

Integrated System for Efficient Human Resource Information Usage and Management: In Case of Debre Markos University

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Abstract: The research entitled with “Integrated System for Efficient Human Resource Information Usage and Management: In case of Debre Markos University” focuses on choosing the best information systems integration approach and automating the human resource management (HRM) tasks. In the walk-through, an integrated human resource information management system (IHRIMS) is developed for the university by choosing business process integration oriented application integration (BPIOAI) approach. The IHRIMS integrates campus, office, department and college, job and vacancy, selection and recruitment, employee profile, employee attendance, employee leave, employee efficiency, employee position, study leave agreement and file management subsystems. The system uses central database to hold and provide consistent human resource management information for authorized users. This helps the users to have effective communication, do their jobs properly, make appropriate work analysis and decision. In general the new system improves satisfaction of stakeholders, makes resource utilization more efficient which in turn enhance the university productivity and competitiveness.

Keywords: IHRIMS, BPIOAI, Debre Markos University, Systems Integration, Employment Cycle, HRM

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I. INTRODUCTION

Human Resource Management is the process of recruitment, selection of employee, providing proper orientation and induction, providing proper training and the developing skills, assessment of employee (performance of appraisal), providing proper compensation and benefits, motivating, maintaining proper relations with labor and with trade unions, maintaining employee’s safety, welfare and health by complying with labor laws of concern state or country. Many great scholars had defined human resource management in different ways and with different words, but the core meaning of the human resource management deals with how to manage people or employees in the organization [1]. The employment cycle involves an organization determining its employment needs in line with its business strategy. Once employment needs are established, it’s time to hire staff. Once staffs are employed, steps need to be taken to ensure employees are satisfied and productive. The final phase of the cycle is managing what happens when employees leave the organization. These three phases of the employment cycle are summarized in the following diagram.

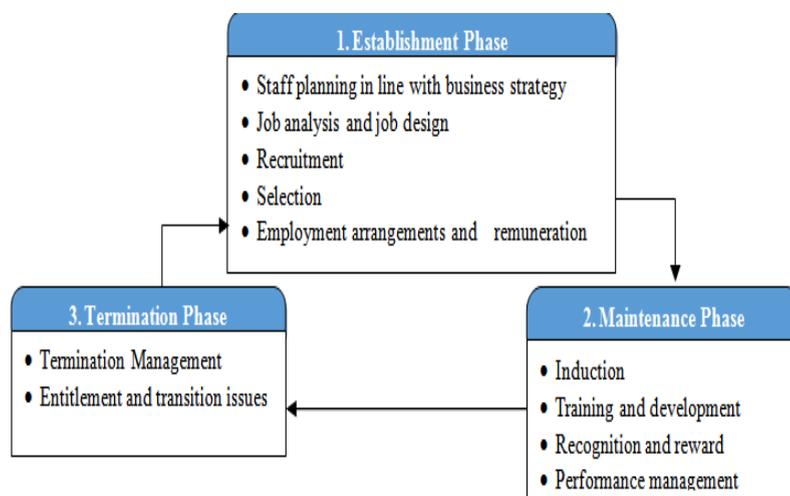


Figure 1. Employment Cycle

Activities of the three employment phases are discussed below:

Human resource (HR) planning is the development of strategies to meet the organization's future human resource needs. Job analysis is the study of an employee's job in order to determine the duties performed, the time involved with each of those duties, the responsibilities involved and the equipment required. A job description is a summary of what the worker will be doing — the role they will have in the organization in terms of duties and responsibilities. A job specification will indicate the sort of person an organization is seeking in terms of personal qualities, skills, education and work experience. Job design details the number, kind and variety of tasks that individual employees perform in their jobs. Jobs may be designed so they include a variety of tasks to keep employees interested and motivated. Recruitment is the process of attracting qualified job applicants from which to select the most appropriate person for a specific job. When an organization decides to recruit staff, it may choose internal or external recruitment methods. Employee selection involves choosing the candidate who best matches the organization's requirements. Induction is a process of acquainting new employees with the organization — its history, structures, objectives, culture, policies and practices — and the jobs they will perform. Training generally refers to the process of teaching staff how to do their job more efficiently and effectively by boosting their knowledge and skills. Development refers to activities that prepare staff to take on greater responsibility in the future. Recognition and reward programs aim at both acknowledging the work an employee has done and providing some sort of benefit, such as cash, merchandise, travel or gift certificates, in return for a job well done. Performance management focuses on improving both organizational and individual performance through relating organizational performance objectives to individual employee performance objectives. Performance appraisal is the formal assessment of how efficiently and effectively an employee is performing their role in the organization. Termination is the ending of the employment of an employee. There are many reasons why employees leave an organization. However, it is possible to classify the different types of separation into two broad categories: voluntary and involuntary. [2]

In Debre Markos University, the human resource management tasks are currently performed using office automation tools like MS-Word, MS-Excel and paper based official letters. Handling information generated from these activities using only the specified tools is not enough and appropriate to manage the tasks properly, make the right decision on the right time, make the data accessible easily, protect data from unauthorized access, maximize customer satisfaction, make the university productive and competitive in the market. Therefore, using the appropriate information technology and information system is unquestionable to automate and facilitate human resource management tasks.

Information technology (IT) has become a vital and integral part of every tasks of an organization. Information Technology tools used to capture, processes, transmits and stores information resource. In organization, especially in medium or large organization, it is very difficult for the top management and authorized employee to manage all the organization information resources manually. Information technology has played a main role in managing such complex problems by introducing user friendly solutions called information systems. An information system is an integrated and cooperating set of software directed information technologies supporting individuals, group, organizational or societal goals [3]. Today there is a rich and diverse choice of software selection available for almost every business domain. This software has a huge amount of processing capacities. However these software applications are like 'islands of processing systems' even within an organization and across business boundaries [4]. Joint use of systems provides the organization with complete control over its production processes. Due to their integration, the latest product data becomes available to the users immediately and it can also be used by all the necessary company departments in order to ensure a more effective production resources planning, which is especially important in modern highly competitive environment, when the rate of development of new products is one of the most important elements of the enterprise success [5].

II. SYSTEMS INTEGRATION

One common problem for many organizations is how to efficiently manage the continually expanding amounts of data they have to store regarding employees, clients and suppliers. Despite technology being implemented across many organizations in order to assist with the management of data, it is not the case for all of them and many of those that do have an adequate information system, are not maximizing its potential to make the overall business more efficient [6]. Systems integration is the practice of joining the functions of a set of subsystems, software or hardware, to result in a single unified system that supports the requirements of an organization [4]. Systems Integration or application integration is a strategic approach to binding many information systems together, at both the service and information levels, supporting their ability to exchange information and processes in real time. System integration is necessary for any organization to facilitate information management, meet its goal and become competitive in the world. It ensures data connectivity between different subsystems database and reduces proneness to errors, improving both the internal workflow of an organization.

Having all systems integrated into one helps the organization to achieve consistent data sharing between different offices, in time reliable information availability, in time information based decision, effective communication between subsystems and managers and different end users, avoid paper based report communication generated from subsystems. Although approaches to Systems integration vary considerably, it is possible to create some general categories, which include [7].

Information-Oriented

Information-oriented Application Integration (IOAI) deals with the simple exchange of information between two or more systems. Most application integration project will leverage IOAI. Indeed; IOAI is the ground floor of application integration, providing a simple mechanism to exchange information between two or more systems. In order to move data from one database to another, the application integration architecture and developer need to understand the metadata for each database so they can select the data that will move from one database to the next. The architecture and developer also must determine the frequency of the data movement.

Business Process Integration-Oriented

Business process integration Oriented Application Integration (BPIOAI) is the science and mechanism of managing the movement of data, and the invocation of processes in the correct and proper order to support the management and execution of common processes that exist in and between applications. BPIOAI provides another layer of easily defined and centrally managed processes that exist on top of an existing set of processes and data contained within a set of applications. BPIOAI is an aggregation of business process modeling, business process automation, and workflow. This approach implements and manages transactions and real time business processes that span multiple applications, providing a layer to create common processes that span many processes in integrated system.

Service-Oriented

Service-Oriented Application Integration (SOAI) allows applications to share common business logic or methods. This is accomplished either by defining methods that can be shared, and therefore integrated, or by providing the infrastructure for such method sharing such as Web services. Methods may be shared either by being hosted on a central server, by accessing them inter-application (e.g. distributed objects), or through standard Web services mechanisms. Service-Oriented Application Integration provides mechanisms to create composite applications, leveraging services found in many remote systems.

Portal-Oriented

Portal-Oriented Application Integration (POAI) allows us to view a multitude of systems both internal enterprise systems and external enterprise systems through a single user interface or application. POAI avoids the back end integration problem altogether by extending the user interface of each system to a common user interface (aggregated user interface) most often a Web browser. As a result, it integrates all participating systems through the browser, although the applications are not directly integrated within or between the enterprises.

III. THE EXISTING SYSTEM

In Debre Markos University tasks in every phase of employment cycle is processed and communicated among different offices, departments, colleges, institute and campuses via office automation tools and official letters. In the university, new job levels are proposed and send for approval to Ethiopian Ministry of Public Service and Human Resource Development. Once the new job is allowed to the university, the human resource management office allow the job to a specific office or department or college and announce them that they do have a vacant position. Whenever there is amendment of a job profile, the office is responsible to announce the change to the concerned office or individual in the university. Human resource management office is also responsible to identify the staffing needs of each office, department and college in the university. The office collect human resource needs of each office by requesting them through a letter. The offices also reply for the requests through a letter but it requires approval of officials hierarchically. The human resource team leader compiles the staffing needs collected from each office and makes it ready for advertisement. Then the available vacant positions will be posted on notice boards, the universities website and news paper to announce for public. Application for the available vacant position is submitted by applicants directly to the human resource management office via post, fax mail or in person. During the recruitment or selection process, applicants will be notified about their status through notice or sometimes by phone calls. Selection of the applicant that best matches to the position is done by a recruitment committee. Member of the recruitment committee includes one human resource officer, manager and immediate manager of the office to which the selection is being done. The selection criteria include applicant's documents, written examination, practical examination and interview. The criteria may vary depending upon the type of job and qualification of the applicants.

Applicants selected for recruitment needs to bring a medical examination result from medical centers and figure print registration confirmation letter from police office. The candidate has to fill his/her personal details and other required information on the recruitment form. To complete the recruitment, the candidate must also provide a legal representative and make recruitment agreement with the university. As soon as the recruitment agreement is completed the candidate becomes an employee of the university so that he/she would receive an identification card and appointment letter from human resource management office. The identification card and the letter are prepared by human resource officers manually by collecting the required employee's information from the filled copy of the recruitment form. An employee through his/her stay in the university at some position is eligible for various types of leave. Both academic and administrative staffs are allowed to get maternity leave, sick leave, leave for personal matter, special leave with pay and without pay leaves. Besides, academic staffs are also eligible for research, sabbatical and occasional leaves where as administrative staffs are eligible for annual leave if they fulfill the requirements. Leave is given to an employee by his/her immediate boss or some times by administrative or academic vice president upon request and the type of leave requested. Fulltime employees get their salary from the university every month. The payroll is prepared by finance office workers. The office always collects attendance records of employee from each office through the human resource management office every month. That means the office sends a letter requesting directors, department heads and college deans to send monthly attendance record of the employees who work under their supervision every month. The human resource team leader compiles the attendances collected and forwards it to the finance office. In addition to the regular job or the job which an employee is recruited for, employees are appointed on some managerial position during their stay in the university. According to their performance or some other reason employees terminate their managerial position voluntarily or involuntarily. In both case the position status of the employee is informed to concerned offices and the employee through official letter. Training and development are necessary to improve employees' skill and abilities for personal and organizational growth. For this reason the university sponsors its' employees for short and long term training given by the university itself or other institutions. Whenever an employee left the University for Study, he/she has to make an agreement with the university by providing a legal representative. The employee should report his/her study status to the university and must also extend his/her study agreement if he/she could not complete the study in time. After completing the study, the employee should repay the University for every Cost the university covers during the employee's study period by service or down payment. Employee performance management is the key element in an organization to make sure that employees are working in line with the organizations' objectives. In the university, there are different employee performance evaluation checklists depending upon the type of employee. Performance evaluation is performed in semester or annual basis. Efficiencies of academic employees are evaluated by colleagues, students and immediate boss of the employee. Efficiencies of administrative employees are evaluated by colleagues and immediate boss of the employee. The summarized evaluation result will be given to employees in hard copy. In the university, most of the files created for an employee and the official communications among human resource management and other offices are stored in the record office. These documents are borrowed from the record office by human resource management office workers and other authorized officials whenever they want to refer those documents and make some decision. Quarterly, half year and annual statistical reports are prepared by human resource officers at 1st, 2nd, 3rd quarters, 1st half year, 2nd half year and at the end of the academic year. The report shows number of administrative, academic or both staffs, and number of employee recruited, terminated and left for study during the selected report period. In general, in Debre Markos University all human resource management activities are performed manually and exchanging of employee information between offices are conducted through official letters.

IV. STATEMENT OF THE PROBLEM

As discussed above in the existing system all the human resource management activities are performed by human resource management and other office workers manually using official letters and office automation tools such as Ms-Word and Ms-Excel. There is no central database that keeps and makes records of employees and other information generated from each tasks available to authorized users. Managing human resource information manually causes the following problems:

1. The human resource management office worker can only meet the staffing needs of any office if and only if there is vacant position allowed for the office. Staffing needs of departments, colleges and offices are announced to human resource management office through official letters. The official letters passes through different office hierarchically for approval. Since there is no way to deny offices from sending staffing request if they have no allowed vacant position, human resource management office workers are enforced to cross check the staffing requests collected from each office with the list of allowed vacant positions for offices manually. Therefore collecting, cross checking and compiling human resource needs become so tedious and time consuming.

2. The university uses news paper, its website and notice to advertize the vacancy for job seekers. Announcing a vacancy through a news paper lets the university to spend too much money.
3. The existing system does not allow job seekers to apply for the vacancy and follow up their application status online which enforces the applicant to submit their application for the office and follow their status in person, which causes unnecessary wastage of time and money for the applicant. If a vacancy only invites internal applicants (employees) for promotion, human resource officer must check the eligibility of the applicants based on the regulations of Ethiopian Ministry of Public Service and Human Resource Development office. To do so the human resource officers must refer employees' service year and promotion history to accept the application which causes work load on the officers.
4. The recruitment committee prepares a minute to approve the final selection result, announce and proceed to the recruitment phase. This minute has to go through different hierarchical offices for approval. Preparing the minute manually is time consuming, error prone and the approval is also a length process.
5. In the existing system President, Vice Presidents, Directors, HRM Officers, Record Officers, College Dean, and Department Heads can't easily get and refer personal details, educational background, family details, work experience, promotion details, position history, status history, study agreement details, discipline case and reward of employee. As a result these officials are facing difficulties to make accurate decisions in time.
6. Preparing identification card, various letters such as appointment, work experience, promotion, position assignment, resign etc of an employee requires referring and compiling different employee documents. This is tedious, time consuming and may also lead for file loss.
7. Whenever a salary amendment is allowed for a particular job or all jobs, the human resource officers prepare salary amendment letter for all affected employees. Since preparing such letter for all employees needs to refer each employee document the process requires more time and labor. It also leads the amendment not to be effective on time.
8. When there is competition between employees for scholarship, position assignment, internal promotion etc, employees are ranked by their efficiency. Compiling employee's efficiency and ranking requires more time and accuracy.
9. When employee requests for a leave, it is difficult for the employee's immediate boss to easily refer leave transaction, know and calculate employee leave balance.
10. To prepare payroll finance officers require employee's monthly attendance. Official are always reminded by human resource team leader through official letter to send monthly attendance records of employees who work under their supervision. This is a routine task and if the report is not sent to the finance officer on time it leads for service delay.
11. It is difficult and error prone to prepare different employee statistical reports such as quarter, half and annual employee statistical report (by level of education, gender, employee type, employee status) at university, campus, college, department and office level.

Generally these problems cause data inconsistency, data duplication, poor employee information usage and management, difficulty in preparing letters and reports, work load on employees, inefficient service provision and resource utilization which in turn dissatisfies the customers, service providers and minimize productivity of the university.

V. MAIN OBJECTIVE OF THE RESEARCH

The main objective of this research is to select appropriate systems integration approach and design an integrated human resource information management system for Debre Markos University.

VI. THE NEW SYSTEM

Human resource management consists of wide range of activities. These activities include human resource planning, recruitment/selection, employee profile management, leave management, attendance management, performance and appraisal management, training and development management and employee file management. In order to manage these activities efficiently and solve the problems stated above, it is possible to use either of the following two approaches. The first approach is designing an Information System and data repository to manage each activity of human resource management and information generated from the activities separately. The second approach is designing a system using systems integration concepts. The researchers choose systems integration approach because designing each human resource management activities (business processes) separately leads to data redundancy, data inconsistency, administration cost, inefficient data management and high bandwidth usage problems. Among the different systems integration approach, the researchers selected Business Process Integration Oriented Application Integration (BPIOAI) approach. Because BPIOAI approach is the best approach to use a central data repository where information generated from different subsystems communicate through it. The researchers designed an Integrated Human Resource Information Management System (IHRIMS) using BPIOAI

approach by integrating the subsystems discussed below. In the new system there is central database where different subsystems can store data to and retrieve data from. The new system integrates the different subsystems together to provide an efficient human resource information usage and management. The following diagram shows the integration of subsystems.

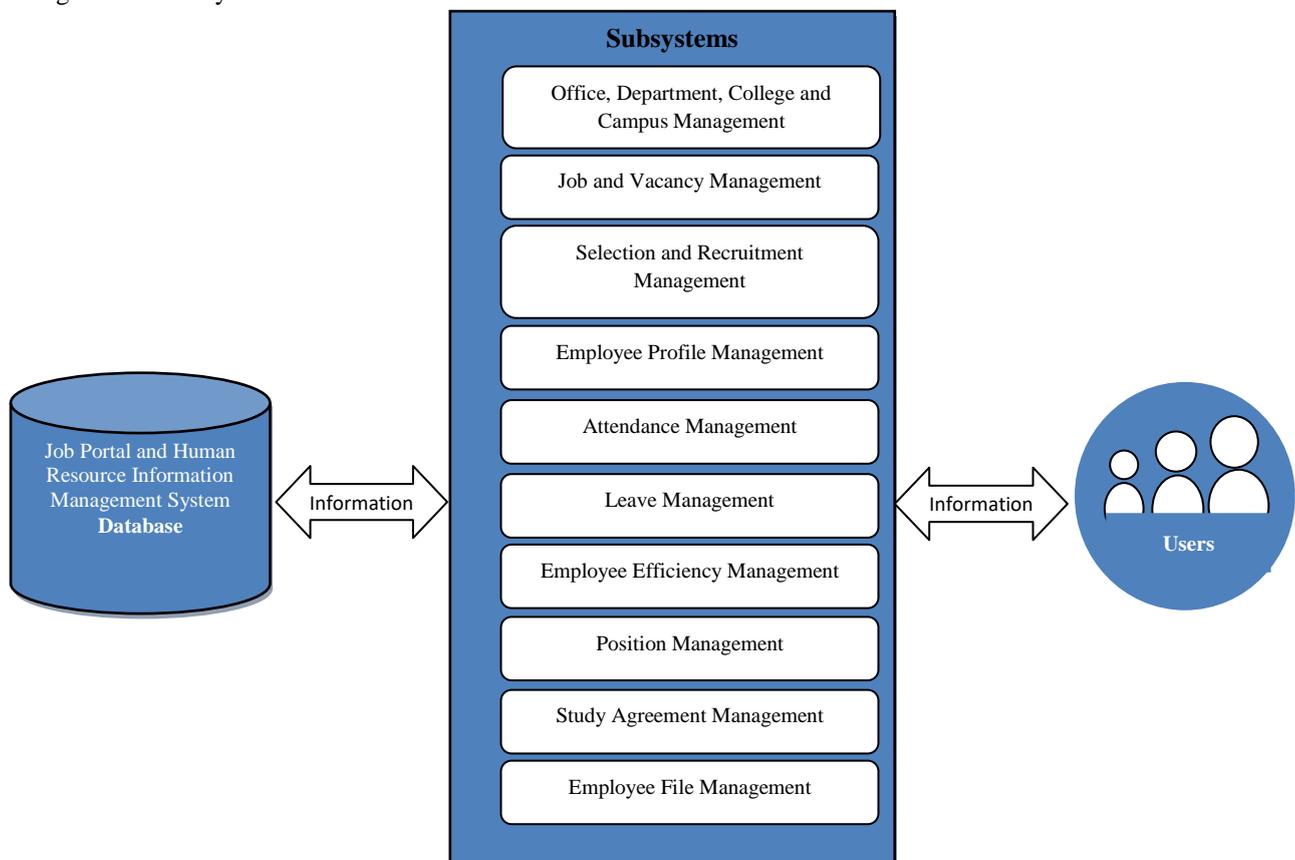


Figure 2. Integrated Human Resource Information Management System

The subsystems are described as follows:

- 1. Office, Department, College and Campus Management:** This module is used to manage information about offices, departments, colleges and campuses.
- 2. Job and Vacancy Management:** This subsystem enables authorized human resources management office workers to manage job levels, job description and allow new jobs for each office. Using the subsystem, department heads, college deans, directors and presidents can manage staffing requirement and approve the requirement as per their managerial hierarchy. It also allows human resource management office workers to announce vacancies and enables applicants to apply for open vacancies online and follow up their application status.
- 3. Selection and Recruitment Management:** It helps the human resource management officers to manage applicant profile, manage recruitment committee members profile, manage and announce applicant result. It also allows the office to generate recruitment minute and make it available for approval to concerned higher officials. The subsystem also enables the officers to announce selected applicants for recruitment.
- 4. Employee Profile Management:** this subsystem is used to manage all the required information of an employee during and after recruitment. It includes personal details, dependents, emergency contact, qualification, work experience etc. Letters such as appointment, promotion, work experience, resign, salary amendment etc are generated by the system as per the request. The system also generates various employees' statistical reports like quarterly, half year and annual. The reports describe employee's statistics on sex and qualification basis. The report also shows the number of employees recruited, left for study and terminated statistics during the selected report period.
- 5. Leave Management:** it is used to manage academic and administrative staff leaves as per the university's legislation.
- 6. Attendance Management:** this subsystem allows officials to manage attendance of employees who work under their supervision. It also makes monthly attendance report of all employees available to concerned

directors and officers such as finance director, finance officer and human resource management director at every month before payroll gets prepared.

7. **Position Management:** It is used to manage positions available in the university, assign position for an employee and terminate the assigned positions. It also generates position assignment or termination letters and position assignment report.
8. **Study Agreement Management:** In order to upgrade employee's skill, the university provides its employees with on job and off job short term and long term training. The sponsorship given to the employee is payable to the university either with service or payment. This subsystem enables human resource management officers to manage employee, study leave representative, study leave agreement and commitment. It also allows higher officials to access study leave report such as study profile, employees who needs to extend their study leave agreement etc. The system also notifies employees to report their study status to the university or extend their study agreement upon completion of the study leave agreement period.
9. **Employee Efficiency Management:** It helps department heads, college deans, directors and presidents to manage efficiency of the employees who work under their supervision. It also allows the officials to generate a summarized printable version of the employee's efficiency.
10. **Employee File Management:** A record office is one of the offices in the university where employee records are stored and retrieved in hard copy. Files are arranged using shelf number, partition number, folder number and employee identification number. This subsystem allows the record officers to manage file location and employee file. It also helps record officers to easily retrieve files and borrow employee files when ever required.

In addition to the above subsystems, the new system provides features that help the human resource management office to get feedback from users and announce notices to an employee or the university's community. In the new system employees have given different roles based on the position at which they are working right now in the university. Here are the lists of user roles: Employee, Department Head, College or Executive Dean, Director, Finance Officer, Human Resource Management Officer, Record Officer, Human Resource Management Team Leader, Vice Presidents and President. The system grant different access privileges when an employee is assigned on some managerial position and revoke the access privilege upon position termination automatically. The system also blocks an employee from accessing the system as soon as their status is changes to terminated or retired.

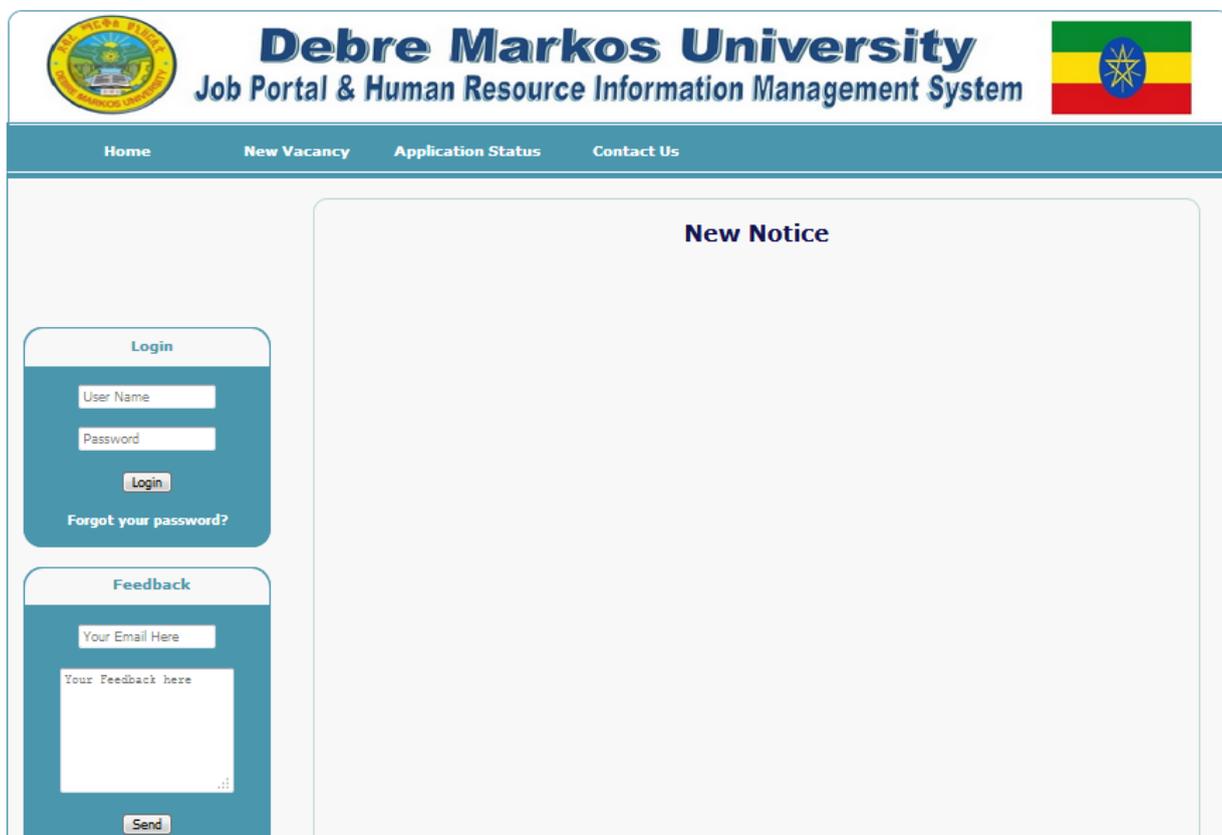


Figure 3. IHRIMS home page

When users logged into the system with their account information, it authenticates the users and provide task links as per the privileges given to them. For instance the page given below will appear when a department head logs into the system.

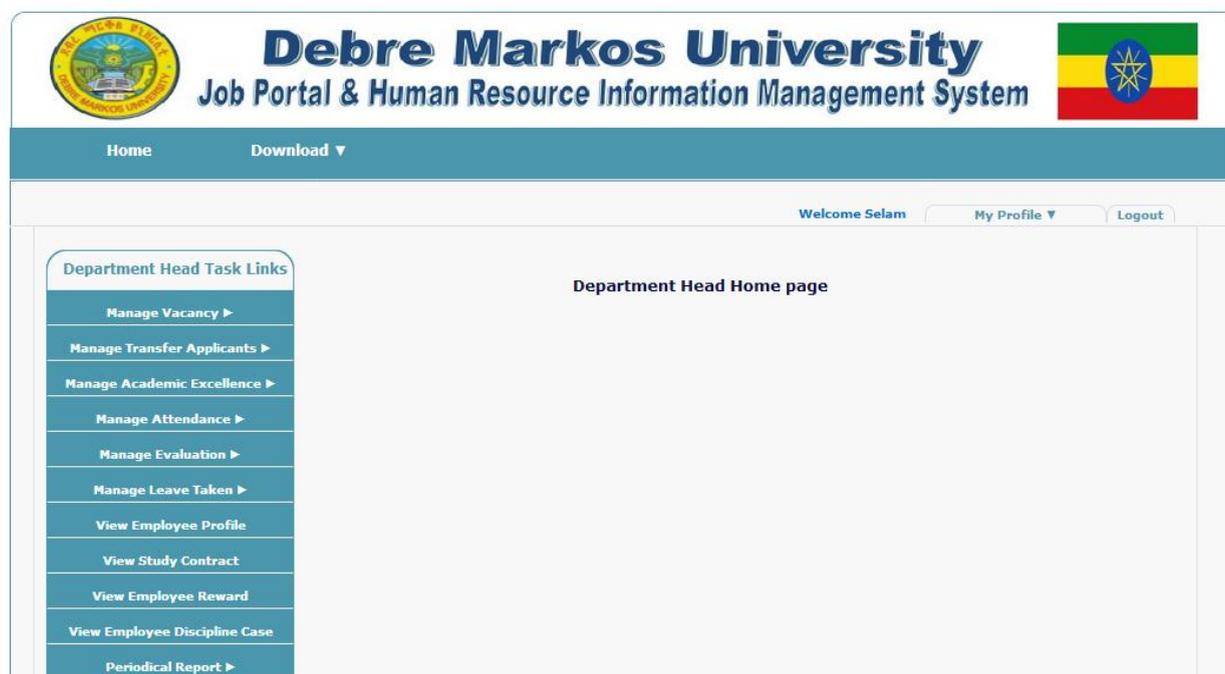


Figure 4. Department Head's Page

The integrated human resource information management system, IHRIMS, developed by the researchers has the following benefits:

Provide Centralized Information Accessibility

The new system makes information available and accessible to authorized users as per the privileges given to them any time. Changes made to information in each business processes will be introduced to the system automatically. It reduces inconsistent data exchange between different subsystems and offices, departments and colleges. It makes communication effective by providing the right information to the right employee at the right time and helps them to get their jobs done in time.

Enhance Security

The new system provides different access control lists and access levels. The system authenticates all users upon login and provides task links based on the access right granted for them. The access rights include read only, or read and write. The system uses encryption to secure some sensitive information.

Support decision making

The IHRIMS provides up to date information centrally and changes made to information in each business processes will be introduced to other subsystems too. This allows employees at different managerial positions to make more accurate decisions, work and analysis.

Reduce Risk of Errors

Since the new system uses well organized central database it avoids data redundancy and bring data consistency that will reduce the chance of making mistakes.

Minimize Costs

The new system make data available at one location centrally which helps the university to save computer storage space. The system also reduces stationary material, advertisement, administration and bandwidth cost.

Adequate File Management

The system generates a file number for new employee by identifying top free shelf, partition and folder. The new system helps record officers to locate employees' document easily from the shelf by providing a digital file management feature. The system also enables record officers to monitor borrowed employee documents transaction.

Maximize Satisfaction and Productivity

The new system provides simplified approach to eliminate very tedious human resource information management paper works. In time information and service provision maximizes satisfaction of employees and customers. Satisfaction by itself is a driving factor for productivity. Besides, since most of the human resource management tasks are automated it reduces employees work load and enable them to spend more time on tasks that will make the university productive and competitive.

VII. CONCLUSION AND RECOMMENDATION

Conclusion

The researchers developed an Integrated Human Resource Information Management System to Debre Markos University which used to manage and use human resource information properly. To develop the system; programming languages Java Server Page(JSP) , Servlet, Java Script, Cascading Style Sheet, Hyper Text Markup Language and structured query language are used and software like Apache Tomcat web server, MySQL database server, Eclipse, Abnet and tested on different web browsers. The system incorporates two products, Ethiopian Calendar and Ethiopian Date Manipulator Java Package, which are designed by the researchers to handle date related data manipulation. These products are used to localize date values in IHRIMS. The system manages the activities of human resource management from staff planning up to termination phase of the university. It also allows different authorized users to interact with the system and perform human resource related activities with a user friendly interface easily.

Recommendation

The IHRIMS developed by the researchers is used to retain root information (employee information) for other information systems like inventory management system, finance system, registrar system, library system etc. So the researchers believe that all information usage and management throughout the university becomes efficient and easier if such information systems are also integrated with IHRIMS. The researchers also recommend that since all higher institutes in Ethiopia have similar organizational structure with Debre Markos University, they should use the same approach of this research output, IHRIMS, to make their human resource information management and usage efficient.

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