

A New Model for Enhancing Student Portal Usage in Saudi Arabia Universities

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Abstract—Portals are gateways that provide users with the information they need from different sources and display it on a single page. It is important to see that universities utilize the resources and services provided by their student portals. With the rapid development of Information and Communication Technology (ICT), the Ministry of Education in Saudi Arabia aims to develop and improve student portals by providing high-quality teaching services through the university portal systems. This paper discusses the importance of student portal usage in Saudi Arabian universities and investigates the factors that influence the utilization of student portals as perceived by the students of the Saudi universities. Based on these factors, a model is proposed which identifies students' expectations about the Saudi university portals. A quantitative methodology was employed to develop the model. The results revealed that 8 out of 10 factors of the model are significant and positively affect student portal usage. The enhancement of student portals based on the identified significant factors will assist the universities to increase their utilization and their provided services.

Keywords—university portal; higher education; e-services; e-learning; quality of service; utilization of student portals; ICT

I. INTRODUCTION

High-quality web portals are critical to commercial and non-commercial organizations [1, 2]. A portal is defined as a general knowledge management system that helps companies to share, reuse, create or exchange information [3]. A university portal provides its users a specialized view that matches their needs and meets their software and hardware

requirements. To build a university portal that is updated regularly with the latest information and can accommodate additional services is a significant challenge [4]. The main concern is to build a portal that controls, coordinates, interacts and takes feedbacks from customers (visitors, staff and students). The Ministry of Higher Education in Saudi Arabia works close with Saudi universities to improve the quality of higher education in order to ensure that university graduates have skills and learning outcomes in line with the international standards and job market requirements. Despite the good Information and Communication Technology (ICT) infrastructure in Saudi universities, the usage of university student portals remains low [5]. According to [6], a big challenge that Saudi universities face is the lack of awareness regarding the use of ICT among students, faculty members, and administrative staff. Many universities in Saudi Arabia spend generously on ICT, but this expenditure does not lead to significant improvements in the usage of ICT services. Many universities have adequate ICT infrastructure, but they do not use it effectively [7]. Higher education institutions, particularly universities in developed countries, are heavily involved in portals which have become an essential tool for service delivery and communication between faculty members, administrative staff, and, most important, students [8].

Several studies have been conducted in Saudi Arabia on the importance and usage of university student portals. Authors in [9] showed that the official university portal for King Abdul-Aziz University is well-below the expected standard. The study

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claims that King Abdul-Aziz University's portal does not match the standards of design, content, user support, and navigation and the undergraduate students are dissatisfied with it [10]. The aim of [10] was to explore usability problems within Saudi university websites in comparison with the UK university websites by applying the SUS methods and Thinking aloud method to measure the usability of the websites. The results illustrated that Saudi students faced various usability problems related with satisfaction, integration, and confidence. The author in [2] evaluated the EduGate, an online academic portal of King Saud University and problems were found concerning its design and content. These problems reduced the usage of the portal and dissatisfied academic staff. The author in [11] revealed that Saudi university portals need to focus on their content to meet the needs of staff and students and to increase their level of usage. Furthermore, authors in [12] revealed that the score for using King Khalid University's website is 53.5 while the average industry score of using a website is 65. This indicates that there are problems impeding the effectiveness and efficiency of the university portal resulting in minimal usage.

Given the above background, this study investigates the factors that affect students' usage of their university portal by proposing a model that meets student expectations and increases their satisfaction. This model will help the universities to communicate more efficiently with their students.

II. RELATED WORK

Web portals are general knowledge management systems that help institutions to share, reuse, create, or exchange information or knowledge [3]. Portals have been employed increasingly to manage the communication between different stakeholders in an organization or initiative. Educational web portals have become more responsive and turned out to be very dynamically based on the demands and the requirements of the varying academic community. The communication between teachers and students is often conducted through these websites and even more these days due to the Covid 19 pandemic. These portals actually integrate the application, content, and information together in order to help the end users. University student portals provide customers with a specialized view that matches their needs and meets their software and hardware requirements. The understanding of the users' needs is a key element in the student portal usage. It mainly includes four important things, namely the accessibility standards, page layout, graphic design, and, most important, content design [13]. Therefore, the main concern of the university is to build a portal that is able to control, coordinate, and receive feedback from the users (visitors, staff, and students). Such input contributes to developing a portal that will meet the expectations of end-users and the industry standards [2, 13].

King Saud University and King Abdul-Aziz University are among the top five universities of Saudi Arabia [14, 15]. Authors in [14] indicated that information technology infrastructure is a key success factor that increases students' confidence in using Saudi university portals. As such, the author in [15] recommended updating the information of the portals, e-services, and redesigning in order to increase their

use. He examined the attitudes of faculty members towards the use of virtual learning portals in teaching language programs at major Saudi universities. Authors in [16] evaluated and compared the awareness and the level of the use of portals among the students of the Al-Jouf University. The study concluded that the undergraduate students of the University lack the necessary information skills needed to meet their academic and research requirements in order to continue to use the portal. Authors in [17] examined different factors that affect the use of the university portals and determined the level of the use of e-learning portals in Saudi Arabia while they compared the results with the results from studies conducted in other countries. It was revealed that the technical infrastructure of the portal, instructor knowledge of the use of portal technologies, and student knowledge of using computer systems are important to the success and increase of the usage of the portal. The author in [18] conducted a comprehensive literature study to identify the current state of using the health information systems' portals in Saudi Arabia. The findings revealed that factors such as: design, privacy, and efficiency affect portal usage. Author in [19] examined the current situation of King Abdulaziz University portal content and proposed a content strategy, which can help the university to solve portal content issues and encourage users to use it. Also, this study recommended examining the students' perceptions regarding the use of the portal. The author in [20] examined the level of the use of academic portals by the staff of Alqassim University in Saudi Arabia. The results showed that the academic staff members lack awareness about the use of the available services in the portal. This study revealed that there is a need to increase the level of usage by training the academic members on how to use the services of the portal. Authors in [21] examined the level of use of university portals by identifying the factors that influence lecturers to use it. The result revealed that there are some issues such as: navigation, response time, minimum download time, and portal accessibility. This study recommended university decision makers and web designers to take into consideration these issues in order to increase the level of portal's usage. The author in [22] examined students' attitudes towards using electronic information resources of the library portal at Princess Nora University in Saudi Arabia. The results revealed that the management should attempt to decrease the gap between student attitudes and their use in order to increase the portal usage. In addition, authors in [10] examined the level of usage of the portal of the King Abdul-Aziz University among undergraduate students. It was found that students were dissatisfied with the portal. The study recommended the improvement of the level of the portal usage by solving the problems the students face.

In spite of the advancements being made in the domain of mobile portals in Saudi Arabia, there are aspects that present obstacles in the progress. For instance, authors in [23] ascertained several limitations related to mobile learning in Saudi Arabia, limitations related to processing performance, memory size, battery life, user interface, and the existence of various platforms. Other concerns encompass the availability of dependable and inexpensive web access from home, because the IT security in Saudi universities makes it difficult for students who are away from campus to access the university

systems. The author in [24] highlighted the substandard wireless network and technical concerns. Utilizing mobile phones for education would render likely issues regarding the hardware specifications of the devices involved: small screen sizes, inadequate input options, small battery life, inadequate memory capacity, and inadequate video quality [26, 27].

Based on these limitations, this study focuses on student web portals in Saudi Arabia universities. Social Cognitive Theory (SCT), which is regarded as a very powerful theory related to human behavior, was utilized. The SCT was applied for investigating computer utilization in [28, 29]. The nature of the proposed model along with its theory allowed its extension to the acceptance and usage of web portals. The SCT was regarded as the base model because: first, the constructs that were used in the model represented the variables that were analyzed as the factors responsible for improving the web portals. Second, since the SCT was a relatively less-represented model in the adoption of the web portals, it was important to investigate its performance and application in the existing context. Finally, this model included all the appropriate and vital constructs that helped in understanding the behavior of an individual. According to [25], user behavior is an important key to enhance and continue using a website. In addition, user behavior and perceived enjoyment on websites are important factors regarding the increase of its usage [26]. Also, the consideration of user behavior provides useful guidelines for designers to deliver the optimum website design. According to [32], student behavior is the most important key factor to improve the use of an educational portal. Therefore, understanding students' expectations has significant influence on their performance and increases user satisfaction [33, 34].

Based on the previous studies, it was found that there are issues regarding the usage of portals of Saudi Arabia universities. These issues decrease the student portals usage and make the students dissatisfied with them. Therefore, this study will investigate the factors that prevent the undergraduate students from using the university student portals.

III. MATERIALS AND METHODS

A. Population and Study Context

This study uses the quantitative approach to achieve its objectives by investigating the importance of student portals and the most important factors that affect students to use the portals of Saudi universities. The collected data were from 399 participants and were gathered from students of four different universities, namely the University of Tabuk, Taibah University, Taif University, and King Faisal University, which are located in different states of Saudi Arabia. Also, the study used the PLS algorithm in SmartPLS3 to analyze the collected data.

B. Factor Selection Method

Five databases were used, namely ScienceDirect, Taylor & Francis, Springer, Emerald, and Google Scholar to determine the importance of student portals and the most important factors which affect the students' usage. Moreover, this study attempts to investigate the importance of student portals among students based on their attitude in order to increase their

performance. There are works indicating the importance of studying personal and organizational factors to enhance users' performance. The factors that enhance academic staff in Nigeria to use ITC in the library were examined in [59]. The findings of the study revealed that organization factors are the most important. Organization factors include the lack of ICT strategy and the lack of commitment by the institutional management. According to [60], personal and behavioral factors are key success factors in improving the performance of employees. It is essential to examine the impact of personal, behavioral, and organizational factors on the academic staff in universities in order to improve the performance of research productivity [61]. Personal factors, such as the level of skills for using ICT, are important. Therefore, this study identified the factors that affect students' use of the university portals by using Microsoft Excel to extract and filter the factors from previous studies. This approach consisted of four steps namely, search for suitable factors, filtering factors, naming three classification categories, and classifying the factors into these categories.

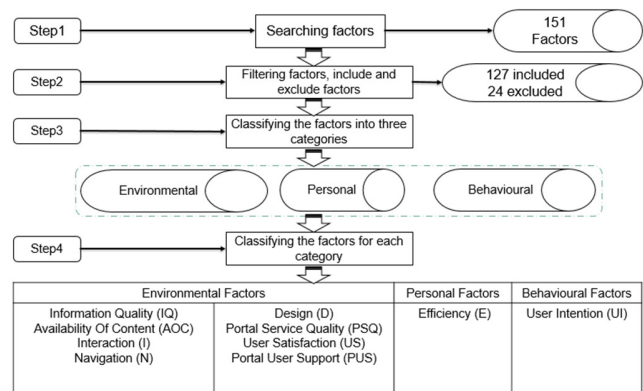


Fig. 1. Factor derivation process.

Firstly, 54 papers were reviewed. Twenty eight papers were found that were related to this study domain. From these included papers, 151 factors were identified. In the second step, the researchers filtered all identified factors to determine the included and excluded factors. In this step, the researchers identified 127 included sub-factors and excluded 24 factors. At the third step, the researchers extracted and classified the identified 127 sub-factors and factors into 3 categories, namely environmental, personal, and behavioral. Then, the researchers divided each category's sub-factors into the main factor. In the fourth step, the researchers identified the main factors related to each category. Regarding the environmental category, the researchers found that there are 8 main factors related with it. These factors are: Information Quality (IQ), Availability Of Content (AOC), Interaction (I), Navigation (N), Design (D), Portal Service Quality (PSQ), User Satisfaction (US), and Portal User Support (PUS). The personal category consists of 1 main factor namely Efficiency (E), and the behavioral category also consists of 1 main factor namely User Intention (UI), as shown in Figure 1.

1) Environmental Factors

Environmental factors refer to the degree an individual trusts the technical and organizational infrastructure that should exist and the level of support for using the system [27] or the availability of technological and external resources of the organization such as money, time, and effort needed to ease the performance of a specific behavior.

a) User Satisfaction

In information technology, user satisfaction of web portals has been studied extensively. Authors in [28, 36] studied the direct influence of competing resources, user satisfaction, and the voluntariness on the portal usage. It has been used as a surrogate measure for the effectiveness of information systems [29]. User satisfaction is defined as the degree of successful interaction between users and the information system [30]. Authors in [31] described satisfaction as the degree of the comparison of the expectations with the perceived performance. The first hypothesis regarding user satisfaction is:

- Ha1: US positively affects students' use of the student portal.

b) Information Quality

Information quality is the quality of the information system output that reflects user needs such as accuracy, content, format and timing [33], which is critical to user acceptance [33]. IQ can predict consumer satisfaction [34]. Accordingly, providing a high-quality student portal will help provide innovative services to students. The assumption made regarding information quality is:

- Ha2: IQ positively affects students' use of the student portal.

c) Interaction

According to [35], interaction refers to the ease by which users can interact with the input and output of the system and their ability to learn through it. Human-computer interaction is vital to improving user performance [36]. Better human-computer interaction provides good learning systems to create portals that are easy to use and increases user satisfaction [35]. As such, interaction helps improving student portal usage.

- Ha3: Interaction positively affects students' use of the student portal.

d) Availability Of Content

AOC can affect students' usage of the university portal [37]. Educational and non-educational services provided in the portal, such as online library services, email services, lecturer evaluation, and registration services are the key areas. The student portal should facilitate the accessibility to all services and be flexible, quick, and allow users to perform their tasks efficiently [38]. The students will be more satisfied when they get more available content.

- Ha4: AOC positively affects students' use of the student portal.

e) Portal Service Quality

Authors in [39] defined PSQ as the support from the information technology department concerning the user system. PSQ is also defined as the level of customers' expectations with the degree of the services delivered via the user information system [40]. According to [41], PSQ can be determined within the context of e-services as a portal that is responsive, available, accessible, and flexible. Therefore, PSQ is a key determinant of use and user satisfaction about the e-services provided in a portal [42].

- Ha5: PSQ positively affects students' use of the student portal.

f) Design

Portal design is considered an important factor that determines the usage of any online portal [43]. Portals through simple user interface design provide services and information that users need [44]. So, a student portal should include design features that help students enjoy their visit, which will lead to increased activity [45, 46].

- Ha6: Design positively affects students' use of the student portal.

g) Navigation

Navigation is a significant factor in using web portals [47]. Users should be able to move through portal links without getting lost. The ease of navigation is a critical component of portal usage [48]. Therefore, the definition of navigation refers to the ease of finding what the user wants in the portal [49]. The navigation hyperlinks should be available and must work properly [50].

- Ha7: Navigation positively affects students' use of the student portal.

h) User Support

US is the ability of the IT department to provide users with assistance when needed [51]. Moreover, because an academic portal is usually complex and needs qualified staff, it is necessary to have online US tools such as online chatting services provided via an instant messenger to help users resolve problems should they arise [28].

- Ha8: US positively affects students' use of the student portal.

Figure 2 presents the environmental factors which affect the students' use of a portal.

2) Personal Factors

This study suggests that the personal factors have a significant impact on the students' use of the portal. Moreover, personal factor efficiency refers to the judgements of people on their capabilities to organize and implement the required courses of action to achieve the required action [52].

a) Efficiency

A student portal is a good learning environment that helps students increase their abilities to learn [38]. Efficiency is a kind of self-evaluation that can assist the understanding of human behavior and its performance in specified tasks [53]. Even though student portals offer good information, their

efficiency will decrease if the students' ability does not meet the expectations [54]. The students' ability to use the portal is vital for them to achieve their needs, as shown in Figure 3.

- Hb1: Efficiency positively affects students with using the students' portal.

3) Behavioral Factors

Authors in [55] defined UI as the degree by which a person can formulate clear plans to perform a determined future behaviour (Figure 4).

a) User Intention

UI is defined by the individual's behavioral intention and, in turn, the behavioral intentions are a function of an individual's attitude to the behavior. This is suggested by the Theory of Reasoned Action (TRA). The attitude towards a type of behavior is defined by a person's feelings toward that action and can be negative or positive [56]. Authors in [57] stated that behavioral intention is an important independent variable that predicts the actual use. Similarly, authors in [58] stated that behavioral intention is likely to be linked with the actual usage.

- Hc1: UI positively affects user with using the students' portal.

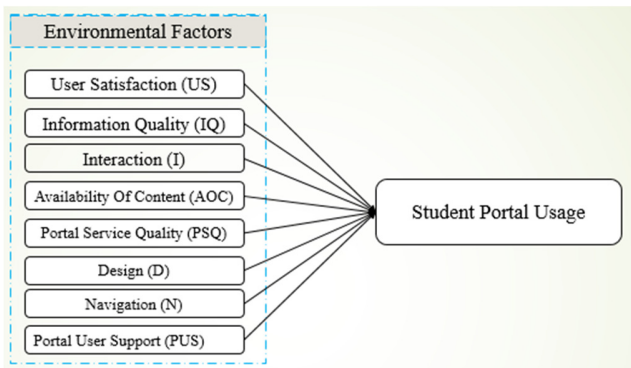


Fig. 2. Environmental factors.

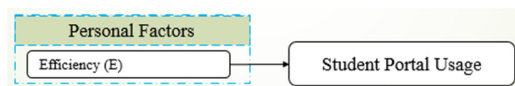


Fig. 3. Personal factors.

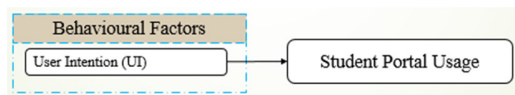


Fig. 4. Behavioral factors.

C. Survey Instruments

In this study, a questionnaire-based survey method was adopted and used to collect study data and test the hypotheses. The method includes data collection, data analysis, and report writing. Authors in [62] identified the questionnaire as recording the respondents' opinions on specific topic as a pre-formulated set of questions. Using a questionnaire method is efficient, less expensive, and less time-consuming compared to

other methods such as interviews and observation. The goal of the developed data collection survey instruments was to measure the validity and reliability of each factor in the model. According to [63], the developing of data collection survey instruments includes three steps: defining the constructs and content domain, generating and judging measurement items, and constructing studies to develop and refine the scale. The first step in data collection is to define each construct definition in the model. The importance in a theory to identify the construct definition and its domain was also highlighted, and conducting a comprehensive literature review to determine them was recommended. Therefore, the authors of this study did a thorough literature review and defined each construct in the model based on the content domain of the study. The second step of generating and judging measurement items follows. In addition, using the existing literature is considered a good scientific method to determine the items of the study [63]. Therefore, the authors of the current paper identified the items from previous studies that are related to this domain.

D. Face and Content Validity Assessment

In this step, the researchers measured the face and content validity of the measurement items [64]. According to [65], via referring to the literature or an expert, content and face validity can be achieved. A content and face validity form to test the validity of the selected measurement items was developed based on the validity form in [66]. The validity form consists of the research title, a short description of the research, the goal of this form, construct definitions, and items choice type. The items include three types of choice, Perfect Match (maintain items as it is), Moderate Match (maintain item but some refining is needed), and Poor Match (remove item) as shown in Appendix C. The researchers distributed the validation form to 9 experts as shown in Table I. The researchers invited experts from different disciplines to examine whether the items of each construct represent the construct's definition. Some items were changed and deleted based on the experts' comments and feedback.

TABLE I. EXPERTS' PROFILES

University	Department/School	Area of Expertise
Universiti Teknologi Malaysia	School of Computing	1 expert in Information systems, e-commerce, m-commerce.
Universiti Teknologi Malaysia	Azman Hashim International Business School	1 expert in Information systems, IT project management, information system planning.
Taibah University	Community College	2 experts in information systems and computer science.
Taibah University	Faculty of Computer Science and Information Systems	5 experts in information system and computer science, educational technology, e-learning.

E. Data Analysis Tools

To analyze the data, Partial Least Square (PLS) technique of Structural Equation Modeling (SEM) was used. By applying PLS-SEM, we were able to examine the measurement and the structural process of the proposed model. PLS-SEM is considered as a data analysis tool that validates predictive models [73]. SmartPLS software tool is appropriate for small sizes of data [73]. In this study, a two-type assessment to

analyze the data has been applied by using SmartPLS V.3. The first assessment is the measurement model, which is accomplished by the assessment of indicator reliability, internal consistency, convergent validity, and discriminant validity. The second assessment is the structural model, which is used to assess path analysis hypotheses testing by examining the size and significance of the path coefficient and coefficient determination [73].

IV. RESULTS AND DISCUSSION

This study examines the importance of student portal usage in Saudi universities by examining the most important factors affecting students' use of these portals. Ten factors were identified, 8 of which with a positive impact on students' usage of the student portal while the other 2 factors had no effect. These factors were divided into 3 main categories, namely environmental, personal, and behavioral. These 3 categories have three primary hypotheses. Furthermore, each primary hypothesis includes a sub-hypothesis depending on how many factors belong to each category in order to investigate the relationship between the constructs.

A. Demographic Background

As mentioned above, the study was conducted in 4 universities, in different states of Saudi Arabia. The total number of participants was 399. The distribution of the participants' gender indicates that the highest percentage of participants were female ($n=295$, 73%), while males were $n=104$, 26.1%. Regarding the participants' age distribution, 299 participants (75%) were aged between 18 and 24 years, 50 participants (12.5%) were in the range of 25 and 29 years, and the same number and percentage were more than 30 years old (50 participants, 12.5%). The distribution of participants in the selected universities is: University of Tabuk $n=77$, 19.3%, Taibah University $n=131$, 32.8%, Taif University $n=91$, 22.8%, and King Faisal University $n=100$, 25.1%. As for the participants' experience in using computer and internet, 51 participants (13%) had less than 1 year of experience, 57 participants 14.2% had 1 to 3 years, 67 participants 16.7% had 3 to 5 years, 103 participants 25.8% had 5 to 10 years, and 121 participants 30.3% had more than 10 years of experience. Two hundred and thirty (27.6%) participants had good computer skills, 154 participants had excellent computer skills (38.6%), and 15 had low computer skills (3.8%). Most (218) participants had excellent internet skills (54.6%), 171 had good internet skills (42.9%), and 10 had low internet skills (2.5%).

B. Data Analysis

This study used the PLS algorithm in SmartPLS3 to identify the reliability and validity of the study items. Measurement and structural models were used to measure the study model and hypotheses. The measurement model examines the constructs and their items. It also determines the degree to which the indicators measure the construct. The structural model evaluated the reliability and validity of the measurement model, determined the measurement of each item and concluded that all are reflective items. Authors in [67] summarize the standard criteria tests used to evaluate the measurement model. Cronbach's Alpha and Composite Reliability (CR) of 0.60 or greater are accepted. The Average

Variance Extracted (AVE) is another criterion for the assessment of the measurement model, and its accepted value is 0.5 or greater. As shown in Table II, the criteria of the measurement model of all construct items meet the standard criteria. Figure 5 presents the study measurement model.

TABLE II. THE CRITERIA OF THE MEASUREMENT MODEL

Types of Analysis	Test name	Standard criteria
Reliability of internal consistency	Cronbach's alpha	≥ 0.6 acceptable
	Composite reliability	≥ 0.6 acceptable
Convergent validity	Factor loading	≥ 0.7 acceptable
	AVE	≥ 0.5 acceptable
Discriminant validity	Cross loading	The outer loading of each construct should be more than the cross loading of the next constructs

1) Reliability of Internal Consistency

The reliability of internal consistency of the constructs was the first indicator that was evaluated. Moreover, composite reliability test and Cronbach's alpha test were used. Cronbach's alpha is a convenient test that uses inter-correlations to estimate the reliability indicator variables. The second test composites reliability which is considered another measure for the reliability of internal consistency that takes into consideration the different outer loading of indicator variables. Cronbach's alpha and composite reliability should be more than or equal to 0.60 for each construct [73]. As shown in Table III, the result of both tests indicated the reliability of internal consistency.

TABLE III. RELIABILITY OF INTERNAL CONSISTENCY

Construct name	Construct code	Cronbach's alpha	Composite reliability
Availability of Content	AOC	0.952	0.959
Design	D	0.954	0.961
Efficiency	E	0.929	0.945
Interaction	I	0.922	0.939
Information Quality	IQ	0.892	0.921
Navigation	N	0.916	0.947
Portal Service Quality	PSQ	0.953	0.962
Portal User Support	PUS	0.967	0.972
Student Portal Usage	SPU	0.942	0.954
User Intention	UI	0.933	0.946
User Satisfaction	US	0.964	0.97

2) Convergent Validity

According to [67], the convergent validity indicates the degree of which alternative procedures for the same construct are correlated positively. In this regard, there are two tests: the AVE and outer loadings of indicators that should be taken into account in this stage to evaluate the convergent validity of the constructs. Outer loading value should be 0.7 and above [67]. The AVE value for each construct should be 0.5 and above [67-69] as shown in Table IV.

3) Discriminant Validity

Discriminant validity is defined as the degree of which a specific construct is different from others [73]. Cross loadings is the first measure to evaluate the discriminant validity indicators. The outer loadings indicators should be greater than

any of its correlations to other constructs (see Appendix A). Fornell-Larcker is the second measure to evaluate discriminant validity. It compares the square root of the AVE values with the construct correlations. Fornell-Larcker criterion determines whether the AVE is bigger than the squared construct correlation with the other constructs [67]. The Fornell-Larcker results satisfy the criterion (Appendix B).

TABLE IV. CONVERGENT VALIDITY TESTS

Independent variable	Items	Loading	AVE
IQ	IQ1	0.804	0.699
	IQ2	0.847	
	IQ3	0.9	
	IQ4	0.842	
	IQ5	0.783	
AOC	AOC2	0.811	0.724
	AOC3	0.775	
	AOC4	0.879	
	AOC5	0.864	
	AOC6	0.836	
	AOC7	0.852	
	AOC8	0.883	
	AOC9	0.862	
I	I2	0.785	0.721
	I3	0.842	
	I5	0.897	
	I6	0.86	
	I7	0.842	
	I8	0.864	
N	N1	0.916	0.856
	N3	0.94	
	N4	0.92	
D	D2	0.805	0.733
	D3	0.871	
	D4	0.862	
	D8	0.871	
	D9	0.842	
	D10	0.859	
	D11	0.882	
	D12	0.846	
E	E1	0.764	0.741
	E2	0.867	
	E3	0.888	
	E4	0.868	
	E5	0.909	
	E6	0.861	
UI	UI1	0.788	0.715
	UI2	0.846	
	UI3	0.837	
	UI4	0.889	
	UI5	0.869	
	UI6	0.852	
	UI7	0.833	
PSQ	PSQ2	0.878	0.783
	PSQ3	0.758	
	PSQ4	0.906	
	PSQ5	0.883	
	PSQ6	0.915	
	PSQ7	0.928	
PUS	PUS1	0.843	0.815
	PUS2	0.889	
	PUS3	0.919	

US	PUS4	0.915	
	PUS5	0.922	
	PUS6	0.905	
	PUS7	0.91	
	PUS8	0.918	
	US1	0.872	0.822
	US2	0.923	
	US3	0.935	
US4	0.904		
US5	0.926		
US6	0.895		
US7	0.891		

4) Goodness of Fit (GoF)

GoF is a global fit measure [70]. It is the geometric mean of both the AVE and the average of R^2 of the endogenous variables [71]. The calculation formula of GoF is:

$$GoF = \sqrt{R^2 \times AVE} \quad (1)$$

The criteria to determine whether GoF values are no fit, small, medium, or large to be considered as global valid PLS model [72] are shown in Table V.

TABLE V. GOODNESS OF FIT

≤ 0.1	No fit
0.1 to 0.25	Small
0.25 to 0.36	Medium
≥ 0.36	Large

The value of the Gof of this study is 0.771, which means the GoF model of this study is large enough to be considered of sufficient global PLS model validity.

The next stage examines the hypotheses of this study using the structural model. This stage tests the predictive capability of the model and the relationship between the constructs. The path coefficients of the structural model are determined after the collinearity assessment, which represents the relationship of the hypotheses among the structural model constructs. The standardized values of the path coefficients are between -1 and +1. If the path coefficients are close to 1, it means that there is a strong and statistically significant positive relationship among the constructs. If the path coefficients are close to 0, then the relationship between the constructs is considered weak [68]. In this study, the one-tailed test was used because the relationships of the hypotheses are positive and direct. The critical values and p-values for one-tailed tests are 1.28 (with significance level=10%), 1.65 (with significance level=5%), and 2.33 (with significance level=1%) [67] as shown in Table VI. Figure 6 presents the path coefficients of the structural model using smartPLS3.

TABLE VI. PATH RELATIONSHIPS

Analysis	Test	Standard
Path relationship	p value	* < 0.10 ** < 0.05 *** < 0.01
	t value	>1.28 level of significance =10% >1.96 level of significance = 5% >2.33 level of significance = 1%

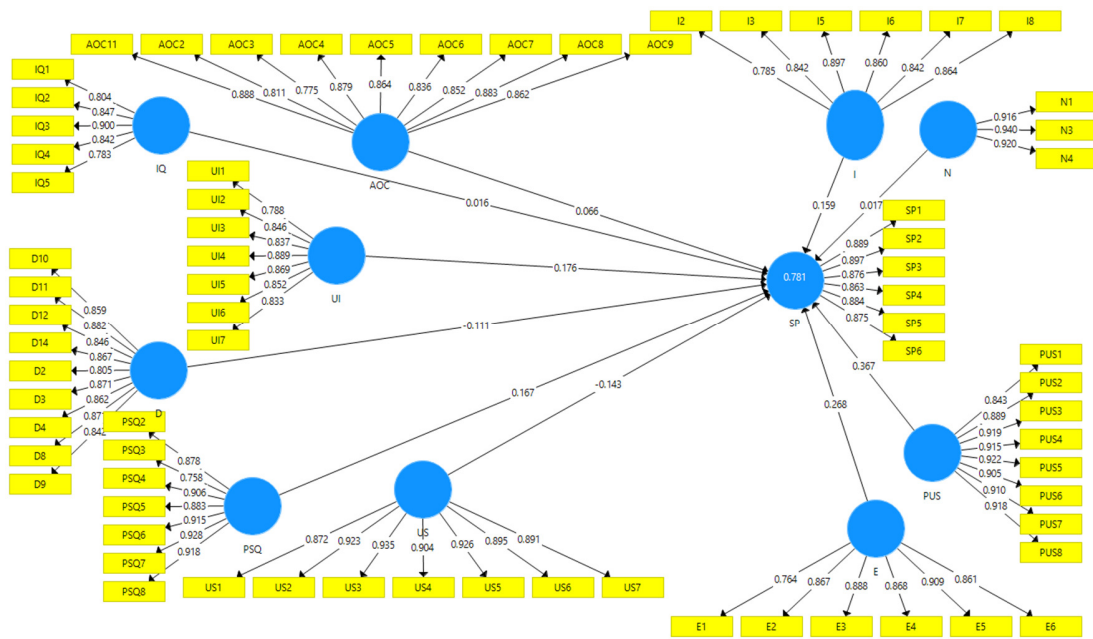


Fig. 5. Study measurement model.

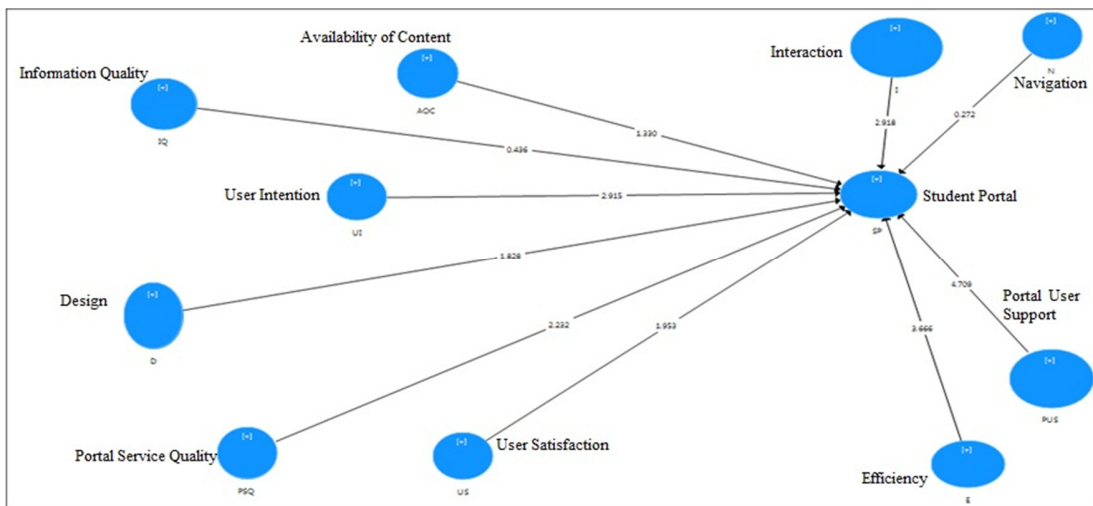


Fig. 6. Path coefficients of the structural model.

TABLE VII. RESULTS OF HYPOTHESIS TESTING

Factor path	t value	p value	Significant level	Decision
AOC → SP	1.33	0.092	*	Supported
D → SP	1.828	0.034	**	Supported
E → SP	3.666	0	***	Supported
I → SP	2.918	0.002	***	Supported
IQ → SP	0.436	0.331	NS	Not supported
N → SP	0.272	0.393	NS	Not supported
PSQ → SP	2.232	0.013	***	Supported
PUS → SP	4.709	0	***	Supported
UI → SP	2.915	0.002	***	Supported
US → SP	1.953	0.025	**	Supported

The result of hypotheses testing shows that most of the hypotheses are significant. Moreover, by using a bootstrapping test in smart-PLS, the result shows that 8 out of 10 hypotheses

are significant. Table VII presents the results of hypotheses testing.

As presented above, this study has 10 hypotheses. Ha1 stated that US has a significant and positive affect on students' use of the student portal. Previous studies indicated that the satisfaction of users will provide a surrogate which is significant to the critical product of the existing or new information system [30]. US is in terms of the use of the system and the acceptance of the portal, which is important in measuring the success of the information system [73]. Therefore, in this study, US about the portal is considered significant based on preliminary studies and the final result of data collection which reveals that there is a positive relationship between US and the use of the student portal (t-value=1.953, p-value=0.018). Saudi universities should take

into account the US when they improve their portals based on their students' needs and demands.

Ha2 states that IQ has a positive effect on students' use of the student portal. According to [38], IQ is the output quality of an information system, which reflects dimensions such as content, accuracy, timing, and format. It is an important factor because providing high-quality information to users in a university student portal can help in delivering innovative services to students. The results show a negative relationship between IQ and the use of the students' portal (t -value=0.436, p -value=0.331) because the student portal does not create new information nor meet students' needs based on students' point of view. However, the quality of the information provided on the portal should meet the students' needs. Thus, universities in Saudi Arabia have to improve their student portals based on their students' needs and demands.

Ha3 states that Interaction has a positive and significant effect on students' use of the student portal. Authors in [35] defined interaction as the ease by which users interact with the input and output of the system and their ability to learn through it. Interaction is one of the main factors that contribute to positive learning outcomes in a learning environment [74]. The findings of this study reveal that there is a positive relationship between Interaction and using the student portal (t -value=2.918, p -value=0.002). Thus, Interaction is considered an important indicator that can help improve student portal usage.

Ha4 states that the AOC has a positive effect on students' use of the student portal [37]. This is shaped by the educational and non-educational services provided in the portal, such as online library services, email services, lecturer evaluation, and registration services. A student portal should facilitate easy access to all services and be flexible, quick, and allow users to perform their tasks [38]. The findings of this study showed that there is a positive relationship between the availability of content and the usage of the student portals (t -value=1.33, p -value=0.092). Thus, the AOC will help Saudi universities to improve their student portals based on their students' demands and expectations.

Ha5 states that PSQ has a significant and positive effect on students' use of the student portal. The author in [40] defined PSQ as a measure of the level of customers' expectations with how well the information system offers services to users. Service quality within the context of the portal can be determined by prompt, responsive, available, accessible, and flexible e-services [41]. Therefore, PSQ is a key determinant for the use and US about e-services provided via a portal [42]. The result of this study reveals a positive relationship between PSQ and the use of a students' portal (t -value=2.232, p -value=0.013). Thus, PSQ is a significant indicator that can help Saudi universities improve their student portals.

Ha6 states that portal design has a significant and positive effect on the use of the student portal. According to [75], university student portals are designed to make the member's experience with the portal as personalized as possible. The design features that attract users and increase their satisfaction include enjoyment, excitement, participation, and charm [45].

Design can motivate them to participate and promote excitement to enjoy while visiting the website. Therefore, student portal design features that help students to enjoy their visit lead to increased activity [46]. This study reveals that there is a positive relationship between design and use of the students' portal (t -value=1.828, p -value=0.034). Thus, the portal design is paramount to improving student portal usage.

HA7 states that navigation has a positive effect on students' use of the student portal. Usually, a navigation bar offers the main tasks of the website [76]. According to [47], navigation is a significant factor in learning the web portal. Users should be able to move through portal links without getting lost. The ease of navigation is a critical component of portal usage [48]. The result of this study shows that there is a negative relationship between Navigation and use of portals (t -value=0.272, p -value=0.393) which means that Navigation is not regarded as an essential predictor for the use of a student portal from the viewpoint of students. Anyhow, the student portal navigation does not attract students or meet their needs, so it will be useful for Saudi universities to improve it, provide more links that students need in their study, and make the portal easier to use and easier to find the necessary information.

Ha8 states that PUS has a significant and positive effect on students' use of the student portal. Authors in [51] define user support as the ability of the IT department to assist users when needed. Moreover, because an academic portal is usually complex and needs qualified staff, it is necessary to have online user support tools to help the users [28]. Students (users) should be given specified training and user support, to increase the ease of use and learnability to effectively and efficiently fulfil a specified range of task scenarios on the web portal while management achieves their economic and global attainments [77]. This study reveals that there is a positive relationship between PUS and the use of the student portals (t -value=4.709, p -value=0).

Hypothesis Hb1 states that Efficiency has a significant and positive effect on students' use of the student portal. As a personal factor, Efficiency is defined as the judgements of people on their capabilities to organize and implement the required courses of action to achieve a required goal [52]. Efficiency was shown to be an important indicator that determines the actual behavior of a person [78]. Furthermore, the student portal is a good learning environment [38]. Even though student portals offer good information, their efficiency will decrease if the student ability does not meet the suitable level [54]. This study reveals that there is a positive relationship between the efficiency factor and the use of students' portals (t -value=3.666, p -value=0).

The last hypothesis is that UI has a significant impact on students' use of the student portal. Moreover, as a behavioral factor, UI is defined as a person's ability to formulate clear plans to perform a determined future behaviour [55]. Many factors might affect students' behavioral intention to use the student portal. Behavioral intention predicts or at least is linked with the actual usage [57, 58]. This study revealed that there is a positive relationship between UI and using the students' portal (t -value=2.915, p -value=0.002).

SPU4	0.553	0.556	0.649	0.611	0.487	0.547	0.598	0.662	0.863	0.653	0.575
SPU5	0.657	0.642	0.768	0.645	0.493	0.634	0.724	0.768	0.884	0.697	0.728
SPU6	0.654	0.656	0.771	0.668	0.498	0.659	0.738	0.768	0.875	0.722	0.728
UI1	0.641	0.724	0.692	0.607	0.455	0.663	0.755	0.612	0.615	0.788	0.768
UI2	0.665	0.708	0.684	0.638	0.486	0.686	0.709	0.63	0.638	0.846	0.727
UI3	0.515	0.565	0.598	0.566	0.478	0.511	0.547	0.555	0.636	0.837	0.55
UI4	0.643	0.72	0.701	0.687	0.528	0.632	0.687	0.639	0.697	0.889	0.687
UI5	0.594	0.629	0.662	0.608	0.538	0.553	0.624	0.601	0.652	0.869	0.614
UI6	0.588	0.621	0.668	0.602	0.517	0.579	0.655	0.643	0.689	0.852	0.646
UI7	0.612	0.629	0.65	0.632	0.537	0.573	0.607	0.61	0.631	0.833	0.622
US1	0.688	0.753	0.748	0.637	0.481	0.692	0.795	0.651	0.661	0.711	0.872
US2	0.67	0.703	0.764	0.615	0.465	0.638	0.833	0.68	0.681	0.697	0.923
US3	0.709	0.742	0.783	0.669	0.499	0.701	0.822	0.665	0.671	0.715	0.935
US4	0.643	0.689	0.768	0.639	0.465	0.657	0.801	0.715	0.683	0.694	0.904
US5	0.658	0.735	0.766	0.634	0.463	0.65	0.802	0.682	0.653	0.724	0.926
US6	0.627	0.692	0.779	0.592	0.459	0.609	0.794	0.68	0.631	0.694	0.895
US7	0.638	0.685	0.785	0.613	0.471	0.602	0.795	0.709	0.708	0.706	0.891

APPENDIX B

Fornell-Larcker of Discriminant Validity

	AOC	D	E	I	IQ	N	PSQ	PUS	SPU	UI	US
AOC	0.851										
D	0.729	0.856									
E	0.71	0.759	0.861								
I	0.77	0.733	0.694	0.849							
IQ	0.658	0.575	0.557	0.619	0.836						
N	0.778	0.75	0.715	0.785	0.54	0.925					
PSQ	0.734	0.769	0.801	0.714	0.531	0.737	0.885				
PUS	0.649	0.698	0.833	0.639	0.501	0.66	0.711	0.903			
SPU	0.705	0.688	0.819	0.722	0.556	0.698	0.75	0.816	0.881		
UI	0.719	0.776	0.786	0.733	0.599	0.708	0.774	0.725	0.771	0.846	

APPENDIX C

The questionnaire

Please answer the following questions by choosing the correct information representing your demographic.
1. Your gender: (Male/Female)
2. Your age: (18 - 24 years/25 - 29 years/ More than 30)
3. Your University Name: (Taibah University/ Taif University/ King Faisal University/ University of Tabuk)
4. Years of experience using computer and internet: (less than 1 year/1 - 3 years/3 - 5 years/5 - 10 years/ More than 10 years)
5. Computer skills: (Low/Good/ Excellent)
6. Internet skills: (Low/Good/ Excellent)

B. For the following questions, please rate your perception with regard to your experience in using student portals. (Possible choices: Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
1. Information Quality (IQ): Refers to the system's output value, as perceived by the users
I believe that the easy to understand information on the student portal encourages me to use the portal.
I believe the student portal provides accurate information to me as a student.
I believe the information displayed on the student portal is useful to me as a student.
I believe the student portal provides information related to my study needs.
I believe the rich information available on the student portal attracts me to use the portal.
2. Availability of Content (AOC): Refers to the availability of portal content and services which provide to student in their portal.
I believe that if the availability of information content in the student portal meets my needs, it will encourage me to use the portal.
I believe that if online discussions were available in the student portal, that would help me increase my interaction with the portal.
The availability of online course catalogues in the student portal will help me in my study.
I believe that if the student portal provides complete information about the university and the various events, it will attract me to use it.
I believe having contact information such as phone number, fax number, e-mail, and postal address in the portal is helpful to me as a student.
I believe that giving feedback and facilitated question forms in the student portal will increase the interaction with the portal.
I believe that if a help facility was provided in the student portal, that will make the portal more usable.
I believe that if the student portal provides e-mail services to students will help me interact with the portal administration.
I believe that if the student portal contains an e-learning material service, will make my materials easy to access on the portal.
3. Interaction (I): Refers to the interaction between the students, instructors, and the portal services.
I believe that the interaction in the student portal enhances the effectiveness of my academic decisions as a student.
I believe that the interaction in the student portal enhances my productivity in my academic life as a student.
I believe that if the student portal makes online discussion tasks easy to use, will increase my interaction with it.
I believe the interaction allows me to share experiences with other students in the portal.
I believe the instructor can encourage students to increase their interaction with the student portal.
I believe interactive feedback between students and teachers in the student portal will encourage both of them to use it.
4. Navigation (N): Assesses whether a portal includes tools (i.e. navigation menu, internal search facility) and links which facilitate users' navigation.
I believe that if all links are working in my student portal, that will make it more interesting to use
I believe that if the internal search is effective in the student portal, that will help me in my study.
I believe that if the internal search is working in the student portal, that will help me to use it.
5. Design (D): Refers to the visual attractiveness of the portal design, the appropriate design of a portal pages and the appropriate use of images, fonts, colors in the portal design.
I believe that if the images in the student portal are interesting, that will increase my satisfaction of the portal
I believe that if there are consistent colors throughout the student portal, that will make the portal more attractive.
I believe that if the student portal menu design is consistent, that will make it more interesting to use.
I believe that if the content text is simple in the student portal, that will make the portal easier to use.
I believe that if the layout of the student portal is very simple, that will make the portal more attractive.
I believe that if the alignment of the header on each page is consistent in the student portal, that will make it more attractive.
I believe that if all pages have proper headings, that will make the portal more interesting to use.

I believe that if consistent language is used throughout the student portal, that will make the portal easier to use.
I believe that the design makes pleasurable for students to use the student portal services.
6. User Intention (UI): Refers to the behavioral of user intention to use the student portal services.
I believe that if the portal services are worthwhile for students, that will make me use the portal more.
If I get good services, I will use the student portal many times per week.
I plan to use the student portal very often in the future.
If the student portal is enjoyable, i intend to use it in the future.
I intend to use the student portal to conduct university related study tasks.
I predict i will use the student portal in the future.
If I get to use the student portal, i intend to use all of its services.
7. Portal Service Quality (PSQ): Refers to the users evaluation that the service they are receiving from the portal is the service they expect.
I believe the services offered in the student portal should be reliable.
I believe the services offered in the student portal save my time.
I believe the pages should respond fast when I use the portal services.
I believe the student portal should provide sufficient information to achieve my tasks.
I believe the student portal should be flexible to use.
I believe the services offered in the student portal should be comprehensive for all student needs.
I believe the student portal should provide up-to-date information.
8. User Satisfaction (US): Refers to student satisfaction about the provided services.
If the quality of information provided through the student portal is good, i will feel satisfied.
If the quality of the student portal system is good, i will feel satisfied.
If the services offered in the student portal meet my needs, that will increase my satisfaction with the portal.
I believe that if the student portal is enjoyable, it will make me satisfied.
If the services offered by the student portal are suited to my needs, that will make me satisfied.
I believe the services offered by the student portal should be easy to use.
I believe that if the process of using the student portal is pleasant, that will make me satisfied.
9. Efficiency (E): Mean users have the ability to organize and perform the actions on the portal in order to achieve their tasks.
I have the ability to download programs and use student portal services.
I believe the student portal services should be easy to use.
I believe that if the information in the student portal is interesting to me, it should be obtained with minimal effort.
I believe that if i find that anyone can use the student portal easily, that will encourage me to use the portal.
I believe that if I can easily navigate the student portal, that will help me to find what i need easily.
I believe the student portal serves its purpose by producing good services.
10 Portal User Support (PUS): The degree to which the usersupport departments are willing to serve the users and provide them with the required services.
I believe the portal loads its pages quickly if user support provides high internet speed.
I believe the user support will help users by providing training in the use of the student portal.
I believe the user support will help users by providing quick responses to their service requests.
I believe the user support will help users by providing correct information.
I believe the user support will help users by providing different browsers where portal pages work.
I believe the user support will help users by providing a help desk.
I believe the user support will help users by providing feedback forms.
I believe the user support will help users by providing orientation in the use of students.
11. Student Portal (SP): Student portal provides services which matche the study needs from different resources in a single page.
I believe using the student portal will provide me with information that would lead me to produce better research.
I believe using the student portal will make it easier for me to do my assignments and prepare for examinations.
I believe using the student portal will give me access to information that I cannot find elsewhere.
I believe using the student portal will provide me with information that would lead me to produce better research.

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