

## PAPER

# Development of a Curriculum Management System for a State University in the Philippines

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## ABSTRACT

Curriculum development is a key to delivering quality education in a university's offered programs. Bulacan State University (BulSU)'s College of Information Technology (CICT) is known for producing globally competitive graduates in the Philippines. With its program offerings that advance from time to time, CICT shall continue to review, enhance, and revise its curricula to address the rapidly changing needs of the nation and the expected population it serves. The study utilized descriptive developmental methodology. This study focused on the digitization of the curriculum development process at CICT, allowing stakeholders, such as faculty members, students, industry, and academic partners, to review the college's curriculum for the coming years. The system was found acceptable by its intended users and will soon improve the curriculum development process at the college upon implementation.

## KEYWORDS

baccalaureate degree, curriculum development, management systems, web applications, web development

## 1 INTRODUCTION

The success of an educational program relies on developing a curriculum that addresses society, industry, and the nation's changing needs [7] [9] [13]. A university's curriculum of programs shall continually undergo a review process, revisions, and enhancements to better serve its expected population [1].

With memorandum orders from the Commission on Higher Education (CHED) guiding universities in formulating a curriculum, those involved in drafting a curriculum must take time to finalize it. One curriculum requires due process before approval. Frequently, a curriculum undergoes revisions to satisfy the needs of the industry or to adjust the courses taken by students per semester.

With all the tools available nowadays for educators to develop curricula digitally, coordination and collaboration among stakeholders will make it easy to review, enhance, and revise a curriculum [8]. Additionally, a custom-made web system to

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develop a curriculum could be developed by a university to address the changing needs of society and manage program curricula through proper management in collaboration [3].

The College of Information and Communications Technology (CICT) of Bulacan State University (BulSU) is in the City of Malolos, Bulacan, Philippines. It is known for producing globally competitive graduates under the Bachelor of Science in Information Technology (BSIT) program and formerly from another program, the Bachelor in Industrial Technology with a major in Computer Technology (BIT-CT). To date, the College no longer offers BIT-CT but is offering another program, the Bachelor of Library and Information Science (BLIS) program.

Drafting a curriculum allows input from other department heads from different university campuses that offer the same course. That being said, the hassle of external campus heads visiting the main campus to review the curriculum draft comes into play. Moreover, once the curriculum is done and approved, more efforts to have a copy of sent to the external campuses arise.

Additionally, problems arise during the curriculum development process when stakeholders need to review the curriculum draft. Stakeholders, such as students, parents, industry, and academic partners, need to review the curriculum draft and provide their insights, suggestions, and recommendations to further enhance the curriculum. With that, they need to visit the university once a schedule is set by the college for the curriculum review. This process takes time because each member of the stakeholders group is given a separate schedule, e.g., a schedule for academic partners, a schedule for parents, and the like.

A college may produce quality graduates with a good curriculum, selecting courses necessary for a student to learn and allowing them to experience industry-like courses to help them in their future. With this, the digitization of the processes involved in developing curricula for the College was aimed at.

This study is developed to help the CICT develop curricula following the requirements set by CHED with due process and approval from people involved in the curriculum development process. The web application digitized the processes of curriculum development for the programs at CICT. This developed system enabled CICT to check all courses included per semester and their prerequisites thoroughly.

## 1.1 Objectives

The study's main objective is to design and develop a curriculum management system for the College of Information and Communications Technology (CICT) of Bulacan State University (BulSU) to digitize the process of curriculum development.

The researchers considered the following specific objectives that determined the processes of curriculum development in the college that led to the features of the developed system: (1) Determining the processes involved in the development of a program curriculum through interviews with responsible persons; (2) Designing the web application's architectural requirements; (3) Addressing the development of curriculum by digitizing its processes, incorporating subject management, curriculum management, and notifications; (4) Developing a management system as an administrator panel, incorporating user management, college management, and department management; and (5) Determining the acceptability of the developed system using the standard software quality evaluation criteria of ISO/IEC 25010:2011 by its intended end-users.

## 2 MATERIALS AND METHODS

The researchers thought that the descriptive developmental approach was the most appropriate research methodology to develop the web-based curriculum management system for the BulSU-CICT.

A descriptive method was applied to this study as it aims to describe curriculum development processes [5]. The workflow was aimed at being digitized by using the developed system. Observations were conducted on how CICT reviews and revises its curricula. With the help of an interview with the dean, program chairs, department heads, and other faculty members, additional information was gathered, and the assurance of the observed data was validated. The problems encountered in the curriculum development process have been identified with this gathered data.

A developmental research methodology was applied to access the accuracy and effectiveness of the developed system. In this type of research, a process is systematically studied, developed, and evaluated that must meet the criteria for users' acceptance of the developed system [4] [5] [6]. The developmental research was adopted after the descriptive method process, after gathering data and additional information through observations and interviews. The gathered data on the curriculum development process enabled the development of a web-based curriculum management system that digitizes the creation, review, and enhancement of a curriculum.

The system was developed by following and applying a System Development Life Cycle (SDLC) process and phases. The developed system used agile software development methodology as its primary SDLC method. This methodology was done by going back and forth on distinct phases, revisiting a phase if there were changes in the later phases, and modifying contents from past phases if there were inconsistencies or anomalies that happened during the development of the system.

### 2.1 Respondents of the study

Table 1 presents the respondents to the study. The respondents to the study were the intended end-users of the developed web-based curriculum management system for the BulSU-CICT.

**Table 1.** Respondents of the study

Respondents	Frequency	Percentage
CICT Local Executive Committee	8	14.81%
CICT Faculty Members	20	37.04%
CICT Student Organizations	20	37.04%
CICT Industry and Academic Partners	6	11.11%
Total	54	100.00%

Respondents to the study are all stakeholders in the College. They have a significant impact on reviewing the College's curriculum offerings. The study's respondents are the CICT local executive committee, headed by its dean, faculty members, student organizations, and industry and academic partners. These people are all involved in the college-wide process of reviewing curriculum offerings and are the intended end-users of the developed web system. In terms of drafting the curriculum design for a specific

program offered in the college, the executive committee, together with selected faculty members, is assigned as the curriculum review committee of the college. The curriculum review committee is composed of the interviewed participants since they are the personnel assigned from drafting to finalizing the curriculum of a program.

Table 2 presents a five-point Likert scale used to determine the system's acceptability with the following range and descriptive rating. The Likert scale was used to evaluate the system using the ISO/IEC 25010 criteria. The scale's interpretation used the term "acceptable" since the objective of using the scale is to determine the acceptability of the evaluators.

**Table 2.** Five-point Likert scale

Scale	Range	Descriptive Interpretation
5	4.50–5.00	Extremely Acceptable
4	3.50–4.49	Very Acceptable
3	2.50–3.49	Acceptable
2	1.50–2.49	Fairly Acceptable
1	1.00–1.49	Poorly Acceptable

### 3 RESULTS AND DISCUSSION

#### 3.1 Processes involved upon the development of a program curriculum

The first and fundamental step in developing a computer system is to gather data and information from the stakeholders involved. This procedure will determine all the requirements for identifying the processes and features of a system [11]. Because of that, the executive council members of the college involved in curriculum development, the dean, and the department heads were interviewed to identify processes and procedures.

Interviews were conducted online and on-site with the previous and current deans and department Heads of CICT. The former and current department heads of both the BSIT and BLIS programs were interviewed. Additionally, the former and current deans of CICT were interviewed as well.

The results of the interviews enlightened the researchers on the processes of drafting and revising a curriculum. Figure 1 shows the process flowchart for creating and revising a curriculum.

The process starts with creating the Local Curriculum Committee, spearheaded by the college's dean. The committee is subdivided into groups based on the existing and proposed programs of the college. Department heads lead the curriculum revision, while a select faculty member heads a new program offering. Next is reviewing and revisiting the CHED's Memorandum Order (CMO) for each program. This process is crucial to identifying the minimum requirements for offering a program. The CMO also indicates the required courses and information for drafting a curriculum. After that, the minimum requirements are identified by benchmarking each program with the college's academic partners. This step will help each group draft a curriculum based on existing curricula and other schools' processes.

The fourth step is drafting the curriculum based on the CMO's inputs and the input from the benchmarking. In this step, the actual curriculum will be created. Aside from the curriculum itself, a curriculum map and a program of study will be made. When a draft curriculum is made, the presentation and consultation of the draft curriculum with the college's industry partners will start. The inputs

from the industry partners are essential in ensuring the curriculum content will be aligned with industry standards and produce industry-ready graduates.

When the inputs from the industry partners are incorporated into the draft curriculum, the sixth step will start, which is the presentation of the draft curriculum to the Curriculum Review Committee. The committee is composed of different stakeholders from the college. The committee will review and scrutinize the draft curriculum for corrections and suggestions. All inputs from the review committee should be carefully considered to produce an appropriate curriculum for each program.

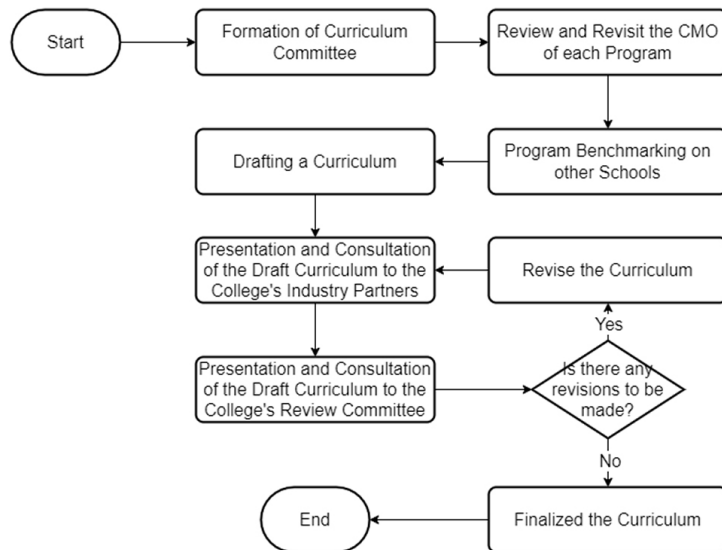


Fig. 1. Home page of the web application

### 3.2 Designs of the web application’s architectural requirements

Systems design is one of the fundamental steps in developing a computer system. According to Siddiqui [14], users’ requirements are met through system designs. They are designed to tackle current issues and find acceptable answers to problems that may develop in the future. From the blueprint to the finished result, the entire system development process entails considering all essential elements, determining the needed specifications, and developing a usable system based on the professionals’ strong technical, analytical, and development abilities. Because of that, the researchers carefully conceived the system’s architectural requirements by creating diverse designs for system development.

According to Biscobing [2], entity-relationship diagrams (ERDs) are a visual place to start for database design and can also be used to determine information system requirements across an organization. An ERD can still be used as a reference point if any debugging or business process re-engineering is required after a relational database has been deployed [12]. On the other hand, a context diagram visually depicts the relationship between data and business processes [10]. External entities, system processes, and data flows are the three major components of this diagram. It lists the factors and events to think about when designing a system.

Figure 2 shows the entity-relationship diagram used to create and model the database of the developed system. The ERD shows entities representing each table on the database and how each table is related to another using crow’s foot notation. Figure 3 shows the Context Diagram, or level 0, of the system.

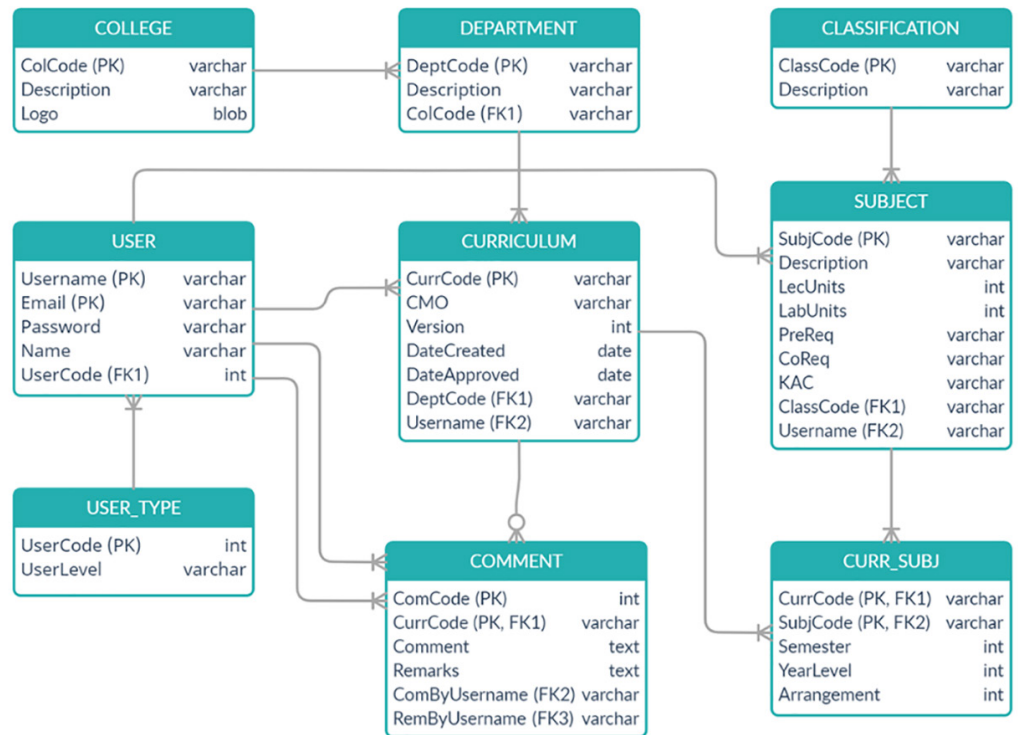


Fig. 2. Entity-relationship diagram of the developed system

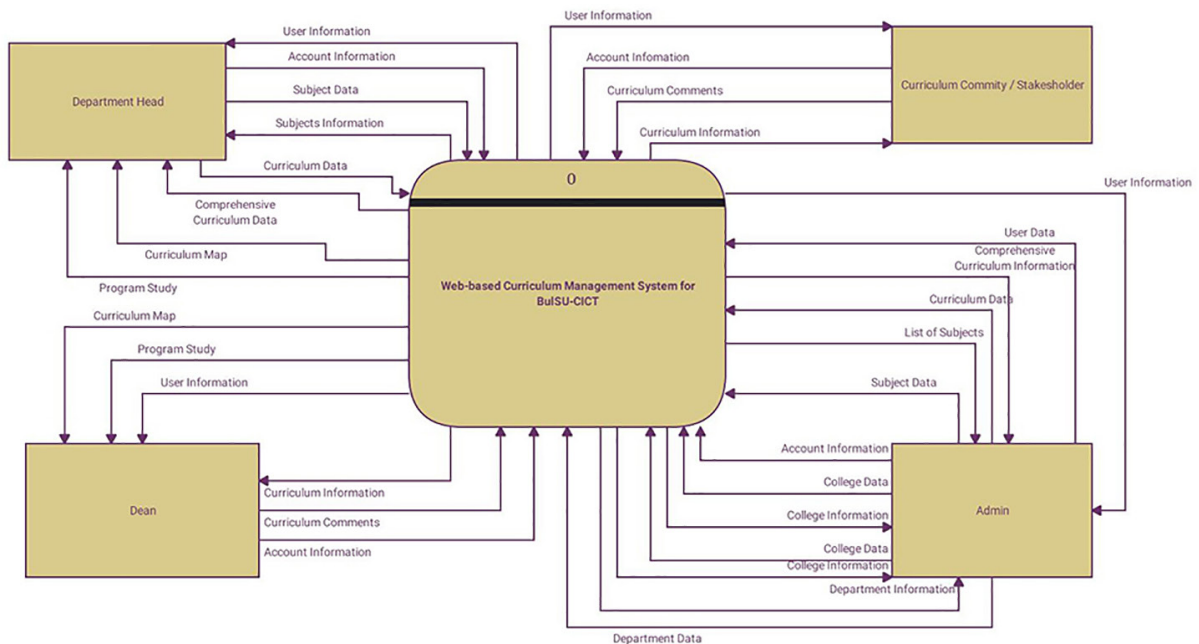


Fig. 3. Context diagram of the developed system

### 3.3 Features of the developed system for curriculum creation

This section presents the features that the intended end-users have access to. The features within this section are for curriculum development, focusing on subject management, curriculum management, and notifications.

Figure 4 shows the Subject Management page of the system. On this page, the administrator and the department head could manage the courses within the system. Figure 5 shows the Curriculum Management of the developed system. The administrator and department head could create and update a curriculum on this page. The system will display the created curricula in tabular form. The data within the table can be searched and filtered using the search bar and the filter menus on the page. Figure 6 shows sample notifications from the system. Notifications can be seen at the top-right corner of every system page. Each time a user creates a new curriculum or updates an existing curriculum, the admin, curriculum committee, and other stakeholders will be notified through the system.

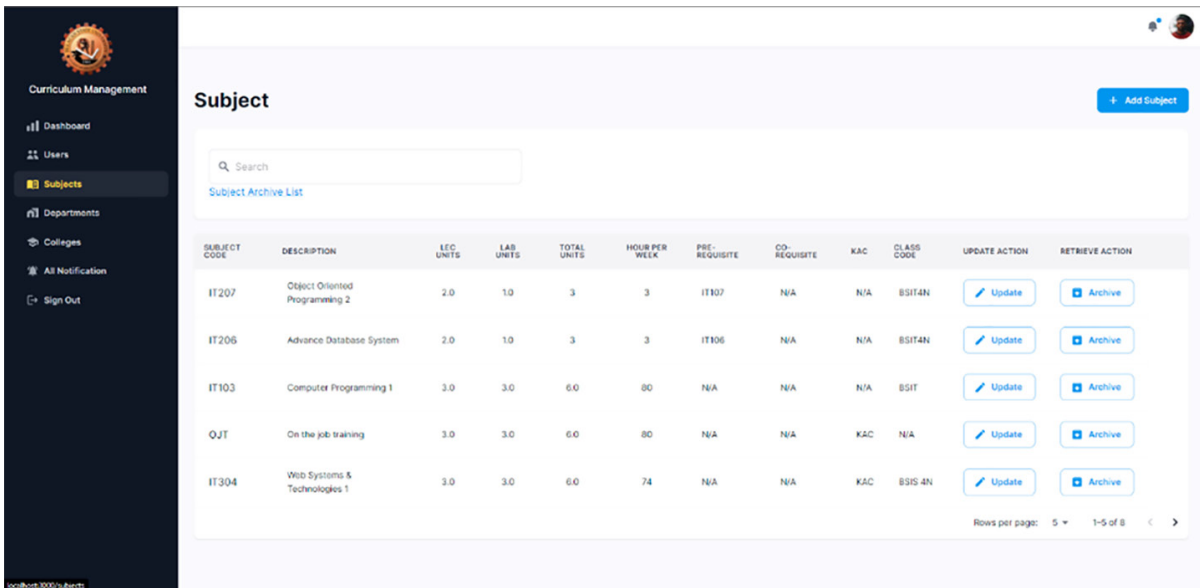


Fig. 4. Subjects management page

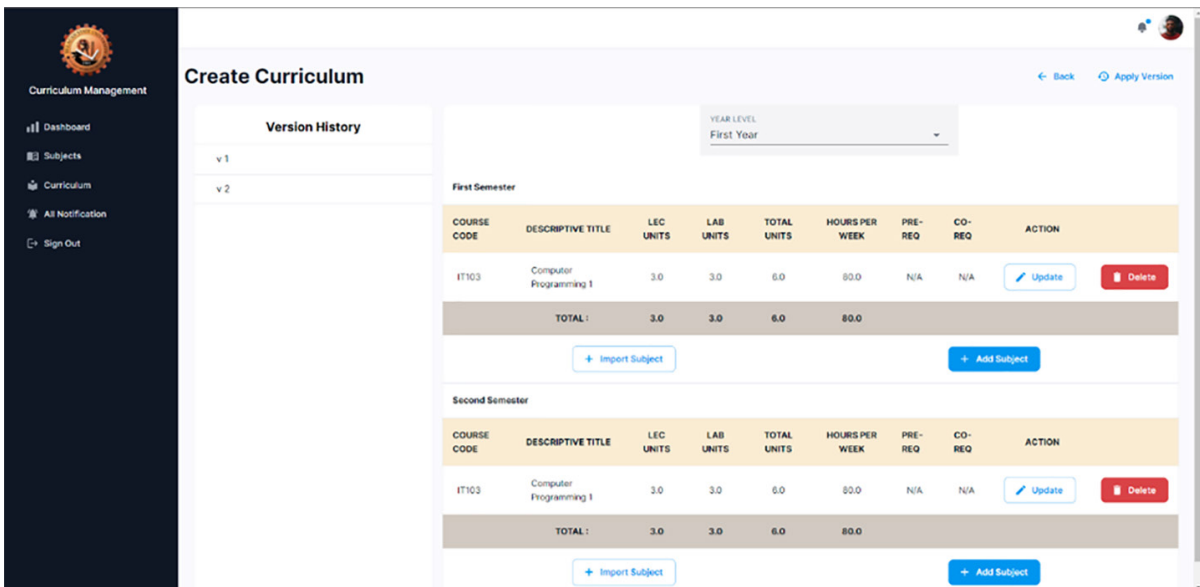


Fig. 5. Curriculum management page

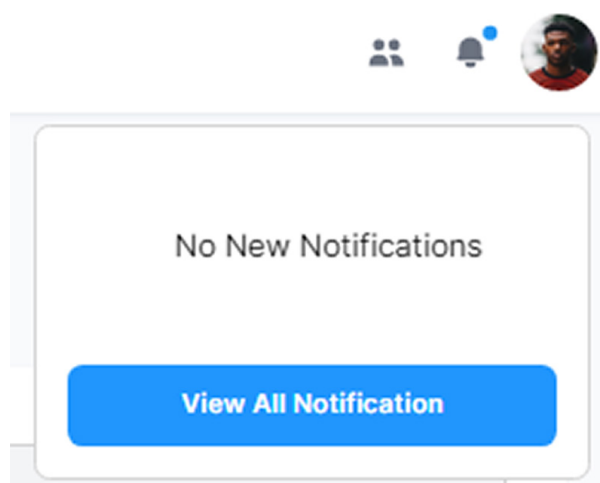


Fig. 6. Sample notification

### 3.4 Features of the developed system for administrative functions

This section presents the features that the administrator of the system has access to. The features within this section are user management, department management, and college management.

Figure 7 shows the user management of the developed system. On this page, the administrator can manage the users of the system. The page will display all the users in tabular form. The administrator could search for a specific user through the search bar. Figure 8 shows the college management of the developed system, where the administrator could see all colleges in a tabular display. Moreover, the administrator can manage all colleges and may add a new one should a college not exist in the system. Figure 9 shows the department management page. All the departments will be listed in tabular format. The administrator could use the search bar to look for a specific department.

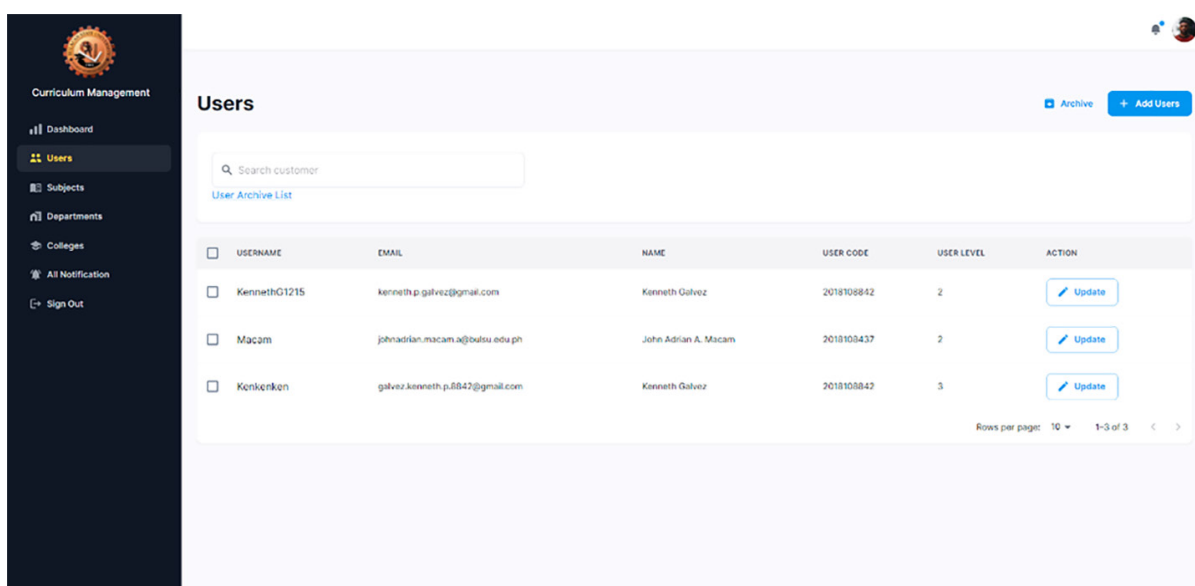


Fig. 7. Users management page



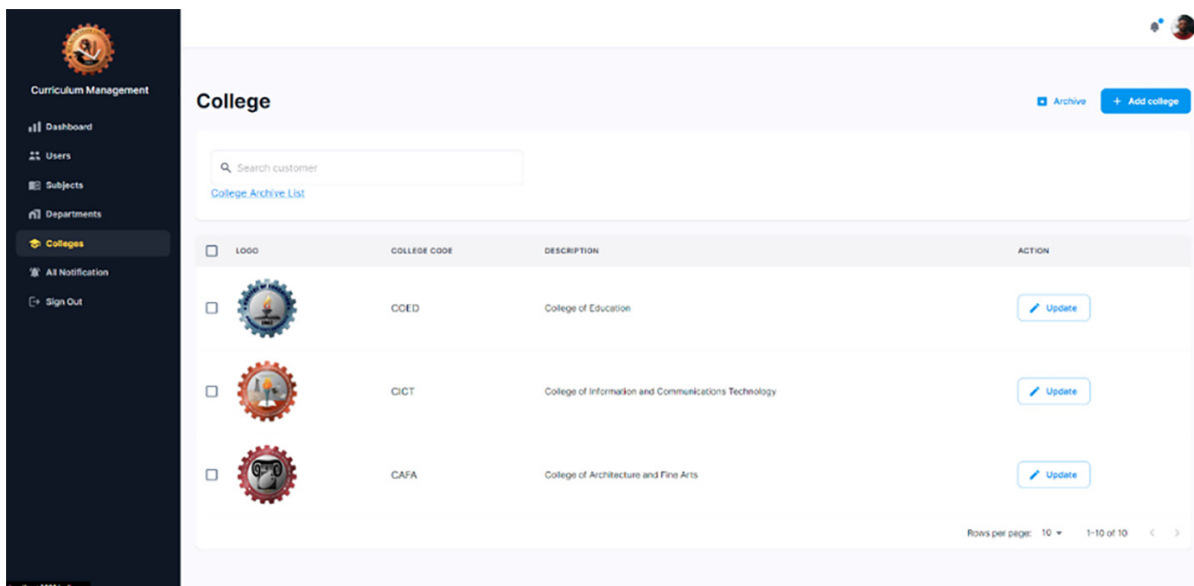


Fig. 8. Colleges management page

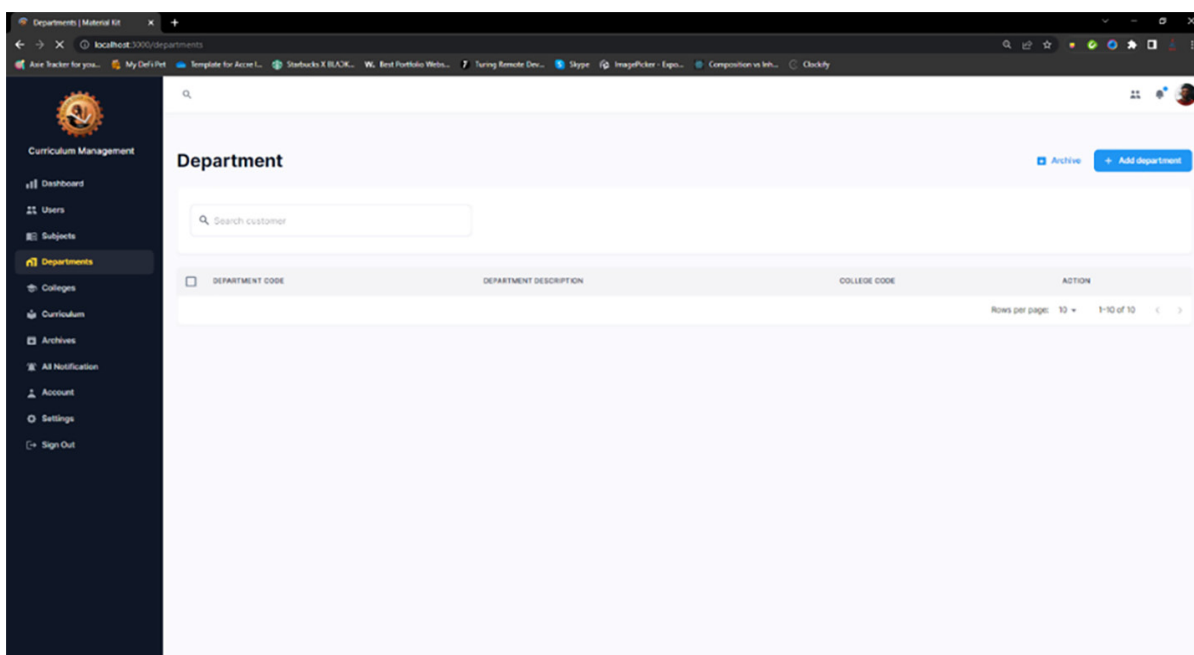


Fig. 9. Departments management page

### 3.5 Acceptability of the developed system using standard software quality evaluation criteria of ISO/IEC software quality standard 25010:2011 by its intended end-users

The developed Web-based Curriculum Management System for the BulSU-CICT was evaluated by the 8 CICT Local Executive Committee, 20 CICT Faculty Members, 20 CICT Student Organizations, and 6 CICT Industry and Academic Partners, which are the intended end-users of the system. The evaluation criteria based on the ISO/IEC 25010:2011 software product quality model were used to measure the degree to

which the developed system satisfies the intended needs of the BulSU-CICT based on eight primary quality characteristics. These criteria are functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Table 3 presents the summary of the evaluation.

**Table 3.** Summary of the respondents' ratings to the system's acceptability

Criterion	Mean	Descriptive Interpretation
Functional Suitability	4.81	Extremely Acceptable
Performance Efficiency	4.72	Extremely Acceptable
Compatibility	4.62	Extremely Acceptable
Usability	4.49	Very Acceptable
Reliability	4.45	Very Acceptable
Security	4.47	Very Acceptable
Maintainability	4.49	Very Acceptable
Portability	4.73	Extremely Acceptable
<b>General Mean</b>	<b>4.60</b>	<b>Extremely Acceptable</b>

Reliability received the lowest rating ( $\bar{x} = 4.45$ ), with a descriptive meaning of very acceptable, which is still a good score. It demonstrates that the developed system can provide reliable data. Functional suitability received the highest rating ( $\bar{x} = 4.81$ ), indicating that it is extremely acceptable. It means that the system works and functions well as a curriculum management system. The evaluation's overall mean is  $\bar{x} = 4.60$ , with a descriptive interpretation of extremely acceptable. It presents that the system's characteristics that measure the provided functions are appropriate for the college's needs.

## 4 CONCLUSIONS AND RECOMMENDATIONS

In summary, the processes of curriculum development have been identified and considered to be the features and functionalities of the curriculum management system. The system was fully developed, following the necessary processes, with features intended for the identified stakeholders in curriculum review. Upon the stakeholders' evaluation, the overall mean was  $\bar{x} = 4.60$  with a descriptive rating of "Extremely Acceptable," which indicates that the developed system has been accepted by the stakeholders. With its implementation, curriculum development within the college will be conducted with ease by reaching out to its stakeholders for comments, suggestions, and recommendations. Additionally, the system ensures that it follows the proper procedures for curriculum development. Lastly, the system generates the curriculum for the program being developed.

Based on the findings and conclusions, this study makes the following recommendations: (1) Develop a generic curriculum management system, should this system be found effective in the CICT, for further use by the rest of the University; (2) Involve the Education Development Office (EDO) as one of the users of the system to enable them to check and review the proposed or revised curricula; (3) Since the system can only be viewed better on desktops and laptops, it is recommended to enable responsive design to allow mobile views when accessing the system for more portable access.

## 5 ACKNOWLEDGEMENT

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