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To cite this article: N Azizan *et al* 2021 *IOP Conf. Ser.: Mater. Sci. Eng.* **1062** 012041

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# The Development of a Web-based Credit Transfer Application (CTA) for Higher Academic Institution: From Feasibility Study to Testing Phase

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**Abstract.** Credit transfer is the process of transferring course credits of the subject to another programme or another institution to support and promote students' flexibility in their study by reducing number of courses or subjects required to complete their studies. Currently, the enrolment of new degree students in Kolej Universiti Poly-Tech MARA Kuala Lumpur (KUPTMKL) is using the manual application forms to apply the subject credit transfer. Understandably, the manual process is tedious and students are prone to make mistake. The objective of this paper is to develop a web-based Credit Transfer Application system (CTA) for Faculty of Computing and Multimedia (FCOM) of KUPTMKL that can be used for the FCOM degree programme Coordinator and student in managing the application of credit transfer with several security applications and mechanisms such as random password, restriction of unsupported file format and database security. The CTA is developed using Agile methodology and Visual Studio Code is used to build the CTA as the code editor to write the programming languages such as Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), Hypertext Pre-processor (PHP) and XAMPP to manage the MySQL databases. In the development of the CTA system, the feasibility study is performed and three methods are used namely, observation, conducting interviews and delivering questionnaires. Based on 100 respondents of FCOM degree students and 5 Coordinators, the result shows more than 95 percent of evidence indicates that the new system developed is able to store, display and manage all information successfully and performed efficiently compared to manual method. CTA can be easily accessed by students and management via the Web.

Keywords: credit transfer, web-based, feasibility study, system

## 1. Introduction

In any higher academic institution, new degree students can apply for a credit transfer. An appropriate mechanism designed to perceive previous academic achievement is essential to guarantee a full range of student mobility choices. It is for this reason that credit transfer and student mobility are linked. Credit transfer systems provide the lubricant to ensure seamless academic mobility [1].

While arrangements for credit transfer exist across the higher academic institution, very little is thought about credit-transfer students from other academic institution or why they reconnect with study. The management in education have referred to acknowledge the credit transfer as an instrument for lessening wastage and drop-out in studies [2]. Credit transfer or subject articulation is to prevent unnecessary duplication of study, thus reducing the total number of courses or subjects required by



students to graduate. Therefore, it also is seen as a mechanism to motivate students to further their studies.

Kolej Universiti Poly-Tech MARA Kuala Lumpur (KUPTM KL) was formerly known as Kolej Poly-Tech MARA (KPTM) is a private university college managed by Kolej Poly-Tech MARA Sdn. Bhd. KUPTM KL offers high-quality home-grown degree programmes in the area of Accountancy, Communication, Business, English and Computing. Currently, KUPTM KL is using a manual system for the credit transfer application. Therefore, we took this opportunity to carry out a research on this topic and develop a Credit Transfer Application (CTA) which is a web-based credit transfer system for Faculty of Computing and Multimedia (FCOM) students in KUPTM KL.

Based on the observation that has been made, in manual system to apply for credit transfer, the Coordinator needs to distribute the credit transfer form to students by gathering them in one venue. Then, students need to fill in the form and attach their transcripts before submitting to the Coordinator. The manual system puts pressure on the Coordinator as well as to the students. The form is also susceptible to lost as the Coordinator needs to keep all the credit transfer forms with the transcript attachment from each students. It takes more effort and physical space to keep track of the forms. Not only that, the form and the transcript can easily be damaged if natural disasters happen such as flash flood and fire.

Findings are presented from a survey of 100 respondents of FCOM degree students and 5 Coordinators, the result shows more than 95 percent of evidence indicates that the new system developed is able to store, display and manage all information successfully and performed efficiently compared to manual method.

Not only CTA promotes paperless environment, it also can reduce huge number of human management task which will lessen human error. The credit transfer application will be more secure, no loss of credit transfer form & transcript, and only authorised users are allowed to have an access to it. With the positive feedback on this new system, it is believed it can enhance the education management in transferring academic credit.

## **2. Web-based Credit Transfer Application System**

Web-based applications have now gotten one of the ideal advancements being utilized to facilitate the way toward overseeing information and records. A portion of the inspirations that add to the advancement of many online frameworks these days are a direct result of its productivity in taking care of quick access of records and its capacity in supporting multiusers at the same time, in this way sparing a great deal of time and hassle free [3-4].

Transferring academic credits is the process to evaluate the components of qualification in determining the overall or the equivalence with another qualification by establishing credits for individuals' academic achievements [5]. It is a mechanism through which an institution shares students' accomplishments with other institutions to facilitate their horizontal mobility and vertical progression. This system seeks to avoid duplication of studies. Furthermore, it saves time and money for students who decide to embark on an exchange programme. An appropriate system of credit transfer is a key facilitator of student mobility and cooperation among higher education institutions [6]. Therefore, the credit transfer system is an important system for institutions and students.

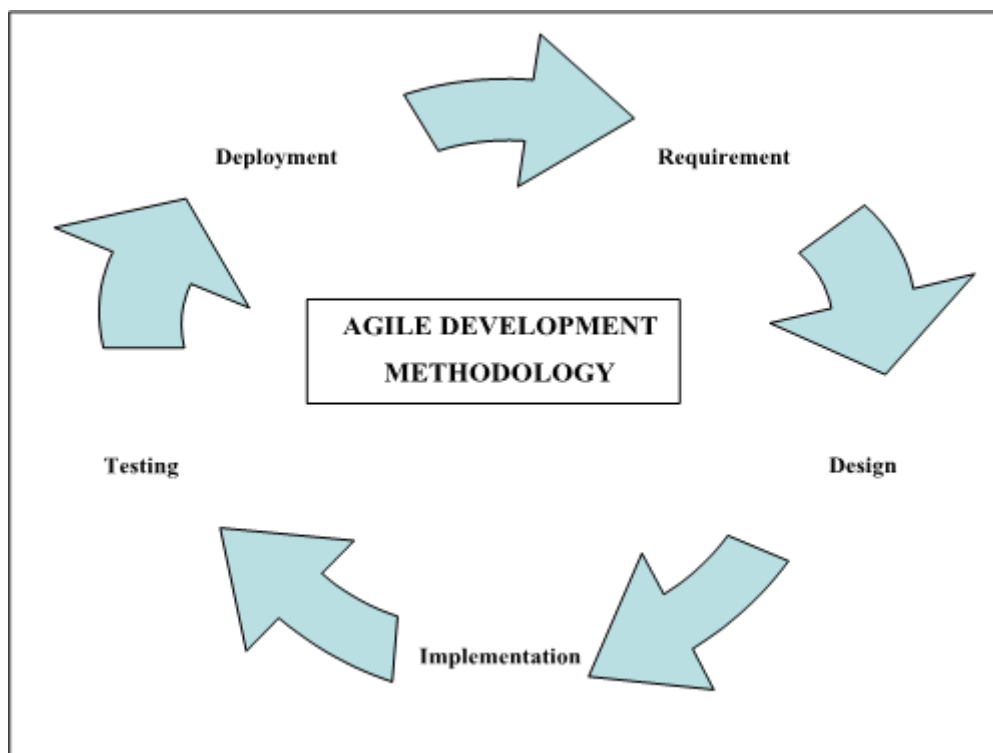
According to Cornet, there are two types of student mobility which are horizontal mobility and vertical mobility. Horizontal mobility can be defined as a student who is pursuing the next education level without changing their education field [7]. This type of student mobility is beneficial for students as it can reduce many credit hours by transferring subjects to avoid duplication of study. As an example, a student took a Diploma in Computer Science and the student continue to the next education level in BSc (Hons) in Information Security.

For vertical mobility, it can be defined as a student who is pursuing the next education level in a different field. This type of student mobility is quite difficult for the student to apply for credit transfer as the education field is different. For example, a student took a Diploma in Mechanical Engineering

and the student pursues the next education level in Bachelor of Education (Honours) in Teaching English as A Second Language (TESL).

### 3. Methodology

The system's development makes use of Agile Development methodology as shown in Figure 1. This methodology extends the advantages of Iterative Methodology and aims at user satisfaction and product adaptability by the rapid delivering of products. It anticipates change and allows for much more flexibility than traditional methods. Moreover, this methodology offers a lightweight framework, given a constantly evolving functional and technical landscape, maintain a focus on the rapid delivery of business value [8-9].



**Figure 1.** The agile development methodology phases.

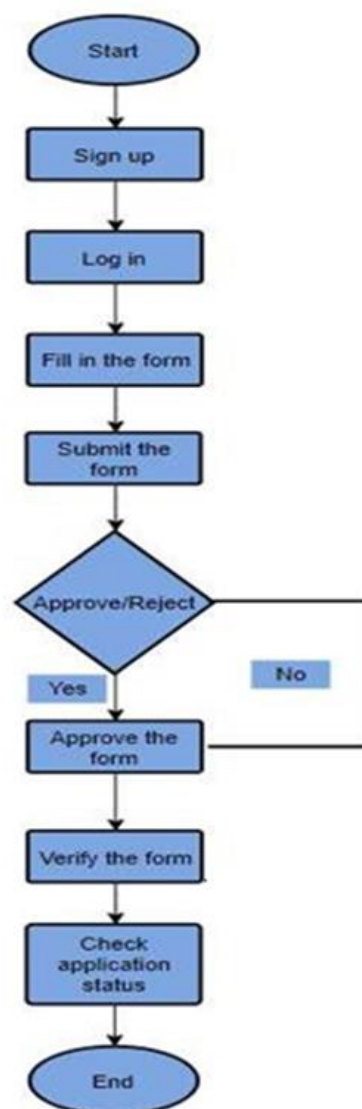
The requirement phase mainly focuses on communicating with users to gather and analyse requirements. We conducted a feasibility study to determine whether the new system is a feasible solution. Observation, interview and questionnaires have been used as the methods in this phase to understand the business problems. Therefore, we have selected Kolej Universiti Poly-Tech Mara (KUPTM), Malaysia to be a pilot study where 105 questionnaires have been distributed amongst students and Coordinators. The results of the questionnaires will then be used to analyse the users' requirements and preferences.

In second phase we evaluated and started on the logical design of the system by making use of the information and requirements collected during the requirement phase. We designed the system interfaces using Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS) programming languages. The design of the system must be user-friendly and easy to understand by the users. Putting too many elements on the page of the system may lead to distracting the users from its main purpose thus we keep it simple as simplicity always works in an effective web page system design [10].

After the best or most appropriate design has been selected, implementation started immediately by using Visual Studio Code, XAMPP and PHP. Testing is the last phase we will discuss in this paper as it is a complementary process that needs to be done in order to verify whether all features and scenarios are working as what users expected. We will present the user testing in next section with more details.

#### 4. Result and Discussion

Figure 2 shows the flowchart diagram of the system. The system starts with the sign up of the user. Then, the user can log in through the system. The student needs to fill in the form and submit the form. After that, the Coordinator will approve or reject the subjects applied for transfer credit. The Dean will then approve the application follow by the Admission and Student Record Department who will verify the application. Lastly, the student can check the application status through the system.



**Figure 2.** Flowchart diagram.

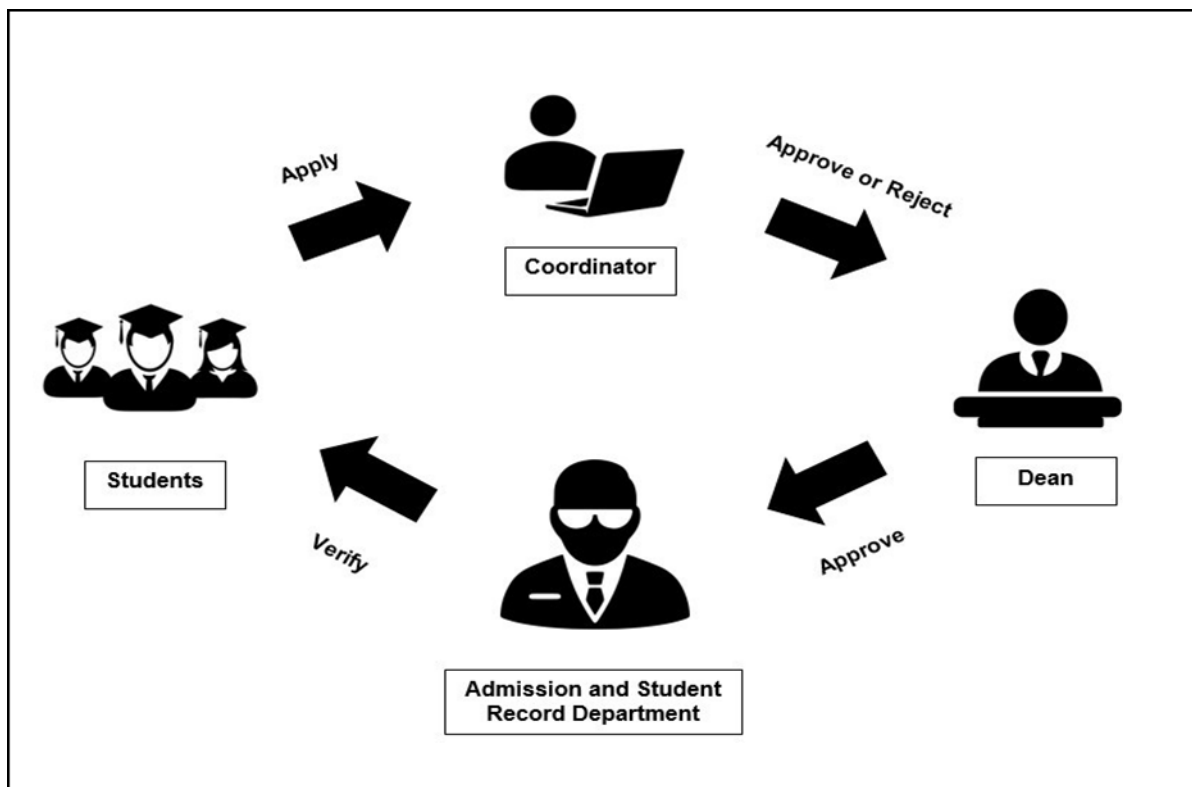
Figure 3 depicts the flow design of the Credit Transfer Application. The main flow starts with students applying for the credit transfer. Then, the Coordinator will approve or reject the applied

subjects. Next, dean will approve the application and the Admission and Student Record Department will verify the application.

The student is able to perform various tasks or activities such as sign up, log in, fill in the form and upload the transcript. After that, they can submit the form. Furthermore, they can view the submitted form and the uploaded transcript. They also can download the submitted forms and check the application status of credit transfer.

The Coordinator is able to sign up and log in to the system. He or she also can add course, institution and subject in the system. Once the student submitted the form, the Coordinator can view the student application's list. Next, the Coordinator also can view and download the form and uploaded transcript by student. Furthermore, the Coordinator can approve or reject the subjects applied for credit transfer.

Once the Coordinator approves or rejects the application, the Dean can view the programme and student application's list. Then, the Dean can view and download the form and the uploaded transcript. Once the Dean has approved the application, the Admission and Student Record department can view the programme and student application's list before verifying the application.



**Figure 3.** Flowchart diagram.

Table 1 shows the comparisons of percentages among 100 respondents which is students regarding the use of the manual method and the developed system. The highest percentage which is 96% shows that students strongly agreed that the developed system is efficient and effective compared to the manual method. Students also strongly agreed that the developed system makes record keeping is more organized, lower the potential of losing application form and transcript, fastens the application process and the potential of unauthorized access to the private and confidential data is low with the percentage of 95%. Furthermore, 95% of them satisfied with the developed system rather than the manual method for credit transfer application. Meanwhile, 94% of students strongly agreed that the developed system enables them to check the application status easily compared to the manual method. Students also are happier with no more printing and photocopying need to be done with the developed system. Lastly, it

shows that in total average, 95% of students strongly agreed that the developed system is better for credit transfer application rather than the manual method.

**Table 1.** Comparisons between using manual system and online system for students.

No.	Factor	Strongly agree	
		Manual method	Developed method
1	Efficiency & effectiveness	20%	96%
2	Record keeping is more organized	15%	95%
3	The potential of losing application form and transcript is low	15%	95%
4	Student can fill in the application form faster	20%	95%
5	Student can easily check the application status	15%	94%
6	The potential of unauthorized access to the private and confidential data is low	15%	95%
7	Satisfaction with the method	20%	95%
8	Student can submit the application anytime from anywhere (mobility)	No	Yes
9	More printing and photocopy	Yes	No
Average		17.1	95%

Table 2 depicted the comparison of percentages among 5 Coordinators on the use of the manual method and developed system. The highest percentage which is 100% of Coordinators strongly agreed that developed system makes record keeping is more organized, lower the potential of losing application form and transcript, the list of student application can be easily tracked and view, the application can be approved faster, unauthorized access is low and satisfy with the developed system rather than the manual method. Meanwhile, 80% of Coordinators strongly agreed that the developed system is more efficient and effective compared to the manual method. Lastly, it shows that in total average, 97.1% of Coordinators strongly agreed that the developed system is better for credit transfer application rather than the manual method.

**Table 2.** Comparisons between using manual system and online system for Coordinator.

No.	Factor	Strongly agree	
		Manual method	Developed method
1	Efficiency & effectiveness	20%	80%
2	Record keeping is more organized	20%	100%
3	The potential of losing application form and transcript is low	20%	100%
4	Coordinators can track and view the list of the student application easily	20%	100%
5	Coordinators can approve the application form faster	20%	100%
6	The potential of unauthorized access to the private and confidential data is low	20%	100%
7	Satisfaction with the method	20%	100%

8	Coordinators can access and view the application anytime from anywhere (mobility)	No	Yes
	Average	20%	97.1%

## 5. Conclusion

Result and discussion had shown that more than 95 percent of evidence indicates that the new system developed is able to store, display and manage all information successfully and performed efficiently compared to manual method. Many advantages can be seen from this online application such as mobility access and usability.

With the development of CTA, students can fill in the credit transfer form, upload their transcript and submit it through the system securely. Once they submit the form through the system, students can check the status of their application and download the form. The burden of academic management also can be lessening with the used of this system. In case of natural disaster, all records will be kept safely in the database system which can be accessed only by authorized users. CTA also promotes the paperless working environment which can reduce the use of paper thus promotes green computing.

However, there are many more functions that can be added in CTA such as auto-calculation for all credits applied by students to be transferred. This is a real scenario which can minimize Coordinator's task in checking the credits. Apart from that, watermark can be implemented to the uploaded transcript to protect the transcript from unauthorized used as it identifies the rights of the owner. However, the advancement of this system will be considered in the future enhancement.

## Acknowledgments

The authors gratefully acknowledge the support provided by KUPTM KL and the supervisor, Associate Professor Ts. Dr Zahrah Yahya, the Deputy Vice Chancellor, Kolej Universiti Poly-Tech MARA (KUPTM). The authors also would like to thanks all the team members involved for their contribution.

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