046-03-01
- Gender: Male, Female
- Marital Status: Married
- Nationality: Iraq
- Date of Birth: 1983-04-07

There is an 'Edit' button at the bottom of the form and an 'Add' button in the 'Attachments' section below.

Figure 11. Employee personal information page

The screenshot shows the 'My Info' page for Ahmed Nasshaat Shakir. The page features a navigation menu at the top with options like Leave, Time, My Info, Performance, Dashboard, and Directory. Below the menu, there are tabs for Configuration, Employee List, Add Employee, and Reports. The main content area is divided into a sidebar on the left and a main form on the right. The sidebar contains a list of menu items: Personal Details, Contact Details, Emergency Contacts, Dependents, Immigration, Job, Salary, Report to, Qualifications, and Memberships. The main form is titled 'Contact Details' and contains the following fields:

- Address Street 1: Iraq
- Address Street 2: Turkey
- City: Kirkuk - Ankara
- State/Province: Ankara
- Zip/Postal Code: [Empty]
- Country: Turkey
- Home Telephone: 05372703972
- Mobile: 05372703972
- Work Telephone: 05372703972
- Work Email: ahna2005@yahoo.com
- Other Email: [Empty]

There is a 'Save' button at the bottom of the form and an 'Add' button in the 'Attachments' section below.

Figure 12. Individual employee personal information page

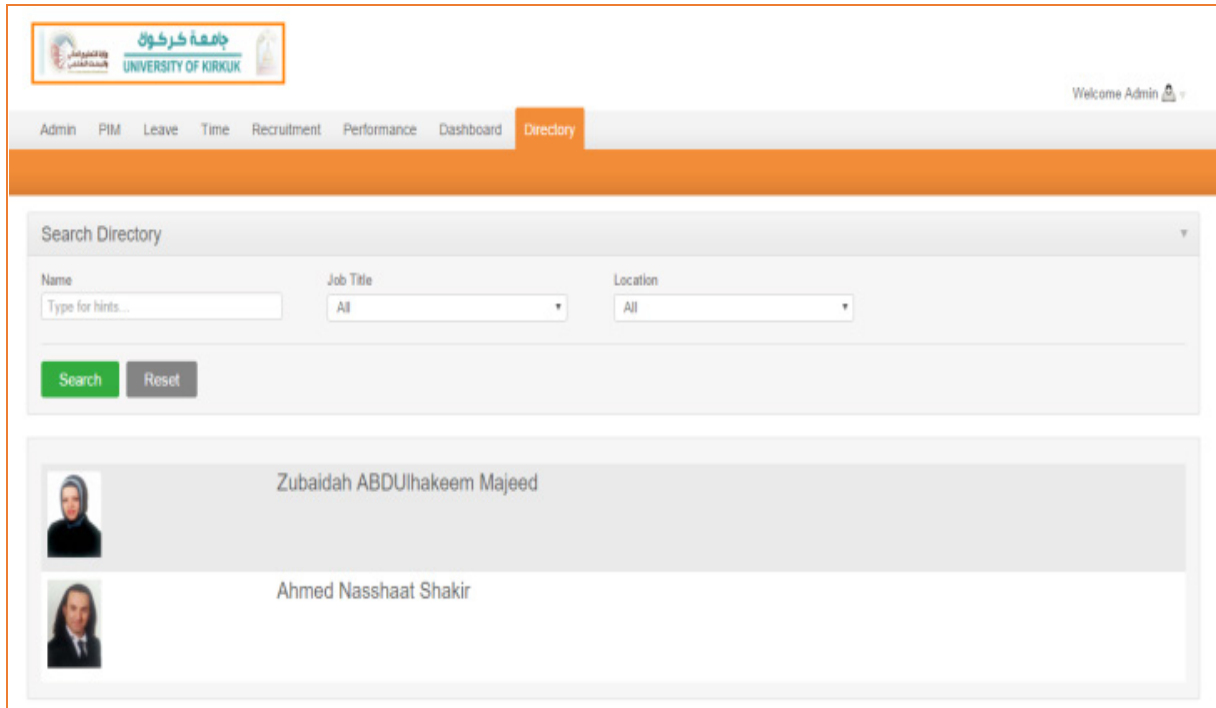


Figure 13. System directory page

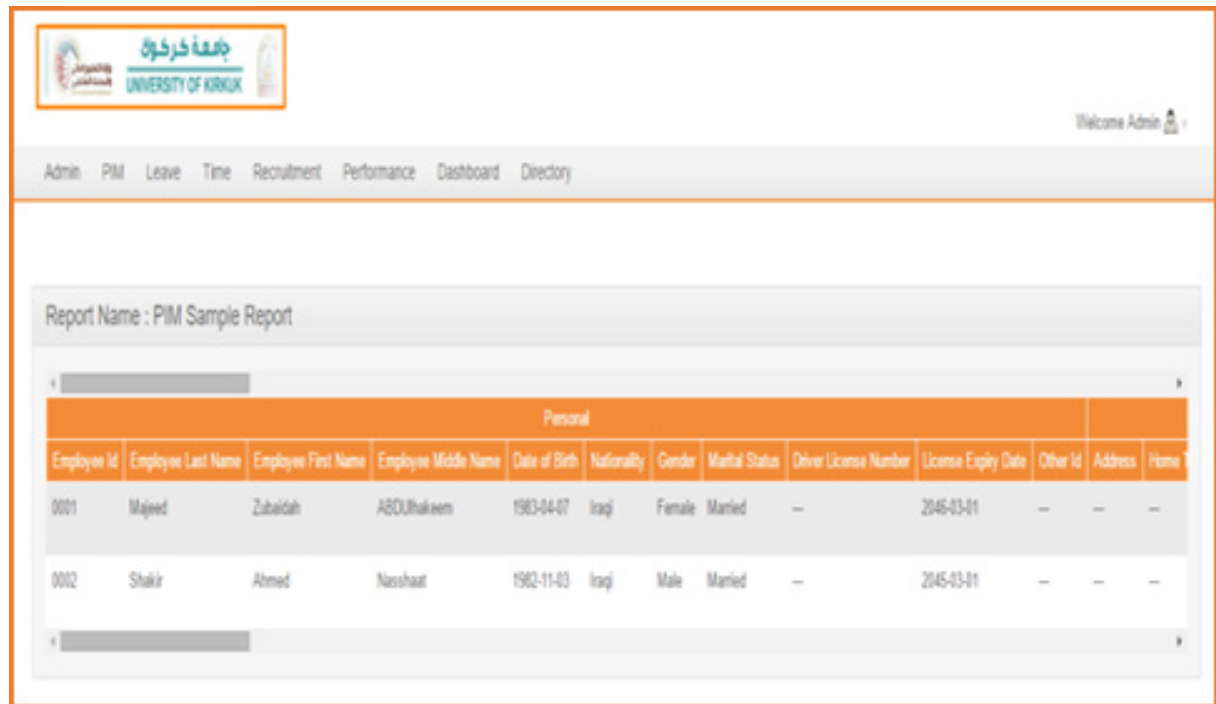


Figure 14. System sample report

The screenshot displays the 'Performance Review' section of the OrangeHRM system. At the top, there is a navigation menu with options like Admin, PIM, Leave, Time, Performance (selected), Dashboard, and Directory. Below this is a sub-menu with 'Configure', 'Manage Reviews' (selected), and 'Employee Trackers'. The main content area is titled 'Search Performance Reviews' and contains several input fields: 'Employee Name' (filled with 'Zubaidah ABDUHakeem Majeed'), 'Job Title', 'Status' (set to 'Activated'), 'From Date' (format 'dd-mm-yyyy'), and 'To Date' (format 'dd-mm-yyyy'). There are 'Search' and 'Reset' buttons. Below the search form is a 'Review List' section with 'Add' and 'Delete' buttons. A table header is visible with columns: Employee, Due Date, Review Period, Job Title, Status, and Action. The table body currently displays 'No Records Found'.

Figure 15. Performance review

8. Conclusions

In this paper, we have reviewed the importance of Human Resources Management (HRM), and the role and contribution of these systems in the development process of any establishment in terms of efficiency, cost and time management. We also reviewed Human Resources Information Systems (HRIS) and gave an understanding of the main differences between Human Resources Management (HRM) and Human Resources Information Systems (HRIS). While HR systems are more comprehensive, HRIS are dedicated to achieve and serve any employee matter. This study intended to discover the importance of the Human Resources Information System and its importance to any organization.

In addition, we discussed the current research on Human Resources Management and Human Resources Information Systems (HRIS). We highlighted the most important expected evolution experienced by these systems through related work studies, and we discussed the research challenges. By selecting the University of Kirkuk as a case study, we revised the possibility of implementing a HRIS system there. In addition, we successfully suggested a HRIS system for the University of Kirkuk.

The suggestion system is based on a real test assessment made by using a virtual environment and the most common open source software devoted to HRMS (or HRIS). Our testing environment was grounded to functionality and performance of the system, and how it can meet our case study. Moreover we work through establishment a detail compression tables as well as implementing a candidate system to customize it to work as a HRIS system for our case

study.

Testing and implementation results showed the following: the OrangeHRM open source software system could be used as a HRIS system for our case study due to the vast potential capability of this system. The University of Kirkuk can use this system free of charge; and there is the option of transition to the stage of adding services in different work stages for a relatively small fee. Moreover, it can be developed in the future to include a new facility. The test results showed that this system is scalable, malleable, flexible and interoperable for any future development.

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