

Knowledge-Based System for Higher Education Institutions

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Abstract: *This study developed and implemented a knowledge-based system tailored for higher for higher education institutions. With the need for automation and computerization, this system leverages advanced technologies by integrating data sources on the academic content and administrative processes. The research includes the design, implementation challenges, and the potential benefits of an innovative approach for higher education institutions.*

Keywords: Automated System, Database System, Knowledge-based Approach, Visual Basic

I. INTRODUCTION

Knowledge-based systems are computer programs that use a centralized repository of data [1]. These computer applications constitute a vital and dynamic aspect of the use of data. Knowledge-based systems play a key role in converting raw data into useful insights as the basis for automation, problem-solving, and well-informed decision-making across a variety of areas [2]. The use of this approach in our daily lives helps to make tasks simpler and more efficient [3]. It also lowers costs for an organization to transition from paperwork to a digital working environment [4].

As a result of the urgent requirement for computerization, the knowledge-based approach has permeated numerous sectors and government agencies [5]. To handle the paperless transactions, higher education institutions (HEIs) in the Philippines have embraced the age of automation. HEIs are knowledge-intensive enterprises with a vast amount of knowledge and skills dispersed across several departments and administrative divisions.[5][6]. Their ability to effectively manage this wealth of information is critical to their success. An effective way to address this problem is through a knowledge-based approach [1][2][3][4].

According to observations, some HEIs still haven't integrated digital transactions into their workplaces. They are currently dealing with a wide range of difficulties in a time of rapid technological improvement. Traditional methods for managing data, disseminating information, and making important decisions within institutions are now being shown to be insufficient. The main issue at hand is the inefficient management of the enormous amount of data, such as recording of the syllabus, table of specifications, tests, SALN, and other papers, which results in a siloed information redundancy of submission and centralized accessible resources. Additionally, this problem is made worse by the absence of a unified platform that can harness institutional data, which may have an impact on the performance of the institution.

Thus, this study developed a knowledge-based system that caters to the need for a repository in a timely approach. This includes the creation of different applications such as a user registration module, requirement module, and report module. The software used for the development is Visual Basic, along with Microsoft Access as a database. The system was evaluated using John Brooke (1986) and the ISO 9126 instrument.

II. METHODOLOGY

2.1 The Spiral Model

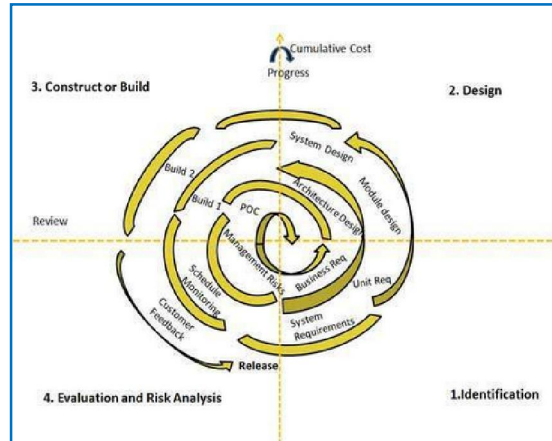


Fig. 1. Sample of the face images generated by Python script

2.2 Data Gathering

The data collection process demonstrates a methodical way to acquire data required for the creation of a knowledge-based system specifically designed to meet the demands of HEIs. The approach aims to build a solid foundation by synthesizing existing information, emphasizing weaknesses in the current process, and conducting an extensive study of the current process. Interviews were conducted among administrators, faculty members, and other respective staff to solicit their perspectives and preferences. These techniques guarantee that the system's development is closely related to and grounded in the needs and expectations of the end users.

2.3 System Development

The development phase of the system involves the use of Visual Basic as the programming language and Microsoft Access as the database. This combination offers a powerful and user-friendly platform for building a knowledge-based system tailored to the unique needs of the HEIs. Visual Basic is known for its ease of use and rapid application development capabilities, enabling the creation of a responsive and intuitive user interface. This is essential in ensuring that the user can easily interact with the system to access and contribute to the knowledge repository.

Microsoft Access, as the chosen database system, provides a robust and scalable data storage solution. It allows for the efficient organization, retrieval, and management of various types of data, such as academic resources and administrative documents. The relational structure of Access accommodates the complex data relationships often found in higher education settings, ensuring data integrity and facilitating seamless data retrieval.

The development process should begin with the creation of a detailed system design based on the findings from the data-gathering procedure. This design should encompass the system architecture, user interface design, database schema, and functional requirements. Visual Basic's integrated development environment (IDE) offers tools for designing and coding the user interface, while Microsoft Access provides a user-friendly interface for defining database tables, queries, and forms.

2.4 Evaluation Methods and Tools

TABLE I: distribution of respondents

Respondents	N	Percentage
Office Clerks	3	10%
Campus Director, Program Heads	7	23.33%
Faculty and Staff	20	66.67%
Total	30	100%

Thirty persons evaluated the system presented in Table 1 along with the percentage distribution. The researcher distributed the questionnaires to measure the perceptions of systems usability.

III. RESULTS AND DISCUSSION

3.1 Screenshots of the System

Fig. 2 presents the registration module. Before using the system following their user type, the user must register in this module by providing all the information requested by the system.

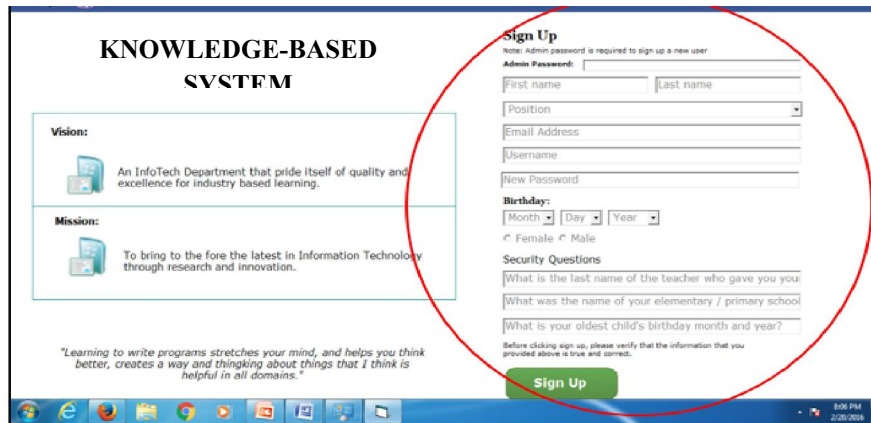


Fig. 2. Registration module

Fig. 3 shows the requirement module. Users upload the necessary documents for submission to the head of office in this module. Such papers as PDS, Grade Sheets, Accomplishment Report, Teacher's Program, Test Questioner with TOS, SALN, IPCR, and OPCR must be in PDF format to compress files for simple uploading.

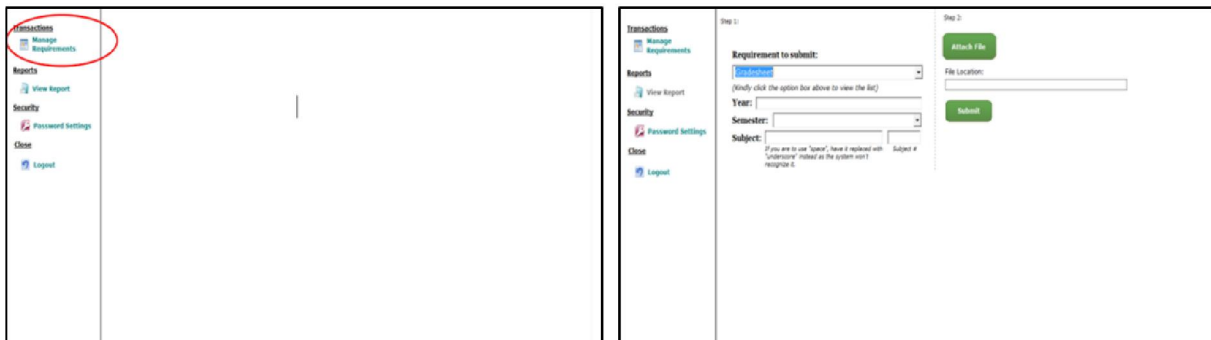


Fig. 3. Requirement module

Once the file is uploaded a message appears as shown in Fig. 4. This is an assurance of a successful submission of files.

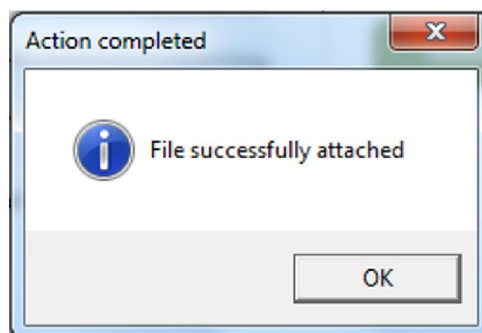


Fig. 4. Sample notification message of the system

3.2 Evaluation of the System

The usability of the system is shown in Fig. 5. Users rated "Strongly Agree" with a mean score of 4.73 for component 1's question about whether the system is likely to be used frequently, and "Easy to Use" with a mean score of 4.67, both of which indicate "Strongly Agree." A mean score of 4.29 was obtained for how effectively integrated the system's many features were, and a mean of 4.11 for how quickly the majority of users would pick up using it. The average score of 4.51 indicates that the respondents believed they were very confident in utilizing the system. The system's overall mean usability index is 4.46, which indicates that respondents highly agree that the system is usable. Additionally, the findings showed that the majority of the employees were happy with the system's functionality and performance. The system's friendly environment, including the graphical user interface and commands, has been noted by users.

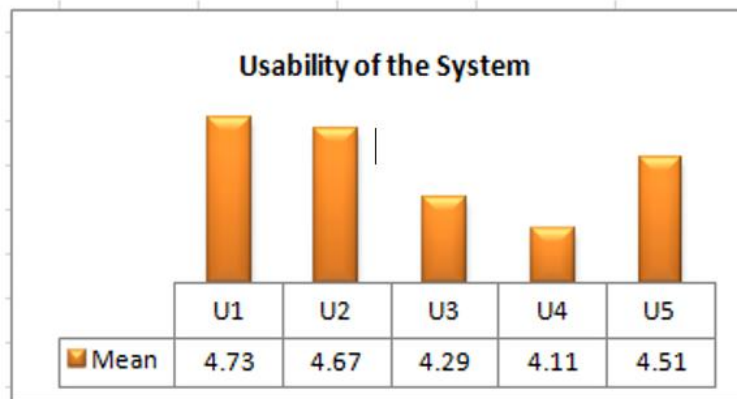


Fig. 5. Usability of the System

Fig.6 shows the extent of functionality as performed by the system. The system's essential appropriate functions are rated as follows: F1-4.34; F2- 4.40; F3-4.45; F4-4.30; and F5-4.40. The system also has security measures in place to prevent unauthorized access to the software functions. No employee gave this aspect a "Fair" or "Poor" rating. Strongly Agree is the weighted mean adjectival rating for the functionality factor, with a score of 4.37.

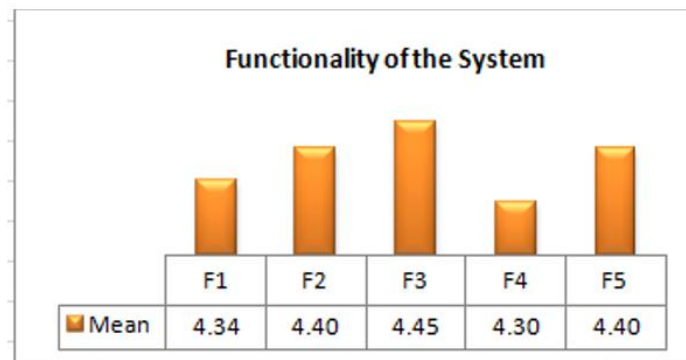


Fig. 6. Functionality of the System

Fig. 7 showed that the weighted means of the item's maintainability and efficiency scores were 4.34 and 4.28, respectively, indicating strong agreement. E1 and E2 are functional items, whereas M1, M2, and M3 are maintainability-related items. Most employees gave the maintainability category high marks on the "Strongly Agree" scale, citing features like the system's ability to quickly pinpoint the source of a software failure (M1-4.27) and its capacity to withstand updates (M2-4.47). Another feature is the system's ability to record system/data changes at a rate of (M3-4.30). In terms of system efficiency, the system has the resources to store enormous amounts of data (E1-4.17), and the system has the speed to carry out the process (E2-4.40).

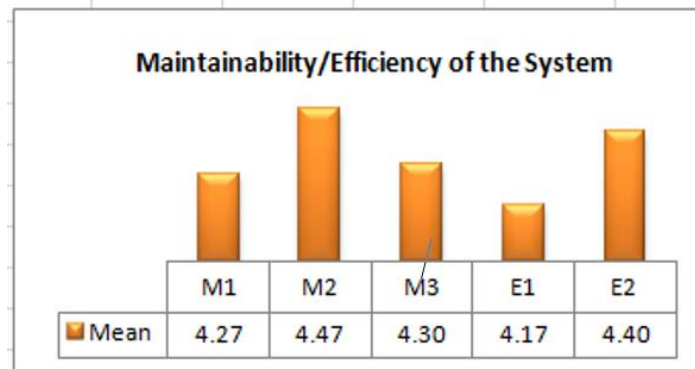


Fig. 7. Maintainability and Efficiency of the System

Given that not all employees are knowledgeable with system technicality, the terminology used in maintainability elements may be the cause of the 4.10 rate. However, having that rate in maintainability is a good sign that users continue to trust in the system's ability to locate the source of a failure and save data updates. Since Access is utilized as a database, the system's efficiency may be relied upon to store a considerable amount of data. Since the schemas are carefully defined, the capacity to perform the procedure quickly is also clearly seen. Further, Table II displays the system's overall mean, which is 4.29 from the mean of all analyzed features. Strongly Agree is verbalized as the grand mean.

TABLE III: Summary of Evaluation

System Evaluation in Terms of	Mean	Verbal Description
Usability	4.46	Strongly Agree
Functionality	4.37	Strongly Agree
Maintainability	4.34	Strongly Agree
Efficiency	4.28	Strongly Agree
Grand Mean	4.36	Strongly Agree

IV. CONCLUSION

According to the study's findings, the developed Knowledge-based System for Higher Education Institutions gave the users the knowledge they need to do any activity quickly and effectively. The system's modules function as intended and give each user precise information about their task in the format that suits them best. When necessary, the developed system can display real-time archived data and is flexible enough to meet new or altered information needs. The implementation is therefore easier and more practical. The division's requirements are met by each module.

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