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Investigating the Factors Affecting Sustainability of Mobile Learning at University Level: An Empirical Study of District Hafizabad, Punjab, Pakistan

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Abstract
Mobile learning leverages portable devices such as smartphones and tablets to deliver educational content and facilitate learning. It offers flexibility and accessibility, allowing students to learn anytime and anywhere. This approach enhances engagement through interactive and personalized experiences. Mobile learning supports diverse educational needs and promotes continuous learning beyond traditional classroom settings. The objective of the research was to analyze the factors that affects students' behavior intention, their attitude towards using technology and sustainability of mobile learning and to find out relationship between technology acceptance variables, student's behavior intention, students' attitude toward using new technology and sustainability of mobile learning. The study was descriptive in nature and adopt the survey method to collect quantitative data. For study all the two universities of Hafizabad district were selected. The data for studies was collected using questionnaire. This study's findings regarding attitude did, in fact, direct impact on the actual use of mobile learning by learner for educational sustainability; however, it's impact on usage was completely mediated by students' BIM to use mobile learning.

Keywords: Sustainability, Mobile Learning, University Level, District Hafizabad

Introduction

In present era of development and continuous advancement in the field of technology, possibility of worldwide access to Portable/mobile devices has enhance the interest of individuals in the mobile learning day by day. Regardless of the fact that M-learning is relatively new procedure of learning in education world it possess brilliant and encouraging future as mobile learning can involve the student in the learning process by providing alternative environment (Al-Rahmi, et al., 2021). Mobile learning is service that provides general information digitally to the students. The meaning of mobile can be as "portable" or in other words the gadget which can be taken anytime, anywhere as laptop, cellular phones and tablet etc. M-learning led focus on portability of learners interconnecting by portable technology employ learning instruments being developing support in stuff has become most vital element of casual learning. Mobile learning is appropriate as it is capable of being reached virtually in anywhere. Mobile learning is very active process in order to increase the exam scores (Alghazi, Wong, Kamsin, Yadegaride hkordi, & Shuib, 2020).

Sustainability is to maintain or preserve energies and resources for relatively long term. Sustainability is capacity to continue or endure. If an activity is sustainable it may be recycle, repeated and reused over time as it has capability to continue and maintain itself. Educational sustainability stress upon application of renewability of victorious exercise by academic leadership evolution and revolution (Afzal, & Anwar, 2023). It has been usually related with the debate of usage of portable learning in the classes. The sustainable competitive benefit of m- learning is the capability to apply and learn accurate stuff faster. Learners' ATT the sustainability of m- learning signify obligation of acknowledgment of Information and Communication grounded learning's, as learners' views are critical in put up of sustainable learning's (Ruangvanich, Piriyasurawong, 2009).

Wang (2009) stated the success of learning may depends on students' willingness and readiness to use some new technologies that are separate by one which have been used before (Wang, Wu & Wang, 2009). The grounds of present study are to investigate state of contemporary adaptation of models in m- learning. This work was support the sustainability of portable learning through m learning by mastery the elements that affect intention of users to use mobile education prior to apply it to make certain continuity or success (Setirek, 2014). The key goal is to facilitate universities a comprehend sight of those elements that can affect the degree to which learners or students adopt any new technology.

Literature review

Concept of mobile learning

Mobile technology is a new system with feature to move everywhere where user move. It comprises of two ways portable communication devices one is digital calculating device while the other is networking technology. Mobile technology is internet enabled portable devices like mobile phones, laptops, digital watches and tablets. The communication network technologies that connect these portable devices are termed as wireless technology. Mobile educating is one of pivotal contemporary style of scholastic applications for up to date machinery (Bernacki, Greene, & Crompton, 2020). Mallay (2003) defined mobile learning as it can take place anywhere without the place fixation of user and learner can enjoy benefits of learning possibilities offered by mobile technology system. Kukulska (2005) explained mobile learning as be concerned with user mobility as learner by this should be able to involve himself without feeling in educational activities and also free of tightly delimited to physical location. So, mobile learning trait learners affianced in learning activities a conciliate tool for learning via mobile gadgets access particulars and do further communication through web technology (Ahmad, Hoda, & Alahmari, 2020).

Mobile technologies have made education more feasible and on the go and also a fast going style in modern education setting (Coskun-Setirek, & Tanrikulu, 2017). Students should say thanks to advent of modern mobile learning system as now they can experience individualized study on their own device. Sharma (2004) also give definition of M-learning as innovative type of learning that incorporates all over communication technology also revolutionary user interfaces facilitated with portable tools. The massive of innovative mobile assistance emerged in recent times that incorporate mobile technology with university studying systems as more sustainable (Althunibat, Almaiah, & Altarawneh, 2021).

With an initiation in Mobile teaching and learning revolution and demonstration in fields of specification and direction, lot of elements of this transformation in educating process became acknowledged. The teacher is now no more just spring source of information for the students. Along with these elements that employed now in advances is insertion of mobile phones in the directive structure. Some explanations that do clear alteration have observed by number of scientist that portable realizing that is known as Mobile Learning, is carrying of some directive stuff to receiver which is generated, also utilized by mobile phones, in any case of even if is simple data or complete academic programme (Altalhi, 2023). In many results of present researches, the main constructive characteristics of technology that learners described were adaptability and satisfaction, that is the main footing of this kind of learning exercise (Sönmez, Göçmez, Uygun, & Ataizi, 2018). Along the evolution made in brilliant tools not resist, multi fact instruction is yet examined an auxiliary plan for finding, which merely helps understudies to collect data. For the time being, the role of human instructor became vital due to specialized and social competencies (Hamidi, & Jahanshaheefard, 2019).

Sustainability of mobile learning

The word "sustainability" is associated traditionally to the discussion of using of M-learning in student classroom setting. researches relevant to the utilization of M-learning in learning institutions observe students' attitudes regarding the implementation and usage of M-learning strategies for educational sustainability , with particular emphasis on significance of its design (Hossain, shan,2019).consequence of many researches show that students should need an instructor even though they have positive views regarding M-learning and also motivation is required. Users' attitude regarding sustainability of knowledge demonstrates as it needed to learn use of ICT-based knowledge, as the student's views are very important in contribution to sustainability of learning (Ruangvanich, & Piriyasurawong, 2019). M-learning probably provide opportunities in educating field to device sustainability of uninterrupted learning (Drwish, Al-Dokhny, Al-Abdullatif, & Aladsani, 2023). Many past work foretell learning along with some other educational technologies can give solutions in finance and quality aspects to sustainable learning (Hoang, & Duong, 2023). As outcome, the considerable closure is that the role of teacher's function in individual learning an instructor must addressed in process of sustainable informal distant education when planning M-learning strategies of technology. so In this circumstance, the teacher attain key role in individual self-directed education, as individualized learning is now compulsory for learning sustainability in whole life (Herrador-Alcaide, Hernández-Solís, & Hontoria, 2020) . Generally, understanding of various extent sustainability has demonstrated as challenge to users (Burmeister, & Eilks, 2013). M learning is sequel of enhancing communication and information system development that can affect learning domain. New scholastic models and theories are necessary to escort the revolution in system of learning (Aresta, Pedro, & Santos, 2015). M-learning facilitate with opportunity to learners to linger their learning territory which cannot be acquire by just static tech devices such as desktop computers. A switch in ideology of learning and teaching should move from to learner centered learning from teacher-centered approach.

Many studies (Li, et al., 2019) seemed accomplished to explore the factors that affect users' adoption and acceptance of Mobile learning. Bourgonjon, (2011), stated that educators not in depth master plan when observing students attitude in some informational affairs. Several studies (Mutambara, & Bayaga, 2020) focused on student and teachers both. mobile devices in current times is very important informational tool for educational activities, learning and entertainment (Hoi, & Mu, 2021) besides all this mobile learning is yet in its phase of infancy, few guidelines are accessible to make sure the transferability , sustainability of initiatives of mobile learning (Farley, Murphy, & Rees, 2013). In addition, the study explore and investigate the factors that may influence user intent to assist m-learning sustainability before its application to make sure continuity and success of system. It has been using to enhance learning and motivation in students, increase students' involvement and also the sustainability of portable digital learning in constructive way (Alghazi, 2021).

Educationist have explored sustainability in multiple ways in higher education as drawing focus on employment ,education systems, technology and syllabus (Vykydal, Folta, & Nenadál, 2020). Even so, students' success, skill and knowledge are researched under sustainability of education (Samuelsson, 2019). M-learning requires for sustainability both teachers and students have free access to the net anytime, anyplace in country (kola, 2018). For sustainable and effective M-learning in

universities of Pakistan, it is vital to look over the insight of educators and learners with regard to probability of pedagogical switch. TAM and M-learning are studied one by one in history to acknowledge mobile information system utilization.
Various researcher have set up that individual self-based learning using mobile phones can boost development of student (Chen, Chen, Huang, & Hsu, 2013). Generally m learning supports students to promote technological skills, communication skills, find their quiz inquiry, and evolve collaboration, permits knowledge transformation and leverage on learning results (Al-Emran, Elsherif, & Shaalan, 2016). Mobile learning provide opportunity to acquire knowledge as this way of learning can fixed in minds , among youths especially who take interest in mobile technology hugely (Alturki, & Aldraiweesh, 2022). Students perceive that through mobile gadgets knowledge obtain faster while permitting students to help and communicate each other, and learn by different methodology (Fagan, 2019). Numerous recent studies showed the positive feature of system that students reported were convenience and versatility that is foundation of learning process (Abu-Al-Aish, & Love, 2013). Mobile learning is set of as salient instructional system of higher education. The result of their research show that students attitudes toward using M-learning and their behavioral intention to utilize mobile learning seem a fruitful effect on use of mobile learning as long term sustainability in higher education.(Alrasheedi, Capretz, & Raza, 2016). Students intended any applications to use depending on which extent the system enable greater performance (Naveed, Choudhary, Ahmad, Alqahtani, & Qahmash, 2023).
Numerous students desire to use mobiles as this provide correspondence to their teachers in conventional strategies hence feasible (Higgins, & Xiang, 2009). Flexible learning can make trainings process adequate, particularly between young who have enthusiasm and bound to look for innovation (Alghazi, Kamsin, Almaiah, Wong, & Shuib, 2021). Several studies investigate the factors that influence users 'adoption of Mobile learning. As alghazi et al., describe mobile phones are widely spreader in present era. Contemporary use of mobile phones in education field is known as Mobile learning. Succeeding growth of Mobile learning designer of education related applications need to have information about user requirements, and the way to satisfy consumers (Khan, Al-Shihi, Al-Khanjari, & Sarrab, 2015). Mobile learning studies emphasized on learner and teachers, besides that m-devices are now very vital tool for learning, teaching, educational and entertainment activities (Dahri, Vighio, Bather, & Arain, 2021). In their research Setiriek (2013) narrated that sustainability of Mobile learning is referred to: ability to fulfil educational needs and intention of mobile learning, potentiality to adopt by consumers, capacity to continue a condition and make advancement, and ability to adopt possible change. Universities and other mobile learning capability must encounter the growing demand a mobile learning with sustainable educational policy (Alturki, & Aldraiweesh, 2022).
A tremendous increase in research relevant to mobile technologies has been seen in previous decade. The reason behind this advancement is development in mobile functions and is less in price. A growing number population of glob is getting accessibility to m-devices, smart phones, tablets and PCs. This enthusiasm globally towards m-devices is because of its handy and compact nature. The growth in the possession of mobile phones between the young generation is main drive force motivating researchers to provide idea to which way use them for learning and teaching this way revolution mobile learning. Mobile learning can be considered a further step one-learning in which learning is transmitted via web mode and m-devices as laptops, tablets, PCs, and mobile phone (Lai, Hwang, Liang, & Tsai, 2016).
Mobile learning is becoming a potent medium for knowledge delivery and altering students' expectations of learning at anytime and anywhere. Students at universities today, who could be referred to as members of the "next generation," are excellent candidates for mobile learning because they were born and raised in the era of emerging technology and were raised surrounded by mobile phones, tablets, and laptops. Education institutions will soon be required to adapt to students' changing needs in order to remain competitive. However, research into students' perceptions of mobile learning is necessary before launching any initiatives in this area at the university level (Malandrakis, Bara, & Gkitsas, 2021).

Technology acceptance model

A number of researches used multiple technology acceptance model as TAM, unified theory of acceptance and use of technology and also some others. Among all of them the most famous and widely popular model to use is TAM, developed in 1989. This was developed in order to measure consumers' behavior and intent towards use of computers (Bettayeb, Alshurideh, & Al Kurdi, 2020). TAM have been used in number of researches to observe consumers acceptance of using new technologies in educational procedures, hence majority of these researches circled around teacher (Almaiah, Al-Khasawneh, Althunibat, & Almomani, 2021), stated TAM as an efficient way to explain consumers behave in order to use any computing technology. Behavioral intent of consumers is affected by attitude of user, and is indirectly and directly influenced by ease of use and usefulness (Davis, 1989). According to Cruz-cardenas (2019) attitude is vital factor in describing consumers' technology utilization and behavior.

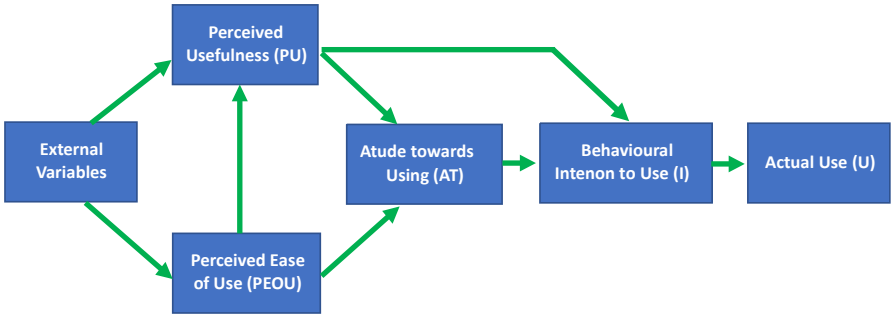

Fig 1

The productive flow of researches on information technology systems usage lay hold diversity of theoretical contexts. Among all theories the TAM is appraise most commonly employed and effective theory for narration of personal acceptance of information and technology system. TAM has got motivation to develop from the Reasoned Action theory (Ajzon and Fishbein, 1980) and was initially presented by Davis [1986] suppose that a persons' acceptance of information systems is directed by following variables:

1: Perceived usefulness
2: Perceived ease of use
3: Perceived enjoyment
4: Attitude towards using technology
5: Perceived resources

Davis et al. used TAM to explain user acceptance of technology. Information technology proposes the potential for s improving white collar performance. Hence performance acquire are often clog by consumers' willingness to use and accept any accessible systems (Bowen, 1986). Due to the importance and persistence of this challenge, explaining consumers acceptance of the problem, spell out consumer acceptance is long standing problem in the field of researches of mobile information system (Swanson, 1974).

When using Mobile learning , a learner do planning, organize it , evaluate and carries out learning's as the user himself is the administrator of mobile activities. This way, the learner not remains a passive individual and to acquire the needed information but also uses mega cognitive and cognitive skills to attain the task. Hence the consumer improves high order thinking skills. This study was looked upon that how Mobile learning can impact the use of Mobile learning in higher education as a representative area of study at universities, both in terms of ATT (attitude towards technology) mobile learning and BI (Behavior intention) towards Mobile learning.

Objectives

1. To analyze the factors that affect students' behavior intention, their attitude towards using technology and sustainability of mobile learning.
2. To find out relationship between technology acceptance variables, student's behavior intention, students' attitude toward using new technology and sustainability of mobile learning.

Rationale

The rationale for present study comes from Hawkins' explanation that an inexpensive and convenient technology must be used in institutions to allow significant use among tutors, students and learners, especially in emergent nations. Therefore, the use of mobile gadgets like personal computers for teaching and learning purpose in developing nations would be an attainable option. Using mobile technologies amid the student's it can be a satisfactory investment to let the learner replace the usual and traditional way of teaching and learning by using up to dated technology. Resulted outcomes of present study can help academics along with managers to fully acknowledge the way mobile educating system utilization can effect learners' educational sustainability as well as academic performance. This study propose a investigation model for merging Technology Acceptance Model (TAM) for mobile learning utilization in the field of academic sustainability. Mobile education is not fully employ in the universities of Pakistan, so that is the reason why students/teacher Attitude towards Technology (ATT) and learning teaching through empirical knowledge is at very low level in universities.

The motivation of this study comes to probe about attitude and behavior Intention of students towards using mobile learning also its influence on learners' believes upon higher education, because of their insight of MLS. Furthermore, the present research is going to conduct investigate the key influential factors in the mobile learning within the learners learning settings classroom to improve mobile learning sustainability of education. To achieve these results, an enlarge technology acceptance Model (TAM) is evolved, which bring out literature relevant to Mobile learning use in Pakistan universities.

Hypotheses

$H_0$1: Usage of mobile learning has no effect on students' perceived usefulness and their attitude towards usage of mobile education.
$H_0$2: Mobile learning has no impact on perceived usefulness and BI of students' to utilize mobile learning.
$H_0$3: Mobile learning has no influence on user friendly environment and their attitude toward using mobile education in classroom
$H_0$4: Perceived user friendly use of mobile education has no effect on Behavioral intent of students' about usage of mobile learning.
$H_0$5: Convenience and ease of using mobile studying have no impact on students' attitudes towards usage of mobile education for learning.
$H_0$6: Perceived enjoyment is not positively associated to students' attitude towards using mobile learning.
$H_0$7: TTF has no positive association with Attitude towards using mobile learning.
$H_0$8: TTF is not significantly correlated with BI to use mobile learning.
$H_0$9: Perceived resources is not favorably associated with Attitude towards using mobile learning.
$H_0$10: There is no significant and positive link between Perceived resources together with Behavior intention to utilize mobile learning.
$H_0$11: Students' attitude towards mobile learning is not positively and significantly coupled with their mobile learning.

$H_0$12: Behavior intention to use mobile gadgets for the sustainability of mobile education has no positive and substantial connection with mobile learning sustainability.

Theoretical Framework

There are too many theoretical models that used to support researches particularly in the field of users perception about acceptance and utilization of digital systems. Although, Technology Acceptance Model (TAM) has been widely used. It was develop by Davis and Richard Baggozi. The model was basically develop to compute behavior about technology based on customers' attitude. It is powerful (model) for predicting and explaining user behavior (Davis, 1989). Technology acceptance model (TAM) is the most influential theory of technology undertaking. TAM is statistical information theory that provide information about users influential factors to accept any new technology. TAM suggests whenever a new technology is presented to customers, too many factors are there to impact their decisions about when and how this can make their work easy and faster. Understanding TAM would guide finer beforehand knowledge to use the new technological resources.

The actual work of system is the extremity point where customers utilize that technology. BI leads the way consumers to use any new technology and is affected by the attitude that is general fancy of that technology. Adaptation and usage about technology services can contribute positively to development. Many factors are there that affect a learners intent about use of mobile as learning instrument, that are social, effective and cognitive need with aid of attitude (Hashim, Tan , Rashid , 2014). Technology Acceptance Model (TAM) is adopted for this study formed on the historical background that can guide and help in present research. TAM is used to hypothesize that the behavioral intention of any person about usage a system is set on five basic factors: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Task technology fit, Perceived enjoyment, Perceived resources (Davis, 1989).

Research Gap

Sustainability have been studied through different perspectives in pastas scholars made research on sustainable university by Velázquez (2006), another research on sustainability in the higher education by interaction with teacher lecturers (Holmberg, et al., 2008), unification of sustainable evolution in higher education curricula (Ceulemans, De Prins, Cappuyns, & De Coninck, 2010) , sustainable consumption in universities (Nuaimi & Ghamdi, 2022), Mobile universities a Critical sustainability factor (Liu, Li, Feng, Chen, & Zhang, 2023). This research was being conducted to explore effects of sustainability factors of Mobile learning among university students. Furthermore there is no such research in this perspective in Pakistan which have integrated three models as TAM (Technology acceptance model), BIM (behavior intention), and TTF (Task technology fit) for acceptance of Mobile learning. The aim of present work is to couple essential features of TAM (Technology acceptance model) and constructivism with academic sustainability.

Research Design and Methodology

The study was descriptive in nature and adopt the survey method to collect quantitative data. For study all the two universities of Hafizabad district were selected. Population of the study was 600 students of B.A, BS, and B.A from Government college university Faisalabad, Hafizabad campus and 150 students from Virtual University Hafizabad campus of District Hafizabad. The sample of study was 60% population of Government College University Faisalabad, Hafizabad Campus that were 360 respondents and 100% population from Virtual University Hafizabad Campus that were 150 respondents. These total 510 students was taken through using simple random sampling technique to collect qualitative data. Sample size has vital role in interpretation and estimation of SEM results (Hair, 2012) commonly suggested by literature that size of sample for SEM run in two hundred to four hundred range with ten to fifteen indicators. 100 respondents are required at least preferably 200 for SEM (Loehlin, 2017). The questionnaire was adopted from the work of (Rahmi, et al., 2021).

Data Analysis

Smart PLS 3.3.9's structural equation modeling (SEM) was used to investigate the correlations between different variables. The PLS-SEM research design is a stable, versatile, and advanced tool for creating a significant statistical model, and the PLS-SEM role helps achieve the intended goal (Yavuzalp & Bahcivan, 2021). Ringle et al. (2015) suggest that PLS-SEM may enable SEM findings with practically any level of structural complexity, including higher-order structures, which reduce multicollinearity problems. Using factor loadings, SEM calculates the model's discriminant, convergent, and average variance for each construct (Al-Gahtani, 2016). Multivariate analytic approaches may investigate various relationships between variables in the conceptual model.

Table 1 Demographic Information of Study Participants

Variables	Categorization	Frequency/Percentage	
Gender	Male	184 (38.3%)	
	Female	296 (61.4%)	
Age	20-25	206 (43%)	
	25-30	274(57%)	
Ethnicity	Urdu Ethnic	405 (84.3%)	
	Punjabi Ethnic	75 (44.3%)	
	Others	0	
Participants of Major Study Subject Classes	Education	**55(11.4%)**	
		Male 20 (36.3%)	Female 35 (63.6%)
	English	**140(29.1%)**	

		Male 60 (43%)	Female 80 (57%)
	Economics	**80 (16.6%)**	
		Male 50 (63%)	Female 30 (38%)
	Science	**150 (31.2%)**	
		Male 80 (53%)	Female 70 (47%)
	General	**55(11.4%)**	
		Male 40 (73%)	Female 27 (%)

A total of 510 questionnaires were circulated, out of which 480 were received back by the respondent's, demonstrating a return rate of 94%.The sample was consisted of different cultures, ethnicities and religions most of which were from urban area. With the approval of participating universities questionnaire were circulated to different classes in two universities of district Hafizabad that were GCUF and Virtual University Hafizabad campus, District Hafizabad. In order to test theoretically developed model, data was gathered from presently enrolled students of B.A/B.Sc/BS by using structured survey physically. The estimation and interpretation of SEM results both heavily depend on sample size. According to the literature, sample sizes for SEM typically fall between 200 and 400 for models with 10 to 15 indicators. For structure equation modeling, at least 100 cases are needed, but 200 is preferred.

The questionnaires were assessed, and 30 were eliminated because they were not returned. The following information describes the respondent's demographics. A total of 480 completed questionnaires were obtained from students of whom 184(38.3%) were male compared to 296 (61.4%) female students.206 (43%) were in 20-25 age range and 274 (57%) were in 25-30. The distribution of respondent's based on specialization was as, 55 (11.4%) were from English department, 140 were from economics department (16.6%), 150 were from basic sciences (31.2%), and55 were from general subjects group (11.4%). In Table 1, the demographic profile, which includes age, gender, and specialization, is displayed.

It has been proven that all of the scales employed in this inquiry to determine the mean scores, standard deviation, excess kurtosis, and skewness values were consistently "reliable" and produced satisfactory results (See Table 2).

Table 2 Mean, standard deviation, kurtosis, and skewness of the study Constructs

	Mean	**Median**	**S.D.**	**Excess Kurtosis**	**Skewness**
PU1	4.292	5	0.984	1.463	-1.387
PU2	4.417	5	0.83	5.518	-2.047
PU3	4.192	4	1.002	1.825	-1.425
PU4	4.281	5	0.943	0.137	-1.096
PU5	4.31	5	0.898	3.238	-1.64
PEU1	4.025	4	0.873	-0.141	-0.652
PEU2	4.125	4	0.74	-1.048	-0.234
PEU3	4.185	4	0.804	0.484	-0.855
PEU4	4.096	4	0.961	0.844	-1.054
PEU5	4.167	4	0.932	1.941	-1.345
PE1	4.265	4	0.813	0.936	-1.08
PE2	4.217	4	0.926	1.804	-1.344
PE3	4.358	5	0.788	2.404	-1.419
PE4	4.381	5	0.813	2.632	-1.48
PE5	4.333	4	0.807	2.751	-1.441
TTF1	4.285	5	0.959	3.073	-1.705
TTF2	4.108	4	0.89	2.5	-1.334
TTF3	4.148	4	0.932	1.275	-1.152
TTF4	4.073	4	0.874	0.839	-0.932
TTF5	4.204	4	0.796	2.105	-1.204
PR1	4.162	4	0.851	1.715	-1.112
PR2	4.077	4	0.881	1.809	-1.161
PR3	4.098	4	0.772	-0.036	-0.579
PR4	4.067	4	0.873	1.899	-1.166
PR5	4.131	4	0.872	1.743	-1.148
ATUML1	4.208	4	0.898	2.864	-1.495
ATUML2	4.331	5	0.881	2.7	-1.543
ATUML3	4.058	4	0.902	1.471	-1.107
ATUML4	4.192	4	1.002	1.825	-1.425
ATUML5	4.281	5	0.943	0.137	-1.096
BIU1	4.31	5	0.898	3.238	-1.64
BIU2	4.088	4	1	1.97	-1.379

BIU3	4.121	4	0.914	1.962	-1.26
BIU4	4.269	4	0.883	2.401	-1.427
BIU5	4.254	4	0.903	1.926	-1.359
AUML1	4.417	5	0.83	5.518	-2.047
AUML2	4.294	4	0.819	2.921	-1.458
AUML3	4.102	4	0.962	0.936	-1.093
AUML4	3.998	4	1.094	1.177	-1.268
AUML5	3.946	4	1.29	0.177	-1.149

Measurement Model Assessment

The statistical findings of this investigation are shown in **Table 3**. The survey's reliability was assessed using alpha values. According to (She et al., 2021), the established alpha value for assessing dependability is more than 0.7, and each component is deemed reliable based on the standard and Cronbach alpha values (ranging from 0.716 to 0.820). Composite reliability (CR) values were obtained (ranging from 0.804 to 0.863). Loading levels consistently surpassed 0.6 in this investigation. The extracted average variance (AVE) is 0.5. The square root of each construct's AVE should be more significant than its link with other constructs for discriminant validity (Fornell & Larcker, 1981). The AVE values in this investigation were more effective than the average range (from 0.500 to 0.559).

Multivariate Analysis

Table 3

Constructs	Items	Loadings	Alpha	CR	AVE
Perceived usefulness	PU1	0.633	0.804	0.863	0.559
	PU2	0.731			
	PU3	0.821			
	PU4	0.668			
	PU5	0.704			
Perceived Ease of Use	PEU1	0.796	0.772	0.845	0.523
	PEU2	0.652			
	PEU3	0.705			
	PEU4	0.715			
	PEU5	0.740			
Task Technology Fit	TTF1	0.815	0.779	0.848	0.531
	TTF2	0.832			
	TTF3	0.803			
	TTF4	0.685			
	TTF5	0.580			
Perceived Resources	PE1	0.748	0.820	0.878	0.601
	PE2	0.924			
	PE3	0.482			
	PE4	0.920			
	PE5	0.715			
Attitude Toward Using Mobile Learning	ATUML1	0.779	0.763	0.844	0.528
	ATUML2	0.773			
	ATUML3	0.469			
	ATUML4	0.848			
	ATUML5	0.713			
Behavioral Intention to Use Mobile Learning					
	BIU1	0.694	0.716	0.804	0.500
	BIU2	0.691			
	BIU3	0.718			
	BIU4	0.647			
	BIU5	0.618			
Actual use of Mobile Learning	AUML1	0. 743	0.720	0.805	0.500
	AUML2	0.649			
	AUML3	0.628			
	AUML4	0.622			
	AUML5	0.503			
	AUML6	0.670			

Discriminant Validity

Discriminant validity (DV) was utilized to analyze and characterize unrelated constructs. DV additionally verifies all measurements relating to component dissimilarity. DV includes analyzing non-statistically related components while determining measure correspondence. The DV of a factor may be computed using its AVE. The DV demonstrated that the square root of each concept and AVE was bigger than its relationship to other constructs (Table 4 & Figure 2).

Table 4

	ATUML	AUML	BIU	PE	PEU	PR	PU	TTF
ATUML	0.726							
AUML	0.415	0.640						
BIU	0.392	0.413	0.674					
PE	0.279	0.202	0.152	0.748				
PEU	0.274	0.275	0.218	0.316	0.723			
PR	0.464	0.237	0.254	0.206	0.267	0.775		
PU	0.823	0.577	0.532	0.213	0.303	0.283	0.715	
TTF	0.362	0.405	0.526	0.236	0.249	0.395	0.338	0.728

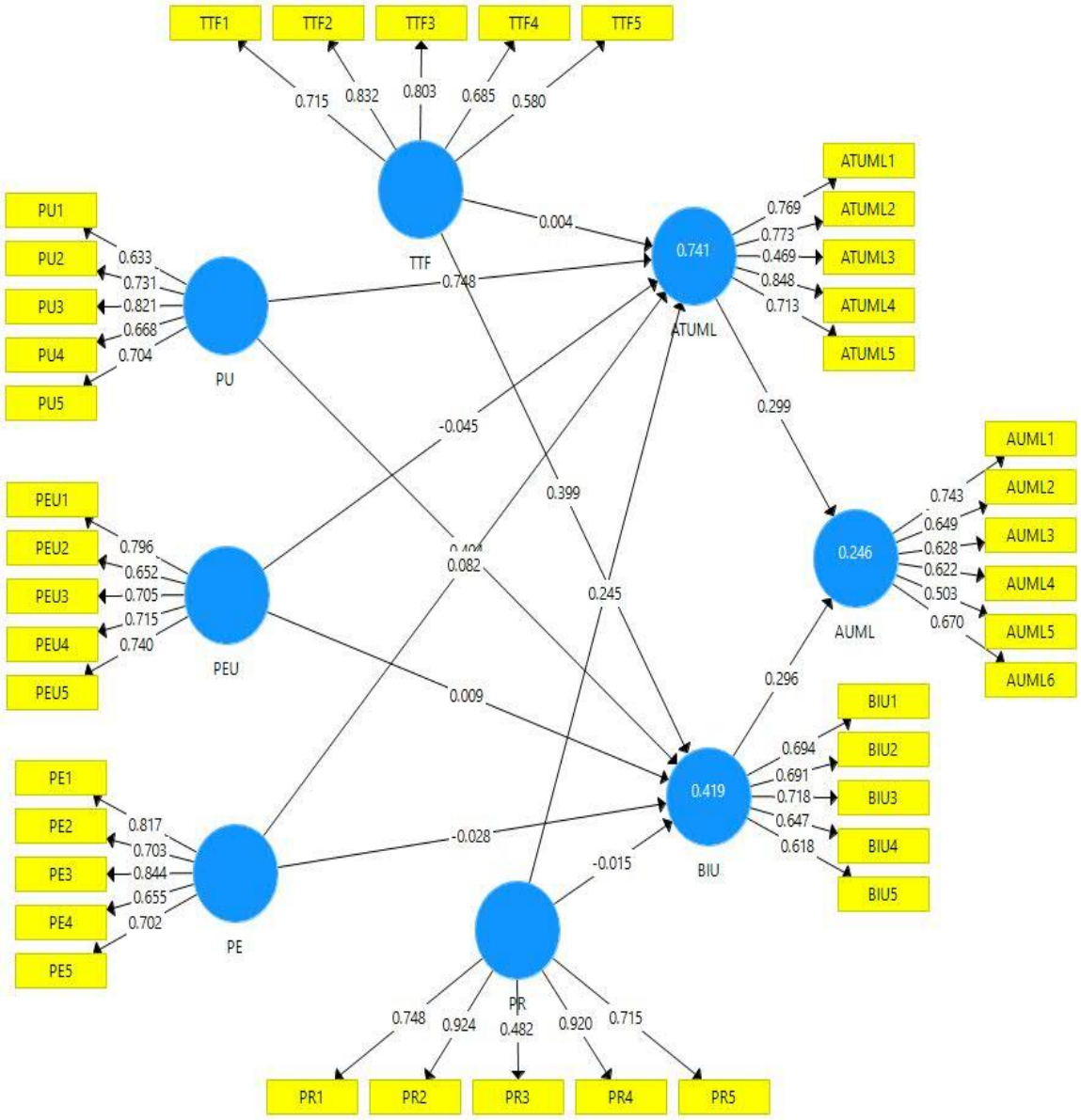

Figure.1 PLS-SEM

Structural Equation Model

The Structural Equation Modeling component of Smart PLS 3.2.9 was used to verify all hypotheses (Chin 2010). Model fitness was determined by calculating the standardized root-mean-square-residual (SRMR), a standardized-residuals index that evaluates model fitness, along with the chi-square and normed fit indices (NFI). (Brown, 2006; Chen, 2007) both provide supporting evidence. To get the SRMR value, we compare the dependence on the expected matrices' covariance. Results with an SRMR of 0.08 or less are permitted for use. An SRMR of 0.0545 is anticipated, which is a respectable level of model fit. According to Table 5, the NFI is 0.504, and the chi (2) value is 14975.234.

Model Fit Summary

Table 5

	Estimated Model
SRMR	0.0545
d_ULS	5.910
d_G	2.58
Chi-Square	14975.234
NFI	0.504

SRMR = Standardized-root-mean-square-residual, d_ULS = Unweighted least squares discrepancy, d_G = Geodesic discrepancy, X^2 = Chi-square, NFI = Normed fit index.

Bootstrapping

To establish the significance of the hypotheses, the standard beta was used, and the beta value reveals how different variables may vary. The standardized beta (β) value for each connection was calculated using the predicted research model **(Table 6).** If beta (β) values are extensive and substantial, the relevance of endogenous latent variables will be deemed critical. T-statistics were used to assess the significance of each path's beta value.

The bootstrapping approach was utilized to establish the importance of the beta (β) value and investigate the relevance of presumed linkages. The proposed structural model connections and (β) statistics are shown in **(Table 6, Figure 3).** The smart-PLS-bootstrapping research variable t-values display the research variables' smart-PLS-bootstrapping t-values.

Table 6: Standard Beta, T-statistics and P-values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ATUML -> AUML	0.299	0.301	0.050	5.930	0.000
BIU -> AUML	0.296	0.299	0.047	6.295	0.000
PE -> ATUML	0.082	0.082	0.025	3.226	0.001
PE -> BIU	-0.028	-0.023	0.050	0.550	0.582
PEU -> ATUML	-0.045	-0.043	0.027	1.677	0.094
PEU -> BIU	0.009	0.009	0.044	0.201	0.841
PR -> ATUML	0.245	0.241	0.037	6.715	0.000
PR -> BIU	-0.015	-0.014	0.041	0.367	0.714
PU -> ATUML	0.748	0.752	0.026	28.562	0.000
PU -> BIU	0.404	0.396	0.078	5.148	0.000
TTF -> ATUML	0.004	0.004	0.030	0.131	0.896
TTF -> BIU	0.399	0.404	0.081	4.935	0.000

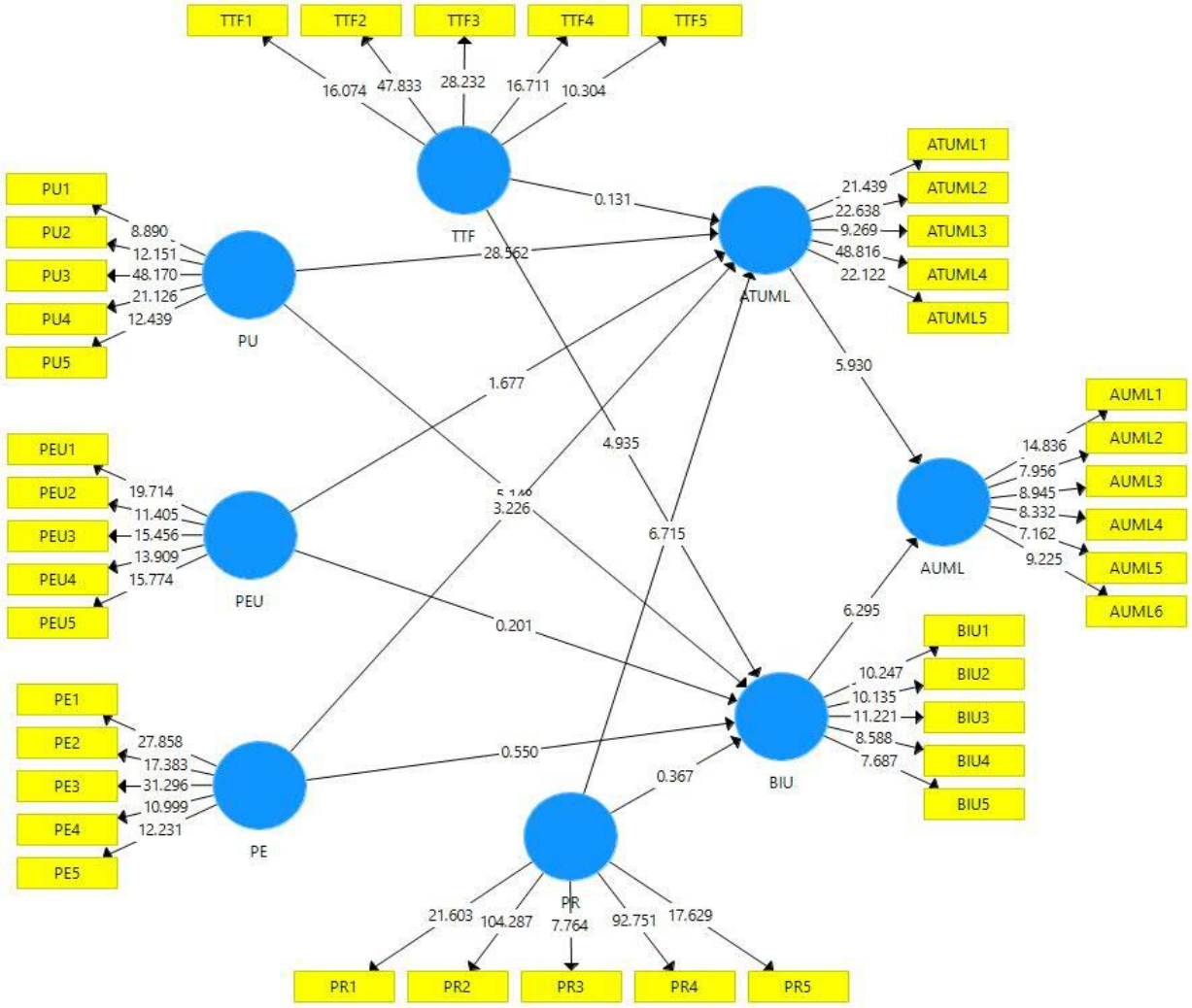

Figure 3: Bootstrapping

Discussion and implementation

According to the study's findings, all hypotheses significantly improved attitudes toward using technology for mobile learning and behavior intentions for mobile learning, both of which affect how long mobile learning can be sustained. Same conclusions have been observed in earlier research on technology adaptation (Venkatesh, 2003) and when referring to mobile services (Gao, & Krogestie, 2014). Additionally, the characteristics showed a strong direct connections with Mobile Learning attitudes and BIM M-learning. This might be as a result of students depending more on the mobile learning versions that are already setup on their computers as a result, their opinions about usage are skewed and accurate. These factors may also be contributing to the increase in using mobile learning, as intended by students. Because of the nature of the link, increased PU results in greater use of mobile learning. The importance of PU referring to mobile learning has drawn the attention of numerous researchers. The investigation's findings support those of other studies (Cheng, 2013). The results also make two significant contributions to the TAM model in the context of education. In an effort to enhance students' use of mobile learning for education, they advised promoting the use of mobile learning for education as well as PU, PEU,PE,TTF, and PR. Teachers ought to encourage students to use mobile learning for the purpose of education. Previous studies compared in person courses and online courses and the results were that online courses had a positive impact on MLS. This study adds to those findings by usage of m-learning, BIM mobile education, and exchange of information. In the context of Pakistan, where mobile learning is being used for learning, it is important to note that theories are derived from and positioned within practice, which forms the foundation for the creation of new methods and concepts. It should be mentioned that this could be the first time the TAM theory has been used to higher education in Pakistan. The major goal behind the study is to determine how student attitudes and BIM towards mobile learning affect the long-term viability of education.

Previous studies that discussed the use of mobile phones for education discovered that the following are the most important concepts and determinants of mobile education system adoption PU,PEU,PR,PE, attitude, and social effects. The research model determines that TTF and TAM variables are the most significant influences on students' academic performance when mobile learning is used as a sustainable educational strategy. One of the constructs examined in the modified TAM model, attitude toward the actual use of mobile learning for educational sustainability, is one that most significantly affects students' academic performance.

As a result, it was discovered that this study's findings regarding attitude did, in fact, direct impact on the actual use of mobile learning by learner for educational sustainability; however, its impact on usage was completely mediated by students' BIM to use mobile learning. These results suggested that learner would develop a favorable attitude towards mobile learning and following their realization of the value of mobile devices, they expressed a desire to use mobile learning, their ease of use for learning, the accessibility of organizational and technical support, as well as peer pressure. Additionally, the mobile learning system is clearly supported by the study's findings as a sustainability factor, showing that attitudes toward and intentions to use a mobile learning system for sustainability have a favorable effect on students' MLS mobile education system for educational purposes.

Conclusion and Future work

Five constructs, including PEU, PU, ATT, TTF, PR and Behaviour intention towards m-learning, variables extracted from TAM, were noted as having the greatest impact on university students' use of mobile learning as sustainability. However, no study in Pakistan, specifically in District Hafizabad, has made. In order to support student's adaptation of mobile education for educational learning sustainability, universities are strongly encouraged to use PU, PE, and PEU, which is strongly suggested by the TAM model in this research.

Further research should examine planning advice for instructors on PE and Task technology is compatible with the widespread adoption of mobile learning and their positive assessment of its potential educational use. Another thing to keep in mind about the study is that it is based on student opinions, which might not necessarily reflect real-world effects. Future research in this field should take into account the opinions of the professors and other stakeholders in the higher education level regarding use of mobile learning in classrooms. The results of this study may be expanded, and a greater understanding of the best way to approach this problem with in universities and higher education may result from comparing and contrasting viewpoints from and with other countries.

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