Development of a Rule Based Prototype in Course Selection Process

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Abstract- Grade point average and Cumulative grade point average are key indicators of student performance throughout the academic semester. Based on study conducted by the UniKL MIIT academic affairs division, there are several factors contributed to this issue. At present, the process of selecting future course follows a procedure suggested by the UniKL academic advisory system. Currently weak student is required to consult the academic advisor to select future courses. This procedure is recommended to improve the advisee academic standing. A study is suggested to analyze the current procedure used in assisting advisee when performing the course selection process. As a result from the data analysis phase, an initial prototype is developed and evaluated. To perform this study, primary data and secondary data is gathered and the system development methodology is adopted. This paper, presented the methods adopted in developing of the initial prototype. Meanwhile the result of the prototype evaluation will be further discussed in the next paper. Sharing this information with other researcher is to foresee ways to improve this study, hence the same study can be initiated and explored by other institute of higher learning.

Keywords— Grade Point Average (GPA), Cumulative Grade Point Average(CGPA), Rule based prototype, Course selection

I. INTRODUCTION

Being in an institute of higher education, it is important for student to trace their academic performance though out the academic years. In Malaysian Institute of Information Technology (MIIT), University Kuala Lumpur (UniKL) Malaysia, student performance is evaluated base on the calculation of Grade Point Average (GPA) and the Cumulative Grade Point Average (CGPA) [1]. UniKL MIIT is of the technical university in Malaysia, this institute produces student specializes in the area of Information Technology. This program is divided into five (5) other specialization areas. The specialization comprise of the E-Commerce, Software Engineering, Multimedia, Security and Computer Entrepreneurial Management.

II. BACKGROUND

As stated by University Rules and Regulations Handbook, student obtained GPA below 2.0 will be placed on academic probation [1]. Referring to the overall performance reported by the academic affairs department of UniKL MIIT in the January 2009, 6.6% of the Bachelor in Information Technology students is identified on probation. While the overall result in July semester of the same year, calculated that, 12% of the Bachelor in Information Technology student is on probation [9]. Comparing the results between January and July 2009, a significant increase in the total number of probation students is presented.

Based on a study conducted by Madam Azinah Mohd Zain, the Manager of Academic Affair Division of UniKL, there are nine (2) factors which may cause student to be on probation. These includes absenteeism, failure to attempt the final exam, unable to manage studies, lack of study skills, no motivation, un clear academic goal, culture shock, quit from courses, and refuse to seek guidance [2].

As a result, the academic affair division has proposed an academic advisory system with the intention to guide probation student in selecting the right courses. To conduct this process, several stakeholders were selected. This includes two academic advisors, the academic affairs unit and counselor. Meanwhile, the advisees are students whose academic status is on probation. The role of the academic advisor is to monitor the advisee academic progress and assist them in selecting the right courses to register to help them attain a better academic standing. In addition, the role of the academic affairs department and counseling unit is to provide necessary information to help them deal with the advisee [2], [3].

III. PROBLEM STATEMENT

As reported by the MIIT academic affairs department, the overall result in January 2010 semester, 9.1 % of the total Bachelor in Information Technology students is on probation. The overall report in July 2010 semester shows the percentage

of probation students remains 9.1% [10]. This presents a significant reduction in the number of student on probation since the previous result in year 2009.

Based on our observation, the process recommended by the advisory system has helped to reduce the percentage of probation students. Azinah stated that a good study plan is important for students to keep track their academic standing. To facilitate the academic advisory system, the academic advisor is required to spend time to identify the status of the advisee by analyzing the student details. The types of information required by advisor includes of the student probation status, details of the previous result (GPA), bachelor specialization program and semester level [2].

According to the counseling unit, the consultation process is difficult as it has to rely on several factors [3]. Meanwhile, the Academic Affairs Department is raising concern to continuously improve weak student academic status in UniKL MIIT. As a result, we were suggested to perform a study and identify the possibility of developing a prototype as a tool to facilitate the course selection process.

IV. SCOPE

In order to conduct this study, the scope for this project must be clearly stated. The advisee involved is the Bachelor in Information Technology specializing in Multimedia students who is on probation. Other stakeholders include the academic advisor, counseling unit, student academic affair department of MIIT and division, the bachelor program coordinator (Multimedia) and finally the management representative of MIIT. The duration planned for this study is two years. This project has started on December 2009 and is progressing. The proposed prototype is developed on a web base environment

V. SYSTEM DEVLOPMENT METHODOLOGY

In order to support the development process, the system development methodology is adopted [6], [11]. Evolutionary prototype model is used to represent the processes involve when developing the rule based model. This method was replicated as it has been previously used to develop a decision support system [11], [13]. In addition, Woojung, in his book chapter stated that adopting this method helps to speed up the development process. Fig I illustrates the evolutionary prototype development model.



Fig 1 : Evolutionary prototype model

A. Initial Concept. Requirements Determinations

To start off with this study, data gathering process is first conducted. Approaches used involved interviews, meetings, document review and brainstorming [12]. Several interview sessions were performed between project team and the panel of experts from the academic affairs division and department. This involves the UniKL Manager of Academic Affair Division, Madam Azinah Mohd Zain and the MIIT, the UniKL Manager of Academic Affairs Department; Madam Norzaini Zakaria. Another interview was conducted with the Multimedia Program Coordinator. The purpose of this interview is to identify the relationship between the prerequisite and difficult subjects in the particular program.

Multimedia program is selected in this case because, based on our observation the number of probation students is higher than other specialization programs. Two academic advisors were interviewed to identify the common guidelines used as a reference when they perform the supervision. Besides multiple interview sessions, several supporting documents related to the advisee were collected. On top of that, the overall result from year 2009 and year 2010 is reviewed [9], [10]. A Meeting with the UniKL MIIT management representative, the MIIT Deputy Dean of Academic, was carried out. This is to identify the concern from the management perspective. Finally a brainstorming session among the project team is continuously performed for the purpose of compiling and analyzing collected data.

B. Initial Design: Data Analysis Formed Rule-Base Algorithm

Based on the data collection procedure, the information is compiled and analyzed. As a result of the analysis phase, descriptive information related to the rules and condition is accomplished. Based on to the descriptive rules, a rule-base algorithm is devised. The general formalism of the rule-base algorithm generated was drawn from the following attributes:

- The detail of student result
- Detail program structure based on Multimedia

- Subject's difficulty
- `Subject's nature and level
- Credit transfer
- Grading system
- Academic standing system

The of sequence using this attributes must be referred by outlining features of the particular program structure and also identifying if the subject is offered in that particular semester. Next the prerequisite subject is determined and categorized according to its difficulty level. Later on advisor must refer to the student's results in detail which consists of credits gained, GPA, CGPA and total credits transfer. In addition, the Malaysian Quality Accreditation (MQA) subject must be considered in order to pursue the university regulation and grading system. With the list of information gathered, the rule is then formulated.

Next, the advisor will collect and analyze related information to determine the list of recommended subjects. Table 1 shows the example of rule constructed based on cumulative grade point average (CGPA);TABLE 1 showing the suggested action should be taken based on CGPA.

TABLE 1 RULES BASED ON CGPA [2]

		Suggested Action				
Category	if CGPA	Repeat "F"	Improve			
		subject	grades			
1.	<= 1.70	\checkmark				
2.	1 71 2 10	\checkmark	Х			
3.	1.71 - 2.10	Х				
4.	> 2.10	\checkmark	Х			

The construction of the rule based is then translated into a code base. Fig 2. Illustrates part of the of the overall rule represented in code .

1.	IF academic_standing != Good THEN
	total credit hours ≤ 12
2.	IF subject grade = `F' THEN
	Select subject
3.	IF difficult subject > 1 THEN
	Select only one difficult_subject
4.	IF MQA subject grade < `C' THEN
	MQA_subject_status = `Fail'

Fig 2. Coded Rule-based Condition

C. Refine Prototype : Initial Prototype Development

Once the rule based code was devised, the work proceeds with the development of the initial prototype. A prototype is a small scale and least functions system. The development process involved transforming the model specification into executable form. This process involves coding with the C# language, MS SQL is use to support the database which run in the ASP.Net environment. The Windows XP professional is use as a platform and the Internet Information Service (IIS) version 5.0 as the web application server. The initial design of the prototype was shown in Fig 3.

Mutiara UniKL	Manage Sections					
Sign Out	Search By All Columns 🐱					
Home	Name Coordinator	Coordinator	Semester	Subjects	Date Added	Acto
Users	BIT (HONE) IN SOFTIMATE ENGINEERING Programme Disature	Rhaft Khashan Julahi			Beg 05. 2011	/*
Programme Add Programme	·Figt ·Fighted fast - Last · ver	0 Goth page 1	10 💌 84	crics Per Page	Page 1 of 1	
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Fig 3.: The administrator login

Fig 4 Demonstrated the result based on the user input and rules coded

Sign Out	Semester	llo	Subject	Subject Name	MQA	Heavy	Cr.	Grade	Grade	Accumulation
Home			Code				1978.		Point	Point
	2	1	10810433	Clove Networks for IT	30	10	8)	0	187	411
Subject / Results		2	15616000	Object oriented Programming	50	Yes	1	7	1.01	0.90
		8	(6818102	introduction to Torbook Engineering		100	1_{i}	.01	111	1.10
		4	10810522	Introduction to Industrial and Digenizational Psychology	10	No	2	ŀ.	2.67	\$34
			08819102	Technopeneurity	Air.	16	${\boldsymbol E}$	6	2.01	4.00
			108818202	Polissonal Communication 1	10	No	1	ъ.	2.87	8.01
		1	10814203	Consular Organization	- 14	No.	1	p.	187	8.01
	Current GPA	1.01								
	Subject Co	de	,	lubject Rame			QA.	Yes	n	Cr. Hrs.
				and a second and a second second						

Fig 4.: Page subject recommended to be registered next semester

D. Evaluation

The final stage of the adopted method is the evaluation process. As presently the project status is ongoing, the evaluation is now going through a refining procedure. This is a very important stage in system development to ensure the initial concept is well interpreted and user expectation is met. In order to evaluate the prototype, two phases of testing is selected. The first evaluation phase is the White box testing [4]. White box testing is ideal in this case because the backbone of this prototype contains lists of conditional statements. The purpose of performing white box test is examine the accuracy of the rule based designed in the earlier stage. This test will help indicate the internal working of the logic and the code structure [4]. This process is run during the execution of the modules containing the conditional statements. At present the white box testing is continuously perform, and initial result shows some flaws as it is complex to evaluate multiple nested conditions at once. As a result, the initial prototype is undergoing a complete refinement process. However, this is a normal situation in a system development process, thus it proves that the white box testing is relevant to test logical accuracy of conditional statements.

The second phase of the evaluation process planned is usability testing. The purpose of conducting this type of testing is to measure how easy the system is use. By performing this test, we will observe the prototype in terms of its effectiveness through whether or not tasks can be successfully performed by the users; efficiency this is to find out how fast those tasks are performed; and user satisfaction to identify how much users like the prototype [7]. Nevertheless, the usability test will be performed once the prototype is completely developed. To conduct the usability testing, the predefined tasks will be given to users. Four panels of expert from the university's academic affair department will be selected to run the test. To conclude the study, the final result of the white box testing and the usability testing will be discussed.

VI. CONCLUSIONS

We have presented an initial study to analyze and develop a rule based prototype. This is derived based on the logical guidelines provided during data gathering. The result of this study is then evaluated in two phase, nevertheless, at this point of time, this study in going though a refinement process. The final result of this study is planned to be evaluated and discuss on a later stage. This is to ensure the reliability and accuracy of the prototype. The purpose of sharing this study with other researcher is to obtain feedback as this shall improve the future results. The same study can be apply and extended in other institute of higher learning. One immediate research which needs to be done is to determine whether the facilitation of the course selection process using the prototype actually improve weak student performance. This study will be quite complex as there are various factors [2] which may affect students academic performance.

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