

The Unified Theory of Acceptance and use of Technology as Adoption Framework: A Study

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Abstract—Acceptance of the online learning environment is an up-to-date research pattern in the information system's (IS) acceptance domain. Online learning and training are becoming increasingly common worldwide, reducing the temporal and spatial problems associated with conventional education forms. The key reasons driving online learning are improving access to education and training, improving the quality of learning and lowering costs, and enhancing education's cost-effectiveness. This study's primary purpose is to contrast and integrate various research findings that used the Unified Theory of Technology Acceptance and Use (UTAUT) and its extensions and narrow down the different constructs used. The literature, collected from databases like Emerald, Science Direct, and Taylor Francis, were based on other technology adoption models in education. This study did a perusal of various factors found in the literature, and all aspects related to 'Perceived Behavioural Control' and 'Cognitive Engagement' had a strong positive significant impact on the adoption of technology in education except for factors like 'Price Value' and 'Personal Characteristics,' depending upon the sample. This paper tabulates the literature in which the Unified Theory of Technology Acceptance and Usage applied in education. The review identified the Topic, Author, model, and different factors addressed in the model.

Index Terms— UTAUT, E-learning, Digital learning, Distance learning.

I. INTRODUCTION

The online learning system in research is often pointed to as the interactive learning environment, electronic learning technology, the Learning Management System. The online learning platform is an interactive web-based system. that offers teachers, and learners access anytime and anywhere. The growth of online learning has led to a rise in studies that explore its role in higher education settings. Several of these researches have examined the adoption of online education technology in higher education institutions (HEI). Other research either concentrated on using online learning systems for educational purposes and its influence on teachers' and students' academic achievement or focused on exploring factors that affect teachers or students in accepting online learning technology in higher education (HE) institutions.

A. Online Learning Adoption

Online learning is delivered in either of the two ways as synchronous or asynchronous settings[1]. Time lag characteristics of asynchronous learning, unlike synchronous learning on online platforms, take advantage of access to materials anytime and anywhere, achieve greater mass simultaneously, and quality content. The

geographically dispersed team of an enterprise will receive their skills training through online platforms while at the same time achieving a higher degree of competitiveness. Online learning is also useful for students as they can study at their speed by using online materials. The e-learning market is becoming more and more prominent with the education and business sectors.

Because of the COVID-19 crisis, both instructors and learners find themselves in such a condition where they feel pressured to accept the digital teaching environment. The COVID-19 situation (Source, 2020) has created an enduring challenge to our schools and universities from elementary school to masters level and has intensified teaching-learning day by day. (DQ Institute, 2019) Through digital expertise, teachers can tailor children's technology capabilities that are on the verge of cyber risk, learning opportunities for growth in future projects, particularly in this disease outbreak, where children rely entirely on the internet learning.

After a considerable amount of online experience during the pandemic time, a massive change in online learning has taken place, gaining popularity even after the COVID-19 pandemic, pointing to refreezing. The refreezing phase is necessary for implementing technology into our current teaching process, which allows us to educate people on how they will feel secure and satisfy technology demands in recent years.

B.Unified Theory of Acceptance and Use of Technology (UTAUT)

For over two decades now, studies have performed technology adoption studies. They have used various models and theories to test these experiments using different analysis units in other contexts. The conclusions of these studies differ. Eight theories and models were unified by the developers of the UTAUT model, including Action Theory of Justification (Fishbein and Ajzen 1975), Social Cognitive Theory (SCT) Bandura (1986), Technology Acceptance Model (TAM) (Davis 1989), Expected Behaviour Theory (TPB) Ajzen (1991), PC Utilization Model (MPCU) Thompson et al. (1991) Motivational Model (MM) Davis et al. (1992), TAM and TPB (C-TAM-TPB) Taylor and Todd (1995) and Invention Diffusion Theory (IDT) Rogers (1995).

"The researchers' unification combines all the constructs from eight models to four determinants that predict intentions and use and four moderators (gender, age, experience, and voluntariness of use) of the key relationships. The four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions are direct determinants of behavioral intention and ultimately use behavior Venkatesh et al. (2003)."

" Performance expectancy is the degree to which an individual believes that using the system will help him or her to attain gains in job performance. Effort expectancy is the degree of ease associated with the use of the system. Social influence is the degree to which an individual perceives that important others believe they should use the new system. Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system Venkatesh et al. (2003)."

Over the years since its creation, UTAUT has been popularly used as a conceptual perspective for technology adoption and integration analysis by authors who have conducted observational studies of user intent and behavior. At the time of writing, the main study by Venkatesh et al. (2003) was highlighted more than 30,000 times, with UTAUT addressing various technologies with various control factors (e.g., revenue, sex, experience, ability to use, and schooling).

However, to adopt online learning or different technology in the education sector, various research papers are published regarding adopting online learning by modifying the UTAUT model. This is in line with the other analysis study, Like the one of Lee et al. (2003). This review paper studies the different modifications of UTAUT regarding different technology adoption in the case of learning, which will help the future researcher examine the modification (extension) of UTAUT and various factors used in previous studies.

II. RESEARCH METHODOLOGY

This study examines recent UTAUT research. A systematic electronic search has been carried out. The keywords used were UTAUT with E-learning, Interactive Learning, and Distance Learning. Though spread through numerous conferences and journals, studies have appeared more regularly in journals such as Computers in Human Behavior, Telematics and Informatics, and Computers & Education. The papers were reviewed in terms of features and the types of relationships among model constructs and external factors. Table I provides a detailed list of studies.

Key: TAM - Technology Acceptance Model, PEOU - Perceived Ease Of Use, PU - Perceived Usefulness, BI- Behavioral Intention, FC - Facilitating Condition, SI Social Influence, IT - Information Technology, PV - Price Value, TPB - Theory Of Planned Behavior, HM - Hedonic Motivation, GETAMEL - G70 al Extended Technology Acceptance Model For E-Learning, SE - Self-Efficacy, CA - Computer Anxiety, SIN - System Interactivity, ASE - Area Of Scientific Expertise, IU - Intention To Use.

TABLE I. LITERATURES WITH UTAUT AND ITS MODIFICATION AND EXTENSIONS

Study	Author	Country	Models	Decision parameters and measures of performance (Moderator are not included)
Digital devices adoption in case of children education.	(B. Park, Chang, and Park 2019)	South Korea	UTAUT2	PEOU, PU, Perceived Playfulness, Perceived Risk, Purchase Intention, Attitude
Adoption of mobile learning in HEI.	(Hamidi and Chavoshi 2018a)	Iran	Extended TAM model	PEOU, PU, BI, Context, Trust, Personal Qualities.
Developing UTAUT-3 for e-Learning adoption in HEI.	(Gunasinghe et al. 2019)	Sri Lanka	UTAUT3	PU, PEOU, FC, SI, Habit, Personal Innovativeness, PV, BI
Studying the adoption of interactive whiteboards (IWB).	(Wong, Teo, and Goh 2015)	Australia	Social Cognitive Theory (SCT), TPB, TAM, UTAUT	SE, PU, PEOU, SI, BI.
Studying Factors affecting the adoption of online learning in a different context.	(El-Masri and Tarhini 2017)	Qatar and USA	UTAUT 2	PU, PEOU, SI, FC, HM, PV, Habit, Trust
Developing GETAMEL for analyzing different factors.	(Abdullah and Ward 2016)		TAM and UTAUT analyzed to develop GETAMEL	SE, Enjoyment, Experience, CA, Subjective Norm.
Studying adoption online-learning in HEI in Sri Lanka.	(Samsudeen and Mohamed 2019)	Sri Lanka	UTAUT 2	PU, PEOU, SI, FC, HM, Work Life quality, experience.
Proposing an extended model for E-learning adoption.	(Uğur and Turan 2018)	Turkey	Modified UTAUT	PU, PEOU, SIN, ASE
Studying intention to use Social Learning Platform in HE.	(Khechine and Augier 2019)	France, China, Brazil, USA	UTAUT 2	PEOU, PE, SI, FC, BI, Anxiety, Attitude, Autonomy
Study regarding the adoption of mobile phones by university students for education purposes.	(Nikolopoulou, Gialamas, and Lavidas 2020)	Greece	UTAUT 2	PU, PEOU, SI, HM, FC, BI, PV, Habit, USE Behaviour
Adoption of MOOC.	(Fianu et al. 2018)	Ghana	Extended UTAUT	PU, PEOU, SI, FC, Computer Self-efficacy, System quality, Instructional quality.
E-learning Adoption effect of Values.	(Mehta et al. 2019)	Gambia, UK	Values-Enhanced Technology Adoption (VETA) model (Derived from UTAUT2)	PE, PEOU, SI, PV, Habit, BI, HM, Security (SE), Achievement (AC), Conformity (CO), Tradition (TR)
Emergency adoption of E-learning.	(Patricia 2020)	USA	TAM	Attitudes, Affect, Motivation, PEOU, SE, and Accessibility to Technology, Cognitive Engagement
Multimedia technology Adoption for learning.	(C. W. Park et al. 2019)	USA	Task technology fit and TAM	Technology Characteristic, Individual Characteristic, PU, PEOU, IU, Attitude, Actual use,
Studying Factors influencing the adoption of E-learning.	(Tarhini et al. 2017)	England	Extended UTAUT	PU, PEOU, HM, Habit, SI, PV, FC, Trust, SE
Adoption of Cloud Computing for HE.	(Juma and Tjahyanto 2019)	Zanzibar	"TAM" + "TOE" = "ITOETAM"	Internal-External Factors (reliability, Management, Acceptance, Privacy), Technological Factors (Data Security, Risk), Organizational Factors (Age, Size), Environmental Factors (Government Regulation), PU, PEOU
Studying factors like technological, individual, and pedagogical for the adoption of mobile learning in HE.	(Hamidi and Chavoshi 2018b)	Iran	UTAUT	Interactivity (INT), Technological factors, Social factors (SI), Individual factors (PI, SE, Trust), PE, PEOU, Learning Content Quality (LCQ),
Shifting of traditional learning to distance learning.	(Rizun and Strzelecki 2020)	Poland	GETAMEL	PU, PEOU, Enjoyment, Experience, IU, Attitude, AU, SE, CA

III. FACTORS OF UTAUT

Several researchers for distinct work intentions and topics of significance have performed UTAUT studies by applying a range of research methodologies in various contexts. Many new constructs have been integrated into the original theory in this complex body, with UTAUT being combined with certain other theoretical frameworks and, on the circumstance, the new-specification of the underlying relationships among UTAUT variables. The most frequently used external variables are discussed below.

A. Attitudes and Motivation

Attitudes towards actions apply to the positive or negative assessment of the individual's activity [3]. Student attitudes towards digital learning have a significant effect on their learning experience. PEOU and PU presented distinctive trends in the development of attitudes. As a mindset, it translates directly into a behavioral intention [4]. Another result of this study is the finding that attitudes seem to be the most potent predictors of behavioral intent, as explained by the large variance of the behavioral intention variable [5]. This agrees with Attitude Towards Use has the most significant impact on using learning technology [6].

Motivation refers to the inner grounds of the learner to learn. Motivation relates to the perceived significance of an action influencing behavioral intent. Learners who are motivated will take part in self-regulation behaviors that help them reach their goals [3]. Theoretically, HM has been described as a significant indicator of the intention to implement e-learning systems. HM has already proved to be a substantial factor in influencing student BI's use of e-learning systems [7],[8]. Another research shows that HM has been shown to affect BI, as K. Nikolopoulou et al. (2019) suggested. It can be inferred that the probability of using a mobile phone is higher when students find it enjoyable. According to Mehta et al. (2019), HM was only significant in the United Kingdom, suggesting a possible disparity in how e-learning pleasure was viewed to help different contexts (culture) gain knowledge outcomes. When learners are not motivated, their cognitive involvement level is low, and vice versa [1]. Motivation affects the efforts of students and the degree of dedication they have put in particular tasks. The relationship between habit and HM is presented by Tarhini et al. (2019), which is if any use of the application became the habit, Users and also believe that the online learning system will be pleased to use it, as they're more willing to use it.

B. Self-efficacy

It's an oriented definition in which consumers test what they can do with the skills that they hold. Students can improve digital self-efficiency knowledge based on the experience of technology. They can need instruction and training about using learning resources and technologies before beginning an online program. In the research carried out by K. T. Wong et al. (2015) observed that TSE (Teachers' Self-Efficacy) had substantial favorable effects on PU, PEOU, and FC. Professionals and curriculum design designers must make an attempt to boost school leaders' TSEs by paying close attention to increasing teachers' belief and confidence with the use of IWBs, particularly in the design of curriculum content for teacher-education programmers [9]. SE can influence people's behavioral intent to use technologies, so people who think technology too complex and believe they do not have enough capacity to use technology will resist them. Based on this study's findings, the strongest indicator of PEOU user online-learning systems is self-efficacy [10]. Studies on MOOC's acceptance in studying notes that learners' use of the online-learning systems is impacted by device self-efficiency. It turns out that relevant expertise in electronic devices is essential for MOOCs' effective use. Therefore, the report suggests that teachers should indicate that students who may not have the appropriate expertise to use electronic equipment receive any preparation to successfully use the MOOC and any other online-learning systems [11]. Self-efficiency is yet another critical consideration in the successful use and uptake of online education (due to unforeseen circumstances or not). The results of this research backing prior findings that learners who are confident in accepting a variety of self-regulatory methods are more suitable to accomplish their educational tasks [1]. The study on m-learning acceptance also states that perhaps the self-confidence of people using m-learning helps them believe that they will have control over the world even though it is not hard for them to use this platform quickly [16].

Self-efficacy was found to play a significant factor in deciding student behavioral intention to adopt the e-learning process. Self-efficiency has been interested in the production of a more successful learning mechanism. Policymakers can also have online and off-line assistance and preparation that is critical to enhancing self-efficiency in e-learning [12].

C. Experience and Habit

Habit is just the extent to which a consumer behaves instinctively or spontaneously based on prior experience [13]. Habit is practice, but practice might not be enough to build a habit [13]. Many studies have previously checked and verified the major effect of Habit on BI. The research findings showed that the majority of participants had standard views about the use of online learning [14]. The research carried out by M. El-Masri et al. (2017) acknowledged the importance of habit and suggesting that administrators should explain the benefits of online learning programs to students and help them find online assistance in response to the instruction until users enter a point where the use of new tech became an essential part of the learning experiences and practice. As e-learning programs become a habit for learners, the technique is much more likely to also be used [7]. In the context of mobile education, habit reflects the consequences of prior contact with mobile use. The elevated use of smartphones by technology users has led to a higher level of efficiency of cell phones [15]. Established work-related procedures for seeking knowledge and gaining work-related skills could help assess future work-related objectives and participate in work-related activities, like e-learning. Students prepared to use online-learning to develop workouts that included online education methods [16]. In general, users who mostly use smartphones are assumed to have a much more extraordinary potential to adopt innovations even while using them. If the platform's use becomes a practice for users and that they also realize that perhaps the online-learning system is delighted to use it, they are often more willing to use it [12].

Experience (XP) is defined as the number and type of skills gained by a person over time. XP is among the most significant key variables for such a reason. People with better programming skills can be more positive when using any web / remote learning tool. Person usage and perception of the web have a direct link with the adoption of technology. Online experience (IE) is recognized as one of the major elements evaluating technology's adoption [17]. More the experience people have while using the web, the duration of their visit at the entry point, and the intensity of their visit to the web, the more probably they appear to be using the e-learning system [8]. It is in accordance with the C. W. Park et al. (2018); as stated, practitioners will be able to make up for the fact that human traits, such as knowledge and enthusiasm, play an essential role in the adoption of multimedia learning technologies [18].

D. Anxiety

Meta-analysis performed by N. Bozionelos (2004) has confirmed the impact of anxiety on the human adoption of information technology. This influence ensures that fear allows consumers to avoid stress and seek escape [14] physically. In a heterogeneous study setting, it is difficult to control personal attributes like anxiety while explaining any use of actions [5].

Computer Anxiety (CA) is identified as an expression of anxious or emotional responses when performing certain tasks on the computer. For anxiety, it might be the only construct with a pessimistic feeling. Computer anxiety among students, which is sensed in the distance teaching practice, harms their perception of the utility of distance learning [6].

E. Personal Innovativeness and Enjoyment

Personal innovation (creativity) is a positive characteristic that made people want to test out new technologies [19]. This may influence the use of online-Learning for educators. In comparison to the findings of UTAUT-3, the impact of Personal innovation and creativity in Information Technology on both BI and Use was marginal, showing its ineptness in describing HEI 's acceptance of online-Learning by academics [14]. This finding confirms that the PI study has positively influenced the PEOU of m-learning, which was incorrect [20].

Following the GETAMEL, enjoyment is interpreted as the extent to which the task of applying any method is deemed to be pleasant, irrespective of the ramifications of the implementation of the system [10]. The study was done by Rizun (2020) on distance learning, which states that individual satisfaction with the distance learning experience has a direct and positive influence on the distance learning experience.

F. Trust

The theory of trust is being used in extensive research in education and medicine, which differ in nature and description. Trust is generally accepted as an independent competition to accomplish an assigned assignment [21]. Trust is a moral conviction that someone is reliable and able to admit weakness. Trust is a tool adopted by people to relieve the anticipated concerns regarding the use of a technical system, and trust has a healthy and positive relationship with the application use plan [22]. That's because users' activities will be controlled by the problem of security and trust when using the device. Trying to improve trust would significantly enhance the user's affecting the adoption of e-books in online university databases.

Consequently, trust throughout this research was predicted to affect the person's behavioral intention to use online-learning [7]. Work on the implications of trust in literary works has said that it is vital to facilitate students to accept e-learning platforms, so trust plays a key role in implementing and rapid adoption of many of these electronic systems [12]. This also supports the result shown by Hamidi (2018); if the user feels that perhaps the system has the power, the states that expanded and the integrity to deliver its services, he/she trusts it and, if the users have trust in the technology, they feel comfortable with it. Work-life quality (WLQ) means the belief or assumption that somebody has that, while using technologies, WLQ is yet another construct that influences students through their BI about using an e-learning system, i.e., while using an e-learning system [8].

G. Autonomy and Cognitive Engagement

Student autonomy in the current study refers to their freedom and motivation to learn. We consider it necessary to assess the significant effect of autonomy on the decision to use new technologies, as a sense of duty and self-control would make students more comfortable and willing to use new technologies. Like in the case of a heterogeneous sample, we could not control personal characteristics, such as autonomy [5].

Cognitive engagement is a cognitive process that lets the person understand knowledge. This entails simply focusing, engaging curiosity, concentrating. Cognitive absorption refers to deep commitment and flows that focus on a given activity without paying too much attention to something else [3]. Online education tools must be offered in ways that enhance the educational experience, which includes insight into the factors that influence online learning. In the study by Patricia (2020), cognitive involvement (understanding, focus, dedication, participation, and involvement) among learners declined after staying at home due to COVID19. The experiments were quite different, but more study is needed to get an accurate idea of management methods for student performance.

H. Price Value (PV)

This variable appears to be valid in the consumer context, where PV relates to an essential intellectual exchange-off between the potential gains of just using technology and the money spent upon this. When the expected rewards are more important than that of consumer cognition's perceived costs, PV has a particular benefit, which has a beneficial impact on the system's behavioral intent. In certain situations, the factor is trivial since e-Learning is freely available to all educators in the HEIs. PV is, therefore, considered to remain constant but does not significantly impact the adoption of e-learning. As in the study by El-Masri et al. (2017), the price value was not a significant behavioral intent indicator. This is consistent with the result; the PV constructs did not have a significant effect on BI [9][12]. However, it is contradicting to the finding of Mehta et al. (2019); that Price Value was the strongest direct predictor of behavioral intent, that Learners intended to use e-learning based on the assessment of non-financial costs, such as time and effort to use e-learning.

I. Other Factors

System Interactivity (SIN) is about collaborative interaction with the system interface. This study indicates that system interaction directly affects the behavioral intent of e-learning [23]. Computer interactions have a strong impact on BI. It indicates that educators continue to use e-learning tools to learn as long as they see their interface as collaborative, flexible, and efficient to use and coordinate with students [23]. This implies that academicians do believe that the interaction of interaction and flexibility has an influence on their efforts to use e-learning technologies [23]. The same research forecasts that the area of empirical awareness does not significantly impact educators' intention to use e-learning technologies [23].

Ongoing-external factors (validity, control, approval, and data protection) are cloud computing characteristics. According to the study that included these factors, ongoing-external factors have been a statistically significant challenge in implementing a higher education cloud-based adoption model [24].

IV. CONCLUSIONS

It is apparent from the review that the factors which need to be addressed to assess the user's technology adoption differ based upon the technology to be introduced, context, and culture of the population. Furthermore, the reviewed research articles does not provide a clean edge of predictions, even though most of them (study results) had been consistent with the previous submissions of the publishers of UTAUT [2]. The impact of the construct factors EE, PE, and SI on the variable BI is not considered. It is evident in the above review that almost all variables positively affect the implementation of technologies in education, except price value and some personal attributes such as autonomy, anxiety, and attitude. The PV construction did not have a significant

impact on BI [9][12]. Whereas, in the case of personal characteristics, a homogeneous sample is required because, in a heterogeneous sample, it is challenging to control personal characteristics when explaining use.

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