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School of Computing Course Slots Distribution System

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Abstract : Every year there will be thousands of students enrolling into universities. Before the starting of every semester, the head of department in all schools have a very important job which is deciding the numbers of classes/slots to be opened for every course and submit them to the Academic Affairs (HEA) office. The number of classes/slots for each course is determined based on the number of students enrolled for the course. Knowing the accurate number of classes/slots to be opened could help in allocating suitable lecture halls for each class/slot. This would then ensure the lecture halls are used to the fullest and the students would have a comfortable learning environment. The traditional method of counting the number of classes/slots manually course by course is rather troublesome and time consuming. Therefore, a web-based School of Computing (SOC) Course Slots Distribution System is developed to help solve the problem. The system aims to distribute the classes/slots for each course in BSc in Information Technology and BSc in Computer Science according to the number of students enrolled for the course. The system is developed using HTML, PHP and CSS. The system was then tested by the representatives of SOC management and evaluated based on user acceptance using an online survey platform – Google Form. The result of the evaluation suggested that the SOC Course Slots Distribution System is usable to assist the head of department of every school in Universiti Utara Malaysia (UUM) to calculate the number of classes/slots to be opened for each course efficiently**.** The respondents also suggested for the system to have lab allocation as well for further improvement. With the help of this system, the workload of head of departments will greatly decrease.

Keywords: course distribution, class distribution, class slot

1. Introduction

Timetabling problem has many variations such as sports timetabling, nurse rostering, educational timetabling, employee timetabling, and transport timetabling [1]. A university course timetabling problem, generally concerns with allocating students to classes and slots to each class [2]. Currently, at most institutes, this time-consuming and difficult issue is handled manually by a single person or a small group of people with the purpose of providing feasible timetables. Due to a lack of efficiency in

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the development of timetables, this may result in wastage of time for faculties and concerned members [3]. To get feasible timetables, a set of courses are allocated to a set of students with multi-unit demand in which to be called a classic multi-unit resource allocation problem, or equivalently, a one-sided many to-many matching problems. Due to a variety of constraints and difficulties, allocating courses efficiently and fairly is a challenging market design problem [4]. Each university has its own way in designing a course timetable, considering their own preferences and constraints [5].This project focuses on providing the number of classes/slots for each course to be used in developing a feasible course timetable.

In Universiti Utara Malaysia (UUM), before the students of every intake can arrange their class timetable, the university will have to assign the number of classes/slots to all courses correspond to the numbers of students per intakes. The Academic Affair (HEA) office that is responsible in generating course timetable usually would request the head of department for every school to set the number of slots/classes to be opened for each course. This is a very burdensome work to do as there are a lot of courses to be assigned for every program. Traditionally, the head of department of the school distributes the classes/slots for the courses one at a time using Microsoft Excel, which is very troublesome and time consuming.

Not only the head of department has to consider the number of lecturers available for the course to be taught, the number of classroom or lecturer hall available is also a concern for the head of department. In [6], Nakamura and Dev stressed that the size of a class will greatly affect the students' academic performance as smaller class sizes enable teachers to provide more customized instruction and alter the curriculum. Unfortunately, there is no such system to assist the relevant department to distribute the subjects' slots/classes. The only similar system that exists is Timetable Management System [7] whereby it helps students to distribute their classes corresponding to their available time. Therefore, the Course Slots Distribution System is proposed whereby it can automatically distribute the number of classes/slots to be opened for the course according to the number of students in a much more efficient way.

2. Materials and Methods

In this project, the waterfall model is chosen because it is simple and easy to use. In the waterfall model as shown in **Figure 1**, each step must be completed before starting of the following step as overlapping of phases are not allowed.

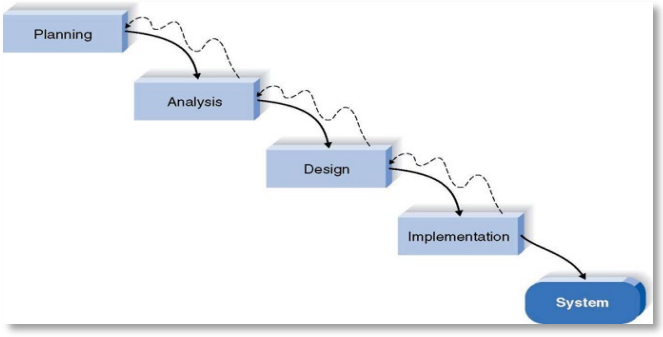

Figure 1: The Waterfall Model

For planning phase, it is important to identify what needed to be achieved and what is needed to develop the system, including procedures and functionality. To calculate the number of classes/slots for each course, a head of department first needs to identify the number of students per semester and determine a suitable number of students for each course. Different courses would have different number of students per class/slot depending on course types. Then, for each course, divide the total number of students per semester by the number of students per class/slot, as shown in **Eq. 1**. The system will also

produce a report of class/slot distribution for the Academic Affairs office as preparation to generate a course timetable for the semester.

$$\frac{Total\ number\ of\ students\ per\ semester}{Total\ number\ of\ students\ per\ class/slot} = Total\ number\ of\ classes\ to\ be\ opened \quad \textbf{Eq. 1}$$

As for requirement analysis, it will capture all feasible needs for the system to be created and documents them in a requirement specification document. Specific requirements should be understood clearly to ensure the features of the system is correct and solution of the problem is solved by the system developed. For this particular project, considering the total number of students in a class/slot may not be the same every semester, the system will not fix the number but letting the user to edit whenever they need to.

The system design phase helps in the identification and specification of the system software and hardware requirements. As the SOC Course Slots Distribution System is a web-based system, therefore HTML and CSS is chosen to design the frontend interface of the system while PHP as the backend of the project. The implementation phase involves the development of software and hardware, where the system would be developed as the solution to solve the specific problems. The source code for the system is written and tested to make sure the correct output is produced while bugs and errors are removed at this stage. In this phase, we must make sure that the calculations are all correct and the report generated includes the accurate numbers.

The system developed must meet the document criteria and able to function properly. After that, evaluation and adjustments of the system are performed. If no changes are needed, the system is completed and ready to be released to the end user.

3. Results and Discussion

For this project, quantitative methodology is chosen as the evaluation method. This is due to the cheaper price and faster respond by the respondent. An online survey is used in this project's evaluation where respondents are required to answer all the surveys and questionnaires in the Google Form.

The best type of evaluation is Usability Evaluation as it is the most suitable evaluation mechanism to evaluate the SOC Course Slots Distribution System. The usability evaluation focuses on how easily the user can learn and use the system to complete their goals on their own. Usability also refers on the satisfaction and the experience when the user is interacting with the system's function including Calculate, Edit and Report.

As the user of the system developed are the heads of department of every school in UUM only, therefore only specific users are selected for the study. As this project focuses on the courses offered by SOC, thus the users approached for testing and evaluation are the management from SOC, UUM. Three users/respondents were identified, namely the deputy dean of the school, the previous SOC head of department and the program coordinator.

All three users/respondents that were approached for the evaluation had seen a short demo of how the system should work and given a chance to explore the system (as shown in **Figure 2**) to make sure that the system is functioning and able to provide the solution requested. Each user/respondent then must answer a questionnaire which consists of four sections: usability, usefulness, satisfaction and security. There is also a section for them to include other suggestions if applicable. The users/respondents answered the related questions via Google Form based on their observation and understanding from the demonstration.

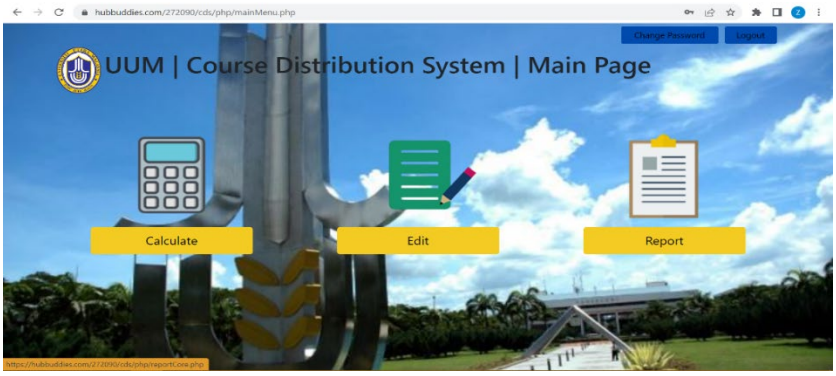

Figure 2: The Main Page of SOC Course Slots Distribution System

Figure 3 illustrates the usability of the SOC Course Slots Distribution System. It was found that all three respondents strongly disagree that the system is unnecessarily complex, would need a support of a technical person to be able to use the system and thought there was too much inconsistency in the system. They also strongly agree that the system was easy to use, functions in the system were well integrated and felt very confident using the system.

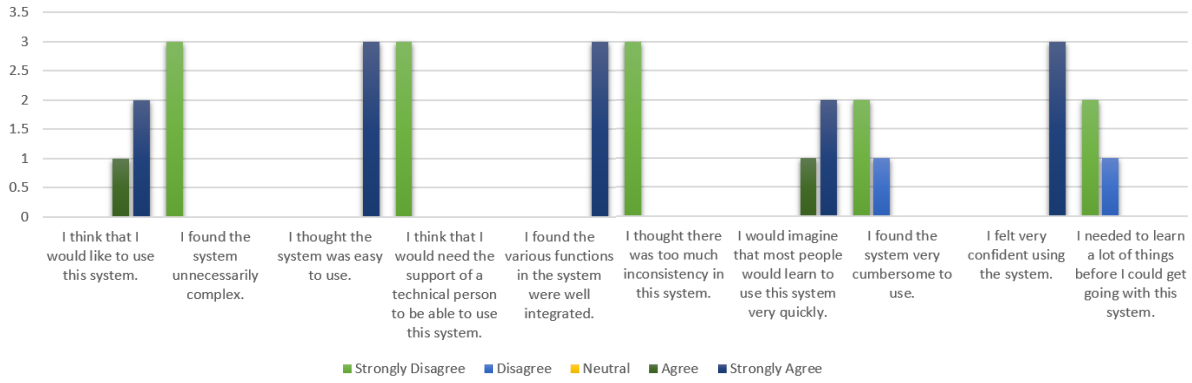

Figure 3: Usability of Course Slots Distribution System

Figure 4 shows the usefulness of the Course Slots Distribution System. Two out of three respondents strongly agree that the system has increase their productivity, enables them to calculate the slots to be open per semester more quickly, saves their time, met their needs, does everything they would expect it to do and useful in overall.

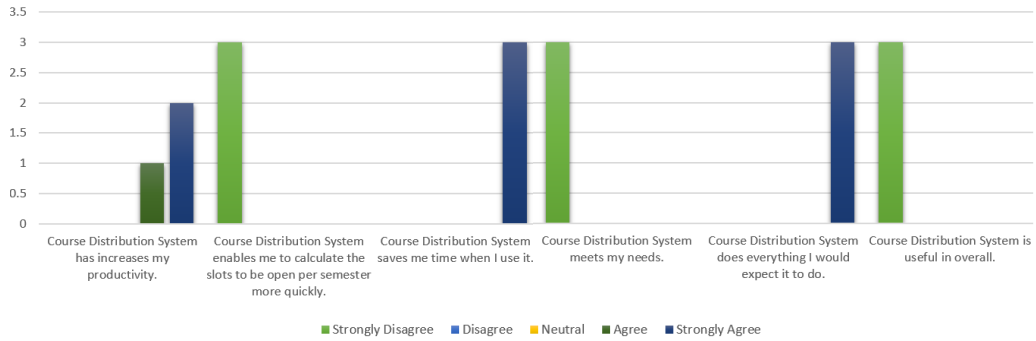

Figure 4: Usefulness of Course Slots Distribution System

Based on **Figure 5**, it shows that all three respondents strongly agree that they feel satisfied with the SOC Course Slots Distribution System. Two respondents agree to recommend the system to other schools, while two out of the three respondents strongly agree that the system works the way they wanted to, and that the system is needed, as well as is wonderful and pleasant to use.

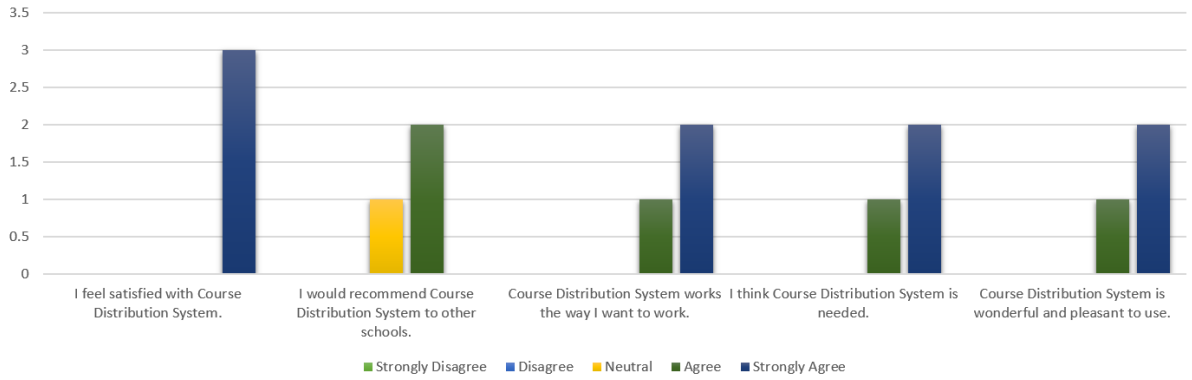

Figure 5: Satisfaction of Course Slots Distribution System

The evaluation on the security of the SOC Course Slots Distribution System is depicted in **Figure 6**. It shows all three respondents strongly agree that the system allows them to change their password at any time, secure and makes their life easier. Two out of three respondents strongly agree that this system authenticates users and prefer to use the system. All the three respondents have different views on the safety while using the system.

For comments and suggestions, one of the respondents thinks the system is good but overall usage is minimal. This could be because this project is a part of a bigger project in solving management problem handled by the head of departments. Other suggestion includes considering the needs of determining for lab/tutorial classes for each course, which is suitable to be considered for future work.

The result of the evaluation suggested that the SOC Course Slots Distribution System is usable to assist the head of department of every school in UUM to calculate the slots to be opened efficiently. In conclusion this system can be implemented in SOC so that the head of department can get benefits from this system. It is also observed, from the evaluation, that most of the respondents were satisfied and prefer to use this system.

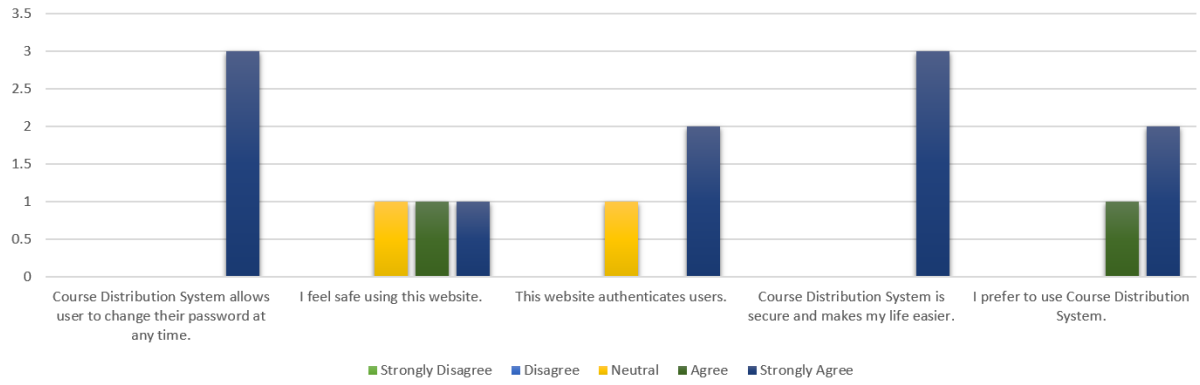

Figure 6: Security of Course Slots Distribution System

4. Conclusion

A web-based SOC Course Slots Distribution System was developed to automatically distribute the number of classes/slots to be opened for each course according to the number of students in a much

more efficient way. The system was developed for School of Computing, UUM with the hope that it can be implemented in other schools as well. As this process was previously done manually, with the help of this system, it will greatly minimize the workload of the head of departments. In the future, the system can be upgraded by adding the functionality of lecturer allocation to the respective classes/slots opened.

Acknowledgement

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