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Supporting Kolej Tun Dr Ismail (KTDI) Residents Evaluation with Kolej Tun Dr Ismail (KTDI) College Merit System

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***Abstract*—The purpose of this paper was to highlight the development of a web application for the Kolej Tun Dr Ismail (KTDI) College Merit System. The current manual system of college merit in Kolej Tun Dr Ismail (KTDI) was slow and there could be the possibility of miscalculation due to human error which could lead to unfairness in evaluation. Due to the pandemic, some processes are forced to use other methods while some remain unchanged. However, it is still processed manually. Thus, Kolej Tun Dr Ismail (KTDI) College Merit System was focusing on developing a system that is able to manage students' hostel applications including calculating the merit points to give priority to those who have the highest mark to choose their room in Kolej Tun Dr Ismail (KTDI) accommodation. The methodology used in this thesis was the scrum agile methodology. Meanwhile, the software architecture chosen for the proposed system was Model-View-Controller (MVC). At the end of the project, a web-based application will be developed.**

Keywords — Merit System, Model-View-Controller (MVC).

I. INTRODUCTION

Kolej Tun Dr Ismail (KTDI) was a popular college among UTM students because of its strategic location. As one of the colleges in Lingkaran Ilmu, Kolej Tun Dr Ismail (KTDI) was surrounded by many faculties and had easy access to university facilities. However, due to demand outnumbered the hostel provided in Kolej Tun Dr Ismail (KTDI), College Merit System was used as a selective medium for the student to reside in Kolej Tun Dr Ismail (KTDI). Placement of hostel or colleges in university for students need a proper mechanism as the number of students enrolled was always higher than the number of places to stay offered by the university [3]. Currently, in Kolej Tun Dr Ismail (KTDI), they are still using a manual process where students of Kolej Tun Dr Ismail (KTDI) need to fill in forms and Kolej Tun Dr Ismail (KTDI) staff and fellows will check their qualification step by step before releasing the names of students who are chosen to stay in the college. Merit points are calculated manually, then the merit points will be keyed in by JKM using Google Sheets as the medium to collect data. The merit points will be calculated and reviewed by fellow council together with the principal of Kolej Tun Dr Ismail (KTDI). Unfortunately, this system was slow and there could be the possibility of miscalculation due to human error. Besides, all students' calculated merit points also need to be keyed in by JKM, thus, there was always the possibility of typos during the process of keying in. Since it was a sequential process, the previous mistake could lead to unfairness in evaluating the residency. There are some problems in the distribution of merit marks to the students like being left out of names, low merit marks and unclear records [2].

Kolej Tun Dr Ismail (KTDI) College Merit System was a system that would automatically calculate the merit points for all students with the precondition that there are records of the activity of the students. While the stakeholder request was to allow the admin to approve the students without having to go through so many processes. This project aims to develop an efficient and user-friendly college merit system that will store user data and accurately calculate merit points to be evaluated. The system will ease the process of collecting student data and ensure fairness in evaluating and giving merit to students. Consequently, staff and students would be able to save time to process the application. The benefit was more toward automation of collecting students' data and also for ease of staff and students.

The objectives of this project include eliciting and analyzing the requirement from Kolej Tun Dr. Ismail for college applications, designing a system that would calculate the merit points automatically, developing a system that would have less layer of work to approve student's acceptance status and lastly to test and validate the functional requirements of the Kolej Tun Dr Ismail (KTDI) College Merit System.

II. LITERATURE REVIEW

The literature review was the study related to the project and review of some existing systems. It was generally about analysis and research of the existing system such as studying the problem domain, studying the current system and studying the existing solution to the problem. It was to gain a better understanding of the scope of the system. In addition, compared to the existing system was to determine the system's strengths and weaknesses.

A. KTC Merit Online System

Kolej Tuanku Canselor (KTC) UTM has implemented a computerized college merit online system in partnership with the School of Electrical Engineering (FKE). Kolej Tuanku Canselor (KTC) Merit Online System was accessible to Kolej Tuanku Canselor (KTC) students that have an account. Any college activity that was overseen by a fellow or fellow assistant must be registered in the system. Students who wish to participate in the activity must simply enter their matric number on the page supplied by JKM or the person in charge of the event. As a result, all information about the pupils who participate in the activity will be stored in the system, and the system will calculate merit points based on their place in the activity. Students merely need to log in to the system at the end of each session to download and print the activity list as well as the total merit point acquired for the selection of eligibility for college hospitality.

B. MyNemo – UMT

MyStar was the merit system used by Universiti Malaysia Terengganu, similar to any other merit system from other universities, MyStar required students to input their matric number every time they attend an event organized by either the college or the university. MyStar was used to record the list of activities the students joined. Data such as program category, organizer, program name, program date, student's role and Merit points are saved and accessible if students want to view their records. Besides that, MyStar also display the total merit point of the students with the total of the star the students obtained. The application for the hostel can be done online via the e-Mynemo of the student portal at HEPA (Permohonan Penempatan Asrama). The hostel application was based on MYSTAR MERITS connected depending on the selected date.

C. MyUPSI Student – UPSI

MyUPSI Student was the integrated system usde by Universiti Pendidikan Sultan Idris, similar to any other university's student system, this system will record all the activities that the student joined. Slightly different compared to the other merit system, this system provides more details for the student such as batch, type and the hour of the activity. Moreover, student are able to print the activity report transcript that displays all activities according to the categories such as "Penyertaan", "Pertandingan", "Kehadiran" and more. Besides, the transcript also consists of the student total merit points. The application for the hostel can be done online via the same system on the Hostel Registration page. Table 1 shows the comparison between existing systems and the proposed system.

TABLE I. COMPARISON BETWEEN EXISTING SYSTEMS

Application Features	**KTC Merit Online System**	**MyNemo – UMT**	**MyUPSI Student - UPSI**	**(Proposed system) KTDI COMETS**
Add event details	1. Admin	1. Admin	1. Admin	1. JKM
View activity list	√	√	√	√
View upcoming activity list				√
Calculate total merit points	√	√	√	√
Online hostel application	Manually	Online	Online	Online

III. METHODOLOGY

The methodology used is also described as the framework for the knowledge-work processes that engage during the development of the application [1]. Most system development activity was said to be directed or guided through the use of a methodology. Agile scrum methodology was chosen to develop Kolej Tun Dr Ismail (KTDI) College Merit System. Scrum was a subset of agile methodology which was a structured and iterative approach to project management and product development. Scrum was an agile project management framework. It was used to develop, deliver and sustain complex products. In Scrum, there are three phases which are the initial phase, followed by a series of sprint cycles and lastly, closure phase wraps up the project. There were a few sprints each sprint usually took around two to four weeks to release

A. INITIAL PHASE

This phase was to outline the planning phase where the general objectives for the project and design of the software architecture were established. The software requirement specification (SRS) and software requirements and design document (SRDD) were completed to provide the basis for the design and implementation of the system. The use cases, activity diagram, system architecture and database design were identified in this phase.

Figure 1 shows the use case diagram of Kolej Tun Dr Ismail (KTDI) College Merit System that was identified in this phase as well.

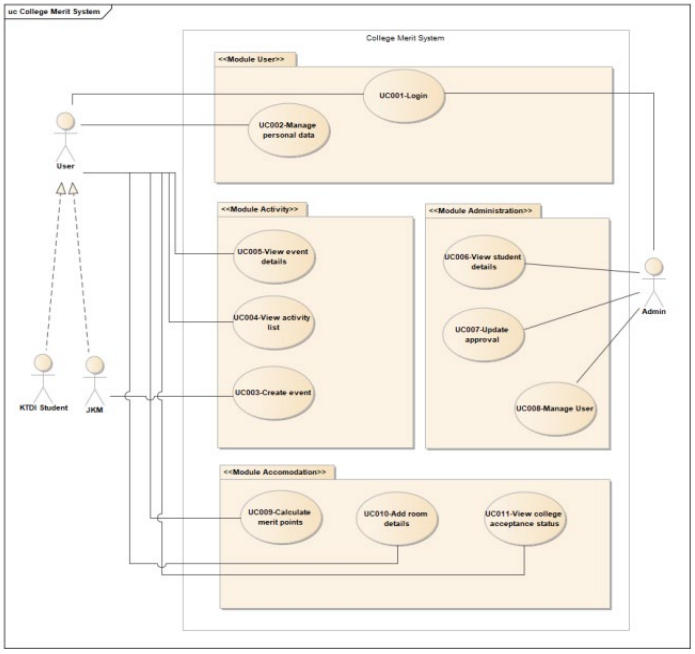

Figure 1. Use Case Diagram of Kolej Tun Dr Ismail (KTDI) College Merit System

Sequence diagrams used to represent the flow of how the operations are carried out. Figure 2 shows a sequence diagram of the Login use case of Kolej Tun Dr Ismail (KTDI) College Merit System.

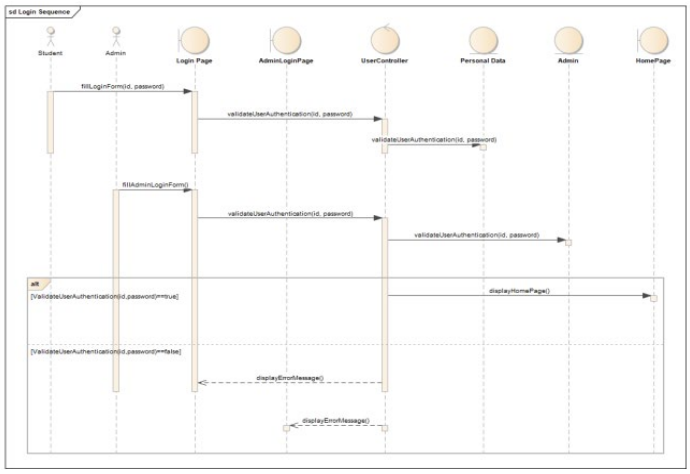

Figure 2. Login Sequence diagram of Kolej Tun Dr Ismail (KTDI) College Merit System.

The activity diagram was one of the behavioural diagrams in UML that use to describe the dynamic aspects of the system. It is also used to describe the steps in a use case diagram and it shows a particular operation of the system. Figure 3 shows the login activity diagram of the Kolej Tun Dr Ismail (KTDI) College Merit System.

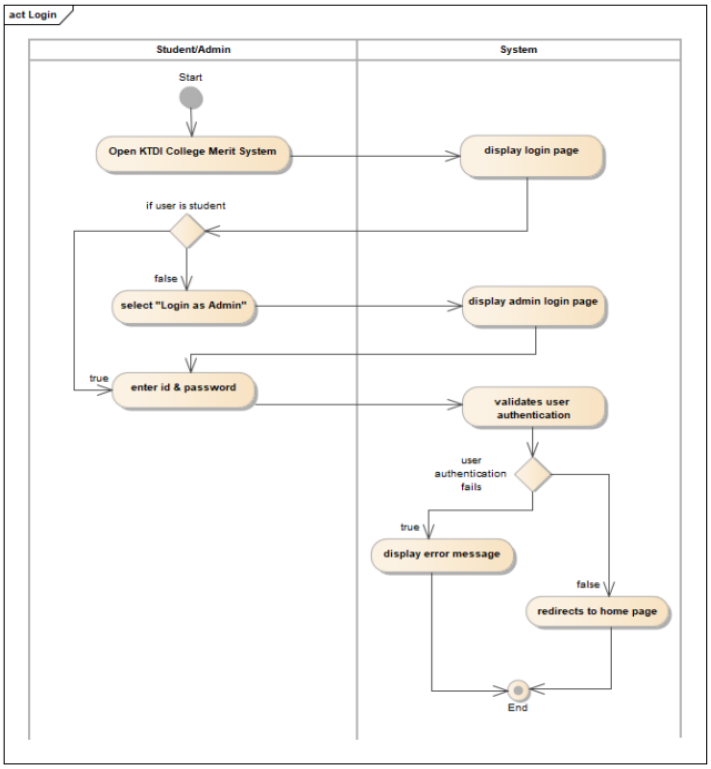

Figure 3. Login activity diagram of Kolej Tun Dr Ismail (KTDI) College Merit System.

In this phase, the system architecture for the system was designed. Model-View-Controller (MVC) architecture was designed to represent the component model of the system. MVC architecture separates the interaction within the application into three layers which are Model, View and Controller. This architecture solves the problem of the difficulties of updating the application. Figure 4 depicts the system architecture for the system.

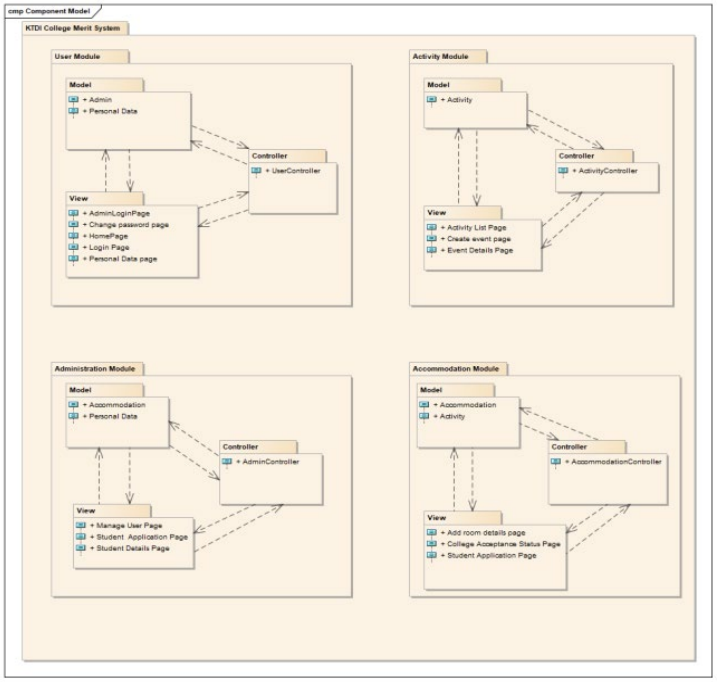

Figure 4. System Architecture of Kolej Tun Dr Ismail (KTDI) College Merit System

Database design for the proposed system was stored in a relational database named "ktdicomets" database and comprises six entities. The data was retrieved and stored in databases through controllers by using SQL query from the dao class. Table II shows the student entity of Kolej Tun Dr Ismail (KTDI) College Merit System.

TABLE II. STUDENT TABLE

Attribute	Data Type	Description
studentId	String	Unique Id for students to login into the system, the Id is the same as student matric number.
password	String	The password for student to login into the system

The interface design was the process of designing the visual to show the interfaces for Kolej Tun Dr Ismail (KTDI) College Merit System. For this system, the interface design was simple and user-friendly so that the functionality was understandable for the user. Figure 5 shows the admin interface of the student application page.

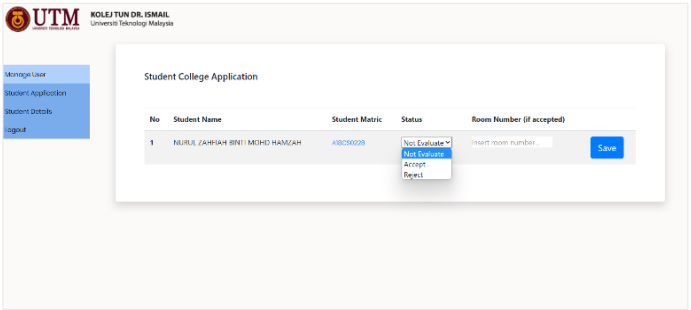

Figure 5. Student Application Interface

B. SPRINT CYCLES

Sprints are fixed in length, normally it takes around two to four weeks for each sprint. In this phase, some module was selected depending on their priority and the requirement for Kolej Tun Dr Ismail (KTDI) College Merit System and produced the product backlog to keep track and get the backlog items done within the sprint cycle. In this phase, a total of five sprint cycles was to finish all use cases from this project. On the other hand, system implementation was a procedure performed to realize the result of the system analysis and design discussed in the earlier phases. All the requirements that are transformed into modules and use cases will be implemented using HTML, CSS, and JavaScript programming language for the front end, MYSQL for database queries and Java for the back-end in this phase. From the previous phase, implementation follows the function and design in the documentation of SRS and SDD.

Firstly, for the database design, phpMyAdmin database was chosen to be implemented for Kolej Tun Dr Ismail (KTDI) College Merit System. The implementation involves creating a database and table, managing the database, establishing the connection between the database and the system, executing the queries and obtaining the data using the database. For the connection of the database was established using Java meanwhile Dao was the service used to retrieve the data from the database that uses model objects to respond to view requests.

Kolej Tun Dr Ismail (KTDI) College Merit System uses Model-View-Controller (MVC) architecture to represent the component model of the system. The MVC architecture separates the interaction within the application into three layers which are Model, View and Controller. The usage of MVC was to solve the problem of difficulties of fetching, updating and saving the data to the database.

C. PROJECT CLOSURE

This phase was the phase to wrap up the project. Some required documentation such as user manuals, bug reports, system help frames and more were completed during this phase. System testing was done in this phase as well.

System testing was the process to test the entire system including the design and behaviour of the system. Software testing involves black box testing and user acceptance testing.

1) Black Box Testing

The testing technique used to test the proposed system was black box equivalence partition, this technique will be focusing on the result of the input. It was to ensure that the system will return the desired output to each input. The input which was the test data was divided into classes using the equivalence partition technique, where the valid and invalid classes are being differentiated based on the desired test result. In the test cases where the inputs are only pressing buttons or mouse clicks from the users, the EP class has only one valid class and no invalid class. This was due to the only possible test case was only when the user triggered the click events and the expected output was produced or the user did nothing at all. On the other hand, the testing documents had been prepared in simple language for clearer insight into the test cases. Table II shows the test case using black box testing.

TABLE III. TEST CASE OF STUDENT LOGIN

TC001_01: Student Login (id)

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC001_01_01	(Valid and register id) Id="A18CS0228"	Input accepted	Input accepted, able to go to Personal Data page.	Pass
TC001_01_02	(Incorrect format) Id="A180228"	Error message displayed "Incorrect Id format" when login button is clicked.	Error message displayed, the screen display "Password cannot be blank"	Pass
TC001_01_03	(Id is not registered) Id="A18CS1999"	Error message displayed "Invalid Id" when login button is clicked.	Error message displayed "Invalid user credentials".	Pass

2) User Acceptance Testing

User Acceptance Testing (UAT) was an action to test the software by the end-user or client to verify whether the system meets user requirements. Developers can monitor how users behave when engaging with the system and gauge how satisfied they are with it by conducting user acceptance testing (UAT). Kolej Tun Dr Ismail (KTDI) College Merit System uses the black box testing technique for the acceptance testing due to users does not require to have detailed knowledge of how the internal structure of the system.

IV. CONCLUSION

In conclusion, the paper provides a clear overview of how Kolej Tun Dr Ismail (KTDI) College Merit System will be developed based on the documented requirements. This paper also explained the software implementation and testing for the proposed system. After undergoing all the phases, Kolej Tun Dr Ismail (KTDI) College Merit System had successfully developed.

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