

User Acceptance of a Novelty Idea Bank System to Reinforce ICT Innovations: Sri Lankan University-Industry perspective

Chaminda Wijesinghe^{#1}, Henrik Hansson², Love Ekenberg³

Abstract— Information and communications technology (ICT) represents an enormous opportunity to introduce significant and lasting positive changes across the developing world. Several attributes determine behavioural intention to adopt the technology. Some elements will stimulate end users' intention to use the technology, while others are detrimental. This study is designed to measure the relationship between various factors on individuals' perceptions of adopting an ICT-based instrument to stimulate ICT innovations. A model was developed by combining the technology acceptance model and the diffusion of innovation theory. A survey questionnaire was distributed among students and teachers in higher education and industry professionals working with university collaborations. A sample of 202 responses was analysed using structural equation modelling. A good insight into user acceptance and the adoption of a systematic model to reinforce ICT innovations are provided in this study with the derived results. Theoretical and practical implications for the factors influencing the acceptance of the system are discussed.

Keywords— Collaboration; Diffusion of Innovation; ICT-Innovation; Structural Equation Model, Technology Acceptance; Knowledge Management.

I. INTRODUCTION

This study is designed to measure individuals' perceptions of adopting an instrument to stimulate ICT innovations through university-industry collaborations. This instrument is intended to be a tool between the university and industry to disseminate knowledge and ideas for innovation. Knowledge and innovation are considered crucial sources for sustaining the competitive advantage of organisations [1].

Knowledge generates value by supporting an organisation's capability to produce innovation [2][3][4] learn and transfer best practices across boundaries [5][6]. Successful companies consistently create new knowledge, disseminate it widely throughout the organisation, and quickly embody it in new technologies and products [7]. Knowledge management implementations require a wide range of quite diverse tools that come into play throughout the knowledge management cycle. Gressgård et al. [8] claim that using ICT-based tools to promote external knowledge flow into the organisation may help realise their innovation potential. Many ICT-based tools

have gained popularity as instruments for disseminating knowledge for innovation [9]. Organisational knowledge and ICT refer to a distinct set of constructs, and several variables need to be considered when assessing the relationship between ICT and knowledge management. The technology primarily facilitates communication, collaboration, and content management for better knowledge capture, sharing, diffusion, and application [10].

Diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" [11]. It is a particular type of communication in which messages are concerned with new ideas. The nature of diffusion demands at least some sort of heterophily between the two parties. Ideally, it can be in education, social status, and the like. The ICT tool is the communication channel in the present study, enabling the exchange of messages between two groups or units [11]. Universities and industries can benefit from adapting proper channels and tools for their collaboration [12]. Students engaging in research can be widely accepted by the industry and impact society. A need has been created for a systematic collaborative platform where industry professionals and academics can engage and share expert knowledge. In contrast, academic supervisors can empower and guide students in theoretical aspects and future directions. Innovation consists of an interactive process where diverse expertise are combined through communication amongst and across organisational borders [13].

Further, firms can absorb ideas from suppliers, users, and knowledge institutions, as this innovation process demands interaction with many disparate actors. Adequate support mechanisms can further accelerate such interactions. It is evident that there are substantial barriers regarding UIC and the motivation to interact systematically, and a significant obstacle is the lack of interconnections of this nature.

A. The Idea Bank System

The Global Idea Bank (GIB) [14] is a platform designed to support these interconnection activities. More precisely, GIB is a web platform where individuals can submit, exchange, discuss, and fine-tune fresh ideas to produce new innovations. Organisations may use the idea bank to collect users' feedback and enhance their ideation process. When paired with a unique innovation strategy and methodology, the idea bank creates a holistic innovation solution that allows organisations to collectively generate and elaborate ideas. To determine the worth of an idea, the idea bank uses a voting mechanism. The idea bank's underlying premise is that if a large group of individuals collaborate on a project or develop an idea, that project or idea would ultimately improve the performance of those who worked on it [15]. Figure 1 illustrates the GIB concept.

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Fig. 1 Global Idea Bank concept.

GIB mainly addresses collaboration barriers between universities, governments, companies, and societies to acquire and implement valuable ideas exerted through problems. The authors propose the idea bank as an IT platform that is much about ideals as it is about ideas. This fact fuels innovation since the essence of innovation is about changing the world according to a particular vision or ideal [7]. Because of the originality of the notion toward proliferating ICT innovations, the idea bank system itself may be regarded as an ICT innovation.

The early phase of innovation is frequently referred to as "fuzzy" [15] because it works best when a collaborative system fosters confusion, disruption, and the fortuitous discovery of ideas. An essential feature of GIB is to be a backbone to develop an organisation's innovation culture supporting the fuzzy front end of innovation. Every individual must create an account and log into the system. Individuals may use the platform to submit items of interest to other users, search for information, comment on information, and find specialists in the organisation when needed, resulting in everyone being well informed. The platform functions as a knowledge management system in this way. It allows users to submit ideas and keeps track of these ideas by enabling others to remark on them, moulding them further, grouping them with similar ideas, and accepting some type of vote mechanism to determine their merit. When ideas in the system receive the most votes, comments, votes on comments, views, "follows," "alerts," bookmarks, and related ideas uploaded, they are automatically promoted. All ideas can be clustered depending on how they match the United Nations' Sustainable Development Goals. If an idea does not match any of these seventeen goals, a new group can be created, or it can be added to the "other" category. Students who create an idea in the system and expect financial assistance can specifically mention the requirement. Other collaborating partners can then support the idea's commercialisation.

GIB will thus be a potential solution for disseminating knowledge across different social systems and, more importantly, among students to obtain potential opportunities for innovation. However, it is essential to evaluate how users accept such systems, as there is no prior use, especially in universities and industries.

B. Problem Description

Universities and industries can benefit from adapting proper channels and tools for their collaboration [12]. Students engaging in research can be widely accepted by the industry and impact society. A need has been created for a systematic collaborative platform where industry professionals and academics can engage and share expert knowledge.

Further, firms can absorb ideas from suppliers, users, and knowledge institutions, as this innovation process demands interaction with many disparate actors. Adequate support mechanisms can further accelerate such interactions. Universities and industries are ideal for sharing knowledge, best practices, and ideas for innovation. However, it is evident that there are substantial barriers to university-industry collaboration (UIC) and the motivation to interact systematically, and a significant obstacle is the lack of interconnections of this nature. The above-explained Idea Bank is a platform intended to solve interconnectivity partly. However, understanding the acceptance of the idea bank system as a tool for stimulating innovation under the purview of UIC is an essential factor. The system is intended to be used by a mixed group of participants. Most users will be young undergraduates, and their desires may differ from industry professionals. There may be deviations from the system's functional expectations between academics and industry users. Can we use the idea bank system with its existing features as the communication channel between the university and industry to stimulate innovations? Do such systems require more influential features to be included? The full benefit of the university-industry collaborative platform cannot be achieved unless students and industry partners can use the system. Individuals' behavioural intention to use the system may depend on several important factors. The platform will be a potential solution for disseminating knowledge across different social systems and, more importantly, among students to obtain potential opportunities for innovation. However, it is essential to evaluate how users accept such systems, as there is no prior use, especially in universities and industries. Therefore, this study was conducted to measure the factors influential on user acceptance of an Idea Bank system as a source of innovation.

C. Related Works

Over the years, evaluating user acceptance of technologies has become a popular topic in numerous disciplines. These disciplines include eLearning systems [16][17][18][19], mLearning [20][21] in universities, knowledge management systems [1][22][23], e-commerce and m-commerce applications [24][25][26], social networking sites [27][28], professional networking sites [29], and other educational applications such as the adoption of Google in education [17][30]. The e-collaboration system was a rare application type, and Dasgupta et al. [31] conducted a study about twenty years ago in a similar discipline. However, the aim of collaboration and collaboration technologies is drastically different from today's technological advancements and the nature of collaborations. Hence, the scope of the study was limited to measuring user acceptance of e-collaboration technology, where technology was limited to emails and chat messages. However, a collaboration system between universities and industries is different from all the above systems. Since most system users are young undergraduates,

their intentions to use the system may be different from industry users. There is no study aimed to identify the factors influencing this nature of collaborative system between universities and industries aiming for innovation.

D. Theoretical Background

Innovation and technology refer to a distinct set of constructs, and several variables need to be considered when assessing the relationship between technology acceptance and innovation. When identifying a theoretical model, understanding human behaviour and the determinants of intention are of concern. Several competing theoretical models demonstrate human behaviour for the user acceptance of technologies. Previous studies such as the theory of reasoned action (TRA) [32], theory of planned behaviour (TPB) [33], technology acceptance model (TAM) [34], extended technology acceptance models TAM2 [35], TAM3 [36], and unified theory of acceptance and use of technology (UTAUT) [37][38] demonstrate theories in the relevant domain.

The TRA is designed to predict people's daily life volitional behaviour and understand their psychological behaviours [32]. The theory is more oriented toward individuals' attitudes toward behaviours and subjective norms. Subjective norms refer to attitudes toward social pressure to perform a behaviour. According to the TRA, the determinants of behavioural intention (BI) to use the system are attitudes toward behaviours and subjective norms. However, a person may not perform an activity even if motivated by positive attitudes because of a lack of control over the person's actions. Therefore, TRA is extended to TPB [33], including perceived behavioural control as an additional variable. The TPB model's problem is that a person's attitude toward using the computer system becomes irrelevant if the computer system is not accessible to that person. TAM is derived from TRA [39] by eliminating the uncertain and psychometric status of subjective norms, including two essential factors, perceived ease of use (PEU) and perceived usefulness (PU), to determine BI. Then, the TAM model is extended to TAM2 by including the factors for social influence required when evaluating systems beyond the workplace. Venkatesh and Morris [37] introduced UTAUT by comparing differences and similarities in eight theories relating to technology acceptance and derived 14 constructs from these eight theories, including effort expectancy, performance expectancy, social influence, and facilitating conditions significant constructs [39].

TAM has been considered a parsimonious and powerful theory by the information systems community [40]. Moreover, the three constructs PEU, PU, and BI used in TAM are more relevant in this study than those used in other models. Constructs used in other models, such as social norms, image, job relevance, output quality, usage behaviour, result demonstrability, and behavioural controls, are considered less relevant because of the nature of the current study. TAM has received substantial empirical support during the past decades, and it has probably become the most widely cited model in technology acceptance studies [39]. Therefore, the TAM introduced by Davis [34] is considered more relevant for evaluating the user acceptance of the LIB.

Structural equation modelling (SEM) is a multivariate statistical modelling technique used to analyse structural relationships [41]. Furthermore, this has become a standard

method for confirming or disconfirming theoretical models in quantitative studies [42]. This technique combines factor analysis as well as multiple regression analysis. It is used for analysing structural relationships between measured and latent variables (constructs). SEM has several benefits over more conventional data analysis methods, such as the linear regression model. The capability to account for measurement errors when estimating effects, examine the model's fit to the data, and construct statistical models that more closely agree with the theory, have all been advantageous.

This paper is organised as follows: The second section follows the introduction with a conceptual model and hypothesis' development. The research methodology is presented in the third section. In the fourth section, data analysis and findings are provided. The fifth portion presents the discussion and conclusion, while the sixth section presents recommendations for further research.

II. CONCEPTUAL MODEL AND HYPOTHESIS

The study's conceptual model is presented by modifying the TAM with the diffusion of innovation theory (DIT) [11]. TAM requires external variables to support PU and PEU, and integration efforts are needed to understand better technology adoption [40]. The DIT presented by Rogers [11] helps understand important innovation characteristics. Among the five constructs presented in DIT, relative advantage (RA), compatibility (CO), and trialability (TR) were considered more relevant to the current study. Moore and Benbasat [43] suggested reducing the instrument based on the research objective and organisational context. In the present study, the system under investigation was a novel system, and people other than the survey participants did not use it. Therefore, the complexity and observability of the other two constructs are considered less important in this context. The conjunction between TAM and DIT has been used in many previous studies in various disciplines, including e-learning systems and mobile apps (e.g., [16][25][44][45]).

PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [34]. PEU refers to the degree to which a person believes that using a particular system would be free of effort [34]. BI to use is known as the learners' choice of whether to continue using the new system. This term is seen as a factor that determines the use of technology.

In this study, PU refers to how a person believes that using the system would enhance ICT innovation. Davis [34] claims that an application perceived as easier to use than another is more likely to be accepted by users. Based on this, the authors of the current study propose that.

H1: Users' PEU is positively related to the BI to use the system.

H2: Users' PU is positively related to the BI to use the system.

H3: PEU is positively associated with PU.

The DIT explains how innovations are adopted within a population of potential adopters. Everett Rogers first developed the theory in 1962 based on the observations of 508 diffusion studies [11]. The DIT theory consists of crucial elements, innovation, communication channels, time, and

social systems. The characteristics of innovation perceived by individuals help explain the different adoption rates measured in 1). Relative advantage (2) Compatibility, 3). Complexity, 4). Trialability, and 5). Observability [11] as mentioned previously.

RA is the degree to which an innovation is perceived as better than the idea it supersedes [11]. What matters in RA is whether an individual perceives innovation as advantageous. The rate of adoption is higher when the RA of innovation is higher.

Compatibility refers to the degree to which an innovation is perceived as consistent with the existing values, needs, and past experiences of potential adopters [11]. An idea incompatible with the current norms and values of a social system will not be adopted rapidly as a compatible innovation.

Trialability refers to the extent to which people think that they need to experience innovation before deciding whether to adopt it. Trialable innovation tends to have less uncertainty perceived by individuals who consider adopting it, and those individuals tend to learn through this experience. In the current study, this concept refers to how students view their use of the proposed system as having a significant impact on their innovation performance.

Based on the identified characteristics of DIT, the authors propose that,

H4: RA is positively related to the PU of the system.

H5: RA is positively related to the PEU of the system.

H6: Compatibility is positively related to the PU of the application.

H7: Trialability is positively related to PEU

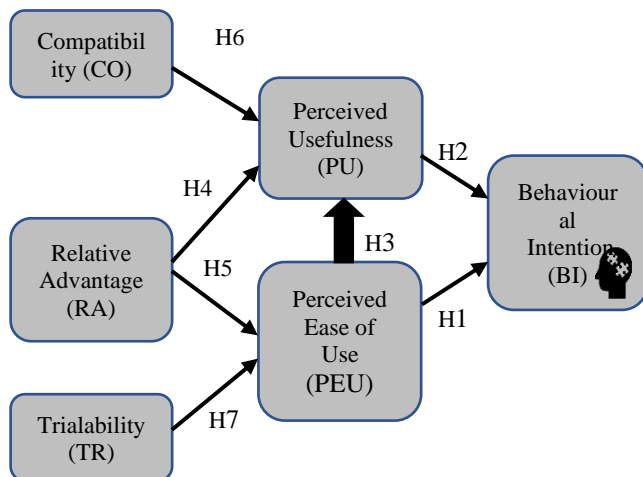


Fig. 2: Combined theoretical model (TAM & DIT)

TAM is combined with DIT to check the perceived usefulness and perceived ease of use of the system described by Davis [34] in TAM. Figure 2 explains how DIT is combined with the TAM to derive a hybrid theoretical model with the derived hypothesis.

This study contributes to the literature as a model developed with the diffusion of innovation theory combined with the technology acceptance model to evaluate users' perception of

a newly developed tool for escalating ICT innovations. The study also helps practitioners focus on the criteria in a university-industry collaborative tool to stimulate innovations.

III. METHODOLOGY

This study aims to understand some factors and how they contribute to the system's usability. We wanted a broad response from various stakeholders to achieve a reasonable idea of these factors. We designed a questionnaire distributed to 300 individuals, including 250 students in higher education, 30 academic staff members, and 20 industry representatives. The survey was conducted in two phases, with a pilot study using a convenient sample of higher education students, followed by the main study. The scope of the study was limited to measuring user acceptance of e-collaboration technology, where technology was limited to emails and chat messages.

A. Measurement of Items

The questionnaire was developed from an extensive literature review to test the constructs used in this research's theoretical model. A total of 34 questions (see Appendix A) were modified to suit the context under study, including five demographic characteristics, 13 TAM factors, and 16 DIT factors. Among the 29 items used to measure TAM and DIT, 21 items were selected from Moore and Benbasat [43] as follows: for RA, out of nine items, eight were selected, and the deselected item measured the control over individuals' work, which is considered less significant in the study; further, all three items for compatibility, all five items for trialability, and all five items for PEU were extracted and modified. The remaining eight items for TAM were selected as three items for PU, and two items for BI were selected and modified from Venkatesh and Bala [36]. Two items for PU were selected from Davis [34] and modified. Based on the literature, one item (Appendix A: BI2) was created for this study. All scales used in this study were adapted from the existing literature.

The items in the constructs were measured using a five-point Likert scale with answer choices ranging from "Strongly Disagree (1)" to "Strongly Agree (5)", "previously validated scales operationalise the constructs.

A short video was created to understand the system's features and distribute it with the questionnaire. A link to the system was created, and access was granted to all respondents via guest login credentials. This process was required because the system is a novel system, and the respondents were novice users

B. Pilot Study

A pilot study, a small-scale rehearsal of the larger research design, was conducted to identify potential issues and check the measurement items. A convenience sample of 50 students studying in the second year in a higher education institute in Sri Lanka was selected, and the questionnaire was distributed using Google forms. All the students are computing undergraduates and are therefore considered highly ICT literate. In the Google Form, the study's title, the purpose of the survey, the objective, and the intended audience to fill the pilot survey were mentioned. A text area was included for each construct, and respondents were asked to write feedback on each construct measurement item. One questionnaire item was

rephrased to improve clarity based on the respondents' feedback.

C. Main Study

After the pilot study, university undergraduates in computing and software industry professionals representing university collaborations were selected to distribute the refined questionnaire. The respondents were purposefully selected as all software companies in Sri Lanka do not have UIC, and all undergraduates do not know about ICT innovations or collaborations at the early stage of their university education. Generally, in Sri Lanka, students engage in various industry-related activities while studying at universities. Therefore, when choosing undergraduates, those in the second year and onwards were chosen because they are mature enough to understand the system's requirements related to university-industry collaborations. In the survey, a forced response option was used in the main section after the demographic data section to avoid missing values. Thus, all respondents could only move to the next question by answering the current question. Finally, the questionnaire was distributed among software industry professionals, academics, and the above-described students, using a google form. All respondents were active in Sri Lanka, a South Asian country.

Related literature suggests that a minimum sample size of 100 to 150 is required in SEM [42][47]. A minimum sample size of 150 is required when the number of constructs is less than seven, with modest (0.5) item communalities and no under-identified constructs [47]. According to Barclay et al. [48] and Gaskin & Happell [49], one guideline for sample size is that the sample should have at least ten times more data points than the number of questionnaire items in the most complex construct in the model. It becomes ten times the number of predictors, either from indicators from the most complex formative construct or the most significant number of antecedent constructs leading to an endogenous construct, whichever is larger. Since Schumacker & Lomax [42] claim that these multiple values should be ten times or 20 times, in the current study, the most complex regression involves the formative construct with eight items requiring a minimum sample size of 20 times 8, which equals 160.

The system is intended to be used by university students, especially after the first year, academic staff members, and industry professionals. Therefore, the questionnaire was distributed among 300 survey participants, including 250 undergraduates enrolled in the second, third, and fourth years of computer and IT-related degree disciplines. Twenty industry participants worked in ICT-related industries, were familiar with university engagements, and had 30 academic staff members. The respondents' involvement in university-industry collaboration was questioned in the questionnaire and required to be answered. A total of 210 responses were received, with eight incomplete responses. These eight respondents did not attempt the main questionnaire and were therefore excluded, and the remaining 202 responses were used for data analysis.

IV. DATA ANALYSIS AND RESULTS

A. Demographic Analysis

The participants were almost equal in terms of sex. Among the 201 participants, 47.3% were men, and 52.2% were women.

One participant opted not to indicate their gender. The majority of participants were between the ages of 18 and 25 (86.6%), and 9.4% were 25 to 30. The next highest age category was 35–40, which was 2.5%. Only 1% were from the age group 30 to 35 years, and only 0.5% were reported from the age group 40 to 45 years. The total number of responses in the age group was 202. Among the three categories of participants as students in higher education, academic staff members, and industry respondents, the majority of respondents (87.6%) were students in higher education. The second and third categories were almost equal, 6.4% and 5.9%, respectively. 46.8% of participants had direct university-industry interactions, and 28.9% of participants had no interactions. There were 24.4% reported as they may have had university-industry interactions with uncertainty. Among the undergraduate respondents, 60.6% studied in the third year, and 17.1% studied in the fourth year. There were 7.3% in the second year. The remaining 15% of the participants responded to none of the above categories. Students are given an internship in the second semester of the third year in the higher education institute selected for the survey. Students can continue their internship or become employees after the internship. Therefore, some respondents can become undergraduates, and at the same time, they can be employees.

B. Model Analysis

The model analysis was conducted with Partial Least Squares Path Modelling (PLS-PM), which was used in two stages: 1) assessing the validity and reliability of the measurement model and 2) assessing the structural model. The Statistical Package for Social Science (SPSS) AMOS was used to analyse the questionnaire's data.

1) *Assessment of the Measurement Model*: The measurement model describes the relationship between constructs (latent variables) and their measures (observed variables) [50]. One of the primary objectives of SEM is to evaluate the construct validity of the proposed measurement model [41]. The validity of the measurement model depends on the model fit for the measurement model and construct validity evidence [41]. Kline [51] and Hair [41] emphasise the guidelines to measure the goodness of fit and suggest reporting model fit statistics as the minimum of model chi-square (χ^2) and its degree of freedom (df), root mean square error of approximation (RMSEA), and comparative fit index (CFI). The initial model test values are reported as RMSEA= 0.066, which indicates a good fit, GFI= 0.799 was below the cut-off value for a good fit, CFI=0.937 reported as a good fit, TLI=0.928 reported as a good fit, $\chi^2 = 747.072$, $df= 362$, $\chi^2 /df= 2.064$ reported as a good fit. Except for GFI, all the values are within the cut-off values for an accepted model fit (see Table I). The considered GFI value for a good model fit should be greater than 0.9 to ensure the construct's validity. Then, the model modification was conducted by specifying covariances for the error terms. The highest Modification Indices (MI) were paired (see Figure 4), as higher values of MI indicated item redundancy [52].

TABLE I.

THE THREE CATEGORIES OF MODEL FIT AND THEIR LEVEL OF ACCEPTANCE (AFTER THE MODEL MODIFICATION) INDICATE AN ACCEPTABLE MODEL FIT.

Name of Category	Name of Index	Level of Acceptance	Level achieved
Absolute fit	RMSEA	RMSEA<0.08	0.066
	GFI	GFI>0.90	0.824
Incremental fit	CFI	CFI>0.90	0.937
	TLI	TLI>0.90	0.928
Parsimonious fit	ChSq/df	Chisq/df <3.0	1.872

Note: RMSEA-Root Mean Square of Error Approximation, GFI-Goodness of Fit Index, CFI-Comparative Fit Index, TLI-Tucker-Lewis Index, ChSq - Chi-Square, df- degree of freedom

Individual item reliability was evaluated by examining loadings. A value of 0.7 or more is considered an indication of acceptable reliability [52][53]. One item from the relative advantage (RA4) reported a low factor loading of 0.62, as shown in Figure 3. An item with low factor loading means that a particular item is deemed useless to measure that construct [52] and is therefore removed. Figure 3 and Figure 4 show the parameter values before and after the model modification, respectively.

After the model modification, the reported values were: RMSEA= 0.066 (no change), GFI= 0.824 (improved), CFI=0.937 (no change), TLI=0.928 (no change), $\chi^2 = 619.6$, $df= 331$, $\chi^2 /df= 1.872$ (improved). GFI and the χ^2 /df values improved after the model modification. Although the GFI value does not reach 0.9, a value above 0.8, should be considered a reasonable fit and acceptable, c.f.,[54],[55]. Every construct has reported AVE's value greater than 0.5 (see Table II), confirming the measurement model's convergent validity [53].

Discriminant validity was conducted to ensure that the measurement model had no redundant constructs. For adequate discriminant validity, the diagonal elements in Table II should be greater than the corresponding off-diagonal elements in the rows and columns [42]. Therefore, the measurement model was verified with discriminant validity, indicating that all diagonal values were greater than their corresponding off-diagonal values.

2) *Reliability of the Measurement Model:* Reliability measures were assessed to verify the latent construct reliability and internal consistency of the measurement model. The reliability of the measurement model was examined using composite reliability (CR) and Cronbach's alpha (CA) [42]. If the values of CR and CA are greater than or equal to 0.7, it is considered that the composite reliability for a construct is achieved [53], and if CA is greater than 0.8, it is a good level [56]. The results show that estimates for CR and CA range between 0.8161 and 0.9142 (see Table II), indicating a good reliability level.

The structural model was used for assessment when the measurement model was satisfied and confident with the constructs' reliability and validity.

3) *Assessment of the Structural Model:* The structural model specifies relationships between constructs [50]. We use the standard of Gefen et al.[47] (p.45). Table III is developed to test each hypothesis's support by investigating the endogenous latent variables' coefficient of determination (R²). The critical ratio (CR), or t value, has become a popular statistic for evaluating the structural model.

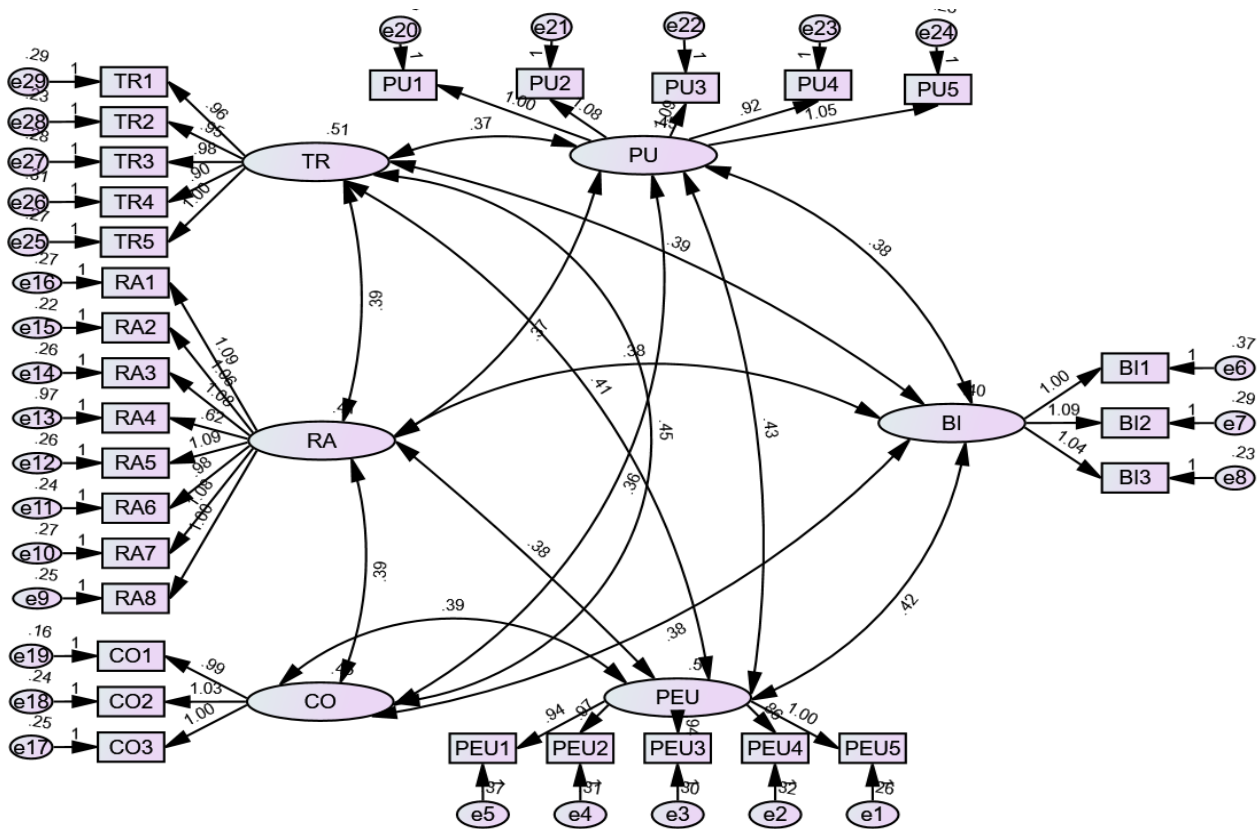


Fig. 3 Initial model showing factor loadings of the measurement model before modifications.

Note: TR- Trialability, RA- Relative Advantage, CO- Compatibility, PU- Perceived Usefulness, PEU- Perceived Ease of Use, BI- Behavioural Intention

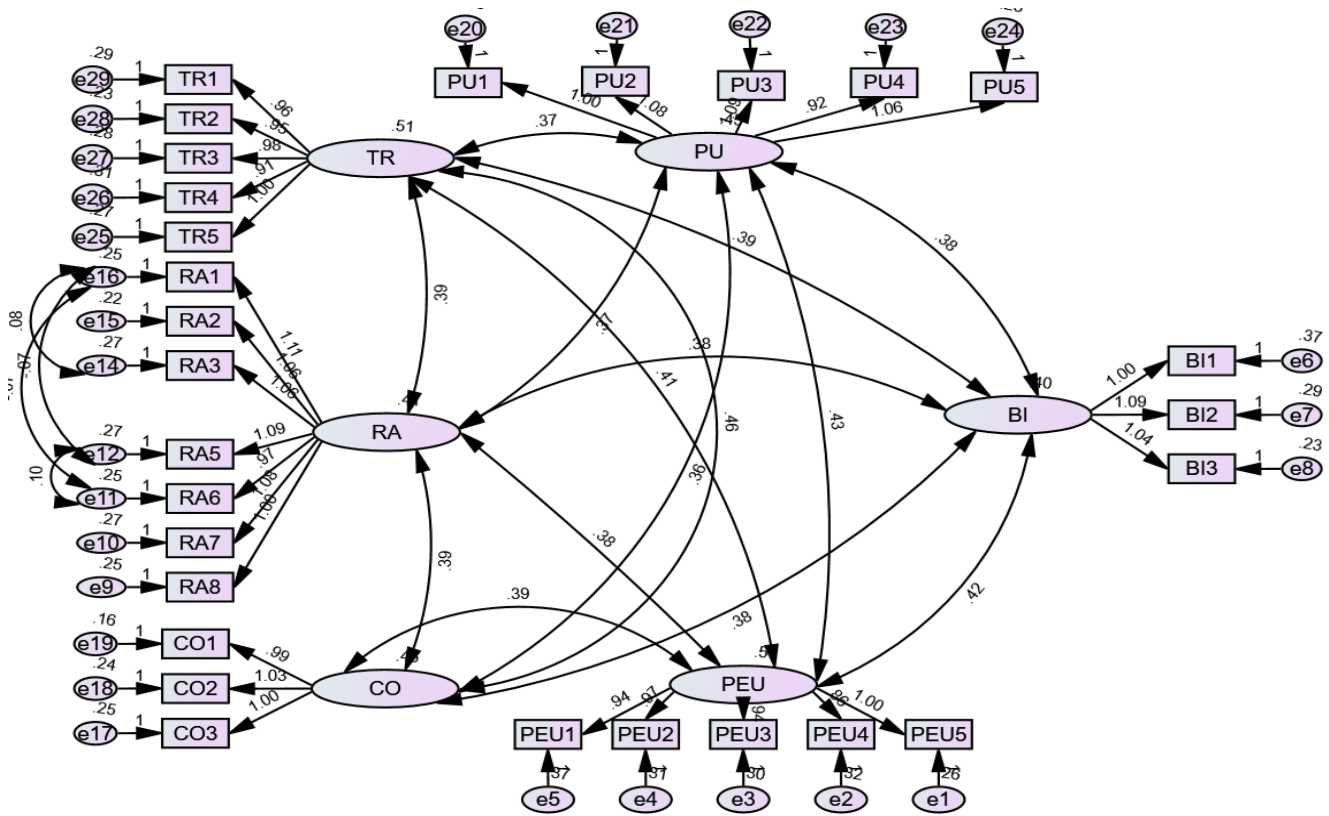


Fig. 4 Measurement model after modifications.

Note: TR- Trialability, RA- Relative Advantage, CO- Compatibility, PU- Perceived Usefulness, PEU- Perceived Ease of Use, BI- Behavioural Intention

TABLE II.
CORRELATION MATRIX SHOWING INTERNAL CONSISTENCIES AND CORRELATION OF CONSTRUCTS INDICATING MEASUREMENT MODEL'S DISCRIMINANT VALIDITY AND RELIABILITY

Hypothesis	IV	Relation	DV	Estimate	SE	CR	P-value	Result
H1	PEU	→	BI	0.892	0.156	5.723	0.000	Supportive
H2	PU	→	BI	0.096	0.136	0.702	0.483	Unsupportive
H3	RA	→	PU	0.403	0.150	2.680	0.007	Supportive
H4	RA	→	PEU	0.621	0.118	5.265	0.000	Supportive
H5	CO	→	PU	-0.095	0.135	-0.708	0.479	Unsupportive
H6	PEU	→	PU	0.626	0.105	5.975	0.000	Supportive
H7	TR	→	PEU	0.323	0.100	3.231	0.001	Supportive

Note: CA- Cronbach's Alpha, CR- Composite Reliability, AVE- Average variance Extracted.

TABLE III.
HYPOTHESIS TESTING RESULTS OF THE STRUCTURAL MODEL SHOW FIVE SUPPORTIVE AND TWO UNSUPPORTIVE.

	No of items	Correlation of constructs						Internal consistencies		
		RA	CO	TR	PU	PEU	BI	CA	CR	AVE
RA	8	1						0.902	0.9142	0.579723
CO	3	0.81	1					0.859	0.8626	0.676857
TR	5	0.78	0.84	1				0.894	0.8946	0.62959
PU	5	0.77	0.69	0.70	1			0.903	0.9044	0.654916
PEU	5	0.76	0.71	0.71	0.80	1		0.877	0.8766	0.587306
BI	3	0.80	0.75	0.74	0.76	0.77	1	0.817	0.8161	0.597344

Note: IV- independent variable; DV- dependent variable; SE- standard error; CR- critical ratio; PU- perceived usefulness; PEU- perceived ease of use; RA- relative advantage; CO- compatibility; TR- trialability

Among all seven hypotheses, five were supportive, and only two were unsupportive, based on the results depicted in Table III. Three hypotheses were significant at $p < 0.001$, and two hypotheses were significant at $p < 0.01$. Perceived ease of use has a positive effect on the behavioural intention to use the system. ($B = 0.892$, $p < 0.001$), while perceived usefulness had a negative impact on behavioural intention ($\beta = 0.096$, $p > 0.05$). This result implies that the ease of using the system is more decisive for the behavioural intention to use the system than its usefulness. Relative advantage has a positive effect on perceived usefulness ($\beta = 0.403$, $p < 0.01$) and perceived ease of use ($\beta = 0.621$, $p < 0.001$). Compatibility had a negative effect on perceived usefulness ($\beta = -0.095$, $p > 0.05$). Perceived ease of use was positively affected by perceived usefulness ($\beta = 0.626$, $p < 0.001$), and trialability had a positive effect on perceived ease of use ($\beta = 0.323$, $p < 0.01$).

V. DISCUSSION AND CONCLUSION

The TAM has been used in various educational studies to evaluate the acceptance of different technologies for education. Among these studies examining the behavioural intention to use learning management systems (LMS) [18][19] and other e-learning platforms [16][17][45][57], mobile learning systems [20], and e-collaboration systems [31] are considered to be more relevant. The examined information system is different from the above systems in terms of its collaborative features between educational institutes and industries for stimulating ICT innovations. Therefore, the study's theoretical and practical implications bring new insights to researchers, information system designers, and administrators at UIC.

A. Theoretical Implications

The TAM proposed by Davis [34] claims that an individual's adoption of information technology depends on perceived usefulness and perceived ease of use. Our results provide limited support for the original TAM. First, perceived ease of use positively influences perceived usefulness and behavioural intention to use the system. Second, perceived usefulness has a negative effect on the behavioural intention to use. While the first result supports the original TAM, the second result contradicts the original TAM. In comparing our results with previous studies of TAM, behavioural intention to use e-learning systems (e.g. [16][17][45]) and learning management systems [18][19] have been influenced by perceived usefulness and perceived ease of use. However, investigating the behavioural intention to use an e-collaboration system in another study [31], the authors concluded that perceived usefulness has a negative relationship with the use of an e-collaboration system. This result contradicts the results of the original TAM. However, perceived ease of use has a strong positive effect on the perceived usefulness of the system, supporting the results of the original TAM. However, the e-Collaboration system has not radically changed over the last few years (ibid). Consequently, advanced system users may be efficient users who are familiar with the navigational structure of the system. This contradictory situation is supported in two other studies [26][28], and perceived usefulness does not influence behavioural intention due to environmental factors.

The possible reason for the contradictory relationship in our study may be that participants already know the usefulness of an IT-supported system for ICT innovations. That is not

considered an extrinsic motivational factor. The result may have also been affected because all participants had a strong background in IT. However, the current study's findings are consistent with the original findings of the TAM [34].

Moreover, it is evident that external factors derived from the diffusion of innovation theory comply with the existing similar studies [16][25] in the literature regarding their relationship with TAM. The relative advantage greatly influences the perceived ease of use and perceived usefulness. This result implies that when users regard the idea bank system as better than the traditional collaboration system or approaches, they may perceive the Idea Bank system to be more useful [24][44]. The factor trialability also positively supports the perceived ease of use. However, factor compatibility negatively affects perceived usefulness. However, many studies (e.g.[16][24]) have shown a positive relationship between compatibility and perceived usefulness

B. Practical Implications

The idea bank system has many features that contribute positively to ICT innovation. The relative advantage of using the idea bank system compared to other systems significantly influences perceived usefulness and perceived ease of use. Perceived ease of use is an assessment of the cognitive effort involved in using the system. In such situations, users' focus is on the interaction with the system and not on objectives external to the interaction. Since the system is mainly intended to be used by young undergraduates in universities, they will be more focused on the ease of using the system than its usefulness. Previous studies have shown that factors affecting user acceptance may vary between hedonic and utilitarian systems [58]. Higher demand for perceived ease of use is expected in hedonic systems than perceived usefulness. Heijden [58] suggested that developers include hedonic features to invoke other configurations to achieve user acceptance.

Systems trialability before deciding to purchase is a significant factor in the ease of using the system. This result implies that when users had more opportunities to try the idea bank system, they could view it as easier to use [45]. Since the idea bank system is quite a new system, it would be good to make it available for users on a trial basis and grow the system with ideas before deciding to purchase. Additionally, cognitive absorption may also be experienced with visually rich and appealing technologies when designing an information system [59].

Diversity in societies and organisational structures may challenge the use of information systems. While some factors such as IT proficiency and experience promote the system's ease of use, technology acceptance and intention to use may be moderated by its rules, policy, and IT guidelines [60].

Generalisability is commonly accepted as a quality criterion in quantitative research [61]. Adopting a modelling framework (SEM) that allows for a variety of statistical models in the study increases the study's credibility. The reliability of the survey is high since it was preceded by a thorough literature review to adjust the scales used in the study. Respondents were carefully chosen to adequately represent academic staff, industry, and students involved in the university-industry partnership, assuring the internal validity.

C. Conclusion

A good insight into the user acceptance and adopting a systematic model to rein-force ICT innovations are provided in this study with its derived results. Combining the technology acceptance model and diffusion of innovation theory derives varied results based on the system under investigation. The significance of the current study is the identification of factors affecting users' perceptions of using a collaborative tool for stimulating innovation. This study fills the gap in the literature by providing valuable features in such a collaborative system, primarily when young students mainly use it in universities. Since the system is intended to be used primarily by young undergraduates, developers of such systems are encouraged to use hedonic features.

The study presents several essential findings for researchers in a similar domain, information system designers, and university-industry partnership managers. Our main conclusion is that the usefulness and behavioural intention to use the system will be determined by how far the system use is free of effort. Second, the relative advantage is an excellent determinant of perceived usefulness and the perceived ease of use of the system. The free effort to use the system is an influential factor for behavioural intention to use the idea bank system. The authors recall that the relative advantage is the degree to which a new product is superior to an existing product. Therefore, new products should be incorporated with ease of use. These results indicate that the system becomes more valuable by increasing the ease of use, and hence, the behavioural intention to use the system can be improved. Finally, since there has been no prior study that has evaluated user acceptance of an Idea Bank system or university-industry collaborative system aiming at innovation, the results of the study are unique

VI. LIMITATIONS AND SUGGESTIONS FOR FUTURE WORKS

One limitation of the study is that the respondents have not used the system for an extended period to become familiar with all system functionalities. That can make respondents feel that the system's ease of use is more important than its usefulness. Enthusiastic researchers in the same domain can examine hedonic features in educational systems to consistently use such information systems.

APPENDIX A

QUESTIONNAIRE ITEMS-PART I DEMOGRAPHIC CHARACTERISTICS

Gender
Age group
Status of the respondent (Undergraduate/
Graduate employee/ non-graduate employee)
Involvement in university-industry interactions
If undergraduate: year of study

QUESTIONNAIRE ITEMS-PART II SYSTEM CHARACTERISTICS

PERCEIVED USEFULNESS

PU1. Using the system would improve my innovation performance.

PU2. Using the system would help to accomplish innovation tasks more quickly.

PU3. Using the system would improve the quality of innovation.

PU4. Using the system would enhance the effectiveness of innovation activity.

PU5. I feel that the system is useful to increase innovations.

PERCEIVED EASE OF USE

PEU1. Learning to operate the system would be easy for me.

PEU2. My interaction with the system is clear and understandable.

PEU3. I believe it would be easy to get the system to do what I want it to do.

PEU4. It is easy for me to remember how to perform tasks using the system.

PEU5. Overall, I believe the system would be easy to use.

BEHAVIOURAL INTENTION TO USE.

BI1. Assuming I had access to the system, I intend to use it.

BI2. I intend to recommend others to use this system for future work.

BI3. For future work, I would use the system.

RELATIVE ADVANTAGE

RA1. Using this system enables me to accomplish innovation tasks more quickly than before.

RA2. Using the system improves the quality of innovation activities.

RA3. Using the system makes it easier to do innovation activities.

RA4. The disadvantages of my using the system far outweigh the advantages.

RA5. Using the system improves innovation performance.

RA6. Overall, I find that using the system will be advantageous for innovation activities.

RA7. Using the system enhances the effectiveness of innovation activities.

RA8. Using the system increases my productivity.

COMPATIBILITY

CO1. Using the system would be compatible with all aspects of innovations.

CO2. I think that using the system would fit well with the way I like to collaborate with Industry/University.

CO3. Using the system would fit into my work style.

TRIALABILITY

TR1. I have a great deal of opportunities to try various applications in the system.

TR2. I know where I can go to satisfactorily try out various uses of the system.

TR3. The system will be available to me to test various applications adequately.

TR4. Before deciding whether to use any system applications, I will be able to properly try them out.

TR5. I will be permitted to use the system on a trial basis long enough to see what it can do. I am able to experiment with the system as necessary.

APPENDIX B - ACRONYMS

AVE	Average Variance Extracted
BI	Behavioral Intention
CA	Cronbach's alpha
CFI	Comparative Fit Index
ChSq	Chi-Square
CO	Compatibility
CR	Composite Reliability
df	degree of freedom
DIT	Diffusion of Innovation Theory
DP	Dependent Variable
GFI	Goodness of Fit Index
GIB	Global Idea Bank
ICT	Information and Communication Technology
IT	Information Technology
IV	Independent Variable
LIB	Local Idea Bank
MI	Modification Indices
NIB	National Idea Bank
PEU	Perceived Ease of Use
PLS-PM	Partial Least Squares Path Modelling
PU	Perceived Usefulness
RA	Relative Advantage
RMSEA	Root Mean Square Error Approximation
SDG	Sustainable Development Goals
SEM	Structural Equation Modelling
SE	Standard Error
SPSS	Statistical Package for Social Science
TAM	Technology Acceptance Model
TLI	Tucker–Lewis's index
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TR	Trialability
UIC	University-Industry Collaboration
UTAUT	Unified Theory of Acceptance and Use of Technology

REFERENCES

- [1] A. Elmorshidy, "The impact of knowledge management systems on innovation: An empirical investigation in Kuwait," *VINE J. Inf. Knowl. Manag. Syst.*, vol. 48, no. 3, pp. 388–403, 2018, doi: 10.1108/VJIKMS-12-2017-0089.
- [2] G. Ahuja and R. Katila, "Technological acquisitions and the innovation performance of acquiring firms: a longitudinal study," *Strateg. Manag. J.*, vol. 22, no. 3, pp. 197–220, Mar. 2001, doi: <https://doi.org/10.1002/smj.157>.
- [3] J. Darroch, "Knowledge management, innovation and firm performance," *J. Knowl. Manag.*, vol. 9, no. 3, pp. 101–115, Jan. 2005, doi: 10.1108/13673270510602809.
- [4] K. Z. Zhou and C. B. Li, "How knowledge affects radical innovation: Knowledge base, market knowledge acquisition, and internal knowledge sharing," *Strateg. Manag. J.*, vol. 33, no. 9, pp. 1090–1102, Sep. 2012, doi: <https://doi.org/10.1002/smj.1959>.
- [5] M. T. Hansen, "The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits," *Adm. Sci. Q.*, vol. 44, no. 1, pp. 82–111, Sep. 1999, doi: 10.2307/2667032.
- [6] G. Patriotta, A. Castellano, and M. Wright, "Coordinating knowledge transfer: Global managers as higher-level intermediaries," *J. World Bus.*, vol. 48, no. 4, pp. 515–526, 2013, doi: 10.1016/j.jwb.2012.09.007.
- [7] I. Nonaka, "The Knowledge-Creating Company," *Harv. Bus. Rev.*, vol. Nov-Dec, no. 1, 1991.
- [8] L. J. Gressgård, O. Amundsen, T. M. Aasen, and K. Hansen, "Use of information and communication technology to support employee-driven innovation in organisations: A knowledge management perspective," *J. Knowl. Manag.*, vol. 18, no. 4, pp. 633–650, 2014, doi: 10.1108/JKM-01-2014-0013.
- [9] P. H. J. Hendriks, "Many rivers to cross: From ICT to knowledge management systems," *J. Inf. Technol.*, vol. 16, no. 2, pp. 57–72, 2001, doi: 10.1080/02683960110054799.
- [10] K. Dalkir, "Knowledge Management Tools," in *Knowledge Management in Theory and Practice*, 2011.
- [11] E. M. Rogers, *Diffusion of innovations, Third Edition*. 1983.
- [12] E. Bellini, G. Piroli, and L. Pennacchio, "Collaborative know-how and trust in university–industry collaborations: empirical evidence from ICT firms," *J. Technol. Transf.*, pp. 1–25, 2018, doi: 10.1007/s10961-018-9655-7.
- [13] L. Johnston, S. Robinson, and N. Lockett, "Article information :," *Int. J. Entrep. Behav. Res.*, vol. 16, no. 6, pp. 540–560, 2010, doi: 10.1108/JHOM-09-2016-0165.
- [14] "global idea bank," 2019. <https://ideabank.global/launch/> (accessed Mar. 17, 2021).
- [15] C. Sandström and J. Björk, "Idea management systems for a changing innovation landscape," *Int. J. Prod. Dev.*, vol. 11, no. 3–4, pp. 310–324, 2010, doi: 10.1504/IJPD.2010.033964.
- [16] W. M. Al-Rahmi *et al.*, "Integrating Technology Acceptance Model with Innovation Diffusion Theory: An Empirical Investigation on Students' Intention to Use E-Learning Systems," *IEEE Access*, vol. 7, pp. 26797–26809, 2019, doi: 10.1109/ACCESS.2019.2899368.
- [17] R. Cheung and D. Vogel, "Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning," *Comput. Educ.*, vol. 63, pp. 160–175, 2013, doi: 10.1016/j.compedu.2012.12.003.
- [18] S. Alharbi and S. Drew, "Using the Technology Acceptance Model in Understanding Academics' Behavioural Intention to Use Learning Management Systems," *Int. J. Adv. Comput. Sci. Appl.*, vol. 5, no. 1, 2014, doi: 10.14569/ijacsa.2014.050120.
- [19] N. Fathema, D. Shannon, and M. Ross, "Expanding The Technology Acceptance Model (TAM) to Examine Faculty Use of Learning Management Systems (LMSs) In Higher Education Institutions.," *MERLOT J. Online Learn. Teach.*, vol. 11, no. 2, pp. 210–232, 2015.
- [20] N. Wei and Z. W. Li, "Telepresence and interactivity in mobile learning system: Its relation with open innovation," *J. Open Innov. Technol. Mark. Complex.*, vol. 7, no. 1, pp. 1–18, 2021, doi: 10.3390/joitmc7010078.
- [21] L. Briz-Ponce and F. J. García-Peñalvo, "An Empirical Assessment of a Technology Acceptance Model for Apps in Medical Education," *J. Med. Syst.*, vol. 39, no. 11, Nov. 2015, doi: 10.1007/s10916-015-0352-x.
- [22] M. Del Giudice and M. R. Della Peruta, "The impact of IT-based knowledge management systems on internal venturing and innovation: a structural equation modeling approach to corporate performance," *J. Knowl. Manag.*, vol. 20, no. 3, pp. 484–498, 2016, doi: 10.1108/JKM-07-2015-0257.
- [23] J. Xu and M. Quaddus, "Development of a Research Model of Adoption and Continued use Exploring the factors Influencing End Users' Acceptance of Knowledge Management Systems.," *J. Organ. End User Comput.*, vol. 19, no. 4, 2007.
- [24] J. H. Wu and S. C. Wang, "What drives mobile commerce? An empirical evaluation of the revised technology acceptance model," *Inf. Manag.*, vol. 42, no. 5, pp. 719–729, 2005, doi: 10.1016/j.im.2004.07.001.
- [25] S. Min, K. K. F. So, and M. Jeong, "Consumer adoption of the Uber mobile application: Insights from diffusion of innovation theory and technology acceptance model," *J. Travel Tour. Mark.*, vol. 36, no. 7, pp. 770–783, 2019, doi: 10.1080/10548408.2018.1507866.
- [26] R. Septiani, P. W. Handayani, and F. Azzahro, "Factors that Affecting Behavioral Intention in Online Transportation Service : Case study of GO-JEK," in *Procedia Computer Science*, 2018, vol. 124, pp. 504–512, doi: 10.1016/j.procs.2017.12.183.
- [27] E. Constantinides, C. Lorenzo-Romero, and M.-C. Alarcón-del-Amo, "Social Networking Sites as Business Tool: A Study of User Behaviour BT - Business Process Management: Theory and Applications," pp. 221–240, 2013, [Online]. Available: http://dx.doi.org/10.1007/978-3-642-28409-0_9.
- [28] P. Tantipongant and P. Laksitamas, "An analysis of the technology acceptance model in understanding students' behavioral intention to use university's social media," *Proc. - 2014 IIAI 3rd Int. Conf. Adv. Appl. Informatics, IIAI-AAI 2014*, vol. 12, pp. 8–12, 2014, doi: 10.1109/IIAI-AAI.2014.14.
- [29] W. A. Khan Afridi, H. Hashim, and M. Kuppusamy, "The critical

- success factors of professional networking sites' adoption by university students," *Test Eng. Manag.*, vol. 82, no. 1–2, pp. 653–673, 2020.
- [30] R. S. Al-Marouf, A. M. Alfaisal, and S. A. Salloum, "Google glass adoption in the educational environment: A case study in the Gulf area," *Educ. Inf. Technol.*, vol. 26, no. 3, pp. 2477–2500, 2021, doi: 10.1007/s10639-020-10367-1.
- [31] S. Dasgupta, M. Granger, and N. McGarry, "User Acceptance of E-Collaboration Technology: An Extension of the Technology ...," *Gr. Decis. Negot.*, vol. 11, no. 2, p. 87, 2002.
- [32] M. Fishbein and I. Ajzen, *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Addison-Wesley, 1975.
- [33] I. Ajzen, "From Intentions to Actions-TPB.1985.pdf," in *Action Control: From Cognition to Behavior*, 1985, pp. 11–39.
- [34] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Q. Manag. Inf. Syst.*, vol. 13, no. 3, pp. 319–339, 1989, doi: 10.2307/249008.
- [35] V. Venkatesh and F. D. Davis, "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Manag. Sci.*, vol. 46, no. 2, pp. 186–204, 2000, doi: 10.1287/mnsc.46.2.186.11926.
- [36] V. Venkatesh and H. Bala, "Technology acceptance model 3 and a research agenda on interventions," *Decis. Sci.*, vol. 39, no. 2, pp. 273–315, 2008, doi: 10.1111/j.1540-5915.2008.00192.x.
- [37] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "USER ACCEPTANCE OF INFORMATION TECHNOLOGY: TOWARD A UNIFIED VIEW," *MIS Q.*, vol. 27, no. 3, pp. 425–478, 2003, doi: 10.1006/mvire.1994.1019.
- [38] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Unified theory of acceptance and use of technology: A synthesis and the road ahead," *J. Assoc. Inf. Syst.*, vol. 17, no. 5, pp. 328–376, 2016, doi: 10.17705/1jais.00428.
- [39] H. Taherdoost, "A review of technology acceptance and adoption models and theories," *Procedia Manuf.*, vol. 22, pp. 960–967, 2018, doi: 10.1016/j.promfg.2018.03.137.
- [40] Y. Lee, K. A. Kozar, and K. R. T. Larsen, "The Technology Acceptance Model: Past, Present, and Future," *Commun. Assoc. Inf. Syst.*, vol. 12, no. December, 2003, doi: 10.17705/1cais.01250.
- [41] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 7th ed. 2014.
- [42] R. E. Schumacker and R. G. Lomax, *A Beginner's Guide to Structural Equation Modeling, 3rd edn*, vol. Third Edit. 2010.
- [43] G. C. Moore and I. Benbasat, "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Inf. Syst. Res.*, vol. 2, no. 3, pp. 192–222, 1991, doi: 10.1287/isre.2.3.192.
- [44] S. C. Chang and F. C. Tung, "An empirical investigation of students' behavioural intentions to use the online learning course websites," *Br. J. Educ. Technol.*, vol. 39, no. 1, pp. 71–83, 2008, doi: 10.1111/j.1467-8535.2007.00742.x.
- [45] Y. H. Lee, Y. C. Hsieh, and C. N. Hsu, "Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems," *Educ. Technol. Soc.*, vol. 14, no. 4, pp. 124–137, 2011.
- [46] F. D. Davis, "IT Usefulness and Ease of Use," *MIS Q.*, vol. 13, no. 3, pp. 319–340, 1989.
- [47] D. Gefen, D. Straub, and M.-C. Boudreau, "Structural Equation Modeling and Regression: Guidelines for Research Practice," *Commun. Assoc. Inf. Syst.*, vol. 4, no. October, 2000, doi: 10.17705/1cais.00407.
- [48] C. Barclay, D., Thompson, R., dan Higgins, "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use an Illustration," *Technol. Stud.*, vol. 2, no. 2, pp. 285–309, 1995.
- [49] C. J. Gaskin and B. Happell, "On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use," *Int. J. Nurs. Stud.*, vol. 51, no. 3, pp. 511–521, 2013, doi: 10.1016/j.ijnurstu.2013.10.005.
- [50] J. C. Anderson and D. W. Gerbing, "Some Methods for Respecifying Measurement Models to Obtain Unidimensional Construct Measurement," *J. Mark. Res.*, vol. 19, no. 4, p. 453, 1982, doi: 10.2307/3151719.
- [51] R. B. Kline, *Principles and practices of structural equation modelling Ed. 4*. 2015.
- [52] Z. Awang, "VALIDATING THE MEASUREMENT MODEL: CFA The measurement model of a latent construct," in *SEM Made Simple*, MPWS, 2015, pp. 54–74.
- [53] C. Fornell and D. F. Larcker, "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *J. Mark. Res.*, vol. 18, no. 1, p. 39, 1981, doi: 10.2307/3151312.
- [54] H. Baumgartner and C. Homburg, "Applications of structural equation modeling in marketing and consumer research: A review," *Int. J. Res. Mark.*, vol. 13, pp. 139–161, 1996, doi: 10.1016/j.ecolecon.2015.08.017.
- [55] W. J. Doll, W. Xia, and G. Torzadeh, "A confirmatory factor analysis of the end-user computing satisfaction instrument," *MIS Q. Manag. Inf. Syst.*, vol. 18, no. 4, pp. 453–460, 1994, doi: 10.2307/249524.
- [56] G. Ursachi, I. A. Horodnic, and A. Zait, "How Reliable are Measurement Scales? External Factors with Indirect Influence on Reliability Estimators," *Procedia Econ. Financ.*, vol. 20, no. 15, pp. 679–686, 2015, doi: 10.1016/s2212-5671(15)00123-9.
- [57] I. A. C. Jimenez, L. C. C. García, M. G. Violante, F. Marcolin, and E. Vezzetti, "Commonly used external tam variables in e-learning, agriculture and virtual reality applications," *Futur. Internet*, vol. 13, no. 1, pp. 1–21, 2021, doi: 10.3390/fi13010007.
- [58] H. van der Heijden, "User Acceptance of Hedonic Systems," *MIS Q.*, vol. 28, no. 4, pp. 695–704, 2004.
- [59] R. Agarwal and J. Prasad, "A Conceptual and Operational Definition of Information Technology," *Inf. Syst. Res.*, vol. 9, no. 2, pp. 204–215, 1998.
- [60] P. Ajibade, "Technology acceptance model limitations and criticisms: Exploring the practical applications and use in technology-related studies, mixed-method, and qualitative researches," *Libr. Philos. Pract.*, vol. 2019, 2019.
- [61] F. N. Kerlinger Lee, Howard B., *Foundations of behavioral research*. Fort Worth, TX: Harcourt College Publishers, 2000.