

A Strategic Planning of Developing Student Information Management System Using SWOT Technique*

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Abstract— The strategic planning of developing any information system is the key factor of progress any organization. Hence, SWOT (Strength, weakness, opportunities and threats) analysis for the strategic planning of developing information system has proved to be a good analysis tool for further development and progress of the universities/organization. Further, the implementation of computerized student information management system has become an important issue within the university campus to exchange such information between students and staff. Many studies have developed student information system through the converting of paper-based system to computer-based system in order to facilitate the work of staff. However, none of these studies focused on the development of such systems based on the strategic planning using SWOT technique. Therefore, this research focuses on the requirements needed to develop student information system based on the aforementioned strategic planning technique. Some universities located in the Kurdistan Region, Iraq have been tacking to do the investigation. Moreover, SWOT technique was selected to find strengths, weaknesses, opportunities and threats of developing such system. The findings of this research were processed as matching strengths with opportunities and converting weaknesses or threats to strengths or opportunities. Based on the results, it has been found that the need to address student information systems is of utmost importance now more than ever in order to survive and continue in the competition environment.

Keywords- strategic planning, SWOT, system requirements, student information management system.

I. INTRODUCTION

The strategic planning of developing any information system is the key factor of progress any organization. Based on that, SWOT (Strength, weakness, opportunities and threats) analysis has proved to be a good analysis tool for further development and progress of the universities/organization [1]. Further, information system (IS) applications become an important part in many fields that provide daily operation of information. In most cases, these systems consist of independent units

working as a cooperative system. Each unit has the autonomy to process activities, but can also work either complementary to achieve the main goal or participate in the resources available for each unit [2].

Student information system literally means the general information systems for maintaining and providing student information. Many researchers have addressed subjects related to the design and implementation of such systems within university environment. Such information systems facilitate the work of staff and students. However, those systems still are unable to adapt to the student and environmental requirements due to the lack of integration and cooperation among student information system units. Hence, the process of developing any information system to meet organization's goals needs a strategic planning to analyze environmental requirements of this organization [1,3].

Many universities, including Kurdistan Region, Iraq, have relied heavily on paper records, while paper records are a traditional way of managing student data. Therefore, there are several drawbacks to this method. First, it takes a very long time to transfer the information to students. This happens by putting such information on the notice board, and students have to see this notice board to check their related information. Second, paper records are non-value added activities, and also difficult to retrieve, alter, and re-file the paper records [4].

Indeed, the development process of an information system requires extraction of environmental requirements and factors that can be affecting. Doing such a process needs a strategic planning by selecting a best technique of analysis regarding to system requirements needed. Therefore, this paper aims to use the SWOT analysis technique. Such technique uses to analyze an environment of this study to explore strengths, weaknesses, opportunities and threats, which lead to find all requirements needed to design the integrated student information system, through data collection methods.

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II. RELATED WORKS

A review of related works aim to evaluate the different methodologies adopted in the field of this research in order to identify the appropriate method for investigating the research objective. Then, it aims to determine the significance of the current study and to distinguish it from studies done previously.

In order to develop a student information system, many researchers have used different ways of developing such systems. According to Motta [5], the researcher focused on the design of a comprehensive Student Information System (SIS) and user interface for the Honors College at USF. The USF Honors College relied heavily on paper records for this initiative. While paper records are a traditional way of managing student data, there are several drawbacks to this method: paper records may be difficult to manage and track, the physical exertion required to retrieve, alter, and re-file paper records all non-value added activities and it is only possible for one user to alter physical records at a time.

Moreover, Hamid in 2010 [6], has implemented Radio Frequency Identification (RFID) Based Systematic Students Attendance Management System. The aforementioned research was focused on the complexity of manager tasks. Whereas, most of the universities still use the old method to take student attendance by giving attendance sheet to student and student only needs to sign that paper. By using such method, many students will cheat by asking their friends to help them to sign their attendance if they absent. With this method, RFID is an automatic identification method. The main objective is to automate the whole system of students' attendance registration using RFID.

Further, in 2011, Tudu [7] proposed Student Database Management System based on RFID. This researcher converts the manual student information management to a computerized system. Such system provides all types of information regarding students and faculties, and also of a student starting from the first day to the end of the course.

In 2013, Dacuycuy-Pacio [8] confirmed that the system used in Banquet University based on the traditional method relying on the paper and pencil. The aforementioned research focused on building applications for giving full control to manage the information super fast and great accuracy based on the traditional way of data analysis. However, the aforementioned study was to design and develop an online student information system within university without mentioning any types of cooperation among their units.

Beside the aforementioned proposed systems, in 2014, Paliwal [9] was designed a computerized approach for examination committee system. The main objective was to develop a computer-based examination committee system to improve their work in order to avoiding defects. However, such system focused only on examination process of students without integrating with other related units.

For that reason, developing an integrated information system based on the environmental requirements needs a strategic planning process of analysis to extract all requirements. This can be done using SWOT analysis technique. Such technique requires data collection. This helps the researchers to identify its strengths, weaknesses and opportunities, as well as a sound understanding of internal and external environment [1].

Based on the aforementioned literature, many researchers developed student information systems. Most of them focused on the converting a paper-based student information system to computerized system. Some of these researchers proposed an integrated student information management system including: student registrations, calculate student absences and examination committee operations. Furthermore, such systems need to fulfil all requirements through analysing their environment using strategic planning techniques. Therefore, the recent paper focuses on the extraction of all requirements of developing an integrated student information management system based on the best selected strategic planning analysis technique, such as SWOT.

III. THE SWOT ANALYSIS TECHNIQUE

A number of different techniques can be used to determine where adjustments need to be made. One essential technique involves a discussion of an organization's Strengths, Weaknesses, Opportunities and Threats, commonly called SWOT analysis. Such analysis has been used extensively in industries, but has not been widely used in service institutions, such as universities. SWOT analysis is a precursor to strategic planning and performed by a team of experts who can assess the organization from a critical perspective.

SWOT analysis is an examination of an organization's internal strengths and weaknesses, its opportunities for growth and improvement, and the threats of external environment presents to its survival, see Figure (1). This process of analysis includes many steps and has algorithm as a matrix to get right outcomes [9].

A. SWOT ANALYSIS STEPS

The primary aim of strategic planning is to bring an organization into balance with the external environment and to maintain that balance over time. Organizations accomplish this balance by evaluating new programs and services with the intent of maximizing organizational performance. SWOT analysis is a preliminary decision-making tool that sets the stage for this work [10]:

- **Step 1:** SWOT analysis involves the collection and evaluation of key data.
- **Step 2:** Organizational surveys are an effective means of gathering data in any organization, such as finances,

operations, and processes. Such data are collected and sorted into four categories: strengths, weaknesses, opportunities, and threats. Strengths and weaknesses generally stem from factors within the organization, whereas opportunities and threats usually arise from external factors.

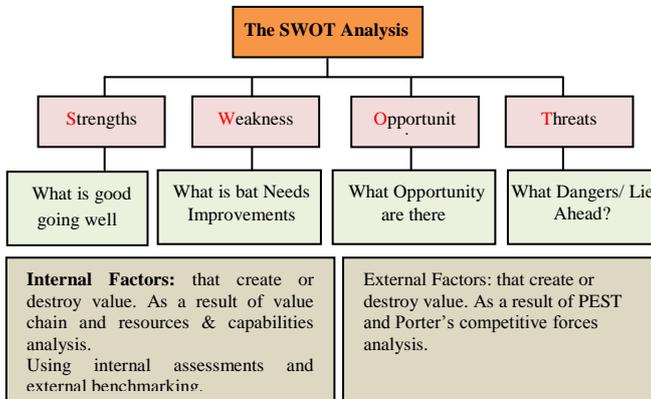


Figure 1: SWOT analysis variables

- **Step 3:** This step involves the development of a SWOT matrix for each business alternative under consideration. For example, assessment of student information system in a college needs two options: looking for designing a computerized one using the capabilities available or purchase another one which has been designed previously. The university expert panel would complete a separate SWOT matrix for each alternative.
- **Step 4:** Final step involves incorporating the SWOT analysis into the decision-making process to determine which business alternative best meets the organization's overall strategic plan.

More than this, by looking at yourself and your competitors using the SWOT framework, you can start to craft a strategy that helps you distinguish yourself from your competitors, so that you can compete successfully in your work, see Table (1) [10].

B. ALGORITHM OF SWOT MATRIX

The algorithm of SWOT matrix involves two methods, referred as Matching and Converting. By using these methods, an organization can utilize when applying the results of the SWOT analysis to strategy decision [11]. The process of each method explained in the following:

- Matching uses competitive advantage to pair strengths with opportunities in order to gain this competitive advantage.
- Converting means convert threats or weaknesses into strengths or opportunities.

Table 1 SWOT analysis diagram

	Helpful to Objective	Harmful to Objective
Internal Factors	<p>Strengths</p> <p>1- What does your organization do better than others?</p> <p>2- What are your unique selling points?</p> <p>3- What do competitors and customers in your market perceive as your strengths?</p> <p>4- What is your organizations competitive edge?</p>	<p>Weakness</p> <p>1- What do other organizations do better than you?</p> <p>2- What elements of your business add little or no value?</p> <p>3- What do competitors and customers in your market perceive as your weakness?</p>
External Factors	<p>Opportunities</p> <p>1- What political, economic, social-cultural, or technology (PEST) changes are taking place that could be favourable to you?</p> <p>2- Where are the currently gaps in the market or unfulfilled demand?</p> <p>3- What new innovation could your organization bring to the environment?</p>	<p>Threats</p> <p>1- What political, economic, social-cultural, or technology (PEST) changes are taking place that could be unfavourable to you?</p> <p>2- What restraints do to you face?</p> <p>3- What is your competition doing that could negatively impact you?</p>

The Attractiveness of SWOT is the matching of specific internal and external factors, which creates a strategic matrix. The internal factors are within the control of the organization, such as operations, finance, marketing, and other areas. The external factors are out of the organization's control, such as political and economic factors, technology, competition, and other areas. This strategic matrix has four strategies as shown in the following [12]:

1. **Max-Max (S/O):** this combination shows the organization's strengths and opportunities. In essence, an organization should strive to maximize its strengths to capitalize on new opportunities.
2. **Max-Min (S/T):** this combination shows the organization's strengths in consideration of threats from competitors. In essence, an organization should strive to use its strengths to stop or minimize threats.
3. **Min-Max (W/O):** this combination shows the organization's weaknesses in tandem with opportunities. It is an effort to overcome the organization's weaknesses by making the most from new opportunities.
4. **Min-Min (W/T):** this combination shows the organization's weaknesses by comparison with the current external threats. This is most definitely defensive strategy, to minimize an organization's internal weaknesses and avoid external threats.

IV. RESEARCH DESIGN

In order to achieve research objectives and answer its questions, this research was followed a methodology including qualitative method to collect data. Such method was used based on the SWOT analysis technique in order to extract internal and external environmental factors. This extraction can explain factors affecting and requiring

in the development of integrated student information management system.

Therefore, the current research was treated as a pilot study in the plan to conduct SWOT analysis in four universities as case studies. These universities were located in Duhok city, Kurdistan Region, Iraq. These universities were the University of Duhok and the University of Zakho as government, and the University of Nawroz and the American University Duhok Kurdistan as private. The rationale of selecting these universities relates with the concept of proper representation of the applied environment. Also, the reason of selecting these different universities was to cover all the required information through data collection techniques.

The researchers in the current study were used more than one style of the data collection techniques to obtain useful requirements of the research target. Such techniques were prepared based on the SWOT analysis. Therefore, this study was used questionnaire, interview and observation tools, as the data collection techniques, to get accurate information directly. Also, the researchers collected data from selected universities in the period (1/12/2014 - 1/4/2015). This process of data collection explained in the following steps:

- A questionnaire was prepared based on the SWOT factors and related to the design of an integrated system for managing student information and the possibility of applied the system successfully.
- The questionnaire was revised by a five of experts in the field of strategic planning, and the adjustments have been taken into account.
- The researchers conducted several sessions in January 2015 to July 2015 from selected universities of this study to explore strengths, weaknesses, opportunities and threats that related to campus information technology services.
- In addition, researchers met members of IT group individually with directors of student affairs. The meetings were intended to inform key decision-makers about the strategic planning process and encourage them to conduct a SWOT analysis with the concerned authorities as partnerships within the process.

V. SWOT RESULTS

Interview data collection method is the most used fact-finding technique. Therefore, preparing a good structured interview with an appropriate member of staff will enable the required facts to be gathered from staff's perspective directly. In reality, SWOT analysis is a preliminary step to the strategic planning process. Within the overall context, the findings from the current analysis are sorted into four categories: strengths, weaknesses, opportunities and threats, as shown in Table (2).

Table 2 SWOT Analysis Results

	Helpful	Harmful
INTERNAL	Strengths	Weakness
	Sources of power that distinguish University and justify its existence and to secure their survival.	Elements that pull of the total balance and the need to develop and improve performance
	<ol style="list-style-type: none"> 1. Willingness and urgent need for an electronic information system. 2. All the academic departments and relevant units need student information. 3. Availability of specialized skills. 4. High support from senior management. 	<ol style="list-style-type: none"> 1. Lack of electronic information systems. 2. Much effort and longtime spend to access the students information. 3. Shortage of strategic planning for designing activities at the campus level. 4. IT unit does not adopt strategic planning in defining its functions and responsibilities. 5. Weak coordination and cooperation between academic and student affairs. 6. There is no financial support to design computerized information systems. 7. Lack of effective communication between students and faculty members.
EXTERNAL	Opportunities	Threats or Risks
	The vacuum which can be blocked in order to continue to compete successfully	Elements that threaten the university development and its scientific abilities.
	<ol style="list-style-type: none"> 1. Improving the university status to keep pace with global development. 2. Adopting a strategic planning at the university level activities, especially the IT unit. 3. Giving IT Team participant role in the proposed system design. 4. Developing new ICT tools based effective contact between academic departments and other units within campus. 5. Developing new ICT technologies for more efficient communication between students and faculty members. 6. Cooperating and interacting with foreign universities 	<ol style="list-style-type: none"> 1. The communications revolution and the proliferation of information. 2. Lack in adopting long term planning within the universities under studies 3. The rapidly growing number of students might create a threat to the quality of services. 4. The current information system is inappropriate enough to keep pace with the sophisticated environment. 5. A growing demand for technology creates a threat. 6. Lack of financial support

Based on the findings of this research, see Table (2), the way of analysis was conducted using SWOT analysis tool. Such tool extracts the strength and weakness points. In addition, this tool can show the opportunities and threats factors. Then, SWOT analyses the aforementioned extractions using matching and converting matrix. More details about this analysis are shown in the following section.

VI. MATCHING AND CONVERTING STRATEGIES

The best utilizing of SWOT is matching and converting process. The matching process always occurs when the analysis discovers a competitive advantage by matching strengths to opportunities. While, the converting is a process of transforming weaknesses or threats into strengths or opportunities. But in return, if the threats or weaknesses cannot be converted, the university should try to minimize or avoid them. The following are the results of the process of matching and converting:

- **Matching:** the results of the analysis confirmed that the desire and the urgent need for the adoption of an electronic information system for students, as strength, achieve many competitive advantages for the university, as opportunity. This is without doubt; keep up with the progress in the world and leveraging on their expertise.
- **Convert:** Converting the poor performance of IT as a weakness, and also non-adoption of strategic planning to improve their performance through their participation in the design of the proposed system as an opportunity. Naturally requires that IT investments must provide measurable and transparent value to the universities to gain a higher level of credibility as a competitive advantage.
- **Convert:** design of the student information system and take advantage of the skills of master students are specialized skills that are available as strength for the college at the present time. In exchange the lack of financial support as threat faced management of the project in the universities to achieve a competitive advantage.

VII. CONCLUSIONS

During this study, a broad investigation into designing and implementing a student information system was carried out. In addition, some insights arose from this investigation; for instance, it is necessary to be conducted to support the management of the university in the follow-up of student progress. Further, the review of previous studies revealed that the requirements of developing an integrated student information management system vary from this study through using SWOT analysis technique

to extract all requirements needed. SWOT analysis technique, as the strategic planning, was used. The results of such technique confirmed that there is a desire and urgent need in all universities of this study for an electronic student information system. This leads improving in the work of colleges within the university campus regarding to students and staff requirements. Also, it has been found that there is a lack of strategic planning for the design of information system whether within campus or IT unit in the university. This has led to the inability of the IT members to performance of their duties as required. Furthermore, SWOT analysis confirmed that the most prominent threat to the university is the lack of an electronic information system enough to keep pace with the sophisticated environment, cooperation and interaction with foreign universities. Indeed, SWOT analysis indicated the more prominent opportunities for the university is to establish a well infrastructure regarding to ICT technologies. Next, the competitive advantage of any university needs to have an integrated student information management system. Further, developing such systems requires automated cooperation technique among system units in order to provide complete information related to students without any human efforts.

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