



# Towards an Innovative Educational Knowledge Model for Intelligent Academic Advising

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Paper ID: 12A11B

Volume 12 Issue 11

Received 06 May 2021

Received in revised form 07 August 2021

Accepted 14 August 2021

Available online 19 August 2021

## Keywords:

Digital transformation;  
Computer application;  
Academic Advising (AA);  
Educational Institutes;  
Saudi universities;  
Electronic Academic Advising System (EAAS);  
Artificial intelligence;  
Electronic advising system; Advising process.

## Abstract

Technology is one of the twenty-first century's most important issues, which affects our daily life and future. Since academic institutes have the power to lead the improvement changes. Sustainability values need to be incorporated in Higher Education Institutions' mission and practice including academic advising services. Academic Advising (AA) is an essential factor that affects the success of any educational institute and sustainability. It is a key to students' success, retention, and loyalty. Digital transformation of AA will help to achieve sustainability, reduce the advisors' workload, improve the advising quality, and enhance students' satisfaction. Much research proved that the low persistence and completion rates highly improved by better advising. The paper discusses the persistent need to develop an intelligent academic advisor system toward fulfilling the responsibility to the stakeholder and leads to enhanced sustainability of such educational institutes. This paper is a part of a research project, aims to improve the current academic advising systems (AAS) in Saudi universities to an intelligent advising system using artificial intelligence. This research study is introduced to investigate the current situation of AA in Saudi universities along with the availability and efficiency of electronic advising systems. We discussed the factors that affect the advising system improvement. We found that the electronic advising system faces many challenges and gaps to innovate new applications that support students' journeys.

**Disciplinary:** Academic Advising, Sustainable Development.

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## Cite This Article:

Assiri, A., Almalais, A., Brdese, H., and Baaqeel, H. (2021). Towards an Innovative Educational Knowledge Model for Intelligent Academic Advising. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 12(11), 12A11B, 1-13. <http://TUENGR.COM/V12A/12A11B.pdf> DOI: 10.14456/ITJEMAST.2021.212

## 1 Introduction

Sustainable Development is one of the most critical of higher education institutions' challenges of this century. Where Higher Education Institutions attempted to infuse sustainability

across curricula and operations as an integrated concept. They have the knowledge and the ability to lead and to induce the changes towards this new paradigm. Digital transformation of academic services is expected to facilitate and accelerate sustainability. To meet the sustainability in higher education, it is essential to enhance services providing to the students and students' life aspects, including Academic advising services [1]. Academic Advising (AA) is a crucial element of any high education institution's success and sustainability. It is indicated by the active relation and communication between the student and the educational institution's representative (mostly faculty members). This communication aims to increase student success, satisfaction, retention, and graduation rate. The advisor guides the students on academic, social, or personal contexts. Usually, academic advising includes many tasks such as selection of suitable courses and educational plans, teach students about educational rules, academic institution rules, shortest graduation path, and clarification of institution requirements [2]. Advisors and advisees are the two main parties in the process of advising. Thus, it is vital to assess their perspective and satisfaction level and institutions need to understand how they support and improve advisors [3].

Continued assessment, improvement of advisors, and the advising process are essential elements and help keep the success of the educational organizations. Also, it helps to identify weaknesses and the needs to address and solve [4]. So, it is essential to provide accurate, online advising services that facilitate students' support, even if they are away. With limited resources and demands on time, it is critical to designing an online advising service that is sustainable [5].

This paper aims to transfer traditional academic advising to intelligent advising using technology, by investigating the current situation of academic advising in Saudi Universities and to understand the weakness and strengths of current electronic academic advising systems (EAAS). The current situation of academic advising in Saudi Arabia was assessed, in terms of efficiency and awareness assessments. Furthermore, we identified the factors that may affect the advising systems' success. Finally, we measured the needs of the student and advisor to use a new advanced electronic advising system. The paper highlights and proves the need for an intelligent, efficient advising system to enhance the quality of students' life as an essential aspect toward the educational institutes' sustainability.

## 2 Literature Review

Academic advising refers to the active relationship between the educational representative and the educators to provide the required guides and support. This support helps to address educators' issues relating to the student's personal, academic, career, and future issues [6]. All the universities worldwide are working to improve academic advising to keep its success and raise student retention and satisfaction. Using technology such as cloud computing, big data analytics, and artificial intelligence will help to improve advising services [7].

Many studies suggested advanced methods to facilitate the advising process using technologies. All of that research supports the digital transformation of academic advising services in different levels; simply by representing the data in the computerized form up to intelligent

systems that support artificial intelligence techniques to provide advice without the need of human advisors meeting [8]. Many studies also investigated AA situations, challenges, and proposed technical solutions to improve them or implement digital transformation [9]. A study [10] was conducted to identify student usage of electronic advising systems, targeting students and advisors at West Florida University to understand student preferences and technologies utilization. This study results show that academic advising must be improved using technologies to meet target user expectations. Also, they indicated the need to improve advisors' skills to use technologies to get an effective and efficient advising system. Considering the main role of academic advising for academic organization success, many research and studies conducted to improve it and address its challenges. Several studies show that the identity of academic advising can be misunderstood and there are several gaps to be addressed [11]. The perspective of the advisor about the advising success and process also differs from the advisee view [12].

A study [13] majored in the needs and expectations of Hong Kong University. This study investigated the most frequent services that students need and the preferred form to find the services. Although, the research indicated the importance of conducting qualitative study to get a deep view of students' expectations, needs, and preferences of AA at all educational organizations. As well, little research was conducted to understand the advisor's perspective of the advising process. The study [14] assessed the faculty experience in academic advising and suggest a way to improve and support them. The study recommends the importance of improving the advisor to increase students' success in higher education. Another systematic review study was conducted to evaluate the current level of communication and the relation between advisors and undergraduate students [12]. It is suggested that adequate training, time management, and communication tools are needed to increase the efficiency of academic advising. also, the study indicated the need for further studies to investigate the effects of different factors on the advising process.

### 3 Methodology

The survey was available in an online format to collect the data from students and their advisors from October 2020 to January 2021. A questionnaire is an effective and preferred way to examine and understand problem dimensions and reach as most as possible of the targeted people students and advisors in Saudi universities [15]. We used qualitative and quantitative research methods for collecting and analyzing data. This included all university student levels (freshmen, seniors, postgraduate students) and teachers who worked in the advising field.

Two questionnaires were conducted, one for university students and the other for advisors. The last part is composed of questions about electronic advising systems characteristics that concluded from the literature, the survey contains 3 open-end questions for additional comments and to make suggestions to address the gap. Regarding the validity of the questionnaire, the draft of the questionnaire was developed based on the literature and assessed by five expert evaluators to ensure the clarity, comprehension, and relevance of the questionnaire. The evaluators made some suggestions for clarification. From the feedback in the pilot survey, the final version of the survey

questionnaire was generated. Then we administered the first round of surveys to 10 participants only to evaluate the questionnaire and ensure there was minimal opportunity for misunderstanding.

Then, we reach 761 participants from students and academic advisors. A Cronbach's alpha coefficient was calculated on the Likert scale items to determine the reliability of the survey. It achieved 0.899, which indicates that the questionnaire was consistent and demonstrated good structural validity. Statistically, we measured three latent variables reflecting awareness, efficiency assessment, and level of the impotence of the characteristic. Exploratory data analysis is implemented to summarize the data. Also, some statistical tests are applied to compare between groups.

## 4 Results and Discussion

Sampling is the process of selecting units from a population of interest so that by studying the sample research they may generalize results back to the population [16]. Saudi universities faculty members and students were the populations of interest for this study. According to the General Authority for Statistics, the Faculty members at Saudi universities are 85,409, and the total number of students at all universities is 1,982,722 [17].

The sample size of our study is 761 students and advisors from all Saudi Universities responded to the survey. Of these, 161 (21 %) were academic advisors and 597 (79%) were students (Figure 1). Participant students were from different studying levels, where 47% were undergraduate students, 29% were postgraduate students and 24% were in the preparatory year. More females (67%) than male participants (33 %) volunteered for the study, and all universities and departments in Saudi Arabia were represented. To assess the participant advisor knowledge level in the advising field, we asked them about their experience years, the result shows that more than half of participants (53 %) have 1- 4 experience years only.

### 4.1 Assessing the Current Situation

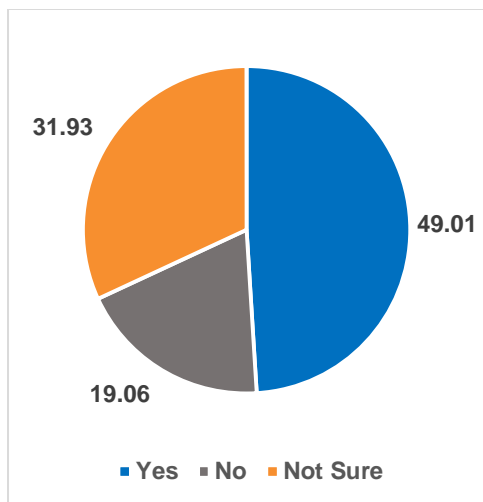
In this section, the current situation of academic advising in Saudi Arabia will be revealed in terms of efficiency assessments and awareness. This survey part aimed to explore the current systems availability, practical assessment, user awareness, and knowledge as factors that may affect the intelligent academic advising system. Parts 3 and 4 of the survey are designed to understand users' needs and difficulties.

#### 4.1.1 Electronic Systems Availability, Knowledge, and Background

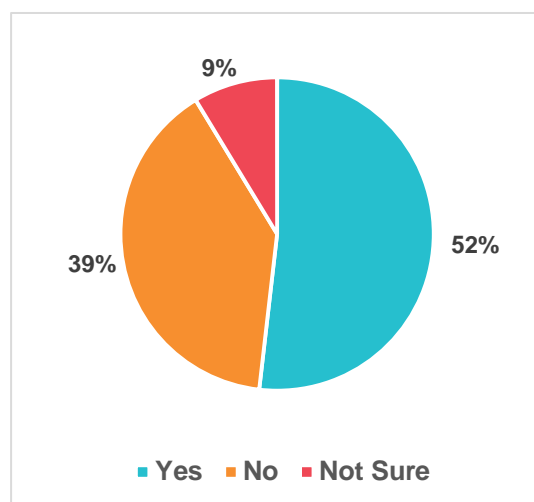
In these two sections of the questionnaire, we aimed to explore the EAAS in Saudi universities for both students and advisors with their awareness about it.

First, we asked them if there is an electronic advising system in their university, the responses indicated that 38% of students and 7% of advisors were not sure if it is there or not, 15% of advisors and 20% of students reply no there is no electronic system available. This indicates that more than half of the participants (51%) did not use EAAS before (Figure 1). Then we asked the

students if they know their academic advisor, nearly half of the students know their academic advisors (52%) while the other 48% do not know or were not sure (Figure 2).

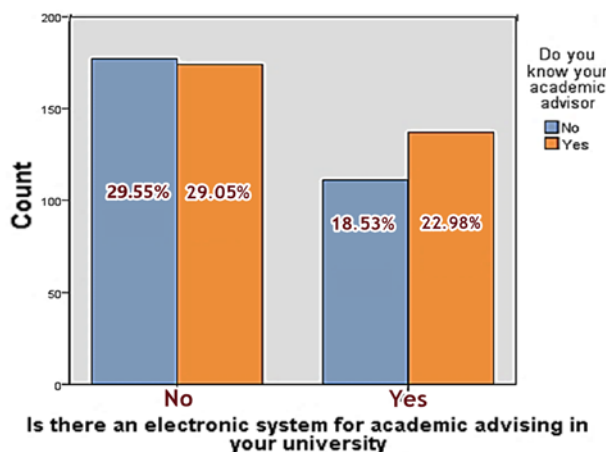


**Figure 1:** Is there EAAS in your university.



**Figure 2:** Do you know your academic advisor?

When we compared the results of two previous questions, we find that about 30% of the participants do not know about AAS and do not know their academic advisor. which means that one-third of the participant does not get advising services at all (Figure 3).



**Figure 3:** Comparing the results of the questions about EAS availability and knowing academic advisor.

Also, we asked students if they know about the services provided by Academic Advising Unit. Most of the students, (79%) don't know what are the services that the academic advising units should provide. We asked advisors if they know all about their advising tasks, 59% of participants said yes, they know. Also, we asked students about the usual way they use to discuss their academic issues, very few respondents stated that they use electronic advising system (5%), 28% used electronic resources (the university's website, the official social media account), other 66% discussing directly with advisor or classmate (Table 1).

**Table 1:** Students' ways for discussing academic issues.

Communicate with the academic advisor or the representative of the college	32%
I discuss with my colleagues and rely on their advice	32%
Return to the university's website or the official social media account	28%
Use the electronic academic advising system of the university	5%
Other	3%

While when we asked them about how they are looking to use to find academic services, 60% of the students said that they prefer the electronic system to find educational services.

Also, we asked students and advisors, if they have electronic advising system, how often they use it, 61% of students did not use it or not have, while 27% of advisor did not use it or do not have. Advisors responded to the question about the currently used ways to communicate with students, and the results show that very few participants (12%) use EAAS, 29% use email, 40% use message (SMS and WhatsApp), and 14% use phone or mobile call.

#### 4.1.2 Efficiency Assessment and Awareness analysis

In this part, we studied the efficiency assessment and the awareness of EAAS from the target user to assess the current situation in the universities in KSA. Two scales are measured, which are efficiency assessment and awareness about EAAS. After checking the assumptions of the Two-independent samples T-test which are satisfied, we used it to compare between two groups. These results are shown in Table 2.

**Table 2: Inferential statistical tests to compare two groups.**

Factors	Efficiency Assessment		Awareness	
	t-value(df)	P-value	t-value(df)	P-value
Students and Advisors	-4.385(225.28)	0.00*	-14.038(759)	0.00*
Male and Female	0.613(759)	0.540	0.568(759)	0.570

\* The mean difference is significant at the 0.05 level.

From the statistical tests in Table 2, we found the following results also:

- *There is a significant difference in the means between students and advisors in both efficiency assessment and awareness scales. In other words, advisors are higher efficient in assessment and awareness than students.*
- *There are no significant differences in the means between males and females in both efficiency assessment and awareness scales. Meaning, males and females are equivalent in terms of efficacy assessment and awareness in Saudi universities.*

In Inferential Statistics, to compare between means for more than two groups, Analysis of Variance (ANOVA) is used. The assumptions of ANOVA are satisfied only in the Educational level and Experience of advisors' factors. As a result, we used the F test. However, the assumptions of ANOVA are not satisfied in the Universities factor, thus we used the Kruskal Wells test with Chi-Square as a test value, see Table 3.

**Table 3: Inferential statistical tests to compare more than two groups.**

Factors	Efficiency Assessment			Awareness Assessment		
	F-value(df1,df2)	Chi-square(df)	P-value	F-value(df1,df2)	Chi-square(df)	P-value
Universities	-----	22.269(9)	0.008*	-----	44.72(9)	1.04e-06*
Educational levels	7.951(2,596)	-----	0.00*	2.407(2,596)	-----	0.091
Advisors Experience	4.988(2,159)	-----	0.008*	1.596(2,159)	-----	0.209

We concluded

- *There is a significant difference in the efficiency assessment of EAAS between universities, students' educational levels, and advisors' experience.*
- *In terms of awareness, there is a significant difference of the awareness between universities, however, the educational level of students and the experience of advisors do not affect in awareness of EAAS.*

Additionally, correlation analysis is investigated and found there is a significant moderate positive correlation ( $r=0.342$ ,  $P\text{-value}= 0.00$ ) between the two scales, efficiency assessment and awareness.

## **4.2 Measuring the Needs and the Current Difficulties**

To understand the services that students usually need from advisors, we asked students to vote for the most regular services they require. Approximately two-thirds (66%) of students indicated the need for information about the college/department/specialization/ courses, while evaluation of academic performance level takes the lowest percent (19%). On the other side, we asked advisors about the services that they preferred to use electronic system with, respondents most frequently selected communication with students and inform them about events and rules (61%), course and classes selection and academic planning 57%, student performance follow-up take 53%, clarification of institution requirements take 39%, advice about major, career and life goals take 38%, educational resources advice take 37%.

To recognize the difficulties students encountered we asked them a multiple-choice question about, 27% of the respondent indicated they had faced a communication difficulty while 34% indicated a lack of advice awareness, 17 % indicated a lack of time. The other 22% faced difficulties related to many students with each advisor. The advisors belong to another college, which leads to a misunderstanding of students' needs. They don't have an academic advisor and do not know about academic advising and its role.

We asked a specific question about communication for both students and advisors to assess the current level of effective communication. We asked students if they ever faced difficulty in communicating with the academic advisors or in using the services of the Academic Advising Unit, 75% of total respondent students faced a communication difficulty or did not communicate with advisors before at all. While more than 80% of Advisors think there are no communication difficulties with students. This great different result indicates a great gap between students' points of view and advisors. To assess the level of students, view to the current system if they think the current system provides enough services without the need of human academic advisor in most cases and how confident students are with the information provided by the advising unit, we asked students if they trust the current system and if they the current systems provide enough services without the need of human advisor. Slightly less than one-half (48%, 46%) do not trust the current system.

### 4.3 Electronic Academic Systems Preferred Characteristics

We asked about the preferred characteristics of advising electronic Systems that users wish to see in advising. We concluded twenty intelligent characteristics proposed in the literature [18] [8] about electronic advising systems. Most respondents indicated the very importance of the second characteristic: providing information related to academic specialization for both advisors (77%) and students (80%). This reflects and supports the results of questionnaire section two. Most students need information about the college/department/specialization/courses that took the highest percentage as the most required service (Figure 4). While characteristic of offering inspiring success stories for students took the highest "not important" percentage for both advisors (13%) and students (17%). All other characteristics tend to be very important for both advisors and students. Generally, to evaluate the intelligent characteristics of the proposed system, a scale of the level of importance of the intelligent characteristics were measured. As a result, we found the majority (95.4%) of responses of the target users are very important and important, which indicates the success of the system, as shown in Figure 4.

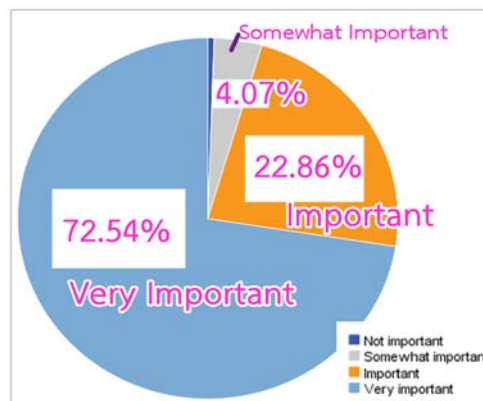


Figure 4: Assessment of Preferred EAAS characteristics

Also, we have asked three open-end questions to provide most difficulties that participants faced with the academic advising unit make suggestions to improve the electronic advising system and any additional comments or needs. Participants indicated to set of difficulties and suggestions we summarized it as the following:

#### 1 Lack of Current Systems

Most advisors and students cited that they suffer from paper-based works even with availabilities of electronic advising systems, which indicated a lack of effect of available electronic systems mainly designed to serve to add and drop the course or withdrawing only. Related to this point, they suggested providing an alert for advisors about students' performance and students' lectures attendance regularly to solve any problems early. Many advisors indicated the importance of notifies advisors automatically about students' level after mid-exams and final exams in a report generated automatically to advisors' accounts or emails. Some other suggestions minimizing students' numbers with advisors and providing a tool to view all students under advisory regarding their courses, GPA, missing courses from previous semesters, prerequisite issues for the coming



semester, the overhead of courses, etc. Also, they indicated the need for career advising to be an active part of the academic advising system.

## **2- Communication Difficulties**

Some others talked about communication difficulties and cited the current system does not facilitate communication. Students indicated the need for an electronic system to serve their needs and answer their queries without referring to human advisors frequently. They think it is easier, available, and they feel free with it. The students said that it is more convenient to look the answer up online than to take the time and appointments to ask. They also recommend providing chatbots and FAQs to answer students' queries. Some advisors said they need to take students' mobile numbers from the deanship of Student Affairs to contact students while others said they usually post announcements paper on the walls to call students and most of the students are late or not responding at all. Additional comments concerning the need to connect the appointment system with email notifications or SMS, adding direct chatting to facilitate communication, and the FAQ section to minimize some effort and appointments.

## **3- Lack of Knowledge**

Advisors indicated the lack of students' knowledge about academic roles, calendars, events, and regulations as one advisor said, "students are not responding, and they are not taking help from academic advisors, they do not know about the importance of advising in university". Others tell that they need to understand more about the advising system. Some advisors suffered from many advisee students and the gap that occurs when they belong to another department. A considerable set of advisors said that they suffer from changing students each semester which increases the effort of following students' performance and academic plan. Several respondents indicated the necessity to increase student awareness about academic advising. Several respondents pointed to the need to increase advisors' knowledge. Many students preferred academic advisors from their department to be more knowledgeable about curricula and needs.

## **4- Technical Problems in General**

A considerable set of respondents indicated the technical problems in general such as the system down or failures, the limited privilege of advisors where the system doesn't show all the academic details or some of the important records, and lack of student data updates at the advising systems, the electronic system doesn't provide all needed resources. Several respondents expressed concern about the lack of the availability of technology in their universities and awareness about technology's role in the advising field. They recommend using mobile applications to facilitate and help to bridge the gaps between the students and their advisors.

## **5- Lack of Training on Technology**

Several respondents cited the lack of time and time conflict for advisors and students which decrease the number of meeting with students and the quality of meetings or services that should be provided. Also, participants indicated the lack of training for technology in advising and the need for responsive technical support. Most respondents indicated the importance of increased awareness about electronic academic advising, continues communication, and the need to improve

the current electronic advising system. They suggested providing online materials such as videos to facilitate its use and solve the lack of electronic systems. Several students reported that the electronic advising system is a good idea even if it is simple. At least it will empower students' knowledge and help for pre-planning, using information available online.

#### **4.4 Factors Affecting the Advising System Sustainability**

The results of this study show us a set of findings:

- **Preferred Technology-Based Services**

Our sample's advisors and students tended to agree that electronic advising systems are more efficient than meeting with an advisor, which often required a long waiting time or a trip to campus. While students

Even though more than half of students in our study preferred electronic advising, they did not use electronic advising systems before, but they prefer to use electronic resources, 60% of the student said that they prefer the electronic system to find academic services.

- **The current electronic systems are poor:**

The currently available systems do not support a minimum level of intelligent system characteristics. It is mostly designed to support the process of add and drop courses and registration processes. Some systems used the appointments feature, but it doesn't implement well and in an ineffective way.

- **Lack of Awareness and Knowledge About Academic Advising and the Electronic Systems**

There is a lack of knowledge from both advisors and students who participated in the study. Most of the students (79%) don't know what are the services that the academic advising units should provide.

- **Academic Advisor Misunderstanding Student's Needs**

Unfortunately, a gap existed between students' points of view and advisors. This result is expected, and it supports other early research conducted in the field [19]. The multichoice questions and the open-end question show a great gap between advisors' point views and students. Most advisors try to do their best while students' satisfaction level is low. From the advisors' point of view, the satisfaction level is greater than the students' point of view where only 18% of advisors think the current system is not efficient while 46% of students said no it is not efficient. From this, we can conclude that the students' and advisors' expectations of the advising process differ.

- **Lack of Communication, Information Accurate and Time**

The most mentioned points are related to the lack of communication, information accurate, and time. While students need more communication, follow-up, and information from advisors, advisors suffer from a lack of time and poor accuracy of information where they do not have up-to-date information. Results indicated that advisors need to communicate more frequently with the students. In fact, lack of contact with an academic advisor is critical for students, advisors, and educational institutes.

### - **Essential Technical Support and Routine Training**

The survey results showed concerns about technical support, system failure, and training on electronic systems. It is essential for any new system implementation is to involve a training plan and effective technical support.

These findings imply that advanced electronic systems, in general, are required, appropriate, and would be welcomed by advisors and students to address these issues but only if it is well implemented and used.

According to the questionnaire, we can conclude main factors that may affect any intelligent academic advising system in academic institutes:

#### **1- Technology Availabilities and Support in Universities**

The universities need to provide and support using technology in the advising field. Including provides access to resources, technical support, and continuous improvements. The process that relies on traditional interactions between learners and counselors, can be led to problems such as poor utilization of resources.

#### **2- Target Users (admin, advisors, and students) Interaction, Awareness, and Knowledge**

One of the most important factors is the interaction of the target user and awareness about academic advising itself and the electronic system used to serve it. It is important to provide regular training sessions, online materials, and workshops for existing and new students and advisors to provide knowledge about what is the process and how it works. Low awareness about the academic advising services and the role of technology in, well negative effect the expected result of using intelligent advising system.

#### **3- The Efficient of Electronic Advising System**

The advising system needs to be designed well to serve users' expectations, needs, and preferences. This includes the quality level of all the systems' aspects to provide more efficient and effective advising services to the target user.

Several limitations should be noted in this data gathering and analysis. First, participants' answers to the questions were based on their experiences with academic advising services but did not provide any details about the reasons for these attitudes. Second, we used a convenience sample that was not fully representative of the population, but as the sample was large, a significant sampling error seems improbable. Third, some of the students' and advisors' opinions may reflect their conceptual understanding of academic advising rather than their experience with the practice. Finally, our study does not test or consider the relationship between technology-based advising and the academic performance of students.

## **5 Conclusion**

In this paper, we introduced a questionnaire part of a research project that aims to improve current academic advising systems in Saudi universities to an intelligent advising system that supports sustainability. The literature concerned to search the current situation of EAAS in Saudi Universities and factors that affect academic advising. So here we aimed to fill these gaps in the literature and get insight into academic advising in Saudi Universities to aid the further

development of an advanced advising system that will support the advising process. We targeted students and academic advisors from different levels. We tried to understand their awareness and knowledge level, and we administered a questionnaire to determine their needs and expectations of electronic academic advising systems characteristics. The results show that both students and advisors looking to improve current advising systems. We found that the advisors' awareness and efficiency assessment are higher than students' significantly. However, males and females' students are equivalent in terms of awareness and efficiency assessment. Regarding the efficiency assessment of EAAS, we conclude there is a significant difference in the assessment between universities, educational levels of students, and the experience of advisors. Furthermore, the awareness of EAAS between universities different significantly, whereas the awareness of EAAS between the educational level of students and the experience of advisors is equivalent. Moreover, we come up with a set of factors that affect the success of advising electronic systems. Also, we found most of the characteristics that are suggested for the advanced electronic advising system are preferred. Thus, we recommend conducting a focus group to elucidate the students' and advisors' views, needs, and preferences. These results can be used to design an intelligent framework for academic advising that serves educational institutes' sustainability.

## 6 Availability of Data and Material

Data can be made available by contacting the corresponding authors.

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