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A Conceptual Framework for University Teachers' Adoption of Educational Technologies in Higher Education: Insights from a Systematic Review

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Abstract: The main objective of this research is to develop a conceptual framework for understanding educational technology adoption intentions in the Indian context. This was accomplished through a system literature review of the publications retrieved from the two well-known databases, Scopus and Web of Science (WoS). A step-by-step process is followed to retrieve the published literature on technology adoption in higher education. The results proposed eight constructs as behavioural intention predictors for educational technology use. Additionally, the authors also discuss the moderators that may affect the adoption intention of university teachers. At the end, a conceptual framework is proposed which the author believes that will effectively use in the future research.

Keywords: Educational Technology Adoption; Behavioural Intention; Conceptual Framework; University Teachers.

1. Introduction

In our fast-paced, constantly-changing world of today, technology has become indispensable to many facets of our existence. It has increased productivity, transformed entire industries and opened up previously unthinkable prospects. The swift progression of technology demands that people and the community keep up with the most recent advancements and modify their practices correspondingly to maintain a competitive edge. Technology has brought about a huge transformation in education as well. With an increasing understanding of how technology can improve and transform teaching and learning, there has been a notable surge in the incorporation of technology into education in the last several years.

The term "Technology Adoption" in education describes how different digital tools, platforms and resources are incorporated into teaching, learning and administrative procedures to enhance the quality of instruction. Particularly in higher education, this tendency has drastically changed the ways that instruction and learning are delivered. It includes enhancing teaching, learning, research and administrative tasks via the use of technological tools, resources and approaches. In order to enhance educational experiences and increase learning results, higher education has embraced technology more and more during the last 20 years. The emphasis on educating students for the modern workforce, technological improvements and the increased need for flexible and accessible learning options have all contributed to this change. Technology's potential to improve learning is one of the key benefits of its adoption in higher education. Teachers may create more interactive and engaging learning environments by integrating technology into their lesson plans. Multimedia presentations, movies, animations and interactive infographics are examples of tools that can be used to better communicate difficult ideas to students, increasing their understanding, retention and engagement. Furthermore, technology has reduced paperwork and human efforts by streamlining administrative procedures in higher education.

The use of technology in higher education has a bright future ahead of it. In order to further improve learning experiences, educators may examine at cutting edge technology like augmented reality, virtual reality and artificial intelligence to further enhance learning experiences. By adopting new technologies and making frequent adjustments to their instructional strategies, universities can provide their students with the knowledge and abilities necessary to succeed in the digital age.

2. Literature Review

The literature review was conducted in two distinct phases are as follows:

2.1 Phase I: Literature Review

A comprehensive examination of theories about technology adoption was undertaken to gain a comprehensive understanding of the overarching concepts prevalent in the existing literature. Over the past 45 years, the field of technology adoption has significantly evolved, with numerous theories and models developed to explain how individuals adopt new technologies. The following is a brief overview of this evolution:

2.1.1 Theory of Reasonable Action

The Theory of Reasonable Action (TRA) by Fishbein and Ajzen (1975) posits that behaviour is largely determined by one's attitudes. "Attitude is defined as a person's assessment of a thing". The term "behaviour" describes the outcome, while the term "belief" refers to the connection between an item and some characteristic. When attitudes are predicated on particular presumptions about the behavior in question, they frequently function effectively. In addition, they are influenced by individual subjective norms of how local communities perceive certain behaviours.

2.1.2 Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Davis (1986) as a refinement of the Theory of Reasonable Action (Figure 2.1). It was specifically modified to stimulate how customers would use information technology (IT). The model's perceived utility and perceived ease of use were its two main characteristics. The term "perceived utility" (PU) describes how a potential user feels about the system and how it will benefit their activities. The concept of "perceived ease of use" (PEU) describes how user-friendly a system is thought to be.

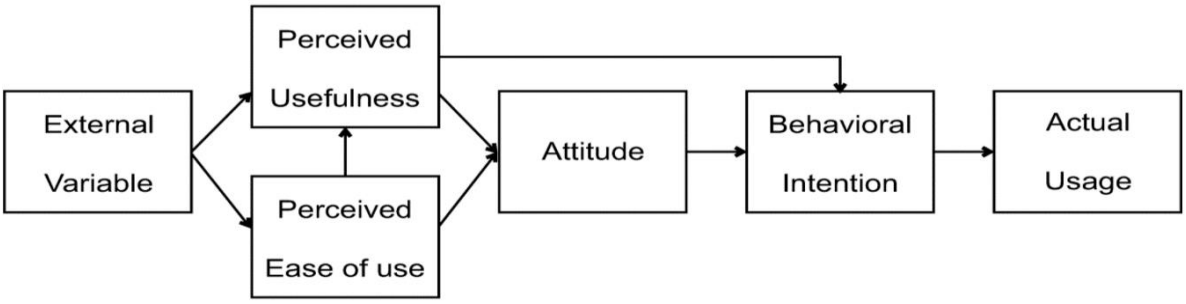


Figure 2.1 – Technology Acceptance Model-1: Source: Davis (1986)

2.1.3 Theory of Planned Behaviour

The Theory of Planned Behaviour, which Ajzen (1991) created, outlined the main elements that influence behavioural intention. The Theory of Reasonable Action's first two components are the same as these. The model's perceived utility and perceived ease of use were its two main characteristics.

2.1.4 Theory of 'diffusion of innovation'

Additional study on innovation acceptance and adoption was made possible by Rogers' (1995) "diffusion of innovation" idea. For his research, he compiled more than 500 diffusion studies on how individuals and organizations absorb innovation. According to the theory, an invention spreads and becomes more ingrained among a social system's participants over time. The concept states that understanding, decision-making, persuasion, execution and confirmation are the first steps toward innovation and acceptance.

2.1.5 Decomposed Theory of Planned Behaviour

The Decomposed Theory of Planned Behaviour was first presented by Taylor and Todd (1995). It is composed of three main influencing factors: Perceived Behaviour Control, Subjective Norms and Attitude.

2.1.6 Technology Acceptance Model (TAM-2)

Using longitudinal data that was initially gathered on four distinct systems at four different firms, Venkatesh and Davis (2000) assessed the enlarged Technology Acceptance Model, or TAM-2. While involvement was mandatory in two of the inquiries, it was voluntary in the other two. Prior to, one month after and three months after adoption, each organization measured the model constructs. At each of the four organizations' three assessment points, the TAM-2 model

demonstrated robust validation. A user's acceptance of technology was greatly influenced by social and cognitive elements (subjective norm, voluntariness, image, work relevance, output quality and outcome demonstrability) as well as professional aspects. The findings demonstrated that in both the required and optional scenarios, the TAM 2 model functioned as predicted. The results of these extensive empirical studies provided a solid basis for further study of technology acceptance models.

2.1.7 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh et al. (2003) following a comprehensive evaluation of the previous well-known theories of technology adoption. After removing similar or redundant constructs, the eight theories and models of technology adoption that make up this synthesis are the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Motivational Model (MM), Social Cognitive Theory (SCT), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Combined TAM and TPB. The four factors that determine users' behavioural intention are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC) in the new model (Figure 2.2). Perceived usefulness, extrinsic motivation, task fit, relative advantage and result expectations are the five constructs that come before performance expectations. Expected effort is influenced by perceived complexity and usability. Gender, age, experience and voluntary usage were taken into account as moderating factors. The study found that PE, EE and SI had an impact on BI, while BI and FC influenced Use Behaviour. Furthermore, it was found that Social Influence did not appear to play any part in Voluntary Contexts.

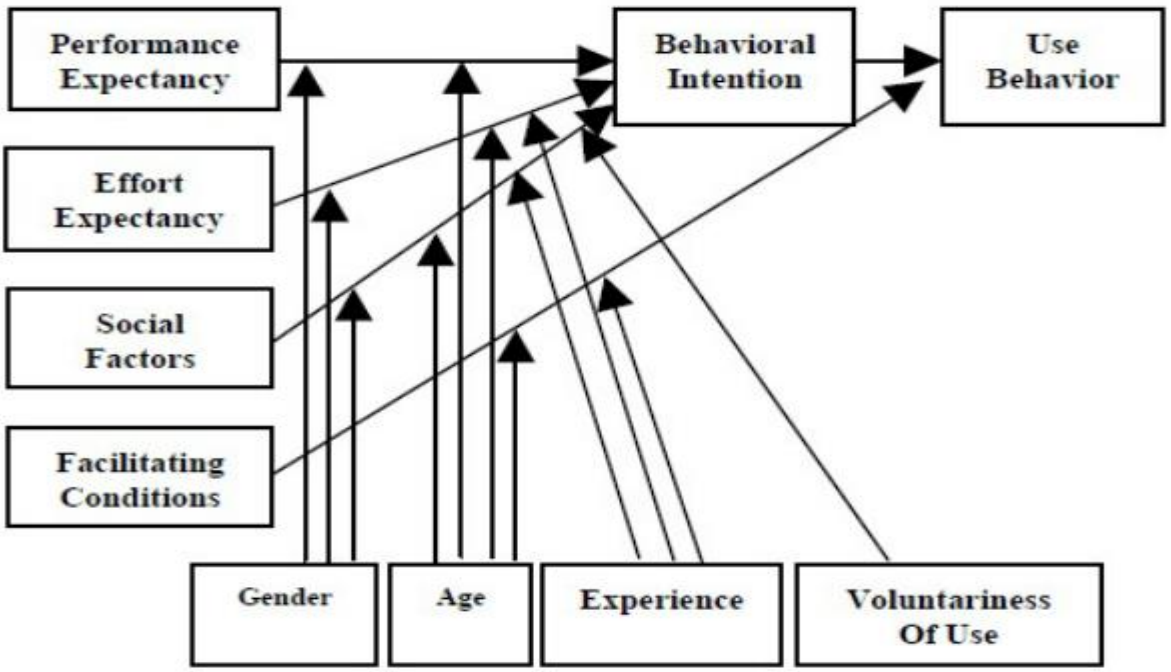


Figure 2.2 - UTAUT Model (Venkatesh et al. 2003)

2.1.8 Technology Acceptance Model (TAM-3)

The TAM 2 Model and the Model of the Determinants of Perceived Ease of Use were integrated by Venkatesh and Bala in 2008 to form the Integrated Model of Technology Acceptance, or TAM 3. This model considered the variables of perceived utility (PU) and perceived ease of use (PEU) in addition to individual differences, system characteristics, social impact and facilitating situations. Between PEU and PU, PEU and Computer Anxiety and PEU and Behavioural Intention (BI), self-experience functioned as a moderator in the TAM 3 model. This model was tested using examples from actual IT implementation projects.

2.1.9 Unified Theory of Acceptance and Use of Technology (UTAUT2)

UTAUT2 placed more of an emphasis on customers than it did on staff, in contrast to UTAUT. It was discovered that the four UTAUT constructs, which were motivated by external factors, centred on utilitarian value. In order to supplement with intrinsic components, three intrinsic motivational factors were introduced to the UTAUT2 model (Figure 2.3): habits, hedonic motivation and price value. To influence the relationship between the independent variables and the purpose and usage of ICT for behavior, moderating variables such as the users' age, gender and experiences were used. The UTAUT 2 model performed much better in the empirical study than the UTAUT model in describing the variance in both Use Behavior (40–52%) and Behavioural Intention (56%–74%).

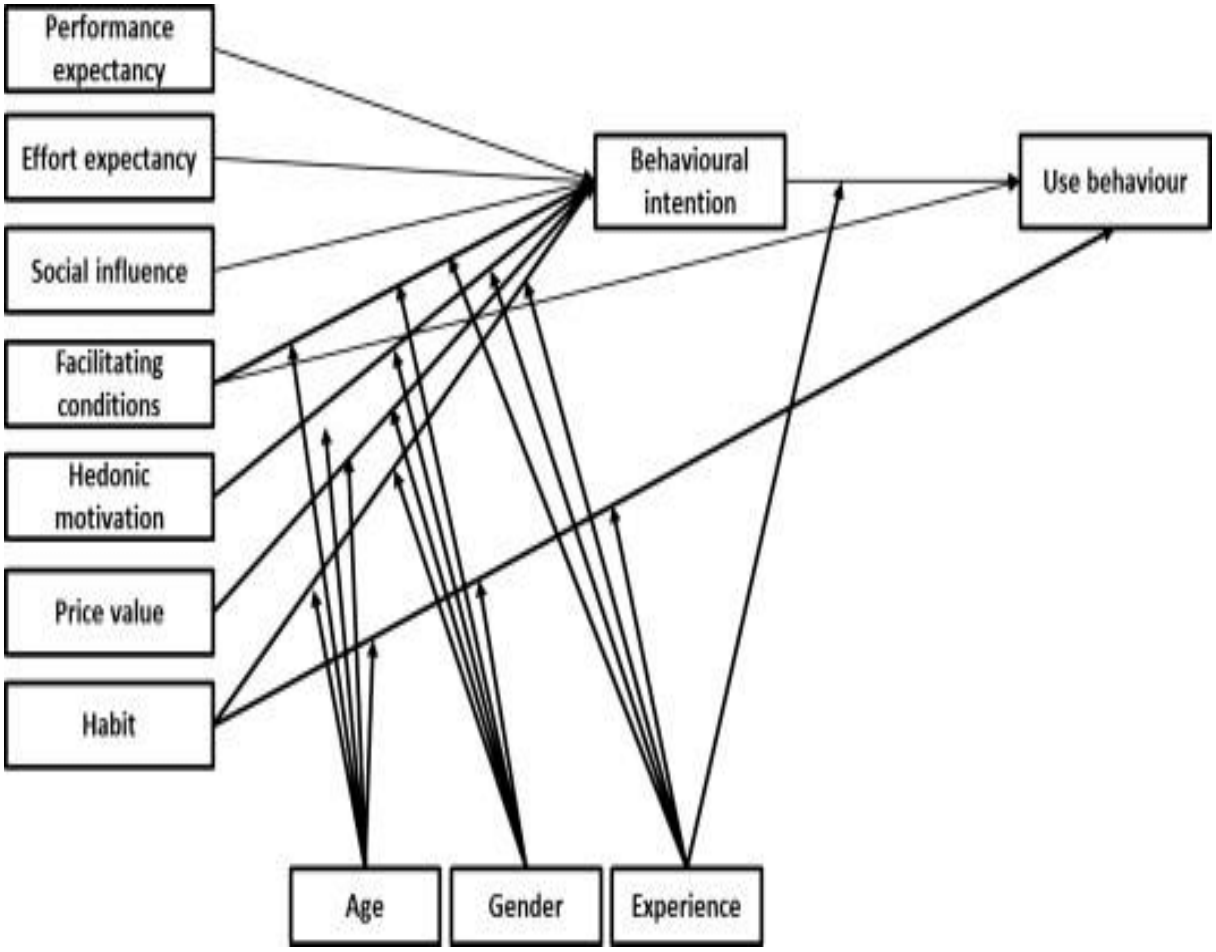


Figure 2.3 – Technology Acceptance Model – UTAUT2 (Source: Venkatesh et al (2012)

2.1.10 Unified Theory of Acceptance and Use of Technology (UTAUT3)

The concept of personal innovativeness (PI) has been introduced and validated by Farooq et al. (2017), adding to the body of knowledge of the expanded unified theory of acceptance and use of technology (UTAUT2). They have made a substantial theoretical, methodological and contextual contribution by achieving this and applying a strict partial least square (PLS) based structural equation model (SEM) technique. They have also yielded a significant potential reward in the setting of poor nations. The study's findings have confirmed the significance of personal innovativeness (PI) as a critical personality trait that affects consumers' adoption and use of technology in the information technology (IT) sector. Furthermore, the research verified the current frameworks of the expanded unified theory of technology acceptance and utilization (UTAUT2). The study's conclusions lend credence to the idea that a variety of factors, such as performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), price value (PV), habit (H) and personal innovativeness (PI), have a significant impact on the adoption of the newest technological innovations, such as lecture capture systems.

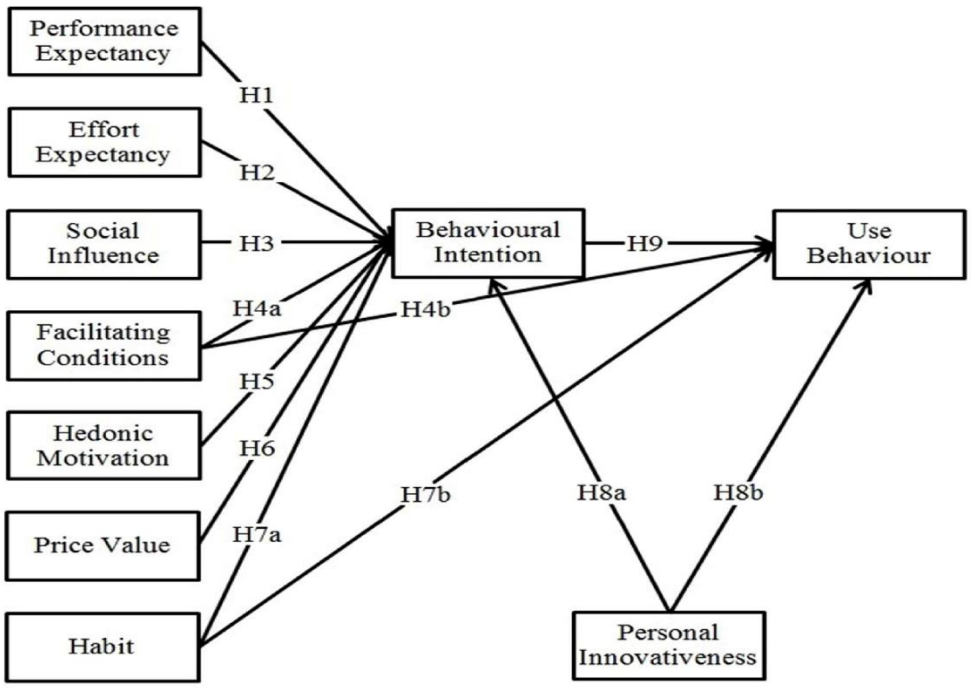


Figure 2.4 – Technology Acceptance Model – UTAUT3 (Source: Farooq et al, 2017)

2.2 Phase-II: Literature Review

Phase II includes carrying out the Systematic Literature Review (SLR) of all the publications that have been published in Web of Sciences (WOS) and Scopus-indexed journals. Additionally, a search was conducted and relevant theses were examined in Shodhganga, the repository of PhD theses maintained by Inflibnet and approved by Indian Universities. In academic research, conducting a literature review using reputable databases like Scopus and Web of Science is essential. These systems provide vast and well selected collections of academic literature, ensuring the reliability and relevance of the information retrieved. These resources can be used by researchers to identify existing knowledge gaps, track changing research orientations and demonstrate the significance of their contributions to the larger academic community. In addition to strengthening the validity of research, this exhaustive review process makes it easier to produce well-informed, contextually grounded research proposals and articles, which promotes the methodical and evidence-based growth of knowledge. Thus, a Boolean search was carried out for published publications on the Web of Sciences (WoS) and Scopus databases. With the following search string: ((“theor*" OR "Model”) AND (“technolog*”) AND (“Adoption" OR "Acceptance”) AND (“Education*" OR "Learn*")), 417 articles from Scopus and 289 articles from WoS data base were extracted for the literature review. Table 2.1 presents the results of a bibliometric study of the literature that was taken from the WoS and Scopus databases.

Table 2.1: Bibliometric analysis of the extracted literature from the Scopus and WoS databases

Year	No. of Articles
2002	1
2004	1
2005	2
2006	2
2007	3
2008	9
2009	3
2010	11

Stakeholder’s	No. of Articles
Students	278
Teachers	81
Review	28
Others	93
Grand Total	**480**

Language	No. of Articles
English	466

2011	8
2012	8
2013	15
2014	18
2015	24
2016	10
2017	30
2018	23
2019	36
2020	39
2021	72
2022	88
2023	77
Grand Total	480

Spanish	9
Chinese	2
Persian	1
Portuguese	1
French	1
Grand Total	480

Type of Article	**No. of Articles**
Article	337
Book chapter	9
Conference paper	98
Proceedings Paper	26
Review	10
Grand Total	480

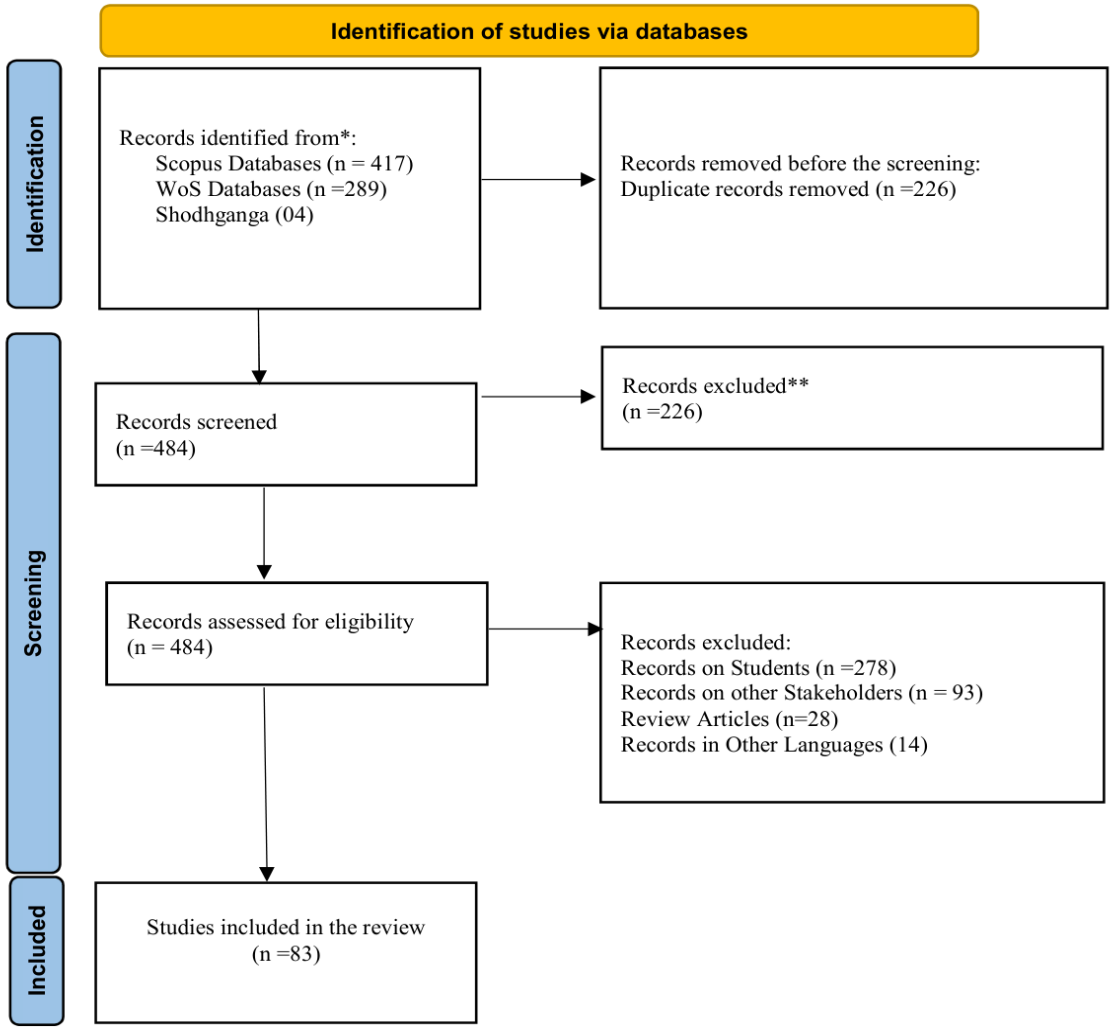


Figure 2.5: Flow diagram for the selection of study

The systematic literature review (SLR) of the numerous research articles and thesis that have been extracted from the multiple databases is displayed using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) flow chart, which is depicted in Figure 2.5.

After going through the comprehensive systematic literature, it is observed that various theories exist in the literature that are extensively to know the use behaviour of adoption of technology and the same theories also has been used for measuring the adoption intention in the educational context. In education, teachers and learners are two main part of the process and factors leading to adoption of any educational technology may differ from student to instructor. Also, there is a need to develop conceptual framework so that the same can be used to measure the adoption intention. Therefore, the primary objective of this work is to create a conceptual model based on systematic literature review that will help future research in measuring the adoption intention of higher education teachers.

3. CONCEPTUAL FRAMEWORK

3.1 Independent Variables

3.1.1 Performance Expectancy (PE)

Performance Expectancy (PE) refers to “the degree to which users anticipate that using technology will enhance their performance” (Venkatesh et al., 2003). In the context of education, this translates to teachers' expectations that incorporating ICT tools into their teaching methods will improve the quality of education they provide (Huang & Kao, 2015).

3.1.2 Effort Expectancy (EE)

Effort Expectancy (EE) is the "degree of simplicity and ease of use of a system” to perform their tasks (Venkatesh et al., 2003), (Huang & Kao, 2015); (Rudhumbu, 2022). In the current study, EE is defined as the “perception of teachers on ease of learning ICT Tools and usage of it in pedagogy, in practice”.

3.1.3 Social Influence (SI)

Social Influence (SI) is “perception of the user on the level of appreciation and respect that they will receive from their social groups, like peers, colleagues and friends, if the technology tool is used” (Venkatesh et al., 2003). In the present study, SI refers to the teacher’s perception of the stakeholders’ appreciation on usage of the ICT tools in pedagogy, thereby influencing the user positively.

3.1.4 Facilitating Conditions (FC)

Facilitating Conditions (FC) refer to “the user's perception of the extent of facilitating support in terms of requisite technology infrastructure and institutional support ,like technical training and support , to enable use of the technology” (Venkatesh et al., 2012). Most of the studies concluded that lack of FC has adverse influence on behavioural intention and usage of technology (Jakkaew & Hemrungrote, 2017). In the present study, FC refers to the perception of the user on availability of enabling infrastructural resources, like Computers, Mobile, Internet etc. and the capability (requisite knowledge and skills) for using ICT tools by teachers.

3.1.5 Hedonic Motivation (HM)

Hedonic Motivation (HM) is “the intrinsic motivation that a user gets out of using the technology” (Venkatesh et al., 2012). The studies conducted by Venkatesh et al., (2012); Alalwan et al. (2017) and Rudhumbu, 2022), concluded that Hedonic Motivation has a significant influence on user’s behavioural intentions to adopt technology. In the present study, a teacher, who loves and enjoys using ICT tools, is more likely to have an intention to use the ICT tools in the academic delivery.

3.1.6 Habit (HT)

Habit (HT) is “the extent to which a person behaves instinctively, as a consequence of previous repetitive experience” (Venkatesh et al., 2012; Gunasinghe et al., 2020). Previous studies concluded that a habit has a positive impact on Behavioural Intention (Venkatesh et al., 2012, Huang & Kao, 2015; Gharrah & Aljaafreh, 2021). As COVID-19 times lasted for a long period of time, certain repetitive behavioural patterns and practices have become habits of the users. In

this study, Habit (HT) refers to "the teacher's perception of the extent to which usage of ICT tools has become a habit, thereby influencing the behavioural intention positively".

3.1.7 Value Belief (VB)

Value Belief (VB) is the "perception and belief that the task is significant for the achievement of the goals" (Research has shown that one of the most important predictors of successful technology integration is teacher's belief in the utility of technology (Venkatesh, Morris, Davis, & Davis, 2003). In our present study, Values and Beliefs (VB) refer to "the conviction of the teacher that use of technology in pedagogy will enable quality STEM education positively".

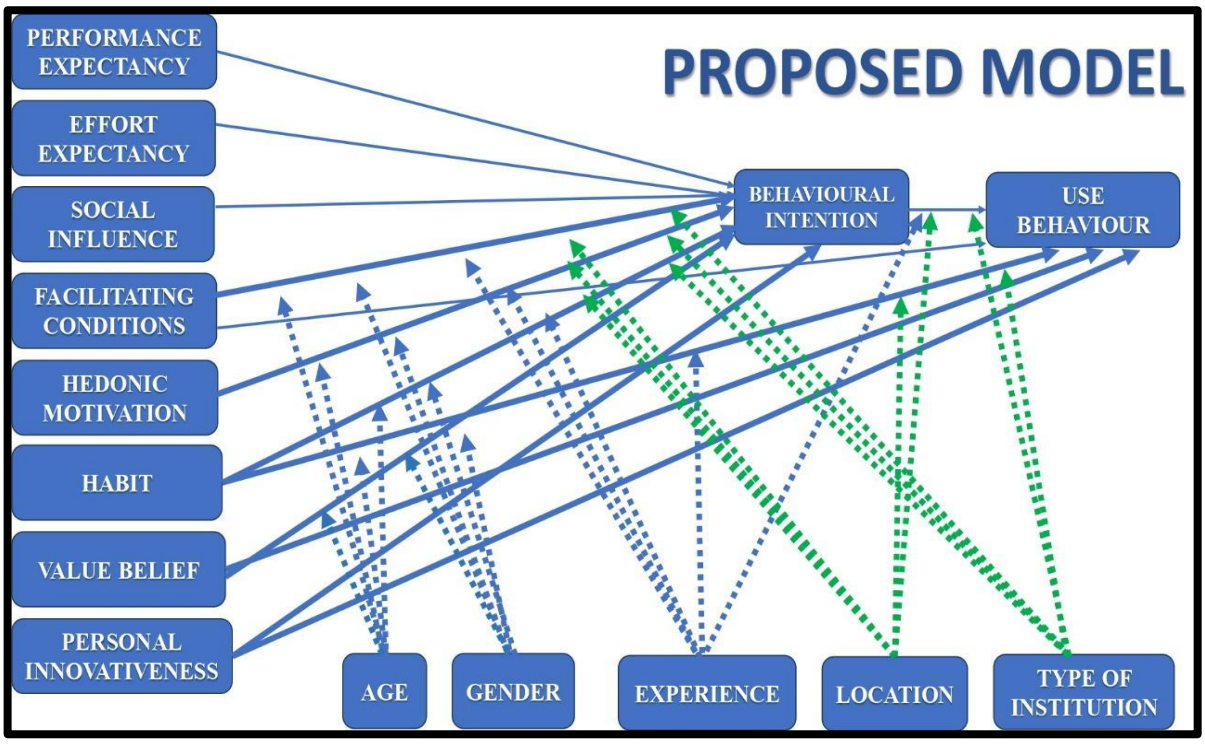
3.2 Dependent Variables

3.2.1 Behavioural Intention (BI)

Behavioural Intention (BI) is the "likelihood of a person to use technology" (Venkatesh et al., 2003). It is the degree to which a user has consciously decided to carry out or refrain from performing a specific act in the future (Meyliana et al., 2019).

3.2.2 Use Behaviour (UB)

Use Behaviour (UB) refers to the actual use of technology by the user (Venkatesh et al., 2003). While Behavioral Intention (BI) represents the user's intent and thought process, UB denotes the user's actual actions. Previous research has demonstrated that BI significantly influences UB (Ajzen, 2002). Most studies based on the Unified Theory of Acceptance and Use of Technology (UTAUT) have measured technology usage through duration, frequency and intensity, or a combination of these metrics, often using self-reporting methods (e.g., Brown et al., 2010; Liang et al., 2010; Venkatesh et al., 2008). In the present study, UB was assessed by both the level of use (including awareness, deployment/experimentation with new technologies and training/facilitating other teachers) and the frequency (measured as the percentage of classes in which the teacher used educational technology.



4. DISCUSSION

The systematic literature review aimed at developing a conceptual framework for the adoption of educational technologies among university teachers has provided several insightful findings. This discussion section synthesizes these findings and highlights their implications, limitations and potential directions for future research. The review revealed that the adoption of educational technologies by university teachers is influenced by a multifaceted interplay of factors, including individual, institutional and technological dimensions. Key individual factors include teachers' attitudes towards technology, perceived ease of use, perceived usefulness and self-efficacy. Institutional factors encompass support from the administration, availability of resources, professional development opportunities and the overall institutional culture towards innovation. Technological factors involve the accessibility, reliability and pedagogical alignment of the technologies. For university administrators and policymakers, the findings underscore the importance of creating a supportive environment that fosters positive attitudes towards educational technologies. This can be achieved by providing continuous professional development, ensuring adequate technical support and fostering a culture of innovation. Furthermore, involving teachers in the decision-making process regarding the selection and implementation of educational technologies can enhance their sense of ownership and willingness to adopt new tools. Despite the comprehensive nature of this review, several limitations must be acknowledged. Firstly, the scope of the literature included may not capture all relevant studies, particularly those published in languages other than English. Secondly, the rapidly evolving nature of educational technologies means that some of the findings may become outdated as new technologies emerge. Thirdly, the review primarily focuses on higher education institutions, which may limit the generalizability of the findings to other educational contexts, such as K-12 education or corporate training environments.

5. CONCLUSION

This systematic literature review has laid the groundwork for a conceptual framework that elucidates the adoption of educational technologies among university teachers. By understanding the complex interplay of individual, institutional and technological factors, stakeholders can better support teachers in integrating these technologies into their pedagogical practices. Ultimately, fostering a supportive and innovative environment will enhance the teaching and learning experience in higher education institutions. Additionally, exploring the role of emerging technologies, such as artificial intelligence and augmented reality, in educational settings could offer valuable contributions to the evolving landscape of educational technology adoption.

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REFERENCES

1. Ajzen, I. (1991). The Theory of Planned Behavior. Organization Behavior and Human Decision Processes, Academic Press, Inc. 179-211.
2. Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control and the theory of planned behavior. Journal of Applied Social Psychology, 32(4). https://doi.org/10.1111/j.1559- 1816.2002.tb00236.x
3. Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. International Journal of Information Management, 37(3). https://doi.org/10.1016/j.ijinfomgt.2017.01.002
4. Davis, F.D. (1986). A technology acceptance model for empirically testing new end-user information systems: Theory and results. Massachusetts, United States: Sloan School of Management, Massachusetts Institute of Technology.
5. Farooq, M.S., Salam, M., Jaafar, N., Fayolle, A., Ayupp, K., Radovic-Markovic, M. and Sajid, A. (2017), "Acceptance and use of lecture capture system (LCS) in executive business studies: extending UTAUT2", Interactive Technology and Smart Education, Vol. 14 No. 4, pp. 329-348.
6. Fishbein, M. and Ajzen, I. (1975), Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Addison-Wesley Reading, MA.

7. Gharrah, A. salameh A., & Aljaafreh, A. (2021). Why Students Use Social Networks for Education: Extension of Utaut2. Journal of Technology and Science Education, 11(1). https://doi.org/10.3926/jotse.1081
8. Gunasinghe, A., Hamid, J. A., Khatibi, A., & Azam, S. M. F. (2020). The adequacy of UTAUT-3 in interpreting academician's adoption to e-Learning in higher education environments. Interactive Technology and Smart Education, 17(1).
9. Huang, C. Y., & Kao, Y. S. (2015). UTAUT2 Based Predictions of Factors Influencing the Technology Acceptance of Phablets by DNP. Mathematical Problems in Engineering, 2015. https://doi.org/10.1155/2015/603747
10. Jakkaew, P., & Hemrungrote, S. (2017). The use of UTAUT2 model for understanding student perceptions using Google Classroom: A case study of Introduction to Information Technology course.
11. Meyliana, Widjaja, H. A. E., Santoso, S. W., Petrus, S., Jovian, & Jessica. (2019). The Enhancement of Learning Management System in Teaching Learning Process with the UTAUT2 and Trust Model. Proceedings of 2019 International Conference on Information Management and Technology, ICIMTech 2019.
12. Rudhumbu, N. (2022). Applying the UTAUT2 to predict the acceptance of blended learning by university students. Asian Association of Open Universities Journal, 17(1), 15 –36. https://doi.org/10.1108/AAOUJ-08-2021-0084
13. Taylor, S. and Todd, P. (1995), "Understanding information technology usage: a test of competing models", Information Systems Research, Vol. 6 No. 2, pp. 144-176.
14. Venkatesh, V. and Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. Decision Science, 39 (2), 273-312.
15. Venkatesh, V. and Davis, F. (2000), "A theoretical extension of the technology acceptance model: four longitudinal field studies", Management Science, Vol. 46 No. 2, pp. 186-204, doi: 10.1287/ mnsc.46.2.186.11926.
16. Venkatesh, V., Morris, M.G., Davis, F.D., & Davis, G.B. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27, 425-478.
17. Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 157-178.