USER-CENTERED DESIGN AND DEVELOPMENT OF A GRADE MANAGEMENT INFORMATION SYSTEM OF A PRIVATE SCHOOL IN CAVITE, PHILIPPINES

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ABSTRACT

This paper presents the user-centered design and development of a grade management information system that can be used by a private school in the Philippines to manage the grades of their students with ease. It aimed to determine the information and features that should be included in the system; determine the tools that should be used to develop the system; test the system's functional suitability, performance efficiency, reliability, security, maintainability, and portability; and evaluate the system in terms of usability. The information and features included in the application were discussed with the administrator and teachers of the school. The application was developed using XAMPP, HTML, CSS, JavaScript, PHP, and MySQL. The application was tested and evaluated by information technology and website developers, school administrator, teachers, and students using the adapted ISO 25010 quality model as the evaluation instrument. The results showed that the application is excellent as perceived by the intended users as manifested by the mean rating of 4.69. This implies that the application can be useful to the school administrator and teachers in managing the grade records of their students, and for the students to easily view their grades.

Keywords: user-centered, grades management, information system

1.0 INTRODUCTION

Management information systems (MIS) are tools that assist processes, operations, and intelligence. MIS tools handle information and transport data. It gives administrators the data they need to decide how to run the organization. Moreover, it collects information from multiple sources and analyzes it to deliver information specifically suited to the needs of administrators and other stakeholders.

Integrating information technology in schools has many benefits. It can increase student engagement, help teachers improve their lesson plans, and facilitate personalized learning. Education management information systems are also now being used by some schools to help the school administrators and teachers in managing the records they need to maintain for their students and for future endeavors of the institution. One kind of management information system used in education is the grade management system. With the system, the school can collect, store, and retrieve the grades of the students easily. They can track their students' performance and identify their strengths and weaknesses. It also provides the teachers, students, and parents the information they need to make important decisions in a student's education.

Developing a user-centered management information system design is important to deliver what the institution needs based on their structure, processes, and resources. User-centered design (UCD) is an approach where the developers focuses on the needs, wants, and limitations of the end-users (Olanrewaju, 2023). It involves the users throughout the design and development process to ensure that the final product meets their needs. In the context of management information systems (MIS), UCD is used to create systems that are easy to use and understand for the end-users. This approach ensures that the system is designed with the user in mind and that it meets their needs.

Generally, the study aims to design and develop a management information system for a private school in Cavite, Philippines that offers kindergarten to senior high school education, to help them in recording, maintaining, and closely monitor the performance of their students.

Specifically, the study aims to:

1. determine the information and features that should be included in the system;
2. determine the tools that should be used to develop the system;
3. test the system's functional suitability, performance efficiency, reliability, security, maintainability, and portability; and
4. evaluate the system in terms of usability.

2.0 METHODOLOGY

The modified waterfall software development model was adapted to serve as a guide in the development of the system. It consists of five stages namely requirements analysis, system design, implementation, system testing, and system deployment.

During the requirements analysis, the users of the system were identified. They were the school administrator, teachers, registrar, and students. The school administrator will be the one managing all the data entered into the system. The grades will be entered by the teachers while the registrar will be the one to release them after the administrator's verification and approval. The students can view their grades once available. The adviser of the students, the administrator, and the students can access their grades from their first enrolment in the school until the current quarter grading. The user's expectations and needs were analyzed and discussed during this phase.

After the requirements analysis, the design of the product were discussed with the users. The system will be implemented as a website to be accessible to all the intended users anywhere and anytime. The data flow and the relation of each data and processes were also discussed for security and efficiency of data and processes.

The implementation phase is where the design was converted into program using development tools such as XAMPP, HTML, CSS, JavaScript, PHP, and MySQL. XAMPP was helpful to simulate the functions and look of the website in the local computer. It also facilitates the communication between the front-end and back-end of the website. HTML, CSS, and JavaScript were used in the front-end side of the website while the PHP and MySQL were used in the back-end.

System testing was then done after the successful conduct of previous stages. Functional suitability, performance efficiency, reliability, security, maintainability, and portability, adopted from ISO 25010 quality model were tested by IT experts who have experiences in designing and developing software applications and websites.

Delivery of the working product after these stages was done to assess the intended users' satisfaction and to get feedback. The performance of the website was evaluated in terms of usability adapted from the ISO 25010 quality model. The school administrator, the teachers, registrar, and students evaluated the system. The Likert Scale was used as the rating scale. The scores were tallied and the overall mean were interpreted using the descriptive interpretation of the mean shown in Table 1.

Table 1. Descriptive Interpretation of the Mean

Numerical Scale	Interpretation
4.21 – 5.00	Excellent
3.41 – 4.20	Very Good
2.61 – 3.40	Good
1.81 – 2.60	Fair
1.00 – 1.80	Poor

3.0 RESULTS AND DISCUSSION

After the data were gathered, they were organized accordingly. Results are presented in the succeeding statements.

3.1 Information and Features of the System

Based on the requirements analysis and design phases, the features and information that were included in the system are as follows:

1. Grade recording and viewing: Easily record and access quarterly grades and averages for each student.
2. Student management: Add, update, and view the list of students along with their academic records.
3. Teacher management: Manage teachers efficiently by adding, updating, and viewing their profiles, while also assigning them to advisory sections, departments, and subjects.
4. School year and section activation: Add and activate school years and sections for smooth academic planning.
5. Section assignment: Assign students to their respective sections, streamlining the allocation process.
6. Records and reports handling: Import and print records and reports with ease to maintain comprehensive documentation.
7. Announcements and event management: Keep everyone informed by adding, updating, and viewing announcements and upcoming events.

8. Account creation: Simplify account creation for both students and teachers, ensuring smooth access to the system.
9. Past school year records retrieval: Easily retrieve records from previous school years for reference and analysis.

Figure 1 shows the administrator's dashboard where the school administrator can view the total number of students, users of the system, announcement and events posted and the list of teachers.
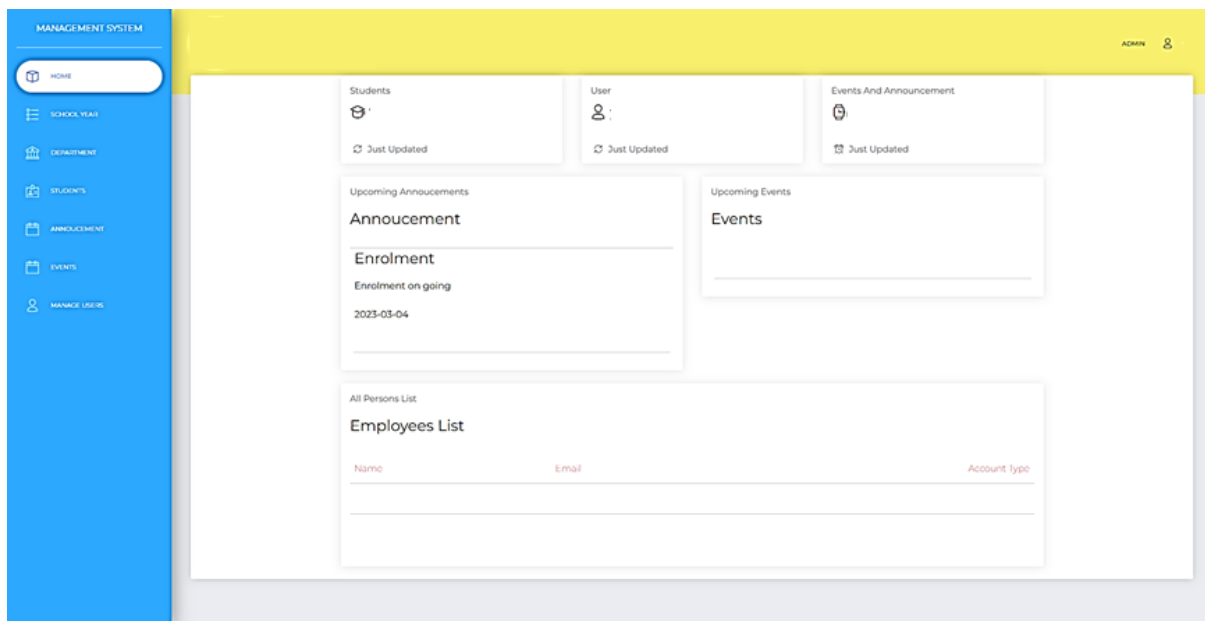

Figure 1. Administrator's Dashboard

Figure 2 shows the list of school year where the administrator can add new school year and activate and deactivate school year. Inside each year, the administrator can also manage class sections for the current school year and assign class advisers for each.
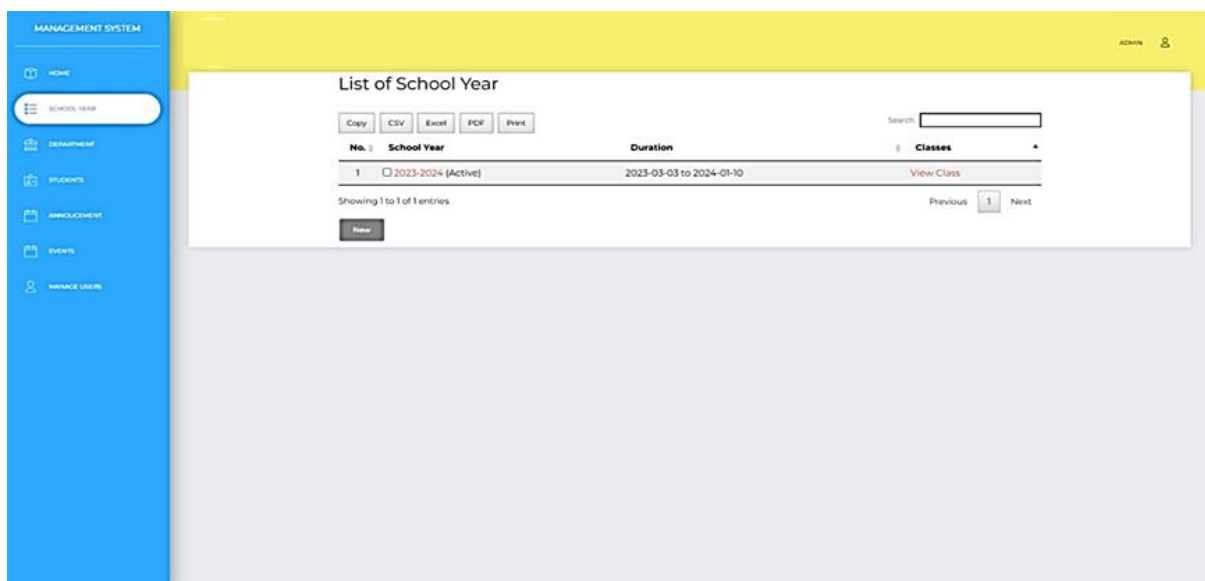
Figure 2. Managing School Year and Class Sections

Figure 3 shows the list of departments the school has. Inside each department are the list of teachers and their advisory class. The administrator can also manage the list of subjects assigned to each teacher.
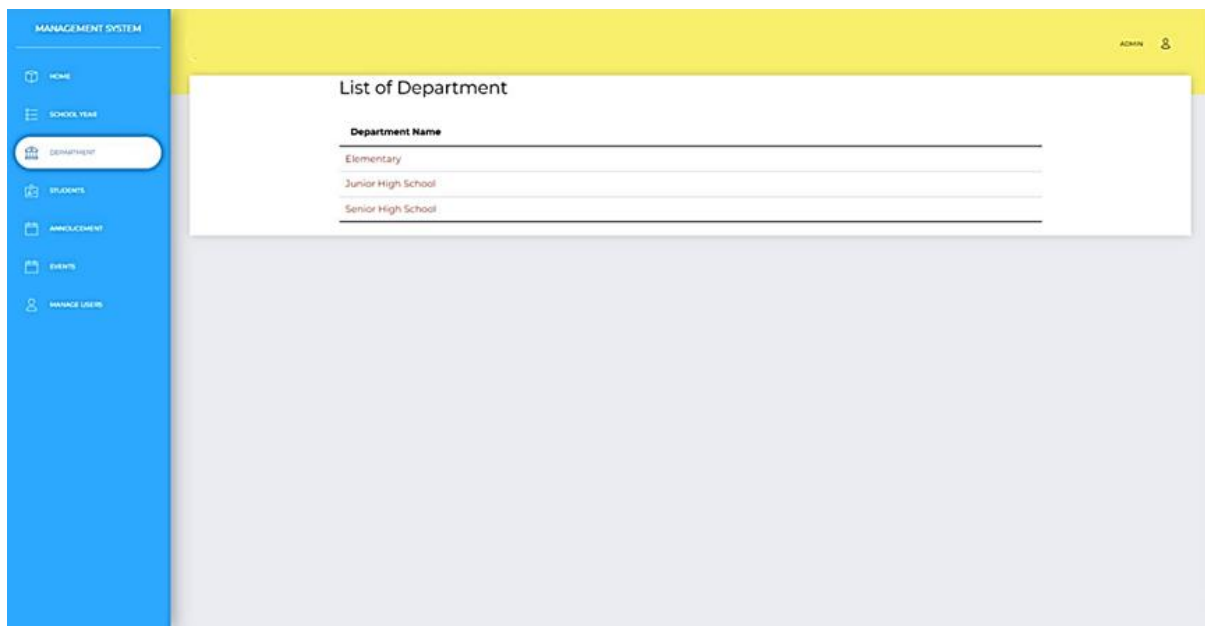

Figure 3. Managing the Departments

Figure 4 shows the list of students for the current school year. In this module, the administrator can add new student, enroll or promote old students to the next grade, and view their grade records.
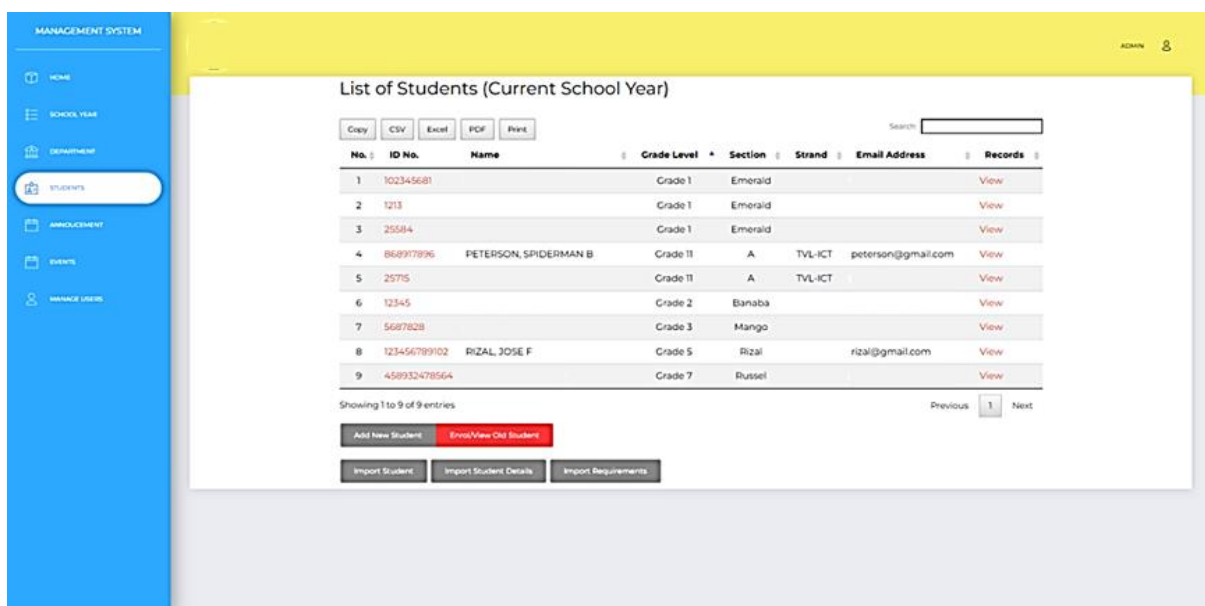

Figure 4. Managing the students' records

3.2 Development Tools

The system was developed using XAMPP, HTML, JavaScript, PHP, and MySQL. A desktop computer was used for development and laptops and mobile phones were used for testing and getting users' evaluation and feedback.

3.3 Test Results

Table 2 presents the overall result of the tests conducted by 10 IT experts. As presented, the functional suitability got a mean rating of 4.86, interpreted as excellent, which means that the system's functions meet the needs of the users and help them accomplish their task with correct results. Performance efficiency was rated 4.81, interpreted as excellent, which means that the system responds efficiently to perform its functions. Reliability was rated 4.68, interpreted as excellent, which means that the system was able to perform its functions as intended when it is required for use. Security was rated excellent with a mean rating of 4.48, which means that the information and data in the system are protected and meet the user's requirement on the required level of authorization for each kind of data it maintains to be accessed. Maintainability was rated excellent with a mean rating of 4.88, which means that the system can be easy to maintain when necessarily updating components to correct it or adapt to changes in the environment. Portability was rated excellent with a mean rating of 4.94, which means that the system can be successfully used in one environment to another.

Table 2. System Testing Results

MEASURE FOR SYSTEM TESTING	RATING	INTERPRETATION
1. Functional Suitability	4.86	Excellent
2. Performance efficiency	4.81	Excellent
3. Reliability	4.68	Excellent
4. Security	4.48	Excellent
5. Maintainability	4.88	Excellent
6. Portability	4.94	Excellent
OVER-ALL FUNCTIONAL SUITABILITY	**4.86**	**Excellent**

3.4 Evaluation Results

Table 3 presents the overall result of the evaluation of the intended users of the system. As presented, the measures were rated excellent, with a weighted mean ranging from 4.07 to 5.0. The highest weighted mean of 5.00 was observed in learnability, while the lowest weighted mean of 4.07 was observed in user error protection. Appropriateness recognizability and accessibility were rated 4.98, interpreted as excellent; operability and user interface aesthetics were also rated excellent with a mean of 4.92 and 4.82, respectively. Overall, the users found the system excellent in terms of usability with a mean rating of 4.69 which means that the developed system is easy to learn and use, appropriate for their needs as its intended users, and the user interface provides satisfying interaction for the users.

Table 3. User Evaluation Results

MEASURE FOR USABILITY	RATING	INTERPRETATION
1. Appropriateness recognizability	4.98	Excellent
2. Learnability	5.00	Excellent
3. Operability	4.92	Excellent
4. User error protection	4.07	Very Good
5. User interface aesthetics	4.82	Excellent
6. Accessibility	4.98	Excellent
OVER-ALL USABILITY	**4.69**	**Excellent**

4.0 CONCLUSION

The results showed that the developed system is excellent as perceived by the testers and intended users. With this, it can be concluded that the grade management system successfully met the necessary features useful to the school administrator, teachers, and students who wants to store, manage and view the grade records maintained by the school. Further research can be conducted to incorporate an accounting account feature to enhance control over the release of students' grades. An auto-generation feature for the list of honors can also be added for efficient and timely announcement of student rankings and performance.

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