OVERVIEW OF UNIVERSITY MANAGEMENT INFORMATION SYSTEM

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Abstract: *The paper presents an overview of the university information management system (UMIS). Management information system (MIS) provides necessary information for the management and administration of an organization/enterprise. A university is an educational organization that needs a UMIS to increase efficiency in implementation and management of activities. The structure and construction cycle for an UMIS is also presented in this paper. The outcome of this study provides a useful methodology for successfully building and implementing a UMIS at the university.*

Keywords: *Management, Information, System, Management Information System (MIS), university, university management information system (UMIS), decision making, system cycle.*

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1. INTRODUCTION

The business information of modern organizations, especially university institutions have become quite enormous and challenging than their concern is how information gathered, stored, disseminated and utilized. Therefore, it requires an information management system that supports management work, more rapid and automated decisions, and to reduce uncertainties. The system also provides enough information for the University to plan activities, manage and evaluate their effectiveness. It provides a foundation for improving university capacity, training quality and competitiveness.

Over many years, building software applications have been carried out in a manner that each business application is built as an independent unit, for instance, student management application, training management application, enroll management application. These applications functioned independently and are not shared database. This approach reveals the following disadvantages:

1. Software functionality depends primarily on the software provider's professional

knowledge. And in certain cases, the requirements of the university are not fulfilled.

2. The database is not shared, which leads to fragmented information, reduced personal responsibility, wasted work, redundancy of data and especially inconsistent information.

3. Data is scattered, not consistently managed. The interface is not user-friendly, each software has a different interface. Therefore, users have a lot of difficulty in finding information.

4. Information security policies are not applied to all university's operational data; they are held by individuals. Then the usage data is difficult and not guaranteed.

As a result, the specification of the university management information system has become important and urgent. This paper presents an overview of the university information management system, the components and the cycle of building a university information management system.

2. UNIVERSITY MANAGEMENT INFORMATION SYSTEM

2.1 Management Information System

2.1.1. Definition of system

The word system is derived from the Greek word Systema, which means an organized relationship between any set of components to achieve common cause or objective. According to Longman Dictionary, a system is a group of related parts that work together as a whole for a particular purpose. As a similar definition, a system is a group of elements that are interconnected and work together towards a common goal [1]. According to the above system interpretations, the components of a system interact with one another to achieve a certain purpose. The system collects data from users, then converts it into information useful to decision makers. As a result, a well-developed and interactive system provides the best information and utility for managers. In order to receive a comprehensive concept and the use of the system, needs to put the system in the context of the system. According to [1], there are three systems in an organization:

- Management system: including persons, vehicles, methods of decision-making.
- Information system: including persons, vehicles and methods of information processing.
- Operational system: including persons, vehicles, and methods of implementing decisions.

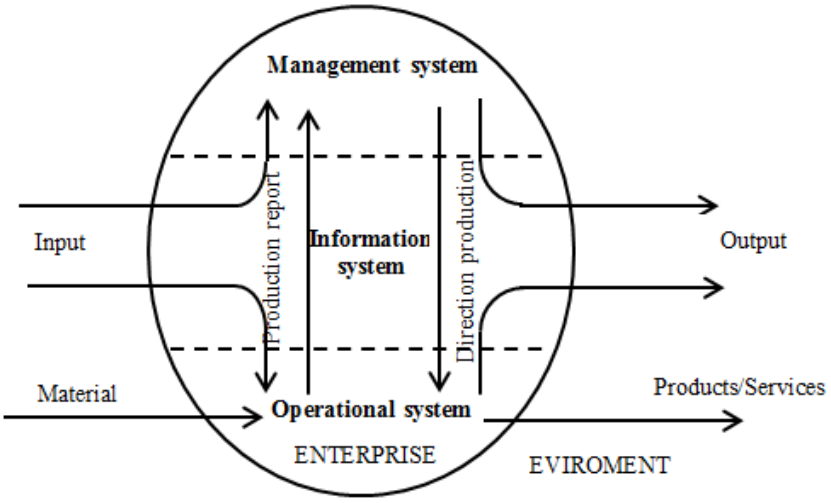

Figure 1. Systems of an organization [1]

Figure.1 shows the intermediary role of information systems within an organization (enterprise). The management system is the center of the organization, the role of that system is the decision-making process. The operational system is the consequence of making decisions: investment, production, inspection, etc. The information system acts as an intermediary between the management organization and the operating system, with the main role of collecting, processing and communicating data. In fact, there is no clear border between the component systems because the components of the above three systems exist in each management function of each organization.

2.1.2. Management Information System.

The term "Management information system" has three subject areas: management, information and system. Management is defined as the process of planning, organizing, implementing and controlling operations in the enterprise [2]. Similarly, management has been defined as the process that addresses the methods, techniques and effective use of organizational resources to achieve established outcomes [3]. The information refers to a data flow that was processed in the form and that is meaningful to the user. And the organization is an assemblage of different but interrelated and interdependent components that works as a whole to achieve common interest [4]. Judging from these definitions, Management information system (MIS) can be defined as “A system to convert data from internal and external sources into information and to communicate that information, in an appropriate form, to managers at all levels, in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible” [5]. Thus, MIS is an information system that provides necessary information for the management and administration of an organization. The core of a MIS is a database containing information that reflects the current state and operations of the organization. The

system collects information from the organization's environment, coordinates with the information in the database, and then gives the results that managers need. The database is constantly updated to ensure that the information accurately reflects the current situation of the organization. MIS is generally categorized at low and high levels [1]:

- **Low Level (Operational Level):** The system responsible for printing a number of transaction tables and documents in accordance with the traditional manual processing model**.** As a result, the system was often called the data processing system which usually commands the processing system, the equipment management system, the accounting system, etc.

- **High Level (Executive Level):** The system must provide strategic and planning information to assist managers in making the right decisions in managing the business of the organization**.** Consequently, the system has been called the Decision Support System. The characteristics of a decision support system are the database, models, methods and when models and methods chosen to apply to the database, the results presented according to the criteria diverse requirements of users.

Determining the functions of the MIS system is an important basis for successfully building a MIS for an organization. Pride et al. identified five important functions for MIS [6]

- **Collecting data:** The collection of data that is necessary for decision making in short-term and long-term perspectives.

- **Storing data**: Keeping the data in an effective format in order to ensure that they can be the right of data can be retrieved in a minimum duration of time whenever necessary.

- **Updating data:** Ensuring that changes related to the data that has been stored are reflected on the system in an instant manner.

- **Processing data into information**: Application of various analytical methods with the assistance of information technology in order to transform raw data into meaningful intelligence.

- **Presenting information to users:** Increasing the level of data presentability that can be used for decision-making by stakeholders**.**

2.1.3. University management information system

In the university, there are many activities that cannot be handled with simple processing applications like admission, registration, conduction of examination, keeping track of the employees and students and managing both employees and student accounts. A university is an educational organization that needs a MIS to manage thousands of students and staff more efficiently. The system, called education management system that can be defined by UNESCO as “A system for the collection, integration, processing, maintenance and dissemination of data and information to support decision-making, policy-analysis and formulation, planning, monitoring and management at all levels of an education system. It is a system of people, technology, models, methods, processes, procedures, rules and

regulations that function together to provide education leaders, decision-makers and managers at all levels with a comprehensive, integrated set of relevant, reliable, unambiguous and timely data and information to support them in completion of their responsibilities" [7].

As defined by UNESCO's Education Management System, a MIS for universities provides the university's operating procedures, processes and collects data on teachers, students and other managers. All of the data relevant to the concerned entities are aggregated, collected and organized, managed and processed which is then shared within the organization and is used by the concerned authorities and management at all grades to get the beneficial decisions for the university. As such, the MIS for the university contains all relevant information required by university managers at all levels to support all their activities. Alternatively, Hazem M. El-Bakry and Nikos E Mastorakis gave the definition of the university management system as "UMIS refers broadly to a computer-based system 'collection of hardware, software, people, data, and information' that provides managers with the tools for organizing, evaluating and efficiently running their departments" [8]. In this paper, the authors also highlight four elements of the UMIS described in Figure 2.

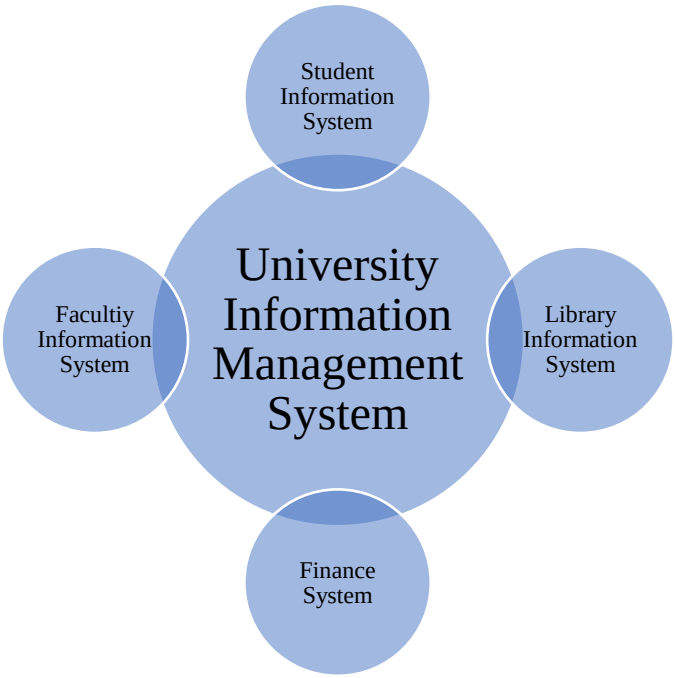

Figure 2. A Prototypical University Management Information System [8]

Student Information System (SIS)

SIS is the information system responsible for managing students' data within the university. SIS typical student record includes ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date of Birth), Faculty, Year, Department.

Faculty Information System

The Faculty Information System is responsible for managing and automating managerial activities related to Instructors, Employees, Courses, and the intersection between them. A typical faculty information system database record includes Faculty data; ID, Name, Departments, Courses data; Course ID, Name, Description, Instructors data; ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date Of Birth), Faculty, Year, Department; and Employees data; same as instructor's data with customized data about job.

Library Information System

The Library Information System is responsible for managing and automating libraries within the university. The system database record reflects the managerial tasks performed by librarians in order to effectively manage libraries. A typical Library Information System record will include Book ISBN, Name, Author(s), Keyword(s), and data like Section, List of all the books, List of books available, List of borrowed books, who is borrowing, when they should return, etc.

Finance System

Finance system is responsible for managing financial issues related the university. A typical Finance System record will include tuition, salary and other financial data relevant to the university's professional activities.

The UMIS system proposed as figure 2 has met most the goals of a UMIS such as: containing information about learners, lecturers, managers, training facilities, information on professional activities, finance and decision support for all levels of management. However, the system specification is still not specific, some subsystems have not fully demonstrated its function. For example, in a student management system, detailed records of what learners have already learned (at the level of learning objects, rather than a module or program), course registration new, the portfolio of skills development has not been clearly described. In the current context, when online learning becomes popular, it not only exists in parallel but in certain cases (e.g., epidemics, disasters,) has replaced face-to-face learning. Thus, when building the UMIS in particular and the educational information management system in general, the online learning management system can be organized as a component of the system or in each component system required contains the information and transaction supported for online training management.

2.1.4. The cycle of building a university information management system.

A UMIS is also a MIS, thus the process of building a university information management system is similar to the process of management information system. This problem given by O'Brien et al who explained a five-step process called the information development cycle, which includes the steps of: investigation, analysis, design, implementation and maintenance [9]. Dr. Abzetdin Adamov, Chief Information Officer, Head of Computer Engineering Department, in the presentation about University

Management Information System sited the implementation of a UMIS includes problem recognition, investigation requirement determination, system design, development and construction, implementation, evaluation and evolution. Similarly, to, Nguyen Van Ba has specified the system development cycle includes the following phases [1]:

Phase 1: Survey and evaluate the current situation: This phase is also known as problem recognition and investigation. The aims of this phase are:

- Approach the expertise and the operating environment of the current system.
- Research the functions, tasks, and how the current system works.
- Indicate the advantages that need to be inherited and the disadvantages of the whole system that need to be studied and overcome.

Phase 2: Requirement determination

In this phase, requirements of new system need cited clearly. It includes following works:

- Determine the scope of the new system (the system is for the whole organization or only involves a few departments, covers the entire management or only deals with a few specific management tasks).
- Define goals and priorities of the new system. The goals are Business benefits: increase processing capacity, meet business requirements, accurate, safe and confidential; Economic benefits: reduced staffing, reduced operating costs, increased income; Benefits of use: fast, convenient; Overcoming the disadvantage of the older system: supporting long-term development strategy, meeting imposed priorities and constraints. The priorities are constraints on system architecture, on equipment usage, on cost, location and implementation timeline.
- Outline the solution and consider the feasibility: The solution current step is the raw level, including Main functions of the system: input, output, key methods to meet user requirements; Overall knowledge of the system, including software architecture (subsystems, main modules.) and hardware architecture (network, computers, other devices.). The feasibility can be considered on professional feasibility (Providing the right necessary business information on time of request), technically feasible (The responsiveness of technical requirements) and economically feasible (The responsiveness of economic solution).

Phase 3: System analysis of functions and data

The objectives of this phase are functional models and the conceptual schema of data. Functional models of the system describe the work the system does. There are some models and means of describing the function, for example: functional diagrams, system flowcharts, data flow diagrams. The conceptual schema of the data is established according to the entity relationship model (E/R) and then completed according to the relational model.

Phase 4. System design

This phase makes the system implementation decisions that meet the given requirements in phase 2, phase 3, as well as adapting to the current conditions. The outputs of this phase are the overall system architecture, interface of information exchange, control and security, physical database, and modular system.

Phase 5. System installation

The installation phase consists of two main tasks: programming and testing. The result of this stage is that the system is executable. System testing requires a test plan that consists of several key activities and steps for programs, system, and user acceptance testing.

Phase 6. Implementation, evaluation and maintenance

In this phase, the system is used by the end users. Sometime, the system is put into a Beta stage where users' feedback is received and based on the feedback, the system is corrected or improved before a final release or official release of the system. Maintenance is necessary to eliminate the errors in the working system during its working life and to tune the system to any variation in its working environment. Some small defects of the system are found, then changes are made to remove them. The system planner must always plan for resource availability to carry on these maintenance functions.

3. CONCLUSION

The findings of this paper clearly show that a MIS is very necessary for an organization/enterprise. The system gathers data from a range of sources, compile and present it in an appropriate form. MIS helps managers at all levels, in all functions create reports that provide them a comprehensive overview of all the information. It also enables them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible.

The business information on the modern organizations, especially university has become quite enormous and challenging then requires a UMIS. All of the data relevant to the university are collected, organized, managed and processed that can be shared within the university’s departments. They are also used by managers at all levels to take the beneficial decisions for the university.

The building a UMIS is a cycle comprises phases: Survey and evaluate the current situation, requirement determination, system analysis of functions and data, system design, system installation and implementation, evaluation and maintenance. The building at UMIS is a cycle, this means that, these phases are not done linearly, they can go back and forth many times. For example, some defects are discovered during a testing in the installation phase, the corresponding analysis or design phase is reviewed and corrected.

In addition, the preparation of infrastructure, technology, human resources are also an important factor determining the success of UMIS implementation. The issue of training, development and use of available human resources should be carefully considered in the UMIS documents.

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KHÁI QUÁT VỀ HỆ THỐNG THÔNG TIN QUẢN LÝ

Tóm tắt: *Bài báo trình bày tổng quan về hệ thống quản lý thông tin trường đại học (UMIS). Hệ thống thông tin quản lý (MIS) cung cấp thông tin cần thiết cho việc quản lý, điều hành của một tổ chức / doanh nghiệp. Trường đại học là một tổ chức giáo dục cần có UMIS để tăng hiệu quả trong việc thực hiện và quản lý các hoạt động chuyên môn giáo dục. Cấu trúc và chu trình xây dựng một UMIS cũng được trình bày trong bài báo này. Kết quả của nghiên cứu này cung cấp một phương pháp hữu ích để xây dựng và triển khai thành công UMIS trong trường đại học.*

Từ khóa: *Quản lý, Thông tin, Hệ thống, Hệ thống Thông tin Quản lý (MIS), trường đại học, hệ thống thông tin quản lý trường đại học (UMIS), ra quyết định, chu trình hệ thống.*