

**Design Intelligent Decision
Support System (IDSS) to Choose the
Appropriate Private Universities
Baghdad City as a Case Study**

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Abstract:

Recently, a huge number of the private universities and colleges are established in the Iraq, most of them are located in Baghdad. The students who are candidates to enrol in such universities/colleges and their families usually are confused and/or uncertain about deciding which university/college is the most suitable one for them. Modern technologies can assist to facilitate this selection process based on the requirements that can be assigned by students and/or their families with the fewest simple steps. Therefore, this paper strives to design a system that achieves this purpose. The proposed system includes direct features where the normal users (students or their families) can use it without any difficulty

Keywords: Decision support system, private universities, students, Baghdad, Iraq

1.0 Introduction

In today's world, every day the people are faced with situations where they need to make decisions. It can be a minor and routine one, such as choosing what to make for lunch or what to wear for work. Or it could be a major and difficult decision which have large, long-term consequences and can alter the course of their life path. For example academic study or career choice is a major decision that should be taken with a lot of carefulness and wisdom because such decision affects people for a life time period. In Iraq, also in many other countries, choosing the right university is deemed as a major concern for parents as well as students themselves, it is considered as a point of departure for a new life.

Recently, electronic decision support system has been successfully applied to numerous decision-making problems in many disciplines, including higher education (Kardan & Sadeghi, 2013). A decision support system (DSS) is a computer-based system that represents and processes knowledge in ways that allow decision making to be more productive, agile, innovative, and/or reputable (Holsapple, 2008).

However, there has been no empirical research on applying DSS for selecting the private university/college from a variety of universities/colleges according to the student's specific desires or needs. Modern technologies and electronic communications have become commonplace and indispensable (Raghunath, 2014). Similarly, Oliver (2002) referred, Information and Communication Technologies (ICT) have become commonplace entities in all aspects of life. Across the past twenty years the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavour within business and governance. According to Kostoglou, Ploskas and Vassilakopoulos (2014) Electronic decision support systems are helpful to implement in the educational sector.

In addition, the subject of using modern technologies in the decision support become an interesting topic for a large number of Information System (IS) researchers. But, almost all of the literature reviews concentrate on the DSS for business sector and depend on the company perspectives. While, this paper strives to design a free system that focuses on the individual's viewpoint to design and use a DSS to support their decision by using the content-base recommending system matching idea.

2.0 Problem statement

Vohra and Das (2011) stated that education is one of the most important issues all over the world. In the same vein, Kelzang *et al.* (2013) pointed out that, education is essential for human being, because it helps people to improve the quality of their lives, and also, the education leads to the development and enhancement of whole of society. Therefore, when selecting the right university/college, especially private ones, students who have completed their studies in high school and their parents, will take a long time before deciding or choosing one of them.

Many private universities/colleges have been established in Iraq recently, 21 of them are located in the capital Baghdad. Because of this huge number of the private university/colleges and because of the multi-disciplinary in these universities, it is a difficult task for an individual (student or parent) to select the best alternative from the existing solutions. Turban, Sharda, Delen and Efraim (2007) pointed out that, the modern communication technologies have capabilities that can facilitate human decision making in a number of ways, such as using the web and also can apply this technology anywhere and anytime . Moreover, decision support focused on provision of analytical tools for calculating optimal solution for the decision problems (Burstein & Carlsson, 2008). Thus, the main target of this paper is to build an intelligent system for selecting the best university/college for a student who is willing to enrol a private university/college depending on the requirements that he/she gives as input to the system. These requirements are built up on the user's desires and needs.

3.0 Content-based Recommender Systems

These systems analyze a set of documents and/or descriptions of items previously rated or liked by a user, and build a model or a profile of the user's interests based on the features of the objects rated and/or liked by that user (Mladenic, 1999) .

They typically apply two kinds of techniques. The first kind of techniques are extracted from machine learning, they are concerned with finding out the user's preferences. The other kind of techniques is concerned with information retrieval to select similar items to recommend for the user (Lang, 1995; Lieberman, 1997; Maes, 1994; Mooney and Roy, 2000).

Pazzani, Muramatsu, & Billsus (1996) characterized websites by words contained in individual pages and build user profiles using websites which the user considered "hot".

A user's profile is considered as a representation of the user interests, and it is used to recommend new interesting items for him/her. The recommendation process basically consists in matching up the attributes of the user profile against the attributes of a content object.

Once the profile has been built accurately; meaning that it reflects the user preferences, it is a great advantage to use it effectively in information accessing and processing. For instance, it could be used to filter searching results done by the user by deciding whether that user is interested in that specific martial/stuff/Web page or any other matter of interest or not.

Systems are usually built in the first place depending on some purpose to serves users in one way or another. Retrieving the most suitable and, in the negative case,

preventing it from being displayed to the user are applied by content-base recommending systems depends in a great deal on building a user's profile in the right way. This could be done with the help of answering direct questions by the user.

Most content-based recommender systems use relatively simple retrieval models, such as keyword matching or the Vector Space Model (VSM). VSM is a spatial representation of text documents. In that model, each document is represented by a vector in a n -dimensional space, where each dimension corresponds to a term from the overall vocabulary of a given document collection. Formally, every document is represented as a vector of term weights, where each weight indicates the degree of association between the document and the term (Baeza, 1999).

In This paper, the researcher adopted the idea of the content-base recommendation system to design a decision support system that serves the student to choose the right private university/college in Baghdad by a simple and understandable interface.

4.0 Decision support system

According to Good (2008), decision support systems are interactive tools which enable users to make informed decisions about unstructured problems. More precise, Holsapple (2008) said that, decision support systems (DSS) are technologies that help to get the right knowledge to the right decision makers at the right time in the right representations at the right costs. Decision support system typically contain a database of information about a problem, a model of how the studied problem functions, and a user interface. Figure 1 below shows the components of any decision support systems (Walsh, 1993).

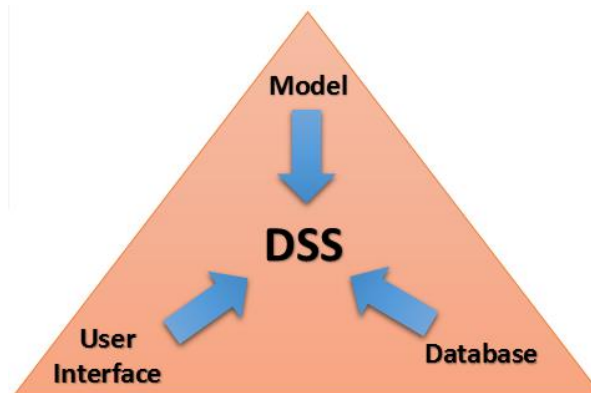


Figure 1: typical decision support system components

In addition, Zhu (2013) referred that, a decision support system (DSS) can be perceived as a combination of human intelligence with computer capabilities in order to solve complicated problems and improve decision making quality. In fact, decision support systems are concerned with the representation and processing of explicit knowledge.

5.0 Methodology

The proposed methodology is made of five main stages, namely, the awareness of the problem, suggestion, development, evaluation, and conclusion. Figure 2 below depict these key stages:

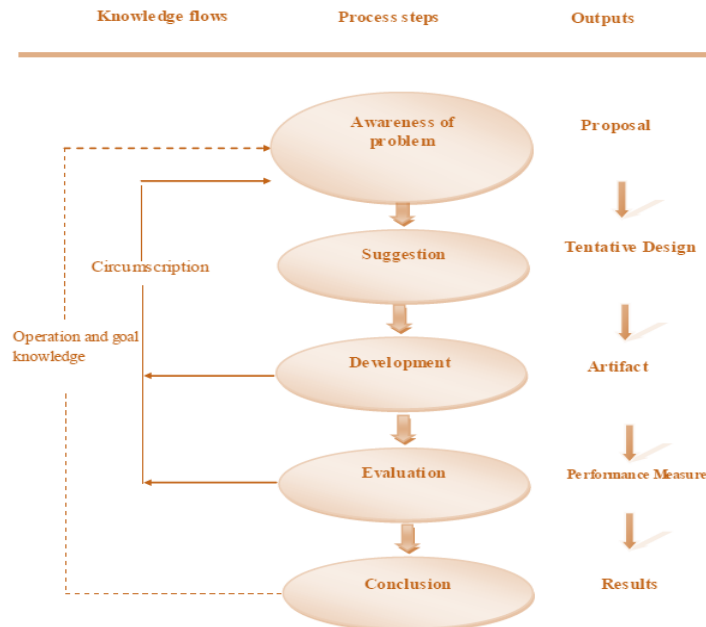


Figure 2: The methodology of the design science research

This study adopted the methodology phases from [Vaishnavi and Kuechler \(2015\)](#). In the first stage the researcher identified the problem statement based on the literature review and real world. Thereafter, analysis the requirement by using UML. Then, build the system through ASP.Net with C#.

6.0 Analysis and Design

A decision support system has been commonly used in the manufacturing industry, especially since it has been combined with the development of World Wide Web (WWW). While, this paper focus on the normal users (individuals), mainly students who are candidate to enrol in private universities/colleges and their parents, by helping them to choose the best option among a large number of choices. This section harness the UML diagrams to highlight the interaction between the users and system. Whereas, for design the system the researcher used the visual studio with SQL server and the platform, and also uses the ASP,NET and C# as a program language for building the interface.

6.1 Unified Modeling Language

The Unified Modeling Language (UML) is a general-purpose visual modelling language that is used to specify, visualize, and document the components of a software system (Shin & Ahn, 2000). UML consists of many diagrams, here is the use case diagram for IDSS..

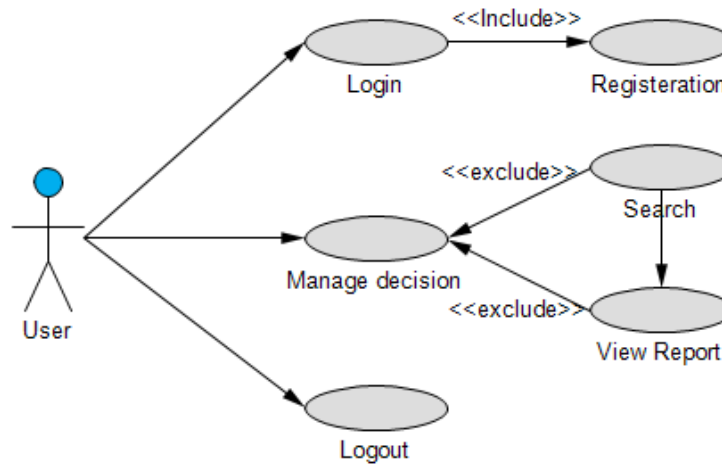


Figure 3: Use case for IDSS

The use case diagram is the best method to define the actions of the system by using figures to describe the cases that the users of the system has to deal with to do the activities of the system also the users here are defined as actors (Rababa & Mahmoud, 2012), this use case diagram is one of the analysis steps defined by the UML, Figure 3 above depicts the interactions among users and the features in this system.

6.2 Design Section

In early 1990s, the World Wide Web was introduced and served as a major booster of information system for individual use. In today's daily life, information systems has have become the essential part of any organisation's and individual's life. In this subsection, the researcher sought to design a system to determine the appropriate private university/college for the high school graduates who intend to pursue higher education.

In the login page as illustrated n Figure 4, users have two options. The first option is if they are already registered in the system they can just enter the username and password. Otherwise, the new user must register to the system so that he/she can use the features of the system.



Figure 4: Login page for IDSS

Afterward, users (students or parents) can select from a number of drop list options their choices based on their desires and needs depending on four features which the man criteria that a user depend on to select the right private university/college. Figure 5 shows the choices page for the user.

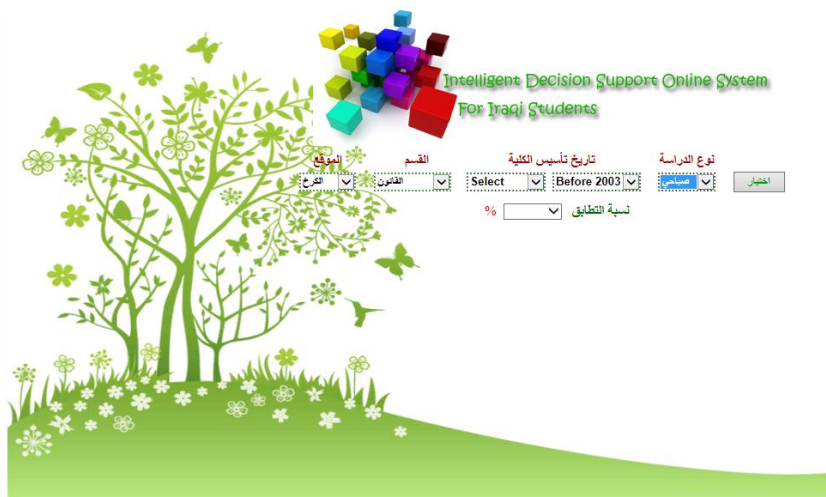


Figure 5: The choices page for the user

This system involves static dataset, which consists of four main features for students who are willing to enrol in any private university/college, they are:

1- The Department or the academic category that the student is interested in. This feature could be the most important aspect that a student's build his/her choice on. All

available departments and academic fields in private universities/colleges are listed here for the student to choose from.

2- The Location of this university/college. For Baghdad as it is our case study the available choices for the student are “Kharkh, Resafa, or doesn’t matter” as options.

3- The year of university/college establishment. Another important aspect for students as well as their families. This aspect measures the sobriety of the university/college. The private universities/colleges established in Iraq before 2003 are considered to be sober in many ways. Few private universities/colleges were established before 2003, while the rest of them were established after 2003.

4- A choice of morning study or evening study s another important aspect for the student. A student may choose “morning study, evening study, no matter” as options.



Figure 6: IDSS output table with 100% matching

The system will help the user to make a clear decision upon his/her own choices and display a table of chosen universities/colleges that matches his/her desires. There are three kinds of output for users. First kind of matching is the 100% matching. Figure 6 shows the output for a user if his/her choices matches the data 100%.

While, the second result is 75 % this is if 100% matching not available. The system will give the user a table of 75% matching for his/her choices with available data. Figure 7 shows a 75% match for user preferences with stored data in the system.



Figure 7: Main page for IDSS with 75% matching

Otherwise the system will not give any output to user and ask user to try again.

7.0 Conclusion and future work

Currently, the high school graduates who intend to pursue higher education face a difficult task when selecting the private university/college. The major problem that faces the students and the parents is to choose the best university/college that satisfies the student's desires and needs. Therefore, designing this system will help them to choose the appropriate university/college based on their desires and needs. The education sector is a good environment to apply modern communication technologies and the new Information Technology (IT) facilities because almost all the students nowadays use the Internet in one way or another. For future work, the researcher will try to make the system design includes all private universities/colleges in all governorates in Iraq instead of only those located in Baghdad, also more features could be added to the design and to the user interface as selections that help him/her to choose the right private college/university, so that improving the flexibility of the system.

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