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Research paper



Terengganu State Decision Support System for School-leavers (TeSDeSS)

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Abstract

Year after year, the numbers of school-leavers increase significantly. Some of them continue their journey by furthering their studies in higher education. The ones that can further their study usually are the ones that know their interests and have achieved good results in government examinations, and hence are qualified to apply to government universities or tertiary institutions such as matriculation, polytechnic, and others with their targeted or desired academic degrees. But, this differs for school-leavers who have dismal grades in government examination (dropout students), most of whom just give up on their first application to government tertiary institutions. The Terengganu state government hence wanted to come out with a system that can help to minimize this problem. In this proposed research, it was found that school drop-outs from Terengganu are not aware of the existing opportunities to further their studies with moderate or low grades, and currently there is no platform that unites all education and skills institutes in one single platform. This proposed research will cater for all the identified problems, to make this research feasible, and the rule-based system will be used as the theoretical proponent.

Keywords: *Matching; rule-based system; SPM leavers; school-leaver; students dropout; decision support system; IPTA; IPTS; skills institute*

1. Introduction

Most of the drop-out school-leavers want to further their studies, but they do not know how and where to apply. This is because there is a lack of information about government, private, and skills institutes. The students do not seem to know what exactly their interests are. This factor is one of the main contributing causes why dropout students fail on their first application to government universities. For example, the students are good in Arts subjects, but they apply for Mathematical courses while their results for Additional Mathematics could be below average. Then, when their applications is not accepted, they just give up on the application.

Currently, the process to apply to public universities, private universities, skills institutes, matriculation programs and polytechnics are not integrated into a 'one-stop centre'. Students need to search for the link that has been provided by the search engine to apply to institutions of higher learning. Not many students take the effort to search for data and information related to institutes for a higher level of study. Moreover, students need to enter their personal information for each of the application websites separately; and this discourages them from diligently searching for possible avenues to further their studies.

The research has highlighted several problems that arise from the issue of making applications to further studies in an area of interest. The first problem is that many Terengganu school-leavers who got low grades in government examination are not aware of the existing opportunities to further their studies with the grades they have achieved. They just give up upon the first rejection of a university application. Then, they end up becoming a menial worker without skills or aspirations. This scenario mainly happens to candidates from families with low education and income level. Next, there is no platform that unites all public institutions of higher learning (IPTA)s, private institutions of higher learning (IPTS)s and skills institutes in 'one-stop centres'. As the information is scattered all over the web, the school-leavers are not aware of the existence of opportunities to further their studies. However, some students do get away from this problem when they seek for help from relevant parties. To overcome these problems, this research tries to propose a strategy for dropout school-leavers to apply to further their studies at educational and skills institution. The main of this study is to design and develop a system that can help drop-out school-leavers to get timely information easily to further their studies. Finally, the functionality and feasibility of the support system will be evaluated to measure its effectiveness.

This research can be beneficial for the Terengganu State government to eradicate the problems faced by low-income groups, and students can largely benefit from this venture. Students who have experience in dealing with the system in TeSDeSS can promote this new improvement by word-of-mouth to their friends as word-of-mouth communication is more powerful than advertising messages.

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2. Related Works

2.1 Decision Support System

Nowadays, coming to a decision is the most important part in our life. School-leavers too need recommendations that can support their decision to further their studies. In order to facilitate the school-leavers decision in choosing their programs to further their studies, they can use TeSDeSS, in which this system is capable of supporting their decisions. TeSDeSS adopts the Decision Support System (DSS) as its fundamental information system to support decision-making activities. There are many organizations that use DSS in their daily workspace. For example, the chief executive officer of a company can see the business performance in the desktop dashboard and make decisions based on the information that is shown on the dashboard.

In the 1950s, Herbert Simon and James March for the first time introduced a different decision making framework for understanding organizational behavior. DSS has many different definitions catering to the needs of the different person that define it[1]. In the early 1970s, Scott-Morton was declared as a major concept of DSS, whereby he defines DSS as something that helps decision-makers utilize data and models to solve the unstructured problem utilizing interactive computer-based systems [2]. Over the years, another definition stated by Scott-Morton, is said to improve the quality of decisions, by bringing together the intellectual resources of individuals and the capabilities of the computer. It is a computer-based support system for management decision-makers who deal with the semi-structured problem (Keen and Scott-Morton, 1978) [3].

Educational Decision Support Systems (EDSS) are designed to collect, maintain and supply relevant, reliable and timely information to guide educational policy, planning and management decisions. European 2020 strategy includes both increasing population in tertiary education and the decrease of early school-leavers [8]. This scenario also applies to Malaysia's 2015 Education National Review in expanding opportunities in pursuing post-secondary and tertiary education [9].

2.1.1 Type of Decision Support System

Decision Support Systems refer to an academic field of research that involves designing and studying Decision Support Systems in their context of use. In general, Decision Support Systems are a class of computerized information system that supports decision-making activities. Table 1 shows the type of a decision support system. For TeSDeSS, knowledge-driven DSS will be used because the system will give suggestion on possible courses and institutes for school-leavers before they apply to any higher educational institutions based on their interests and results.

Table. 1: Type of Decision Support System [4]

No.	Type of Decision Support System	Description
1	Communications-driven DSS	Communication-driven DSS is a type of DSS that focus on collaboration, communication and shared decision making support.
2	Data-driven DSS	A type of DSS that allow access to and manipulation of time-series of internal companies' data and sometimes external data.
3	Document-driven DSS	A type of DSS that emphasized on the improvement and management of unstructured documents.
4	Knowledge-driven DSS	This type of DSS can suggest or recommend actions to managers.
5	Model-driven DSS	This type of DSS allows access to and manipulation of a model, example financial, statistical, optimization and stimulation models.

2.2 Rule-Based System

Rule-based system is a system that is capable of using large amount of parallelism, and creates the possibility to match and catch the data memory in parallel [5]. Rule-based system was created to solve problems in a selected domain. Each domain has its own reasoning based on human knowledge, and can be emulated and even replaced through an automated rule-based system [6]. A rule-based system is an arrangement of "if-then" explanations that uses an arrangement of declarations which governs on the proper behavior upon those assertions made [7]. In the rule- base, rule is in the form of:

IF some condition is fulfilled THEN some action can be worked out

This condition tests working memory. For TeSDeSS, rule-based is used for the ***IF-THEN*** condition of the qualification of the school-leavers to apply for particular courses in particular institutes based on their results.

2.3 Similar System

Based on conducted research, there are several systems similar to TeSSDeS. This paper chooses two similar websites that provide the same outcome as this research. All of them have almost the same features with the expected research.

There are "Selangkah Ke UiTM", a Qualification entrance system to Public Universities (UA) and Premier Polytechnics. Table 2 shows the functionality comparison between the similar system and TeSDeSS. Both the stated similar systems do not integrate all IPTAs, IPTSs, and skills institutes into their system. Next, their systems did not link the results to the institutes; they just filter, arriving at possible programs and courses as computed results. Moreover, "Selangkah ke UiTM" and "SemakSyarat.com" did not store users' information. Hence, the users need to repeatedly key in their information each time they use the system.

Table 2: Comparison of similar system

NO.	CRITERIA	Selangkah Ke UiTM	SemakSyarat.com	TeSDeSS
1	Users can enter their information.	/	/	/
2	The system provides concern form to the users.	X	/	/
3	Platform provide decision for IPTA	/ (UiTM only)	/	/
4	Platform provide decision for IPTS	X	X	/
5	Platform provide decision for skill institute	X	X	/
6	Platform can link to the institute	X	X	/
7	Platform can store the data	X	X	/

2.4 Adapted Waterfall Model

Adapted Waterfall model consists of planning, analysing, desiging, developing, as well as testing and evaluation. The reason why this model has been chosen is that it flows by phase, where one phase has to be completed before moving on to another. This will make the developer to focus only on the current phase at hand. Other than that, it can reduce the error of generation at each phase. This helps the developer to complete every phase better. In Adapted Waterfall model, the result of each phase will be brought forward as the next phase's input.

The model starts with planning, where the developer has to prepare ideas for title selection. For this, it is crucial to understand the business process of the selected organization. An idea can be ob-

tained from the problem faced by the organization on their current business flow.

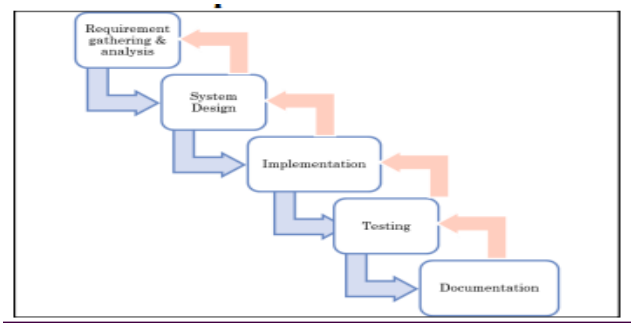


Fig. 1 Adapted Waterfall Model

The second phase is the analysis phase, where it is required to collect data regarding the system to be developed. Here, user requirement will be determined based on a research of a similar system. Then, the phase proceeds with the design. In the design phase, the developer has to create a number of diagrams as to clearly depict the flow of system to be implemented. The fourth phase is the development phase, where the system is initiated to be developed as a system. In order to develop the system, the developer has to refer a diagram that has been sketched in the design phase. Finally, the complete system will be tested and evaluated. The testing and evaluation phase will involve experts for rectification and users to provide the input. The results obtained will be used by the developer as a guideline to fix any arising problem. Fig. 1 shows the Adapted Waterfall Model.

3. Methodology

This research proposes an online-based decision support system to assist Terengganu school-leavers in matching the relevant field of study according to their results, skills and interests. It is a system that is created to give suggestions to students. It is an online system that can be accessed by any users especially Terengganu school-leavers.

3.1 Preliminary Study and Requirement Gathering

At the preliminary study and requirement gathering, early research was conducted to study several similar systems to capture the requirement needed and enhancement of the proposed system. The current process flow takes into account the current application for studies at institutions of higher education, which has been identified based on research that has been done. The entire current problem will be captured during the process flow and will be used to solve the problem, to achieve user requirements. This will lead to the accumulation of information.
The information collected will help students to ease their process of applying to institutions of higher education. The objective that meets user requirements must acquire user needs when developing the system. Other than these, this phase also leads to the significance and scope that is being identified. Table 3 shows the summary of the preliminary study and requirement gathering.

3.2 Analysis

It is requirement to analyse the business process to determine what is needed and wanted by users. The collection of information will be analysed precisely to help Terengganu school-leavers to harvest the advantages of the system. Through this, user requirements can also be defined accurately. Many sources and past literature that are related to decision support systems, institutes and programs recommendation have been the main guidance and provided important and relevant information in the development of the system. Besides, through this phase, the developer can have the final say on how the system will be developed as well as be more knowledgeable about the tools that are going to be used in developing the system.

3.3 Design

In this phase, the developer starts to sketch some model design and interface for the TeSDeSS that will represent the system process, input and output. This process is done to act as a guideline for the developers when engaging in the development of the system. This phase also is a feeder for the previous phase.
In this phase, the development process concentrates on diagrams. The diagrams are Process Flow Diagram, Context Diagram, Data Flow Diagram (DFD) Level 0, Entity Relationship Diagram (ERD), Functional Hierarchical Diagram, Data Dictionary and User Interface Design. During the development phase, Entity Relationship Diagram (ERD) is designed. ERD gives a clear picture of the database structure. ERD consists of three elements which are the entity, attributes and relationship. In this system, there are ten entities and the users of this system are students, administrators and Terengganu authorities. The attributes and relationship of the entities had been identified. Fig. 2 shows the ERD of TeSDeSS.

3.4 Development

At the development phase, the developers will follow the guidelines and user requirements starting off from creating the database and designing the user interface. This process is to make sure that the final system will meet the user requirement and also make them feel satisfied with the produced final system. Two important considerations are in software and hardware requirements needed to develop TeSDeSS. This system will use Rule Based system as the theoretical platform. A high requirement system is needed for the proposed development system to be successfully completed.

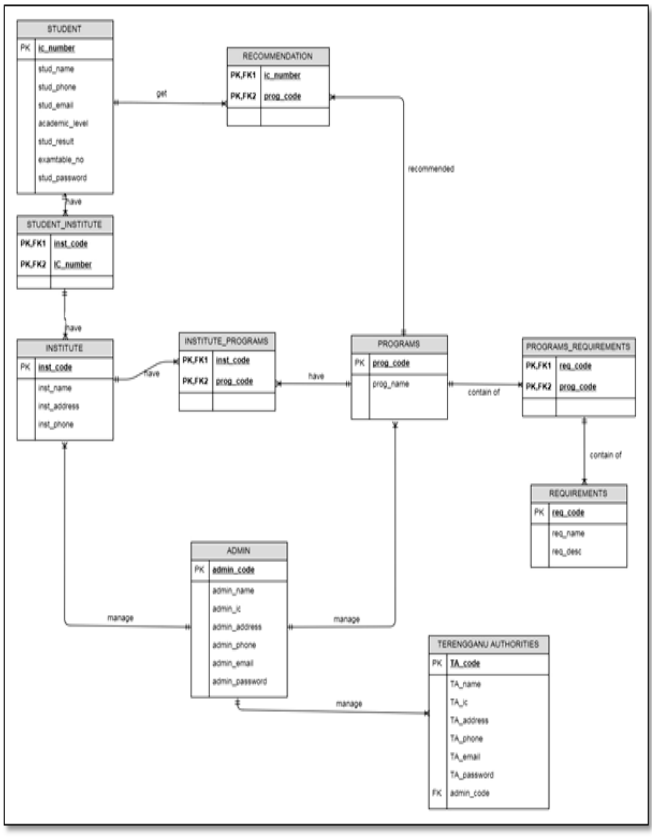


Fig.2: Entity Relationship Diagram for TeSDeSS

3.5 Software and Hardware Requirement

The software requirement is a software tool that helps the developer to complete the research. The software requirements in the development of TeSDeSS are as shown in Table 3. The hardware requirements used in the development of TeSDeSS are shown in Table 4.

Table 3: Software Requirements

Types of software	Software Purpose
Microsoft Word 2016	Used for documentation of the project.
Microsoft Project 2007	To help construct the Gantt Chart.
Draw.io	Used to create Entity-Relationship diagram (ERD).
Lucidchart.com	Used to create context diagram and data flow diagram (DFD).
XAMPP Control Panel	As the database to store the input.
Netbeans	Helps in programming the source code of the proposed system. The system will use HTML to write the whole code and CSS to develop the webpage and PHP for server-side scripting.
Google Chrome	XAMPP Control Panel will run using Google Chrome as a chosen browser.

Table 4: Hardware Requirements

Hardware	Specification
Laptop	Acer
Operating System	64-bit Operating System, x64 based processor
Processor	Intel(R) Core(TM) i3-6006U CPU @ 2.00GHz 1.99 GHz
RAM	4.00 GB
Input devices	Keyboard and Mouse

4. Result and discussion

- To help lessen the number of dropout students in the State of Terengganu.
- To help school-leavers find the right course and programme that is suitable with their Government Examination Results and their self-interests.
- TeSDeSS can filter skills and interests of the school-leavers.
- To be an eye opener for school-leavers that there are opportunities to continue their study although they achieved-low or moderate grades.
-

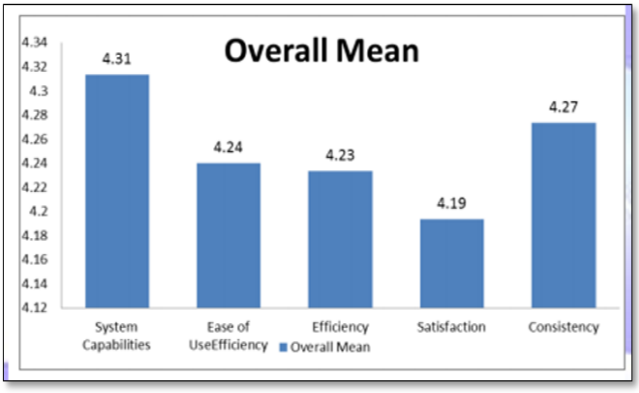


Fig 3. Graph of Overall Mean for All Construct

5. Conclusion

TeSDeSS is a system that helps school-leavers to find their right programmes and the suitable educational institutions to further their studies at tertiary level by providing a 'one-stop centre' system by giving them information about qualifications to IPTA, IPTS and skills institutes. All students in Terengganu State are the target users of this proposed system. Terengganu State Decision Support System for School-leavers (TeSDeSS) will help Terengganu State Government to minimize their Dropout Students problem.

The system will have its administrative function, which will be used by the administrators to handle the administration process. The administration process includes the creation, retrieval, update and deletion of data. For example, if a Higher Skills Institute updates a new course offered, the administrator will automatically update that information into the system. Next, the authorities, including the Terengganu State Government, can generate reports to know the number of students who are using the system and the number of Terengganu state dropout students, as well as being able to use this data for many other related analysis and researches.

As for the students, they can enter their personal information and store them in a database. They can enter their results by accessing the database. They also can choose their field of interest.This is where the system differs with other similar systems because the proposed system will also consider students interest and co-curriculum advantages in matching the students' skills and academic results in proposing the best match. As the result is generated, it will also be stored in the database for future use and re-entry. In future, the students do not need to enter all their particulars into the system, as they will just need to enter their Mykad numbers and their name, and the system will retrieve the information from the saved database.

This research can be beneficial to the Terengganu State government, and students can largely benefit from this too. Students who have experience with TeSDeSS can promote this new improvement by word-of-mouth.

Acknowledgement

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