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SMUPI-BIS: a synthesis model for users' perceived impact of business intelligence systems

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ABSTRACT

Business intelligence is a collection of methodologies, methods, architectures, and technologies that convert raw data into significant and useful information used by organizations to enable more effective strategic, tactical, and operational insights and decision-making. In spite of several studies have examined the critical success factors and development of business intelligence system, but few relevant studies have investigated perceptions of end-user's business intelligence systems. Furthermore, none of those studies was performed in a higher education sector in Iraq. Consequently, the study aims to determine the business intelligence system features influencing perceived impact end users' and of using business intelligence systems in Iraqi educational institutes. A technology acceptance model and technology organization environment framework were syntheses as a basis to develop a research model for business intelligence users' perceived impact and adopt of business intelligence systems named (SMUPI-BIS). Later, an online instrument (questionnaire) was designed to gather data from the business intelligence system users in five Iraqi universities. Twenty-one hypotheses were proposed and later tested. The main outcomes of this study suggest that decision support, information quality, and real-time reporting are the most significant system characteristics influencing end users' perceived impact and their usage of business intelligence systems.

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1. INTRODUCTION

More than two decades ago, business intelligence was introduced, it has become an important option to be taken by decision-makers for making meaningful decisions. Nowadays, almost all organizations have their business intelligence systems [1-3]. The major business aim behind business intelligence is the passion to enhance the decision-making process [4] since business intelligence helps top management to analyze the data to predict the future as well as identify difficulties and opportunities faster and perhaps extend the scope of their interpretation [5]. The core aim of business intelligence systems (BIS) is to focus on supporting an organization's strategic, operational, and tactical decisions by providing decision-makers a comprehensive, accurate, and vivid copy of data. Nowadays, organizations are generating increasingly massive amounts of data due to regulatory requirements, business needs, and new technologies [6, 7]. Data integration

techniques, be it in a physical manner like data warehouse (DW) or virtual manner like data virtualization (DV), is the backbone for business intelligence systems [8]. Data integration in BIS is periodically replicated from heterogeneous and homogenous data sources. These source data are integrated, transformed, and load it into the multi-dimension view of data and read-only data to present it differently for reporting and analytical services.

Besides, researchers in this field have investigated numerous issues related to BIS, including applications, achievement, control, development and BIS success factors, and BIS employment [9]. As far as reviewing relevant literature in this area, the authors found only a few studies that investigated the factors influencing user satisfaction in adopting BIS [2, 3, 10] and none of those studies have examined the adoption and perceived impact of using BIS, especially among the Iraqi educational organizations. The output delivered by BIS is user-driven; that is, users are authorized to be in use of the data and will have the responsibility of interpreting and analyze and find the meaningful information they required. Unfortunately, BIS's users might find this process is dissatisfaction and difficult.

In line with that, the proposed research model adopts three of the technology acceptance model variables (perceived usefulness, the perceived ease of use, and attitude toward using) as the core variables drivers of technology adoption [11, 12]. Additionally, the essential features of BIS and the perceived impact included in the proposed research model are based on the technology organization environment framework [13], as well as the findings of many current empirical studies on business intelligence systems. Measurement of BIS success is considered a significant issue; however, there is a lack of research on the topic. As far as the measurement of BIS success is concerned, two core research questions arise:

a) What are the factors of BIS success that can be measured?
b) How can those factors be synthesis and measured?

The rest of the paper has systematized as follows. Section 2 offers a review of the literature on the technology acceptance model and technology-organization-environment framework as well as business intelligence success. Section 3 describes the proposed model and hypotheses. Section 4 describes the methodology used. Followed by discussion and conclusion spread over Sections 5 and 6 respectively.

2. LITERATURE REVIEW

This section describes the current literature and relevant theories regards to this study, such as the technology acceptance model, technology-organization-environment as well as business intelligence system success factors.

2.1. Technology acceptance model

In an attempt to fully understand and measure user acceptance and measure adopt of the information systems, Davis 1989 developed the technology acceptance model (TAM) [11, 12, 14]. The main suggestion of TAM is "behavioral intention to adopt a new technology or new system can be determined by three assumptions: the perceived usefulness (PU) of using the system, (2) the perceived ease of use (PEU) of the system, and (3) attitude toward (ATT) using such system [11, 12]. The influences of external factors on intention to use the system are mediated by these assumptions. Through reviewing the literature, it became clear that the TAM model was fully extended and expanded by researchers, indicating that it is a theoretical model and cannot be applied in practice except by expanding it and adding the appropriate external variables and according to the nature of the technology required to measure its acceptance. On the other hand, it robust model of measuring technology acceptance behaviors [15]. Figure 1 visualizes the original TAM model.

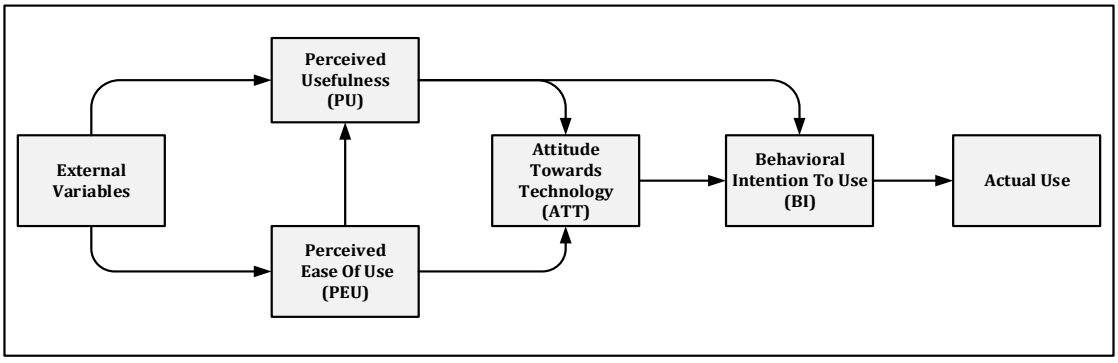

Figure 1. Original TAM model

An extension on TAM introduced by [15], named TAM2 which included social influence processes (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance, output quality, and result demonstrability). Another motivating reason for doing this study is only a few studies based on TAM looked explicitly at the role of system characteristics in terms of PU or PEU or ATT. For Business Intelligence, up-to-date information and decision support, as well as system usability, were significant constructs leading to users' satisfaction with the system and with the information provided which in turn increased PU, ATT, and PEU. Several researchers have confirmed that service quality is added to the TAM model.

2.2. Technology organization environment framework

The technology-organization-environment (TOE) framework was designed by [13], based on the information influence theory [16]. It represents determinants that affect technology selecting and its probabilities. TOE highlights the process by which an organization adopts and implements technological innovations is influenced by the technological context, the organizational context, and the environmental context [17]. In the same aspect, many researchers in the field of information systems (IS) in regards to investigating the adoption of new technologies such as e-banking, e-commerce, e-business, and e-learning. Figure 2 visualizes the TOE Framework.

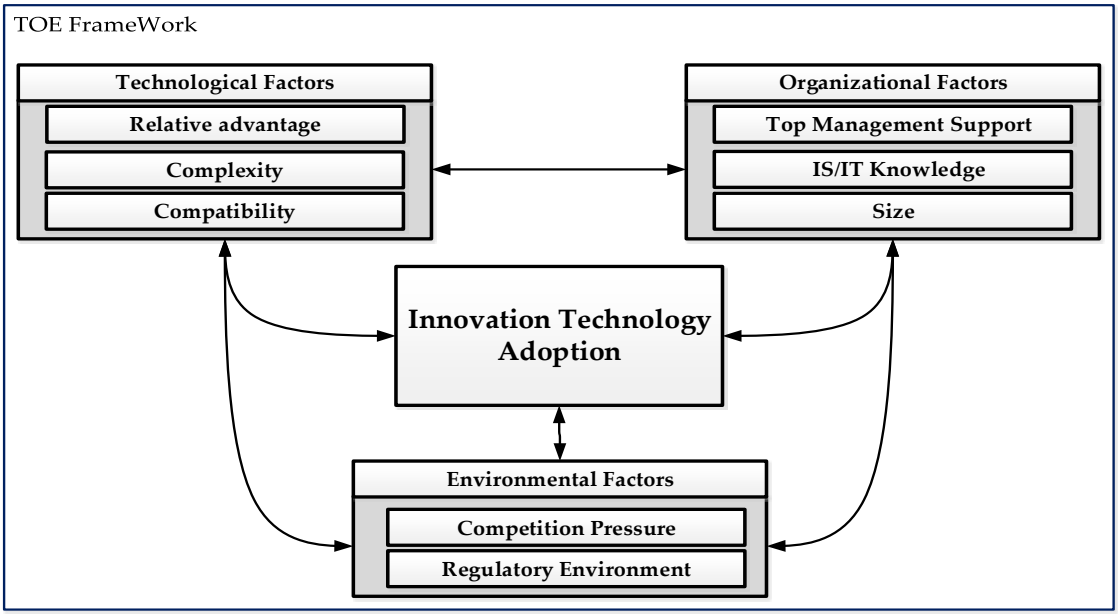

Figure 2. The original version of the TOE framework

Information quality and organizational factors influence user satisfaction with technology and as a result influence expectations about using it [18, 19]. In the context of this study, the organizational factor of the TOE framework is adopted which composed of three constructs (i) Size, (ii) IS/IT Knowledge, and (iii) Top Management Support; while the other factors were intentionally neglected due to being out of the research scope.

2.3. Business intelligence success

Throughout the last two decades, business intelligence systems (BIS) became one of the most significant advancements in the information systems field. BIS is the mechanism to provide insights for most of the operations and performance of organizations, in addition to identifying strategic business opportunities [20, 21]. In investigating these projects, many factors were an influence on the design and implementation of BIS success such as including management and development technology. The BIS development success means that the software developers have convinced the stockholders to accept BIS, completed the software according to planned requirements, and ovoid the technical restrictions that occurred. In the meantime, the development success, in turn, influences the software success, defined as the degree of quality of the BISs and their outcomes [22].

Users of the BIS are from virtually every business sector. A study result found that education, trade, finance, and production and operations sectors were the heaviest users of BIS [22-24]. Unfortunately, there is only a few research on BIS users' satisfaction, and only little systematic research has been undertaken to measure adopting and usage BIS success in organizations. For BIS users, their satisfaction with the systems is based on the facilitating and support provided by those systems for end-users, the fulfillment of end-user needs, and the preciseness of the presentation layer of BIS [6, 25, 26]. Along with a thorough understanding of BIS, it was found that users' satisfaction with BIS is undoubtedly influencing by system quality factors. To sum it up, none of the previous investigations of studies on BIS have focused on the usage and perceived impact of using BIS.

3. THE PROPOSED RESEARCH MODEL (SMUPI-BIS)

The synthesis research model for usage and users' perceived impact of using BIS, as shown in Figure 3. Which is developed from the relevant studies on the TAM model [11, 12], and TOE framework [13] as well as the factors affecting BIS success [23, 25, 27]. Along with the thorough understanding of the proposed model composed of two types of variables; dependent and independent variables collected from TAM and TOE with considered to the relationship among those variables. In the next sections, a brief discussion of the proposed model variables and their relationships was outlined included in the proposed research model.

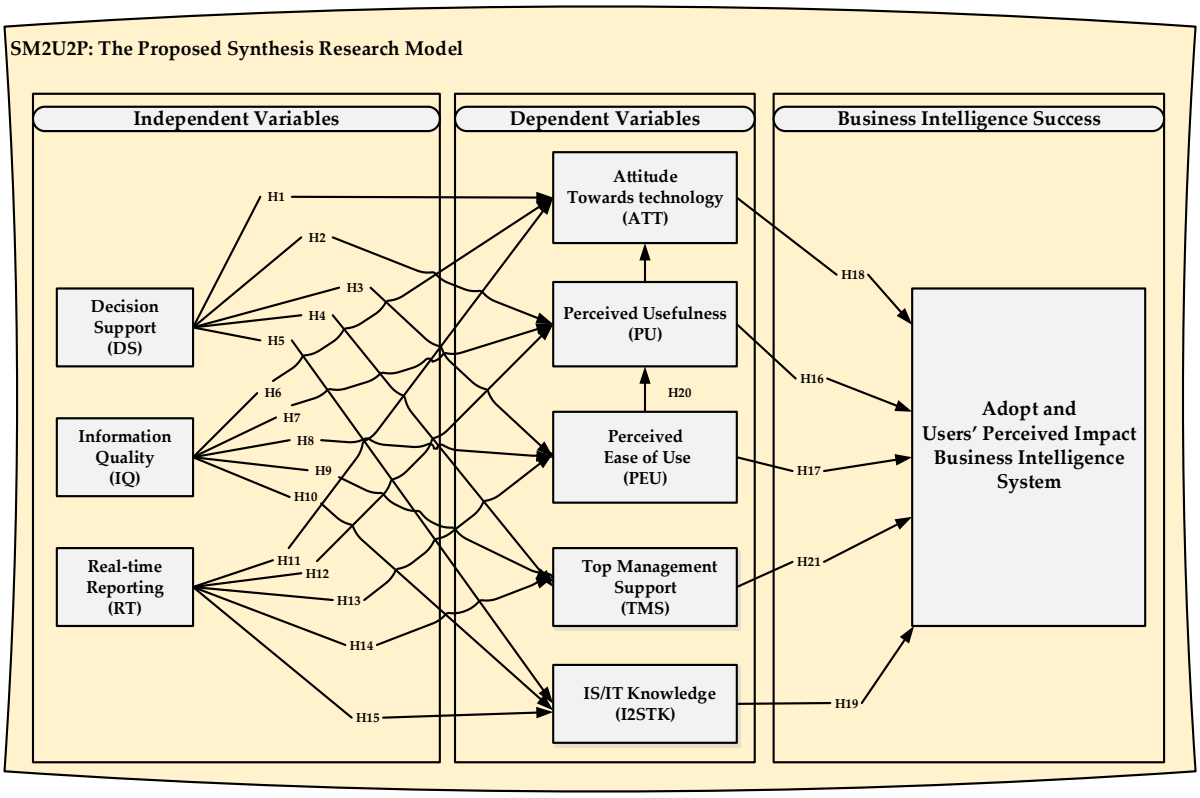

Figure 3. The proposed synthesis research model (SMUPI-BIS)

3.1. The independent variables

As discussed earlier, this study sought to determine the main BIS success factors facing the adoption and Perceived Impact of BIS in the Higher education sector in Iraq to propose a complete synthesis model for Measuring Adopting and Users' Perceived Impact of BIS in Iraq. Based on the proposed syntheses model the following independent variables were identified:

a) Decision support (DS)
b) Information quality (IQ)
c) Real-time reporting (RT)

3.1.1. Information quality (IQ)

The proposed synthesis model comprises three independent variables: decision support (DS), information quality (IQ), and real-time reporting (RT). As mentioned above information quality is one of the elements of adopt a technology success; meaningful information is the backbone of BIS [28]. Therefore, the quality of the information can be considered an important part of BIS success to measure user satisfaction with BIS. In the context of this study, information quality (IQ) can be measured by information cleaning, information cleansing, information relevancy, and information understanding [28, 29].

3.1.2. Decision support (IS)

BIS assists in strategic, tactical, and operational decision making. A Gartner survey ranked the strategic use of BI in the following order [26, 30]: it plays an important role in corporate performance management, assists in enhancing customer relations, monitoring business activity, and traditional decision support, bring together relevant standalone BI applications for specific operations or strategies as well as providing reporting of business intelligence [2, 25, 28, 30]. On the same aspect, business intelligence is a natural outgrowth of a series of previous systems designed to support decision making. Therefore, one of the core factors of BIS success is to measuring the capability of BIS to support the decision. Previous studies have confirmed that top management satisfaction and end-users' satisfaction with BIS is based on to what extend BIS can provide to help them to be making decisions [2, 3, 25, 27, 28, 30-32]. In line with that, the authors have confirmed that the DS is an important factor in business intelligence success.

3.1.3. Real-time reporting (RT)

Nowadays most organizations trend to analyze the past to predict the future by capture all sorts of relevant data and store them and later use them as input for BIS. For any organization, operational performance management involves real-time analysis and reporting about performance indicators, thus. BIS end-users' should be satisfied with BIS's real-time reporting service [33, 34]. The Interpretation of the term real-time is a relative interpretation according to the nature of the institution [6]. However, real-time data delivery, on the whole, is still in progress and has not reached its climax, leading to a gap; however, BIS tries to address and filling this gap [22, 33, 34]. In line with that, the factor of real-time reporting is considering as a measure of BIS success.

3.2. The dependent variables

As mentioned above, this study is based on the TAM model and TOE framework; several studies like [7, 15] confirmed that the TAM model has powerful predictive and makes it has been adopted in apply to various situations. In the context of this study, the proposed synthesis research model composed of five dependent variables: perceived usefulness (PU), perceived ease of use (PEU), system usage, and perceived individual impact. Based on the TAM, PU and PEU are important drivers of system usage. In this study, PU is the extent to which a person believes that BIS will enhance end-users work performance and PEU is the degree of minimal effort that requires using BIS.

3.2.1. Perceived ease of use (PEU)

According to [11, 12] PEU is “measured the degree an effort in using a particular system prefer to be a free effort”. In line with this, PEU is a variable associated with a user's assessment in using a system in terms of effort required [11, 12]. Any technology is based on skills, hence, Users prefer the user-friendly interface of systems in achieving the same performance.

3.2.2. Perceived usefulness (PU)

Perceived usefulness is defined here as “measured the degree whether using the specific system improves the performance of the work for users” [11, 12]. On the same aspect, PU is the expectation of the users whether the system used will improve their working capabilities [11, 12].

3.2.3. Attitude towards technology (ATT)

Both PU and PEU have positively influenced the attitudes toward a particular system as well as affects users’ intentions in acceptance of it.

3.2.4. Top management support and IS/IT knowledge

Information systems (IS) is a comprehensive term for the systems, people, and processes developed to produce, manage, and propagate information. While Information technology (IT) is a subset of IS however works with the technology involved in the systems themselves. In [35], have discussed the influences of a variety of organizational factors such as the role of IS/IT professionalism among users and top management’s

support behavior. Those factors are the most frequently discussed factors with the organizational context that influence technology adoption.

3.3. Hypotheses development

Having detailed the stages in the research methodology, the proposed synthesis model's variables that were considered in this study are adopted from several studies such as [2, 23, 28, 36, 37], A list of refined hypotheses was developed as shown in Figure 3. Some of these hypotheses have been tested in previous studies; while the rest hypotheses have been tested in the context of this study. These formulated hypotheses support the richness of the findings, besides the descriptive analyses.

H1, H2, H3, H4, and H5: DS have a positive impact on ATT, PU, PEU, TMS, and IS/IT Knowledge respectively.

H6, H7, H8, H9, and H10: IQ has a positive impact on ATT, PU, PEU, TMS, and IS/IT Knowledge respectively.

H11, H12, H13, H14, and H15: RT has a positive impact on ATT, PU, PEU, TMS, and IS/IT Knowledge respectively.

H16: ATT has a positive impact on adopting and users' perception of BIS.

H17: PU has a positive impact on adopting and users' perception of BIS.

H18: PEU has a positive impact on adopting and users' perception of BIS.

H19: IS/IT knowledge has a positive impact on adopting and users' perception of BIS.

H20: PEU has a positive impact on PU.

H21: TMS has a positive impact on adopting and users' perception of BIS.

4. RESEARCH METHODOLOGY

4.1. Sampling

In the context of this study, a quantitative study design approach was adopted in which data was collected from participants pursuing both face-to-face (F2F) and online instrument (questionnaires); which were submitted to a total of 150 participants spread over top management and second level administrators for seven universities. Besides, both descriptive and inferential statistics were used to analyze the data.

4.2. Instrument development and sample selection

According to [38], the data collection step considering the most significant due to it collects basic and fresh data that can use to increase comprehension and measuring of a phenomenon. Meaningful information can be elicited upon analysis of the respondent's feedback. Therefore, to measure all the proposed SMUPI-BIS model variables, an online instrument (questionnaire) was sophisticated. This instrument was validated and pilot-tested by the administration staff and faculty staff. The 40-elements spread over eight dimensions was translated into the Arabian language. Subsequently, an email invitation was sent to selected management staff belong to five public universities in the Iraqi higher education sector to engage in this research as a sample selection. A reliability test was conducted to validate the internal consistency of these elements and to show that they duly measured the intended phenomenon. Meanwhile, the Arabic version of the developed instrument was revised based on a re-test and a discussion among twenty-one lecturers from six public universities that accepted to be part of this investigation. Forty elements in the questionnaire were framed using a seven-point Likert scale ranging from strongly disagree (1) to neither disagree nor agree (4) to strongly agree (7). The selecting sample size is 127 participants, this number is suitable for the context of this study as supported and aligned with many researchers such as [39-41]. The model variables, their relevant item, and their supporting references for the developed instrument are illustrated in Table 1.

Table 1. The developed instrument components for SMUPI-BIS

	SMUPI-BIS Model's Variables	The Model's Items	Confirmed References
1	The Independent Variables		
1.1	Information Quality (IQ)	IQ-Item 1…IQ-Item 5	[28, 29]
1.2	Decision Support (DS)	IS-Item 6…IS-Item 10	[27, 30, 31]
1.3	Real-time Reporting (RT)	RT-Item 11…RT-Item 15	[22, 33, 34]
2	The Dependent Variables		
2.1	Perceived Ease of Use (PEU)	PEU-Item 16…BEU-Item 20	[11, 12, 15]
2.2	Perceived Usefulness (PU)	PU-Item 21…BEU-Item 25	[11, 12, 15]
2.3	Attitude Towards Technology (ATT)	ATT-Item 26…ATT-Item 30	[42]
2.4	Top Management Support (TMS)	TMS-Item 31…TMS-Item 35	[43]
2.5	IS/IT Knowledge (I2STK)	I2STK-Item 36… I2STK Item 40	[13]

4.3. Data analysis

Two core stages were followed for data analysis, the first stage is to check the data in terms of eliminating unusable and outliers' data. The process of checking data have done via SPSS v25 statistic software. While the next stage was followed the methodology done by [39] and adopted by many researchers such as [39, 40]. For the validity of the SMUPI-BIS model, the fitness and the construct validity of the proposed model were examined. The process included evaluating reliability, convergent validity, and discriminant validity. To understand test the strength and the relationship between the SMUPI-BIS model variables the structural model was scrutinized using structural equation modeling (SEM) and IBM SPSS software v25. To test the initial estimates of the commonality for all dependent variables, squared multiple correlations (R2) in the proposed model as well as the path coefficients (β) were calculated.

4.3.1. Measuring validity and reliability

The content validity process was performed via an online interview with five BIS experts, besides, instrument tested via piloted with the selected sample. The collected feedback from the experts was used to modify the developed instrument to obtain the final draft. For measuring the reliability, Cronbach's Alphas (α) test was performed. Besides, to ensure to what extent the significance of the developed instrument's items, factor analysis was conducted as supported by [44-47]. Consequently, the Running of factor analysis test was guided for accepting each element developed instrument based on applied Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity and factor loading. The obtained findings indicate that the reliability level is more than 0.60 for each of the items. The reliability and validity findings visualize in Table 2 and Table 3 respectively.

Table 2 indicates the high level of reliability of the developed instrument due to the value of α each construct is more than 0.700. Furthermore, Ƥ indicates satisfaction due to each value of Ƥ≤0:05). Accordingly, this strong indication confirms that the collected data are suitable for the factor loading analysis test. Furthermore, in attempting to understand the selected sample, the mean and standard deviation were calculated. To ensure accuracy and consistency, the test of reliability was performed. The core tests conducted are the composite reliability (α) and the variance extracted measure (ρ). The aggregated findings are expressed in Table 3.

Table 2. The reliability and validity findings

Model's Variables	Cronbach's Alpha Value (*α*)	Bartlett's Test (*Ƥ*)	Kaiser-Meyer-Olkin (*KMO*)
SMUPI-BIS-IQ	0.880	0.001	0.720
SMUPI-BIS-DS	0.770	0.000	0.750
SMUPI-BIS-RT	0.870	0.002	0.740
SMUPI-BIS-PU	0.790	0.001	0.700
SMUPI-BIS-PEU	0.850	0.000	0.770
SMUPI-BIS-ATT	0.750	0.003	0.780
SMUPI-BIS -TMS	0.760	0.001	0.750
SMUPI-BIS-I2STK	0.870	0.000	0.690

Table 3. The aggregated findings

Model's Variables	SMUPI-BIS Items	Mean	Factor Loading	α/ρ	STD
SMUPI-BIS-IQ (5-Items)	Item 1 …Item 5	6.375	0.634	0.88 / 0.85	1.340
SMUPI-BIS-DS (5-Items)	Item 6 …Item 10	6.740	0.743	0.89 / 0.65	1.456
SMUPI-BIS-RT (5-Items)	Item 11 …Item 15	6.371	0.532	0.78 / 0.68	1.431
SMUPI-BIS-PU (5-Items)	Item 16 …Item 20	6.472	0.631	0.87 / 0.78	1.532
SMUPI-BIS-PU (5-Items)	Item 21 …Item 25	6.360	0.624	0.86 / 0.75	1.305
SMUPI-BIS-ATT (5-Items)	Item 26 …Item 30	6.580	0.656	0.84 / 0.86	1.306
SMUPI-BIS -TMS (5-Items)	Item 31 …Item 35	6.781	0.556	0.89 / 0.66	1.441
SMUPI-BIS-I2STK (5-Items)	Item 36 …Item 40	6.585	0.610	0.84 / 0.77	1.441

As can be indicated in Table 5, all developed instrument elements are valid and can be adapted to represent relevant SMUPI-BIS model's variables. As mentioned above, the value which resulted from a factor loading test is greater than or equal 0.50; this confirms that factor loading has significant and well-defined. the structural model was employed for all model hypotheses tests. Furthermore, a new classification for the selected sample was performed, next, an ANOVA test was conducted to interpret whether the grouped sample is significantly different and their influence on adopting BIS in their organizations. The sample classification was performed based on to extent they have experience with BIS. Next, the p-value, the mean, and STD- deviation (σ) was calculated. The findings are visualized in Table 4.

As can be indicated from Table 6, there is no influence among respondents' experience and their usage and adopt BIS. The p-value of 0.9010 is greater than the pretest level of significance (p=0:814>0.05). Moreover, to test the validity of SMUPI-BIS variables, a comparison among the square root of the average variance extracted (AVE) for the model variables with its corresponding correlation values was conducted as suggested by [48]. as indicated in Table 5, the diagonal values indicate the square roots of AVE which are higher compared to the values is based on their corresponding rows and columns which reflect the satisfactory level of discriminant validity.

Table 4. One-way ANOVA

Experience with BIS	No. of BIS respondents	Mean	STD-Deviation (σ)
Less than 2 Years	20	6.0871	0.7721
2- 4 Years	51	6.1790	0.6922
More than 4 Years	56	6.0891	0.7111
Total	127	6.1184	0.7251
	p-value		0.8010

Note: STD=Standard Deviation

Table 5. Overall validity for SMUPI-BIS

SMUPI-BIS Variables	IQ	DS	RT	PU	PEU	ATT	TMS	I2STK
SMUPI-BIS-IQ	**0.832**							
SMUPI-BIS-DS	0.481	**0.864**						
SMUPI-BIS-RT	0.345	0.322	**0.812**					
SMUPI-BIS-PU	0.442	0.441	0.442	**0.872**				
SMUPI-BIS-PEU	0.284	0.428	0.335	0.285	**0.819**			
SMUPI-BIS-ATT	0.311	0.421	0.527	0.354	0.342	**0.809**		
SMUPI-BIS -TMS	0.423	0.289	0.526	0.321	0.422	0.289	**0.831**	
SMUPI-BIS-I2STK	0.485	0.342	0.284	0.412	0.331	0.391	0.367	**0.861**

To test the initial estimates of the commonality for all dependent variables, squared multiple correlations (R2) in the proposed model, as well as the path coefficients (β), were calculated. The R2 refers to the percentage of a variable's variance in the proposed model while β the degree of strength of a relationship between variables [49]. The assessment result found a total of 21 research hypotheses, all hypotheses were supported as shown in Table 5.

5. SMUPI-BIS HYPOTHESIS TESTING

Table 6 shows the significant structural relationships and standardized path coefficients among the SMUPI-BIS independent variables. As for the rest of the hypotheses (H 16…H21), they were previously examined in current and previous studies such as [7, 11, 12, 15, 50], which is considering the original conceptualization of external variables and sober studies, and they were adopted in this study. In the context of this study, the authors used discriminant analysis to identify the dependent variables among the sample. Thus, the value of Wilk's lambda was calculated (0.706) as shown in Table 5. The findings show there are no significant among those groups whether they have differences in their period of experience of adopting BIS.

Table 6. Overall result

SMUPI-BIS Hypothesis			Path Coefficient	t-Value	Overall Result
DS	⇢	ATT	0.421	0.450	Supported
DS	⇢	PU	0.441	0.321	Supported
DS	⇢	PEU	0.428	0.412	Supported
DS	⇢	TMS	0.289	0.376	Supported
DS	⇢	I2STK	0.342	0.432	Supported
IQ	⇢	ATT	0.311	0.398	Supported
IQ	⇢	PU	0.442	0.410	Supported
IQ	⇢	PEU	0.284	0.389	Supported
IQ	⇢	TMS	0.423	0.330	Supported
IQ	⇢	I2STK	0.485	0.398	Supported
RT	⇢	ATT	0.527	0.362	Supported
RT	⇢	PU	0.442	0.425	Supported
RT	⇢	PEU	0.335	0.489	Supported
RT	⇢	TMS	0.526	0.419	Supported
RT	⇢	I2STK	0.284	0.459	Supported

6. DISCUSSION

The core aim of this study the factors impacting adopting BIS in the context of the higher education sector. Therefore, the synthesis model is based on a well-known model, named TAM as well as a well-known framework, named and TOE in which the adoption of BIS. Moreover, the obtained findings of this research delivered a preliminary test of the proposed model validity in terms of adopting and usage BIS. Besides, the obtained findings are harmonious with the proposed theoretical foundation. In-line with this, the influences of the proposed variables of BIS on behavioral beliefs are confirmed by powerful significant relationships among IQ, DS, RT from aside, and PU, and PEU on the other side. Besides, the obtained findings show the integrative mechanisms that synthesize theories from stakeholder satisfaction and the acceptance of new technology acceptance in a single synthesis model.

The obtained findings exhibited that both the research questions were successfully answered through the proposed synthesis model and the hypothesis tests that have been evaluated by users' experience and experts. Three independent variables named (IQ, DS, and RT) as the core factors of BIS success, were proposed and successfully tested, hence, the first research question of this study was answered. In answering the second research question of this study, the SMUPI-BIS was proposed based on a well-known model, named TAM as well as a well-known framework, named and TOE as shown in Figure 3. The main motive stood behind this study test was to determine whether SMUPI-BIS encourages top management to adopt and use BIS. To confirm that this motivate was fulfilling, several hypotheses were elicited. It was found that all hypothesis was proved that efficient the SMUPI-BIS proposed to adopt and utilizing BIS. Moreover, with the statistical evidence in the hypotheses, this study argues that SMUPI-BIS is effective, efficient, and helpful in measuring, adopt, and usage BIS success.

7. IMPLICATIONS OF THE SMUPI-BIS PROPOSED MODEL

There are two Implications types of this study which are: (i) implications of SMUPI-BIS in practice and (ii) implications of SMUPI-BIS in research, as highlighted in the next sub-sections.

7.1. Implications of SMUPI-BIS in practice

The main advantage of this study lies in how top management in any organization can measure the success of BIS, adopt, and use it in their organizations. Moreover, the authors conclude that the proposed SMUPI-BIS model has a value at any stage of a BIS development and/or usage process.

7.2. Implications of SMUPI-BIS in research

This study provides two implications for research. This study visualizes the significance that researchers to guide them to understand essential theoretical relationships when conducting empirical research in the context of this area. Moreover, it also determines opportunities for researchers in this area to extend the proposed model based on TAM and TOE.

8. LIMITATIONS AND FUTURE ORIENTATION

Two limitations to this study. First, the authors performed the research model and its hypotheses based on the TAM model and TOE framework to measure the associated constructs linked with the usage and adoption of BIS. For future orientation, usage and adoption of BIS can be measured by other theoretical perspectives and/or extending the proposed model by adding more relevant dimensions. Second, the selected sample is restricted to the higher education sector. To obtain similar achieving findings there are two ways: (i) select samples from different sectors separately and compare the collected results. (ii) Take a random selection for samples from different sectors to obtain the generalization of the proposed model.

9. CONCLUSION

In this research, three factors impact BIS usage and adoption were investigated in the higher education sector. Three independent variables (DS, IQ, and RT) were proposed; later used to develop the proposed model. A synthesis model based on a well-known TAM model associated with a well-known TOE framework was proposed and tested. Two research questions were arisen and answered. Hence, the outlined achieved contributions are: (1) delivering the synthesis model based on TAM and TOE. Findings indicate that DS, IQ, and RT are positively influencing the adoption and usage of BIS in higher education institutes. The authors believe that the proposed synthesis model affords a significant footprint toward providing conceptual clarity to IS research. Despite this, it is a drop in the ocean.

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