



Article

Decision-Making Strategy for Digital Transformation: A Two-Year Analytical Study and Follow-Up Concerning Innovative Improvements in University e-Services

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Abstract: Universities worldwide strive to provide the best student services possible, particularly those that support student achievements and career goals. Therefore, academic advising continues to be a significant part of the student experience, one which universities need to fully understand in terms of its objectives, application processes, and required skill. As a result of significant technological improvements since the turn of the millennium, including expanding internet applications and digital transformations, universities have established computer information systems that support academic advising and course registration services. This study examined the effects of modifications to the electronic academic advising and course registration systems at King Abdulaziz University in 2018, and then again in 2020, following a university-wide system failure in 2018 resulting from a demand overload. In 2018, a preliminary statistical analysis and student feedback survey were conducted by the authors to measure student satisfaction with the online portal On-Demand University Services (ODUS Plus). In addition to recommendations suggested by the 2018 analysis such as balancing the load distribution of the university's network, organizational (i.e., non-technical) solutions, rules, and regulations were adjusted such as progressive course registration that prioritized those expected to graduate first. The survey and analysis were repeated by the authors in 2020 to assess improvements in student satisfaction. As a result of the changes, the investigation revealed improved student satisfaction with the performance of ODUS Plus and network access. Overall, students were significantly more satisfied in 2020 than in 2018. This research shows that some technical challenges can be resolved using re-engineered processes and organizational solutions.

Keywords: digital transformation; information systems; data analysis; decision-making strategy; electronic academic advising; electronic registration



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1. Introduction

The primary objective of this paper is to investigate how changes made to the electronic educational systems of higher education institutions may affect institutional decision-making strategies. In addition, this study contributes to the ongoing academic and practical discussions concerning the efficacy of digital transformation of higher education institutions based on the latest artificial intelligence developments.

While this study evaluated some changes made to the electronic education system used by King Abdulaziz University, a leading public university in Saudi Arabia, this study is an attempt to stay abreast of recent developments to improve the educational process, especially in terms of digital transformation, which may be central both to enhancing the process and in decision-making.

The university stage is considered the essential link in the educational chain due to its contributions to developing the student's critical thinking skills as well as their resilience

when faced with the challenges of working life. From this perspective, it is critical to provide students with the skills, capabilities, and relevant work experience to assist them as they take their first steps into their career.

The significant increase in students and the expansion of specialties, especially the scientific disciplines, as well as the diversity of student backgrounds have led to increasing innovations in methods and processes concerning academic advising in universities around the world, including King Abdulaziz University. The virtual space has become a critical part of the direction communication between universities and students that allows academic advising to commence regardless of time or location.

King Abdulaziz University has integrated academic advising services and electronic systems that were designed with the latest programming languages, databases, and software for its website applications. Furthermore, providing innovative, interactive advising services to university students provides a gateway to the university's digital educational offerings through their online portal [1–9].

After studying best practices at universities in developed countries, we found that students benefit from a university's efficient implementation of distance education systems, as well as a shift in purpose concerning academic advising. Rather than the traditional concept of academic advising as an educational guide, academic advising can expand its role to effectively, and virtually, support students by providing both guidance and an interactive, supportive community. For clarity, this is not the same process as e-advising, which relies on electronic data, advising instructions and protocols, and a study plan to facilitate the traditional academic process between advisors and students. This novel, interactive academic advising promotes communication between the student and the advisor, the student and other students, and the advisor and other advisors.

The academic advising process at King Abdulaziz University is an integrated approach that enables all associated parties (e.g., students, advisors, faculty members, and university management) to interact and communicate electronically. It promotes the integration of both male and female campuses in the academic environment, so they can reach the highest levels of academic achievement. Therefore, developing students' skills academically, intellectually, and socially is required for attaining the university's education goals. The electronic academic advising system at King Abdulaziz University has numerous key features that connect students and academic advisors for various educational purposes, the most essential of which are shown in Figure 1.

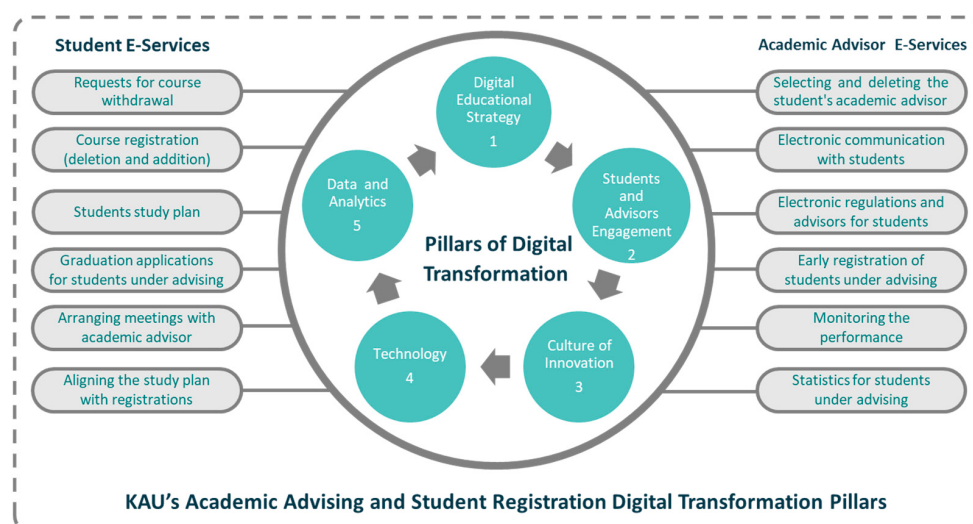


Figure 1. KAU's e-services that connect students and academic advisors investigated in this research.

Taking King Abdulaziz University as a case study, we investigated how changes to the online processes involved in academic advising and course registration impact student satisfaction and their decision-making process.

This research offers insights on practical outcomes when considering similar changes for leaders in higher education institutions (HEIs). It also provides technical solutions for typical problems that can be easily resolved with re-engineered processes and organizing solutions and may be used in the future as a reference for the development and implementation of online course registration and virtual academic advising processes.

2. Literature Review

Universities worldwide rely heavily on online services for registration and academic advising as well as for other services. This shift has expanded and has become a predominant feature of respected universities worldwide, even before the COVID-19 pandemic. As a term, “advising” or “academic advising” or, sometimes, “student advising”, can have variations in their meanings, as each definition has its particular nuance or focus. For example, Crookston [10] tackled advising from a student development approach and, therefore, viewed academic advising as “a teaching function based on a negotiated agreement between the student and the teacher in which varying degrees of learning by both parties to the transaction are the product.” Abernathy and Engelland [11] viewed advising as serving to “provide the primary guidance and direction a student needs to navigate through the college course selection and registration process successfully.” Therefore, we inferred that e-advising could be considered a technology-supported version of academic advising.

While universities must address student dissatisfaction with advising and registration processes regardless of the efforts made by advisors to accommodate student needs, Laghari [12] suggested that from a student’s perspective the registration process involved choosing which courses they should take. However, from the administration’s perspective, it involved keeping records up to date to create class lists and organize other academic activities. Therefore, a robust system for advising and registration is required.

Accordingly, automated advising systems have been developed to successfully assist students in course selection during online registration. Since academic advising has been shown to improve academic performance, Brdese et al. [6] suggested that universities could engage students’ passion for social media to deliver advising services and develop an integrated framework that offered academic advising via social networks. Meanwhile, within the same context, Afify and Nasr [13] proposed a web-based program for academic advising to enhance the overall advising experience that focused on the methodologies used to develop the system, as they considered advising as more of a process than a product. The study’s premise was that the online advising and registration system should detect student problems and, consequently, provide them with solutions. The proposed program, which was built using the Ruby programming language and PostgreSQL’s open-source database system, stressed the significance of the academic advising system as a web-based application and recommended further developments for advising programs using more complex systems.

Pasquini and Steele [14] asserted that artificial intelligence (AI) could support academic advising and other student services with a focus on the impact of AI interactions on all involved parties. To make well-informed decisions and offer students more comprehensive support, technology should underpin advising and registration programs. The study also stressed that stakeholders’ input regarding these issues must be prioritized before the implementation of any new or improved student support technologies, as the stakeholders directly engage with students and have increased awareness concerning how AI could enhance students’ experience in academic advising and registration processes. This view was also shared by Henderson and Goodridge [15]. They maintained that the process of academic advising in higher education has many inefficiencies, including high student loads, redundant issue handling, and long waiting periods, among other issues. Henderson and Goodridge proposed an intelligent web-based application to provide e-advising

services. The study suggested that using AI to facilitate academic advising without any human involvement improved the efficiency and transparency of the advising process in higher education. It was recommended that students who had problems beyond the scope of the online system could communicate with human academic advisors using online methods such as e-mail.

Furthermore, Estevez et al. [16] pointed out that course registration systems often posed usability problems for users. Therefore, the researchers proposed an enhanced model for course registration that improved usability and increased user satisfaction. The study concluded that designing the right solution for a university's needs reduced the time involved in registration and improved student satisfaction. While maintaining that academic advising has a crucial role in resolving academic issues for students as well as in boosting their satisfaction and loyalty, Assiri et al. [2] examined other technologies that have been used in academic advising. They recommended creating robust AI-based e-advising systems while stressing the need to address the challenges and drawbacks in e-advising systems, including how to deal individually with students with special issues, the problems associated with information overload, the need for a holistic approach that encompasses advising goals (i.e., competencies, goals and interests), and system speed and response times, among others. The study also found that the e-advising systems must be integrated with universities' student records databases.

Academic advising is concerned mainly with registration issues. Students contact their academic advisors when they face complex registration problems, usually for reasons such as early graduation, changing majors, transferring course credits, and studying abroad. Since the mid-1990s, universities have, for the most part, computerized their registration systems. The link between academic advising and registration encourages research on assessing the validity, reliability, and usability of higher education electronic advising and registration systems. In a study conducted in Saudi Arabia, specifically on King Abdulaziz University system, Noaman et al. [8] maintained that universities with a large number of students suffered a massive burden in terms of academic advising provisions for students and found that the e-academic advising approach adopted by King Abdulaziz University improved the advising process. The researchers suggested further developments of such e-services. Furthermore, Eckroth and Anderson [17] proposed an academic advising system named "Tarot", which employed planning engines that considered unexpected scenarios for course registration.

Tchouakeu et al. [18] argued that one of the key academic objectives should be making the registration process "more convenient and easier to achieve". Their study considered the "e-Lion" system (now "LionPATH"), used in Pennsylvania State University, illustrating how the system succeeded in increasing efficiency and satisfaction. Meanwhile, Liu et al. [19] proposed a model system for university student registration as an information management system that functions as a registration tool and offers statistics and analysis for all inputs. The researchers recommended upgrading and expanding the proposed system to boost the e-registration process further. Likewise, Almazmomi and Alhassan [20] maintained that usability assessments reflected user satisfaction. Their study investigated optical character recognition (OCRS) and subsequently proposed a model to measure OCRS usability, taking King Abdulaziz University's e-platform (ODUS plus) as a case study. Their study concluded that the student satisfaction level was second only to the importance of the system design.

Abalorio and Cerna [21] proposed the course evaluation generator (CEG) model to address registration and advising problems using (OCR). This allowed the system to read directly from the student's academic transcript. The study proved the feasibility of crediting courses from the scanned image, providing that the right policy and text imaging tools were used. Furthermore, the researchers proposed the integration of more sophisticated AI and machine learning in e-registration systems.

Iatrellis et al. [22] investigated e-advising systems by examining the literature on experimental case studies conducted from 2008 to 2017. After reviewing and analyzing scores of studies, the researchers concluded that there were three predominant focuses in

the empirical research on academic advising systems, namely pedagogy-oriented issues, learning analytics, and educational data mining, while observing that the three issues were not completely autonomous as there was frequent overlap. The study recommended that universities needed effective academic advising software to augment the relationship between students and their advisors, noting that the existing software cannot and should not replace human advisors. The researchers also suggested more interdisciplinary research into learning science, psychology, pedagogy, and computer science in terms of e-advising systems.

Kalamkarian et al. [23] discussed the ongoing efforts to leverage e-advising technologies to redesign the e-advising and registration systems in three HEIs in the United States. The study recommended that other HEIs redesign their e-advising tools so they can be customized for technology-mediated advising to further support their students.

Pelletier and Hutt [24] maintained that although advisors had more technological solutions, they still needed to advance the use of technology and develop new mindsets and skills for a successful transformation. The researchers recommended introducing more training for advisors; nevertheless, operations at the institutional level were also highlighted. The researchers underlined that shareholders needed to go beyond comprehending the features of new technologies and that they must understand how the new technologies operate so that they can apply them strategically. Donaldson et al. [25] examined academic advisors' perspectives on enhanced advising programs, wherein they found that for an improved advising experience, students needed to participate and engage in constructing a proactive educational plan.

After reviewing the literature, and based on the experiences of several universities regarding e-advising services, there is an opportunity to improve higher education e-advising and e-registration systems using advanced technology.

To attain this objective, this study developed two questionnaires that would be issued two years apart to measure the development of electronic registration and academic advising services in a university. The two questionnaires were delivered in 2018 and 2020 to the affiliates of King Abdulaziz University, a leading university in Saudi Arabia. The questionnaires aimed to compare the satisfaction levels of students regarding course registrations and academic advising.

3. Research Objectives

This study examined the effects of changes made to King Abdulaziz University's electronic educational system, specifically to their electronic academic advising and electronic course registration processes. Prior to 2018, the students used their accounts to add and drop courses with online support provided by their academic advisors, which meant that approximately 107,000 students and approximately 3000 academic advisors logged into the system simultaneously. The university network and data servers were unable to handle the load, which caused a system failure. A cascade of complications followed, where students enrolled for courses they did not yet need and others were unable to meet their required course load, among other consequential issues. Therefore, in 2018, a preliminary survey and a statistical analysis were conducted to measure student satisfaction with portal services.

A follow-up survey was conducted in 2020 to examine whether student satisfaction had improved over the previous two years. Based on the survey recommendations, improvements were implemented in work methods. The most important of which was the distribution of the demand across the networked electronic systems. The number of permissible credit hours and other adjustments were used to determine when electronic registration could commence and balance the network load.

This study, therefore, used statistical analysis to examine the data collected from the questionnaire. As a result of the digital solutions implemented by the university, this study analyzed the improvements in course registration as well as in academic advising processes in 2020, as compared with 2018.

Therefore, statistical hypotheses about the extent to which digital transformation had improved registration and academic advising were derived to address this research goal. Six statistical hypotheses were formed, as follows:

Hypothesis 1 (H1). *Improved digital solutions have reduced the pressure on the ODUS Plus electronic system and made network access easier.*

Hypothesis 2 (H2). *Student satisfaction increased as a result of improvements to the electronic systems that permitted course registration for last-year students first.*

Hypothesis 3 (H3). *Improved digital solutions have increased student satisfaction in course registration, allowing the male campus students to register at alternate times other than those reserved for the female campus.*

Hypothesis 4 (H4). *Modifications to the electronic procedures have increased student satisfaction with the university's role in academic advising and course registration.*

Hypothesis 5 (H5). *Student satisfaction with the role of the DAR in academic advising and course registration has increased as a result of the improved digital solutions.*

Hypothesis 6 (H6). *Modifications to the electronic procedures have increased student satisfaction with the role of their academic advisor.*

Initially, descriptive analysis was utilized to calculate the repetitions and ratios of study variables, as discussed in the analysis section, and determine student trends regarding these variables. In addition, some evidentiary approaches were used to determine the improvements in student satisfaction apart from the variances in student satisfaction in 2020 based on various factors such as campus, campus location, and college, among others.

4. Materials and Methods

To confirm the feasibility of using student and academic advisor data to analyze a university's performance in advising services and provide an additional tool for decision-makers, the authors decided to employ a case study framework to understand university digital transformation. One of the biggest Saudi Arabian universities was selected, particularly the university's Deanship of Admission and Registration information system. The system has more than 170,000 users. The system is dynamic, responding to thousands of requests by students, advisors, and admins every hour. Its efficiency ensures that the activities involved in academic advising (AA) have a broader impact through online services.

Data on the activities of the Deanship of Admissions and Registration (DAR) system were obtained through a distributed online survey to students on two occasions, in 2018 and 2020. The authors designed one survey format, which was used for each survey period. A sample of 1100 students was surveyed in 2018 and 2020, and some responses were eliminated while other specific questions were skipped. Only three university campus locations were used, and some were excluded due to a lack of response.

The questionnaire included issues related to electronic registration and academic advising services provided by the university. The first section eliminated typical students such as external or graduate students, as it was designed for undergraduate students. The following survey section requested the student's demographic information including age group, campus, and others. This introductory section was followed by a series of questions related to online services, such as the satisfaction level on performance, availability, and reliability of e-services. They responded using a typical 5-point Likert scale, and there were other scales used based on the question aims.

The survey was submitted to the DAR Twitter account, which had more than 340,000 followers, and it was also sent to student email accounts. The questionnaire was available for ten days. All records were transferred to an Excel spreadsheet and kept securely on

the university servers. The data were used only for research purposes. The following tests were applied in the inference analysis [26–30]:

1. Calculating the ratio between two independent proportions to see if the percentage of difficulties students faced in 2020 was lower than in 2018.
2. A two-sample t-test was used to assess how student perceptions of study variables improved from 2018 to 2020.
3. The one-way analysis of variance (ANOVA) test was used to analyze the differences between student feedback on study variables in 2020 according to a range of factors, such as campus, campus location, college, and others.
4. The correlation link matrix between study variables was calculated to determine the relationship between these variables.
5. It should be noted that a level of significance of 0.05 was adopted in all tests.

Therefore, this research involving structured data was considered quantitative research. An SPSS package was used to analyze the obtained data. The hypotheses mentioned in the analysis section were addressed in an effort to contribute to the existing literature.

5. Data Analysis

5.1. Validity & Reliability Tests

After a questionnaire is produced, it is critical to assess its validity, and Al-Bannaa [28] has suggested that validity should measure a trait or phenomena. Subjective validity was used to verify the validity of the questionnaire, which was calculated by finding the square root of consistency (Cronbach's alpha).

The reliability of a questionnaire indicates that it will produce similar results when used under similar conditions. There are numerous approaches to ensure reliability, and Cronbach's alpha was employed in the current study to ensure the consistency of the questionnaire. The validity for the study years was 79% in 2018 and 77% in 2020 while the reliability results for the same years were 89% and 88%, respectively. These resulted indicated that the tool's validity and reliability across two years were high; therefore, the tool was deemed both valid and reliable [29].

5.2. Students' Characteristics

This section calculates the descriptive statistics for the study variables such as the ratios and the repetitions for the years 2018 and 2020 to determine the categories in which the majority of student responses were clustered and estimate student satisfaction rates across study variables. Table 1 shows the distribution of student responses at different levels between 2018 and 2020 survey periods. We noted that second-year students were 24.82% more responsive in 2018 while third-year students were 28.73% more responsive in 2020.

Table 1. Distribution of student numbers by student year level between 2018 and 2020 survey periods.

Student Year Level	2018		2020	
	Iteration	Ratio	Iteration	Ratio
I am a first-year college student.	272	24.73%	117	10.64%
I am a second-year college student.	273	24.82%	240	21.82%
I am a third-year college student.	180	16.36%	316	28.73%
I am a fourth-year college student or beyond.	208	18.91%	300	27.27%
I am expected to graduate by the end of the current or summer semester.	167	15.18%	127	11.55%
Total	1100	100.00%	1100	100.00%

Table 2 shows the distribution of student numbers by campus between 2018 and 2020 survey periods. During the two periods, we noted that the responses of the female campus students increased significantly, as compared with the male campus.

Table 2. Distribution of student numbers by campus between 2018 and 2020 survey periods.

Campus	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Male students	261	23.73%	359	32.64%
Female students	839	76.27%	714	67.36%
Total	1100	100.00%	1100	100.00%

Table 3 shows the distribution of student numbers by campus location between 2018 and 2020 survey periods. All student responses came from three campus locations, mainly in Sulaymaniyah, Rabigh, and Al-Marjan. During the two periods, we note that more than 90% of the responses came from the main campus location in Sulaymaniyah.

Table 3. Distribution of student numbers by campus location between 2018 and 2020 survey periods.

Campus Location	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Main Branch in Sulaymaniyah	1032	93.82%	999	90.82%
Al-Marjan	6	0.55%	9	0.82%
Rabigh	62	5.64%	92	8.36%
Total	1100	100.00%	1100	100.00%

Table 4 shows the distribution of student numbers by college between 2018 and 2020 survey periods. Colleges with fewer than 30 responses were integrated into another category. In 2018, the Faculty of Arts and Humanities had the highest response rate at 23.91% while the highest response rate in 2020 came from the Faculty of Science at 29%.

Table 4. Distribution of student numbers by the college between 2018 and 2020 survey periods.

College	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Faculty of Arts and Humanities	263	23.91%	224	20.36%
Faculty of Science	56	5.09%	319	29.00%
Faculty of Economics and Management	142	12.91%	80	7.27%
Faculty of Computers and Information Technology	79	7.18%	76	6.91%
Faculty of Engineering	96	8.73%	94	8.55%
Law School	261	23.73%	73	6.64%
Other	203	18.45%	234	21.27%
Total	1100	100.00%	1100	100.00%

Table 5 and Figure 2 display the distribution of student numbers based on the number of academic hours completed between 2018 and 2020, which were classified into five categories. Figure 1 shows how this information was represented graphically. In 2018, the responses from students with 61–90 academic hours were 37.55% greater than those from other groups in 2020.

Table 5. Distribution of student numbers by approved academic hours in 2018 and 2020.

Approved Academic Hours	2018		2020	
	Iteration	Ratio	Iteration	Ratio
30 h or less	57	5.18%	32	2.91%
Between 31 and 60.	296	26.91%	283	25.73%
Between 61 and 90.	413	37.55%	390	35.45%
Between 91 and 120.	222	20.18%	322	29.27%
More than 120 h	112	10.18%	73	6.64%
Total	1100	100.00%	1100	100.00%

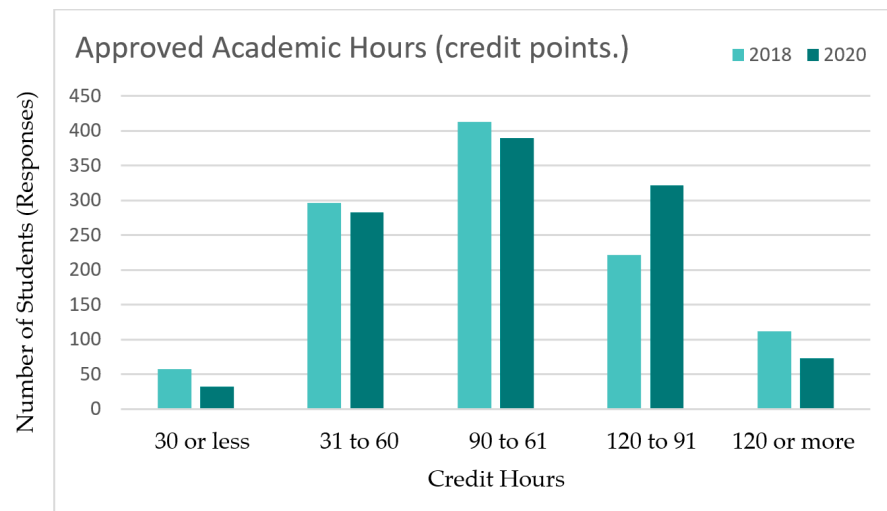
**Figure 2.** Distribution of student numbers by approved academic hours between 2018 and 2020 survey periods.

Table 6 shows the distribution of student numbers according to the student's grade point average (GPA) between the years 2018 and 2020. Their GPA was divided into five main categories, from less than 2 to 4.5 and above. It should be noted that no category with fewer than two responses was found. These data were graphically represented, as shown in Figure 3. The 3.75–4.49 category had the highest response rate at 43.45% and 41.91% in 2018 and 2020, respectively.

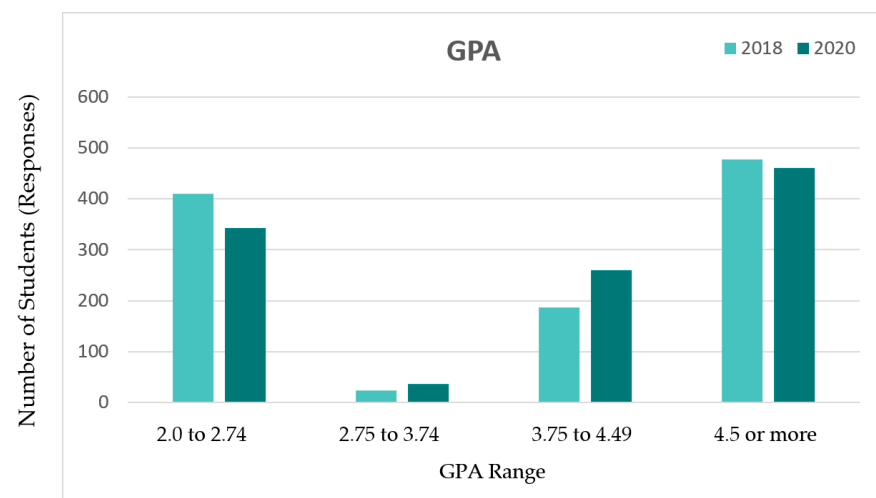
**Figure 3.** Distribution of student numbers by academic GPA during 2018 and 2020.

Table 6. Distribution of student numbers by academic GPA in 2018 and 2020.

GPA	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Between 2.0 and 2.74.	24	2.18%	36	3.27%
Between 2.75 and 3.74.	187	17.00%	260	23.64%
Between 3.75 and 4.49.	478	43.45%	461	41.91%
4.5 and more	411	37.36%	343	31.18%
Total	1100	100.00%	1100	100.00%

5.3. The Most Important Problems Students Face While Registering Courses

Table 7 displays the distribution of student numbers based on the problems they reported encountering during course registration in 2018 and 2020. The most prevalent problem faced by students in 2018 was the system failure of ODUS Plus and the subsequent difficulty accessing the network, which 58.73% of students reported. However, this percentage decreased to 19.18% in 2020. However, despite the decreased ratio in 2020, the list of responses was mostly negative, which indicated a significant improvement in those services after two years. This suggested that by 2020 the procedures to make course registration easier had yielded this decreased ratio.

Table 7. Distribution of student numbers by problems they encountered during the registration of courses in 2018 and 2020.

Most Problems Students Faced during Course Registration	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Pressure on the ODUS Plus electronic system and difficulty accessing the network	646	58.73%	211	19.18%
Lack of cooperation in educational affairs at the college	28	2.55%	52	4.73%
Lack of cooperation of the scientific department	12	1.09%	7	0.64%
Lack of cooperation of the academic advisor	46	4.18%	63	5.73%
Lack of cooperation of the DAR	4	0.36%	6	0.55%
Lack of sections	330	30.00%	684	62.18%
No problems	34	3.09%	77	7.00%
Total	1100	100.00%	1100	100.00%

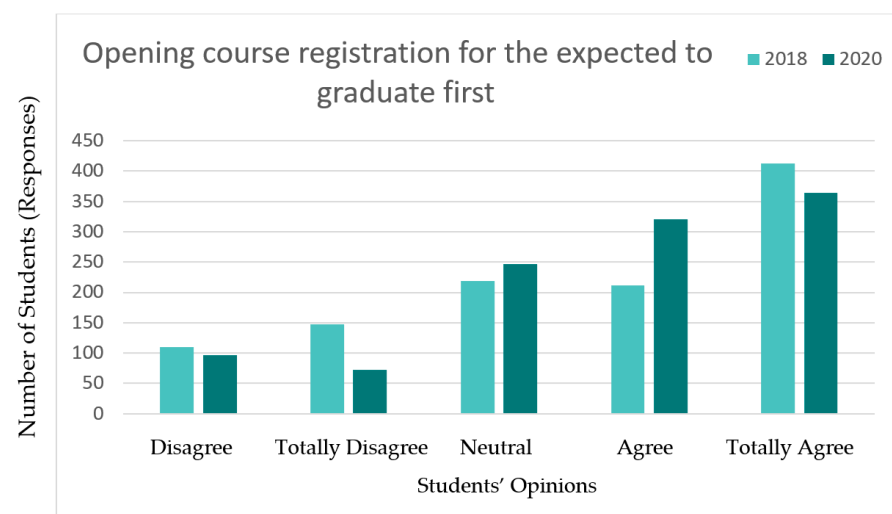
The following discussion includes our analysis of the non-technical improvements the university had made, which were included in the student survey.

5.4. Opening Course Registration for Those Expected to Graduate First

Table 8 depicts the distribution of student numbers based on their feedback regarding the progressive registration procedure that the university implemented between 2018 and 2020, wherein the last-year students (i.e., those expected to graduate within the next two semesters) accessed course registration first; once they had completed their registrations, third-year students could access the registration system, and so on. The registration process in 2020 was more streamlined than it had been in 2018. We found that the approval rating in 2018 was 56.73% (strongly approve and approve). In 2020, student approval rose to 62.18%. These data are graphically depicted in Figure 4.

Table 8. Distribution of student numbers according to their feedback on the progressive course registration process during 2018 and 2020 survey periods.

Opening Course Registration for Those Expected to Graduate First	2018		2020	
	Iteration	Ratio	Iteration	Ratio
I disagree.	110	10.00%	97	8.82%
I strongly disagree.	147	13.36%	72	6.55%
Neutral	219	19.91%	247	22.45%
Agree	212	19.27%	320	29.09%
I strongly agree.	412	37.45%	364	33.09%
Total	1100	100.00%	1100	100.00%

**Figure 4.** Distribution of student numbers according to their feedback on the progressive course registration process during 2018 and 2020 survey periods.

5.5. Opening Course Registration for Male Campus Students on Days Other Than Those Reserved for the Female Campus

Table 9 shows the distribution of student numbers based on their feedback on allowing course registration for the male campus on days other than those reserved for the female campus. We noted that the approval rate during 2018 (strongly approve and approve) was 58%, and the approval rate among students increased in 2020 to 80%. This change led to a streamlined registration process in 2020, as compared with 2018, with approval ratings increasing by 22% between 2018 and 2020. These data are graphically represented in Figure 5.

Table 9. Distribution of student numbers according to their feedback on allowing course registration for the male campus on days other than those for the female campus in 2018 and 2020.

Permitting Course Registration for the Male Campus on Days Other Than Those for the Female Campus	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Disagree.	60	5.45%	38	3.45%
Strongly disagree.	334	30.36%	15	1.36%
Neutral	68	6.18%	167	15.18%
Agree	169	15.36%	367	33.36%
Strongly agree	469	42.64%	513	46.64%
Total	1100	100.00%	1100	100.00%

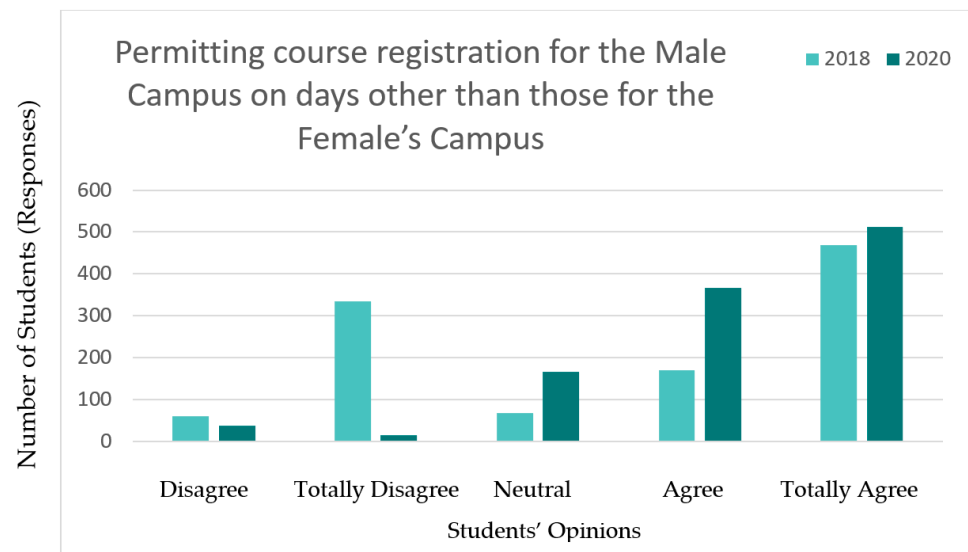


Figure 5. Distribution of student numbers according to their feedback on permitting course registration for the male campus on days other than those reserved for the female campus in 2018 and 2020.

5.6. Role of the University in Academic Advising and Course Registration

Table 10 displays the distribution of student numbers based on their views on the university's role in academic advising and course registration between 2018 and 2020. We noted that the approval percentage in 2018 was 33.9% (strongly agree and agree), whereas it was 51% in 2020. In 2020, students were more satisfied with the university's academic advising and course registration than they were in 2018.

Table 10. Distribution of student numbers according to their feedback on the university's role in academic advising and course registration in 2018 and 2020.

Role of the University in Academic Advising and Course Registration	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Unsatisfactory	246	22.36%	141	12.82%
Totally unsatisfactory	211	19.18%	123	11.18%
Neutral	270	24.55%	275	25.00%
Satisfactory	258	23.45%	375	34.09%
Very satisfactory	115	10.45%	186	16.91%
Total	1100	100.00%	1100	100.00%

5.7. Role of the Deanship of Admission and Registration in Academic Advising and Course Registration

Table 11 depicts the distribution of student numbers based on their feedback on the DAR's role in academic advising and course registration between 2018 and 2020. We noted that in 2018, the approval percentage (strongly agree and agree) was 17.55%, whereas, in 2020, it was 65.64%. Therefore, we estimated that in 2020, student satisfaction with the DAR's role in academic advising, and course registration was much higher than in 2018.

Table 11. Distribution of student numbers according to their feedback on the role of the DAR in academic advising role and course registration in 2018 and 2020.

Role of the DAR in Academic Advising and Course Registration	2018		2020	
	Iteration	Ratio	Iteration	Ratio
Unsatisfactory	564	51.27%	88	8.00%
Totally unsatisfactory	92	8.36%	46	4.18%
Neutral	251	22.82%	244	22.18%
Satisfactory	150	13.64%	615	55.91%
Very satisfactory	43	3.91%	107	9.73%
Total	1100	100.00%	1100	100.00%

5.8. Academic Advisor

Table 12 shows five statements that were used to assess student satisfaction with their academic advisor as well as their responses to various expressions and the overall focal point/axis level for 2018 while Table 13 shows the outcomes for 2020. As shown in Table 12, the majority of the axis expressions and the focal point/axes, in general, were neutral in 2018. Students were satisfied with all expressions, as well as the overall focal point/axes, according to the 2020 findings, as shown in Figure 6.

Table 12. Student trends concerning their academic advisors in 2018.

Expression	Unsatisfactory	Neutral	Satisfactory	Weighted Average	Direction
1. The academic advisor responds to your requests in a timely manner.	21.45%	30.18%	48.36%	2.27	Neutral
2. The academic advisor allots ample time to meet you.	21.91%	33.27%	44.82%	2.23	Neutral
3. The academic advisor is well-versed in your field of study.	16.91%	23.45%	59.64%	2.43	Satisfactory
4. The academic advisor is cooperating with you.	17.36%	26.00%	56.64%	2.39	Satisfactory
5. The academic advisor deals professionally with you.	21.64%	31.27%	47.09%	2.25	Neutral
6. Academic advisor role	19.85%	28.83%	51.31%	2.31	Neutral

Table 13. Student trends about the Academic Advisor in 2020.

Expression	Unsatisfactory	Neutral	Satisfactory	Weighted Average	Direction
1. The academic advisor responds to your requests in a timely manner.	15.27%	25.27%	59.45%	2.44	Satisfactory
2. The academic advisor allots ample time to meet you.	15.82%	26.64%	57.55%	2.42	Satisfactory
3. Your academic advisor is well-versed in your field of study.	10.64%	23.45%	65.91%	2.55	Satisfactory
4. The academic advisor is cooperating with you.	11.73%	20.73%	67.55%	2.56	Satisfactory
5. The academic advisor deals professionally with you.	12.82%	24.36%	62.82%	2.50	Satisfactory
6. Academic advisor role	13.26%	24.09%	62.66%	2.494	Satisfactory

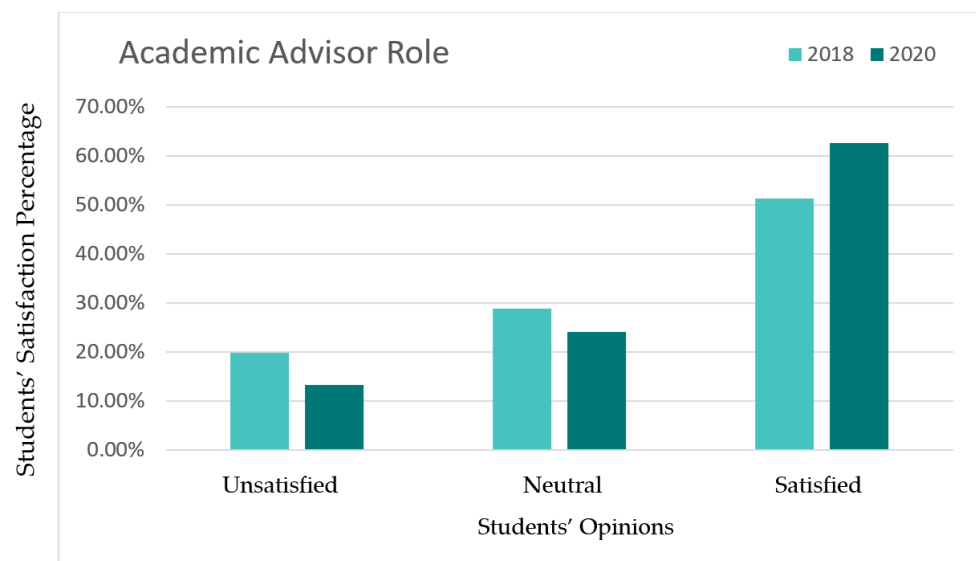


Figure 6. Student trends for academic advisors in 2018 and 2020.

6. Data Analysis: Inference Statistics

This section details the testing of our statistical hypotheses concerning the extent to which digital transformation has improved registration and academic advising and the statistically significant differences between student feedback on registration status and academic advising by campus, college, academic year, campus location, number of approved academic hours, and GPA. It also aims at looking into certain links between variables.

Hypothesis 1. Changes in digital transformation methods have reduced the pressure on the ODUS Plus electronic system and made network access easier.

This hypothesis sought to find out whether changes in digital transformation methods have lessened the strain on the ODUS Plus electronic system as well as the challenges of connecting to the network in 2020 versus 2018. Table 14 displays the results of the independent proportions test in 2018 and 2020, which showed that accessing the network was more difficult in 2018 as a result of digital transformation. However, the modifications relieved the burden on the ODUS Plus electronic system in 2020, which was also reflected in the results.

Table 14. Test Results of the difference between two ratios.

Statement	2018	2020	z	Sig
Ratio	0.1918	0.5873	19.02	0.000

Hypothesis 2. Student satisfaction increased as a result of improvements to the electronic systems that permitted course registration for last-year students first.

This hypothesis sought to find out whether improvements to the electronic systems increased student satisfaction by permitting course registration for students who were projected to graduate first. Table 15 displays the independent samples test results for 2018 and 2020, showing that, due to improvements to the electronic systems, students were more satisfied with a progressive course registration procedure in 2020 than the previous procedure used in 2018.

Hypothesis 3. Improved digital solutions have increased student satisfaction in course registration, allowing the male campus students to register at alternate times other than those reserved for the female campus.

Table 15. *t*-Test results for the difference between two averages.

Variable	Statement	2018	2020	<i>t</i>	Sig
Students' satisfaction has improved as a result of changes in digital transformation procedures that allow courses to be enrolled for those expected to graduate first.	Average	3.57	3.73	2.851	0.0022
	Standard deviation	1.19	1.14		
Students' satisfaction has improved as a result of changes in digital transformation procedures that allow course registration for the male campus on days other than the female's campus.	Average	3.34	4.20	14.536	0.000
	Standard deviation	1.74	0.92		
Changes in digital transformation procedures have improved students' satisfaction with the university's role in academic advising and course registration.	Average	2.53	3.59	26.295	0.000
	Standard deviation	0.96	0.92		
Student satisfaction with the role of the DAR in academic advising and course registration has improved as a result of changes to the digital transformation procedures.	Average	2.53	3.59	26.295	0.000
	Standard deviation	0.96	0.92		
Academic advisor role	Average	2.315	2.494	6.701	0.000
	Standard deviation	0.652	0.603		

This hypothesis sought to find out whether improvements to digital transformation procedures enhanced student satisfaction in 2020 by permitting course registration for the male campus on days other than those reserved for female students in 2020, as compared with 2018. Table 15 shows the results of the independent samples t-test in 2018 and 2020, which indicated that as a result of changes, students were more satisfied with allowing course registration for the male campus on days other than those reserved for female students in 2020, as compared with 2018.

Hypothesis 4. Modifications to the electronic procedures have increased student satisfaction with the university's role in academic advising and course registration.

The purpose of this hypothesis was to see if changes to the electronic procedures enhanced student satisfaction with the university's participation in academic advising and course registration in 2020, as compared with 2018. Table 15 shows the results of the independent samples test in 2018 and 2020, which showed that students had a higher level of satisfaction with the university's role in academic advising and course registration in 2020 than they did in 2018.

Hypothesis 5. Student satisfaction with the role of the DAR in academic advising and course registration has increased as a result of the improved digital solutions.

Table 15 shows the results of the independent samples test in 2018 and 2020, which indicated that students were more satisfied with the role of the DAR in academic advising and course registration in 2020 as compared to 2018.

Hypothesis 6. Modifications to the electronic procedures have increased student satisfaction with the role of their academic advisor.

The purpose of this hypothesis was to see if changes to the electronic procedures increased student satisfaction with the role of their academic advisor in 2020, as compared with 2018.

Table 15 illustrates the results of the independent samples test in 2018 and 2020, indicating that, as a result of improvements, students were more satisfied with the role of their academic advisor in 2020, as compared to 2018.

Next, we examined if there were variations in student satisfaction in 2020 based on a set of parameters. We deduced from prior findings that digital transformation improvements increased student satisfaction with the five study factors (as listed in the following section) connected to course registration and academic advising in 2020, as compared with 2018. The parameters for this analysis were as follows: (1) campus, (2) student year level, (3) campus location, (4) college, (5) approved academic hours, and (6) GPA.

7. To Establish Which Categories Were More and Less Satisfied for Future Planning Purposes

1. Examine the value implications of variations in satisfaction levels with the study variables by campus:

The purpose of this analysis was to see if there were any value differences between students from male and female campuses and their levels of satisfaction with the following five study variables:

First: Progressive course registration starting with last-year students.

Second: Opening course registration for male campus students on days other than those reserved for the female campus.

Third: Role of the affiliated college in academic advising and course registration.

Fourth: Role of the DAR in academic advising and course registration.

Fifth: Academic advisor role

Table 16 shows descriptive data, whereas Table 17 shows the t-test findings (independent samples). Student value feedback differed on the availability of course registration for those expected to graduate first and the availability of course registration for male campus students on days other than those of the female campus students, where male campus students had a higher satisfaction score than female students.

Table 16. Descriptive statistics of study variables by campus.

Variable	Campus	Number	Average	Standard Deviation
Progressive course registration for those expected to graduate first	Male	359	4.0111	1.06487
	Female	741	3.5992	1.23133
Allowing course registration for the male campus students on days other than those of the female campus	Male	359	4.3231	0.91925
	Female	741	4.1471	0.90864
Role of the college in academic advising and course registration	Male	359	3.3092	1.26698
	Female	741	3.336	1.19646
Role of the DAR in academic advising and course registration	Male	359	3.5961	0.96363
	Female	741	3.587	0.90018
Academic advisor role	Male	359	2.4602	0.6007
	Female	741	2.5104	0.60454

Table 17. *t*-Test results for study variables by campus.

Variable	<i>t</i>	Sig
Progressive course registration for those expected to graduate first.	5.710137	0.000
Offering course registration for male campus students on days other than those reserved for the female campus.	3.001067	0.003
Role of the College in academic advising and course registration.	−0.342152	0.732
Role of the DAR in academic advising and course registration.	0.152848	0.897
Academic Advisor	−1.294629	0.196

- Examine the implications of disparities in satisfaction levels with the study variables by student year level:

The purpose was to determine the extent to which, as a result of digital transformation, there were value variations in the degree of satisfaction by student year level from the five study variables for 2020.

Table 18 shows no value disparities in the perspectives of students with different variations on the role of the DAR, enrollment in academic advising, course registration, and the academic advisor. The results of the ANOVA test confirmed that there were value differences between the feedback of students of different grades regarding the progressive course registration for those expected to graduate first, allowing course registration for male campus students on days other than those reserved for the female campus, and the role of the affiliated college in academic advising and course registration.

The least significant difference (LSD) test was used to determine which variables were responsible for these differences. It was discovered that the expected-to-graduate and fourth-year students were responsible for the value discrepancies in progressive course registration, as they were more satisfied than the other students. As for the availability of course registration for the male campus on days other than those for the female campus, the reason for the value differences was that the expected graduate students were less satisfied than the different student year levels.

In addition, those expecting to graduate were less satisfied with the rest of the courses, resulting in value inequalities in student feedback regarding the affiliated college's role in academic advising and course registration.

Table 18. Descriptive statistics of study variables by student year level.

Variable	Student Year Level	Number	Average	Standard Deviation
Allowing courses to be registered for those expected to graduate first	I am a first-year college student.	117	3.2308	1.23445
	I am a second-year college student.	240	3.4083	1.15708
	I am a third-year college student.	316	3.5158	1.20175
	I am a fourth-year college student or beyond.	300	4.15	1.04137
	I am expected to graduate by the end of the current or summer semester.	127	4.3701	0.9743
Allowing course registration for the male campus on days other than those for the female campus	I am a first-year college student.	117	4.0769	1.0184
	I am a second-year college student.	240	4.1375	0.88328
	I am a third-year college student.	316	4.1329	0.94014
	I am a fourth-year college student or beyond.	300	4.2833	0.87499
	I am expected to graduate by the end of the current or summer semester.	127	4.4409	0.86054
Role of the college in academic advising and course registration	I am a first-year college student.	117	3.3846	1.17331
	I am a second-year college student.	240	3.4958	1.25093
	I am a third-year college student.	316	3.3354	1.13031
	I am a fourth-year college student or beyond.	300	3.26	1.27979
	I am expected to graduate by the end of the current or summer semester.	127	3.0945	1.23721
Role of the DAR in academic advising and course registration	I am a first-year college student.	117	3.5556	1.09422
	I am a second-year college student.	240	3.6667	0.90866
	I am a third-year college student.	316	3.5918	0.88073
	I am a fourth-year college student or beyond.	300	3.6	0.846
	I am expected to graduate by the end of the current or summer semester.	127	3.4488	1.02901
Academic advisor	I am a first-year college student.	117	2.5419	0.54587
	I am a second-year college student.	240	2.5233	0.61157
	I am a third-year college student.	316	2.4646	0.60821
	I am a fourth-year college student or beyond.	300	2.52	0.60389
	I am expected to graduate by the end of the current or summer semester.	127	2.4063	0.6223

- Examine the value implications of disparities in satisfaction levels with the study variables by campus location:

The purpose was to determine the extent to which digital transformation resulted from value disparities in the degree of satisfaction by campus location in 2020 based on the five study variables. Table 19 shows that there were no value differences between student feedback in terms of campus locations on allowing the expected to graduate students to register for courses first, the availability of course registration for the male campus on days other than those reserved for the female campus, the college's role in academic advising, the registration of courses, and ultimately the role of the DAR in academic advising and course registration, and academic advisor.

- Examine the value disparities in satisfaction levels with the study variables among college students:

The purpose was to determine the extent to which, due to digital transformation, there were value disparities in the degree of satisfaction by college affiliation regarding the five study factors in 2020. The LSD test was used to determine which college affiliations were correlated to the value differences in progressive course registration for those expected to graduate first, and we found that the Faculty of Science was the origin of the value discrepancies in progressive course registration for those expected to graduate first, as it had the lowest satisfaction average, as compared with the other colleges, see Table 20.

Table 19. Metadata of study variables by campus location.

Variable	Campus Location	Number	Average	Standard Deviation
Allowing courses to be registered for those expected to graduate first	Main in Sulaymaniyah	999	3.7407	1.18434
	Al-Marjan	9	3.8889	1.05409
	Rabigh	92	3.6413	1.32251
Allowing course registration for the male campus on days other than those for the female campus	Main in Sulaymaniyah	999	4.2082	0.92108
	Al-Marjan	9	4.5556	0.52705
	Rabigh	92	4.1304	0.87978
Role of the College in academic advising and course registration	Main in Sulaymaniyah	999	3.3013	1.222
	Al-Marjan	9	3.7778	1.20185
	Rabigh	92	3.5652	1.17018
Role of the DAR in academic advising and course registration	Main in Sulaymaniyah	999	3.5816	0.91912
	Al-Marjan	9	3.7778	0.97183
	Rabigh	92	3.663	0.94086
Academic advisor	Main in Sulaymaniyah	999	2.4855	0.60739
	Al-Marjan	9	2.8444	0.26034
	Rabigh	92	2.5522	0.57445

Table 20. Descriptive statistics of study variables by college.

Variable	College	Number	Average	Standard Deviation
Progressive course registration for those expected to graduate first	Faculty of Arts and Humanities	224	3.683	1.22474
	Faculty of Science	319	3.5016	1.23338
	Faculty of Economics and Management	80	3.975	1.14709
	Faculty of Computers and Information Technology	76	3.8947	1.14983
	Faculty of Engineering	94	4.0213	1.04705
	Law School	73	3.9452	1.18896
	Other	234	3.7821	1.14952
Allowing course registration for the male campus on days other than those for the female campus	Faculty of Arts and Humanities	224	4.1116	0.94752
	Faculty of Science	319	4.1567	0.92513
	Faculty of Economics and Management	80	4.35	0.90148
	Faculty of Computers and Information Technology	76	4.4605	0.79062
	Faculty of Engineering	94	4.3723	0.82935
	Law School	73	4.1644	1.02759
	Other	234	4.1709	0.89145
Role of the College in academic advising and course registration	Faculty of Arts and Humanities	224	3.0402	1.1991
	Faculty of Science	319	3.5235	1.18105
	Faculty of Economics and Management	80	3.1	1.1757
	Faculty of Computers and Information Technology	76	3.6447	0.97576
	Faculty of Engineering	94	3.0745	1.22025
	Law School	73	2.6849	1.45179
	Other	234	3.6111	1.13775
Role of the DAR in academic advising and course registration	Faculty of Arts and Humanities	224	3.4911	0.98869
	Faculty of Science	319	3.6082	0.89023
	Faculty of Economics and Management	80	3.575	0.97792
	Faculty of Computers and Information Technology	76	3.7368	0.71867
	Faculty of Engineering	94	3.5213	0.91262
	Law School	73	3.4247	1.10451
	Other	234	3.6966	0.86282

Table 20. Cont.

Variable	College	Number	Average	Standard Deviation
Academic Advisor	Faculty of Arts and Humanities	224	2.3563	0.64652
	Faculty of Science	319	2.6063	0.55123
	Faculty of Economics and Management	80	2.32	0.63692
	Faculty of Computers and Information Technology	76	2.6868	0.40442
	Faculty of Engineering	94	2.334	0.55213
	Law School	73	2.2219	0.76344
	Other	234	2.6188	0.55123

We should also mention that the Faculty of Computers and Information Technology was connected to the value differences in allowing male campus students to register for courses on days other than those reserved for female campus students, as well as the academic advisor, where it had the highest satisfaction levels among the colleges.

- Examine the value disparities in satisfaction levels with the study variables according to the number of approved academic hours:

The purpose was to determine how much of a difference there was in value satisfaction for the five research variables in 2020 due to digital transformation, as measured by the number of approved academic hours, see Table 21.

Table 21. Descriptive statistics of study variables by number of approved academic hours.

Variable	Approved Academic Hours	Number	Average	Standard Deviation
Allowing courses to be registered for those expected to graduate first	30 h or less	32	3.4063	1.04293
	Between 31 and 60.	283	3.2014	1.25974
	Between 61 and 90.	390	3.5795	1.11894
	Between 91 and 120.	322	4.2764	0.98651
	More than 120 h	73	4.3699	0.99313
Allowing course registration for the male campus on days other than those for the female campus	30 h or less	32	4.1875	0.85901
	Between 31 and 60.	283	4.0495	0.99521
	Between 61 and 90.	390	4.1308	0.90177
	Between 91 and 120.	322	4.4037	0.82318
	More than 120 h	73	4.3288	0.92878
Role of the College in academic advising and course registration	30 h or less	32	3.6563	1.09572
	Between 31 and 60.	283	3.4382	1.20234
	Between 61 and 90.	390	3.3744	1.19483
	Between 91 and 120.	322	3.205	1.22852
	More than 120 h	73	3.0411	1.34823
Role of the DAR in academic advising and course registration	30 h or less	32	3.75	1.016
	Between 31 and 60.	283	3.5901	0.96104
	Between 61 and 90.	390	3.6615	0.87426
	Between 91 and 120.	322	3.5031	0.92473
	More than 120 h	73	3.5205	0.9296
Academic Advisor	30 h or less	32	2.3625	0.72457
	Between 31 and 60.	283	2.5505	0.56952
	Between 61 and 90.	390	2.479	0.62024
	Between 91 and 120.	322	2.4907	0.59759
	More than 120 h	73	2.4274	0.6049

The goal was to see how much of a difference there was in value satisfaction for the five research variables in 2020 as a result of digital transformation, as measured by approved academic hours. Tables 22 and 23 show that there were value differences in the student

feedback based on the number of approved academic hours with regard to progressive course registration for those expected to graduate first, availability of course enrollment for male campus students on days other than the female campus, and the affiliated college's role in academic advising and course registration. However, there were no value differences between the rest of the variables according to the number of approved academic hours.

Table 22. Descriptive statistics of study variables by GPA.

Variable	GPA	Number	Average	Standard Deviation
Allowing courses to be registered for those expected to graduate first	Between 2.0 and 2.74.	36	3.2222	1.04502
	Between 2.75 and 3.74.	260	3.6077	1.1952
	Between 3.75 and 4.49.	461	3.7223	1.24277
	4.5 and more	343	3.898	1.11794
Allowing course registration for the male campus on days other than those for the female campus	Between 2.0 and 2.74.	36	3.5833	0.99642
	Between 2.75 and 3.74.	260	4.1346	0.94703
	Between 3.75 and 4.49.	461	4.2234	0.88709
	4.5 and more	343	4.2974	0.89454
Role of the College in academic advising and course registration	Between 2.0 and 2.74.	36	3.5	1.0556
	Between 2.75 and 3.74.	260	3.3731	1.21575
	Between 3.75 and 4.49.	461	3.2538	1.22057
	4.5 and more	343	3.3732	1.23572
Role of the DAR in academic advising and course registration	Between 2.0 and 2.74.	36	3.6389	0.89929
	Between 2.75 and 3.74.	260	3.5385	0.95176
	Between 3.75 and 4.49.	461	3.6226	0.88013
	4.5 and more	343	3.5802	0.95444
Academic Advisor	Between 2.0 and 2.74.	36	2.25	0.68013
	Between 2.75 and 3.74.	260	2.5608	0.56171
	Between 3.75 and 4.49.	461	2.4529	0.61586
	4.5 and more	343	2.5242	0.60085

The LSD test was used to determine which college affiliations were connected to these differences. It was discovered that a category of more than 120 h was connected to the value differences between the degree of student satisfaction in terms of allowing course registration to be available to those expected to graduate first, where it had the highest average. This group was also correlated with the value differences between the degree of students' satisfaction in terms of the role of the college in academic advising and course registration, where it had the lowest average.

A class of 91–120 academic hours triggered value discrepancies between the students' degree of satisfaction with this variable, which had the highest average, as compared with the rest of the categories, in terms of availability of course registration for male campus students on days other than those intended for female campus students.

6. Examine the value disparities in satisfaction levels with the study variables according to GPA:

The purpose was to determine the extent of value disparities in satisfaction levels according to GPA from the five study factors in 2020 due to digital transformation.

Table 22 shows that there were value differences between student feedback and GPA with progressive course registration for those expected to graduate first, allowing course registration for male campus students on days other than those intended for female campus students, and the academic advisor, while there were no value differences with allowing course registration for those expected to graduate first.

Students with a 4.5 GPA or higher showed value disparities in their attitudes about the availability of course registration for those expected to graduate first. According to the LSD

test, which was used to establish which institutions were accountable for the irregularities, it had the highest average.

However, the 2.0–2.74 GPA group was connected to the value disparities between the student perspectives on course registration for male campus students on days other than those intended for female campus students, as well as the academic advisor, which had the lowest average among the study rate categories.

Table 23. F test results for study variables by different factors.

Factor	Variable	F	Sig
Student Year Level	Allowing courses to be registered for those expected to graduate first.	34.02	0
	Allowing course registration for the male campus students on days other than those intended for female campus students.	4.093	0.003
	Role of the College in academic advising and course registration	2.615	0.034
	Role of the DAR in academic advising and course registration	1.213	0.304
	Academic Advisor	1.325	0.259
Campus location	Allowing courses to be registered for those expected to graduate first	0.368	0.692
	Allowing course registration for the male campus students on days other than those intended for female campus students.	0.971	0.379
	Role of the College in academic advising and course registration	2.6	0.075
	Role of the DAR in academic advising and course registration	0.518	0.596
	Academic Advisor	2.048	0.129
College	Allowing courses to be registered for those expected to graduate first	4.276	0
	Allowing course registration for the male campus students on days other than those intended for female campus students.	2.479	0.022
	Role of the College in academic advising and course registration	11.561	0
	Role of the DAR in academic advising and course registration	1.786	0.099
	Academic Advisor	12.123	0
Approved academic hours	Allowing courses to be registered for those expected to graduate first	44.002	0
	Allowing course registration for the male campus students on days other than those intended for female campus students.	6.961	0
	Role of the College in academic advising and course registration	3.152	0.014
	Role of the DAR in academic advising and course registration	1.654	0.158
	Academic Advisor	1.287	0.273
GPA	Allowing courses to be registered for those expected to graduate first	5.402	0.001
	Allowing course registration for the male campus students on days other than those intended for female campus students.	7.4	0
	Role of the College in academic advising and course registration	1.083	0.355
	Role of the DAR in academic advising and course registration	0.51	0.676
	Academic Advisor	4.054	0.007

7. Examination of the relationship between the research variables:

The purpose was to determine the degree to which the five research variables were correlated. Pearson's correlation coefficients and their semantic levels are shown in Table 24 (between brackets). Table 24 shows that ejective correlations between distinct variables were statistically significant. This graph depicts the relationship between satisfaction and various criteria as a result of digital transformation and the implications for course registration and academic advising.

Table 24. The correlation matrix between the five study variables.

Variable	Allowing Courses to Be Registered for Those Expected to Graduate First	Allowing Course Registration for the Male Campus Students on Days Other Than Those Intended for Female Campus Students.	Role of the College in Academic Advising and Course Registration	Role of the College in Academic Advising and Course Registration	Academic Advisor
Allowing courses to be registered for those expected to graduate first	1	0.338 (0.000)	0.177 (0.000)	0.144 (0.000)	0.101 (0.001)
Allowing course registration for the male campus on days other than those for the female campus	-	1	0.102 (0.001)	0.095 (0.002)	0.62 −0.04
Role of the College in academic advising and course registration	-	-	1	0.338 (0.000)	0.569 (0.000)
Role of the DAR in academic advising and course registration	-	-	-	1	0.206 (0.000)
Academic Advisor	-	-	-	-	1

8. Discussion and Outcomes

As a result of modifications and enhancements to the electronic academic advising and course registration systems at King Abdulaziz University:

1. Balancing the demand for the ODUS Plus electronic system improved network access.
2. Students were more satisfied with progressive course registration for those expected to graduate first in 2020 than they were in 2018.
3. Student satisfaction with allowing course registration for the male campus students on days other than those allotted for the female campus increased in 2020, as compared with 2018.
4. In 2020, students were more satisfied with the university's role in academic advising and course registration than they were in 2018.
5. In 2020, students were more satisfied with the DAR's role in academic advising and course registration than they were in 2018.
6. Student satisfaction with the role of the academic advisor in 2020 was higher than it was in 2018.
7. Students' perspectives on the role of the affiliated college and the DAR in academic advising and the role of the academic advisor differed significantly in 2020. There were also value differences in student feedback regarding the availability of course registration for those expected to graduate first and the availability of course registration for the male campus students on days other than those reserved for the female campus students. In fact, the satisfaction score of the male campus students was higher than the female campus.

In 2020, there were value differences between student feedback in the different student year levels regarding the availability of course registration for those expected to graduate first, allowing course registration for male campus students on days other than female campus students, and the role of the college in academic advising and course registration. The value disparities were connected to the expected to graduate and fourth-year students as they reported more satisfaction than the other students, and the availability of course registration for the male campus on distinct days from the female campus. The results also showed that fourth-year students and those expected to graduate were connected to the value discrepancies, as they were less satisfied than the rest of the student year levels regarding the availability of course registration for male campus students on days other than those reserved for female campus students. In addition, expected graduate students

were less satisfied with the university's academic advising and course registration than the rest of the student year levels, resulting in value inequalities in student grades concerning the university's role in academic advising and course registration.

There were value discrepancies between the different college students' perspectives concerning the five study factors. The data also reveal that the Faculty of Science, which had the lowest average among the colleges, was related to the value dissimilarities in prioritizing course registration for the expected graduate students. We also noted that the Faculty of Law was connected to value differences regarding the role of the university in academic advising and course registration, as well as the role of the DAR in academic advising and course registration, where it had the lowest average satisfaction levels among the colleges. We should also mention that the Faculty of Computers and Information Technology was connected to the value disparities in allowing male campus students to register for courses on days other than those reserved to the female campus students, as well as the academic advisor, where it had the highest average of all the colleges.

There were value differences in student feedback based on the number of approved academic hours regarding progressive course registration for those expected to graduate first, allowing male campus students to register for courses on days other than those reserved for female campus students, and the college's role in academic advising and course registration, while there were no value differences between the remainder of the factors according to the number of approved academic hours.

The findings also revealed that the category of more than 120 h was connected to the value differences between student satisfaction levels in terms of the progressive course registration for those expected to graduate first, which had the highest average. The same category was also connected to value differences between student satisfaction levels in terms of the university's role in academic advancement, which had the lowest average. As for the availability of course registration for male campus students on days other than those reserved for female campus students, a class of 91–120 academic hours was connected to value differences between the students' degree of satisfaction with this variable, which had the highest average, as compared to the rest of the categories.

There were value differences between student feedback based on their diverse GPAs regarding progressive course registration for those expected to graduate first, allowing male campus students to register for courses on days other than those reserved to the female campus students, as well as the academic advisor, while there were no value differences between the rest of the variables.

The results also reveal that the 4.5 GPA group and above was connected to the value differences between student feedback regarding progressive course registration for those expected to graduate first, with the highest average, while the 2.0–2.74 GPA group was connected to value differences between student feedback regarding the availability of course registration for the male campus students on days other than those reserved to the female campus students, as well as the academic advisor, which had the lowest average, as compared to the rest of the GPA categories.

The presence of statistically significant ejective correlations among several variables depicted the relationship between satisfaction and many variables and the implications for course registration and academic advising as a result of digital transformation.

9. Conclusions

Higher education institutions seek to modernize and develop study programs and systems. Universities such as King Abdulaziz University have been interested in developing digital solutions that promote academic counseling and advising for students since they have been shown to be a valuable asset in the educational process. The researchers compared student satisfaction across two surveys, one from 2018 and the other from 2020, to determine any variations, specifically in student satisfaction regarding academic advising and electronic course registration.

The investigation discovered that modifications in digital transformation procedures resulted in balancing the demand on the ODUS Plus electronic system and alleviated the problems accessing the network that occurred in 2018. This study examined student satisfaction with changes in digital transformation methods and advances in many parts of academic advising and course registration, including progressive course registration for those expected to graduate first. This research is intended to broaden other universities' research both inside Saudi Arabia and around the world. The questionnaire that was designed for this study was shown to be reliable and valid and, therefore, may be of use in future research under similar conditions. This research asserted that some technical challenges were easily resolved using modifications and digital solutions. This may provide a reference for the development of online platforms for academic advising and course registration.

10. Academic and Practical Implications, and Limitations

The research provided insights for decision-makers in the educational institutions that wish to enhance their performance in academia. Universities and HEIs seek efficient academic performance in each aspect. Academic advising (AA) is one effective aspect that positively impacts student outcomes in areas such as enrollment, course registration, academic accountability, and career success. The supporting information systems that facilitate AA should accelerate their development to support these goals.

However, implementing novel systems requires investigation into their impact on student performance and satisfaction. Therefore, this research indicated the benefit of examining AA systems to understand the profound learning process more fully. Otherwise, student retention rates may be negatively affected. This would harm not-for-profit and for-profit educational institutions alike. The authors believe that this research area can promote the development of more efficient and effective advising services for both students and HEIs.

HEI leaders may find this research useful in practical applications. Similar investigations can be applied to understand student satisfaction level before and after modifications to digital or other solutions to assure better organizational performance. The authors recommend that AI and machine learning be used to analyze and understand the classification of inquiry topics and the interactions received from beneficiaries in the future. This can be done by analyzing similar calculations from other universities to verify and confirm the findings. By its sample nature, this research was limited to one selected university; thus, the researchers also suggest that this study could be expanded in the future.

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