

ICTE and E-Learning: The Case of Private Higher Education Institutions in Morocco

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Abstract:

The objective of this research is to identify the factors that influence students' attitudes towards the use of information technology and communication for education (ICTE) in their online learning activities, by using several models, specifically in private higher education in Morocco.

Several models have been used to examine the determinants of students' behavioral intention to use ICT in the learning process. Some of these popular models include the Technology Acceptance Model (TAM) and its extension, the Unified Theory of Acceptance and Use of Technology model (UTAUT).

In this research, the methodology used is that of a structural equation model in empirical testing and validation of the different hypotheses of our model based on a sample of 400 private higher education students and with the use of software tools for this purpose. The results showed that the intent of learners to use ICT for distance learning was significantly positively influenced by perceived usefulness, ICT quality, ICT output quality, ease of use, and hedonic motivation. Contrary to our previous expectations, facilitative conditions and social influence had no influence on the intention to use.

Theoretically, this research aims to contribute to an improved understanding of the determinants of ICTE adoption by learners, by proposing a model that is part of a socio-technical analysis framework. Thus, the expected impact on management objectives is important. Managers will have a good tool, easy and quick to implement, allowing them to evaluate either one or all of the variables in the model.

The proposed model aims to identify not only the variables operationalized for ICT in a private higher education institution, but should also provide insight into the pathway that leads to its use by learners.

The model can be contextualized within Moroccan public universities, contextualized at the regional level in the kingdom, our model can also be studied in other Arab or African countries or those with similar economies.

The major limitations of our research are firstly the use of a conceptual model insufficiently based on causal relationships and secondly the failure to use moderating variables (age, level of education, experience)

Keywords: ICT, acceptance, distance learning, motivation.

JEL Classification: A2

Paper type: Empirical research

1. Introduction

Teachers organize learning activities to facilitate the acquisition of knowledge and skills during the teaching process. The learning activities represent the interaction of students with a learning environment consisting of materials and teaching aids that support learning (Aljawarneh, 2020; Gasca-Hurtado & al., 2019; Holenko Dlab et al., 2021). With technology becoming both more powerful and pervasive, for educators it has provided a valuable tool to support learning. With significant advances in mobile technology over the past decade, learning has become more (Mac Callum et al., 2014).

Meanwhile, the literature on information technology (IT) education has called for the development of "soft skills" as part of the educational experience, so that students can work effectively and successfully in professional teams after graduation (Mitchell & Grace Vaughan, 2022; Ragonis & al., 2020). The challenge has been compounded by the worldwide response to the COVID-19 pandemic which requires flexibility in content distribution while providing stability in the delivery of learning in multiple locations (Larson & al., 2021). At the same time, the growing demand for analytical and other technical skills has created the need to add these skills to business school curricula (Clayton & Clopton, 2019; Larson & al., 2021).

The challenges posed by the use of information and communication technologies (ICT) for economic progress have given rise to an abundant literature, often from the perspective of analyzing the microeconomic and macroeconomic impact of these technologies. Education/learning is as important a field as any other (such as industry, commerce, etc.), for the application of information and communication technologies. In countries that have successfully completed the digital transition, plans have been developed for their higher education systems to accelerate the transition of the latter in universities. Indeed, we are seeing a digital boom, so that Information and communication technologies (ICTs) occupy a growing and unavoidable place in our society, both economically, socially and culturally. Their influence is growing and extending to many areas. Through the development of the Internet, artificial intelligence and online platforms, as well as the emergence of new technological tools, the digital revolution is radically changing employment prospects and work patterns over the coming decades.

In the last few years, significant investments have been made in e-learning technologies across all sectors. Despite these investments, learning technologies may not well be adopted, abandoned, or dismissed by learners. Consequently, learner motivation and engagement are still topics of interest to researchers (Mehta et al., 2019).

In the educational context, many institutions have been implementing ICT in teaching and learning in the classroom for a long time and have called it ICTE (Information and Communication Technologies for Education). Learning through ICT offers many advantages, including time efficiency, increased accessibility of content, and affordability of information.

However, ICT advances and decreasing costs have motivated educational institutions and businesses to adopt computer-assisted distance learning (CADL) to take the benefit of the economies of scale and to reach a larger and more varied audience (Brown & Charlier, 2013; Moreno et al., 2017). Students can use mobile technology to support informal learning; however, it is unlikely to be fully integrated into more formal learning without the support and acceptance of educators (Mac Callum & al., 2014).

In this case, the teacher's role is to use methods and media to facilitate the assimilation and memorization of information by the learner: simulation, modeling, problem solving, etc. ICTs have a role to play in this pedagogical model because they are all supports for the development of these strategies: selection and rational processing of information, use of organizational diagrams to form meaningful mental images, etc. Thus, studies of virtual learning environments have shown similar positive effects on user engagement as well as cognitive and motivational outcomes as studies of ICT (Hamari & al., 2014).

There have been various attempts at educational reform in Morocco since independence in 1956, none of which have yielded the desired results. There has been controversy and debate about the education system in a wide range of national forums. While there have been some successes over the years, dysfunctions persist and results remain below expectations (JABER et al., 2022).

In Morocco, higher education is undergoing an unprecedented diversification and an increased awareness of its vital role in socio-cultural and economic development and in building the future, which will require new skills and knowledge from new generations. In terms of information technology and communication for education (ICTE), despite the efforts made by Moroccan universities over the past two decades to integrate them into management and pedagogical methods, the fact remains that the digital has not yet become a structuring project in higher education. Despite the fact that the effective adoption of ICT in Morocco's education system is still in its infancy, the higher education reform suggested by the Council of Higher Education, Training and Scientific Research. Council (2019), demonstrates a strong commitment to achievements (Safsouf & al., 2020).

In addition, following the spread of the COVID-19 pandemic, the Kingdom's decision in 2020, The closure of all schools forced higher education institutions to organize themselves in an emergency situation, knowing that teaching and student activities in classrooms had been suspended according to government guidelines. Therefore, e-learning, which was previously considered a supplement or even an administrative method, became a necessity. The institutions that have invested the most in this technology will undoubtedly be in the best position to deal with this health crisis. The new virus, whose effects were felt around the world in a matter of weeks, would at least have the merit of moving the project forward, but it would also take facilities out of their comfort zone and force them to completely redefine their organization. In response, numerous decisions were taken by public or private institutions. The success of e-learning largely depends on the implementation of an educational model that meets the needs and educational goals of students. Therefore, our main research question is the following: To what extent have students in Moroccan private higher education institutions accepted information and communication technologies for education (ICT) in their learning process?

This research is organized as follows: in the first section we present the literature the key **theories and models in the literature on factors that may contribute to learners' use and acceptance of an e-learning system**. In the second section, we explain how our causal model was developed and justify our research hypotheses. In section 3, we present the data collection procedure. Then, in Section 4, we evaluate the measurement model using structural equation modeling (SEM). In Section 5, we discuss the results of the study and the expectations of our study. Finally, the last section presents a conclusion, the limitations of our studies as well as possibilities for future work.

2. Theoretical and Conceptual Background

This section reviews the research on the main models and theories indicating the factors that can explain the intention to persist of online learners, as well as the acceptance and commitment of learners to the online learning system. Through the most known models in terms of acceptance and adoption of ICT.

2.1. ICTE and Distance Learning

To better understand the process of knowledge capitalization, it is necessary to call upon learning theories. These theories lead to the formulation of working hypotheses and methods in order to conduct more rigorous pedagogical research.

Learning perception is often represented as an independent variable influencing satisfaction. (Sebastianelli & al., 2015) demonstrated in their research that course content significantly

influences perceived learning. The researchers indicate that course content significantly influences satisfaction: the results suggest that course content is the best predictor of all three outcomes (perceived learning, satisfaction, and quality) (Cohard, 2019; Sebastianelli & al., 2015).

The teaching method by which behaviorism is based is a reactive teaching method. Behaviorists are particularly interested in the observable behaviors of individuals and are not concerned with the internal mental mechanisms that influence learning. Based on the assumption that all behavior is the result of learning, this stream focuses on the study of individual behavior. It focuses on observable outcomes (environment and behavior) and not on the learning processes. In 1956, cognitivism emerged, proposed by Miller and Bruner as a response to behaviorism and focusing on the way people think and solve problems. Learning cannot be limited to a conditional intake, but must be seen as a complex processing of acquired information. Memory has its own structure, based on the organization of information and the use of appropriate strategies to deal with it (Crozat, 2002).

In contrast to behaviorists, constructivists assume that each learner constructs, or at least interprets, reality based on his or her perception of past experiences. The role of the teacher is to accompany the learner in his search for meaning by asking questions, arousing curiosity, guiding the learner to manipulate external representations and guiding him to construct knowledge together (Crozat, 2002).

Social constructionism assumes that teachers' meaning is created through dynamic interactions between students and teachers (Barak, 2017). Socioconstructivism is a learning theory that sees the process of cognitive development as a social process that takes place either through interaction with people important to the learner (e.g., parents, teachers, friends) or through the use of mediating tools (e.g., books, physical models, computer visualization, etc.).

2.2. Motivation and Teaching Strategies

Motivation is one of the important factors that determine human behavior and action (George Saadé & al., 2009; Lin, 2007). An unmotivated individual doesn't feel any impetus or inspiration to act, while when they engage in activities with a specific purpose, they are considered motivated (George Saadé & al., 2009). Using specific learning strategies promotes deep processing. That promote the use of actions taken by the learners, these promote the use of learning strategies by the student, allowing them to value and organize the information received in order to be able to understand it and integrate it into his practice on a continuum of time (Larue & Hrimech, 2009).

Most studies have shown that motivation is associated with beneficial effects in terms of learning. In particular, the more motivated students are, the better the quality of their learning, the learning strategies they use, their perseverance and their performance are better (Pelaccia & Viau, 2017).

According to some research, one of the essential factors in learning is motivation or commitment. Motivation to be the driving force behind action, it is a necessary but not sufficient condition for commitment (Vallerand & al., 1997).

Thus, different theories (expectancy value theory, achievement goal theory or self-efficacy theory) focus on the relationship between motivation and learner performance. Among others, the self-determination theory of Deci and Ryan (1985). The latter distinguishes three forms of motivation: intrinsic motivation, extrinsic motivation and a motivation (Ryan & Deci, 2000).

Research associates the positive effects of ICT on motivation with four components: working with a new media, the nature of the more individualized education offered by ICT, Greater autonomy for learners and the ability to get quick and regular feedback (Knoerr, 2005). All of these factors are intended to help the learner develop and consciously use appropriate learning strategies.

For Lepper & Hodell (1989), four factors are crucial to increase students' intrinsic motivation intrinsic: curiosity, challenge, fantasy and control. Gregoire et al (1996) conclude that ICT has three positive effects on motivation to learn: the development of various intellectual faculties, the fact of being interested in learning activity, the increased time and attention dedicated to these activities.

2.3. Learning and Artificial intelligence (AI)

Mobile phones are becoming more commonplace among university students. They use their smartphones to access study materials or supporting information online, to manage group assignments and to communicate with lecturers. (Anshari et al., 2017).

Some researchers regard distance learning as the delivery of learning materials via electronic media such as the Internet, extranet, intranet, broadcast, audio/video tapes, integrated television and CD-ROMs (Engelbrecht, 2005; Lee et al., 2009). Further researchers consider distance learning as online learning that uses communication, collaboration, knowledge transfer and online learning to provide value to both individuals and organizations (Lee et al., 2009).

University students form the largest group of users of mobile electronics, although mobile phones are considered the most commonly used devices (Crompton & Burke, 2018; Lavidas & Gialamas, 2019; Nikolopoulou et al., 2020). Students' perception and actual use of mobile technologies in education should influence the direction of future developments in distance learning (Nikolopoulou et al., 2020; Vrana, 2018).

Using mobile equipment for teaching purposes (called mobile learning) can support and improve the learning experience anytime, anywhere, and distance learning is a new aspect of teaching technologies at different levels of education (Nikolopoulou et al., 2020).

The field of AI originated in computer science and engineering, but is heavily influenced by other disciplines such as philosophy, cognitive science, neuroscience and economics. Given the interdisciplinary nature of the field, there is little agreement among AI researchers on a common definition and understanding of AI - and intelligence in general (Zawacki-Richter et al., 2019). Regarding the introduction of AI-based tools and services in education, AI is already being introduced in higher education, although many teachers are unaware of its scope and, more importantly, what it consists of (Zawacki-Richter et al., 2019) (Hinojo-Lucena et al., 2019).

A second major trend in the use of artificial intelligence is adaptive learning. In the context of adaptive learning, technologies allow, above all, to easily and dynamically adapt learning paths to the needs and characteristics of learners. Thus, adaptive learning is a pedagogical method that uses AI to structure learning by taking into account the individual abilities or needs of each learner (Karsenti, 2018). However, artificial intelligence solutions are for tasks that can be automated, but still cannot be considered as a solution for more complex higher education tasks (Popenici & Kerr, 2017).

2.4. Technology acceptance model

Emerging from the Theory of Reasonable Action (TRA) and the Theory of Reasonable Action Behavior (TRA) and the Theory of Planned Behavior (TPB), the TAM has become prominent in explaining user behavior toward technology (Marangunić & Granić, 2015).

Proposed by Davis & al. in 1989, the Technology Acceptance Model (TAM) aims to explain and understand the behavior of individuals in the use of ICT. It is considered to be the theoretical model that most widely explains the use of information technology (Hu et al., 1999) as well as to study the phenomenon of prediction and use of technology.

The model attempts to conceptually explain and understand an individual's intentions to use or not use a technology based on two perceptions. The first is perceived usefulness (PU), which is the user's perception of whether or not using a system will help him or her accomplish appropriate tasks. The second perception is perceived ease of use (PEOU), which is the user's

perception of effort required to use a system. These two determining factors are supposed to influence the intention to use the technology, which, in turn, has an influence on the actual use of the technology. The constructs used by (Devis & al. 1989) are: perceived usefulness, perceived ease of use external variables, attitude toward use, intention to use, and actual use. External variables include user training, management support, and system quality management support, and system quality (Igbaria et al., 1995).

- Perceived usefulness: is defined as the extent to which an individual believes that using a particular system has improved their job performance. (Davis, 1989). This means that it is the subjective probability that an individual will use technology;
- Perceived ease of use: refers to judgments about the effort required to use technologies. It indicates the extent to which the user believes that using a particular technology will be effortless (Davis, 1989);
- External variables: these include three groups that influence individuals' intention to use IT: organizational, individual and technological (Agarwal & Prasad, 1998);
- Attitude to use: describes the expected consequences of use. It includes social values, habits and facilitating conditions;
- Intent to use: represents the degree of commitment and valence a person has towards the technology. Behavioral intention is significantly influenced by user attitude (Karahanna & al., 1999);
- Effective use: used as an effective alternative measure of success for the information system. It is directly influenced by the intention to use the technology (Davis, 1989).

2.5. Development and Extension of the TAM Model

During subsequent experimental stages, the TAM model was refined to include additional variables and to modify the relationships that were initially formulated. Similarly, other researchers have requested and proposed several additions.

TAM2 presents two theoretical constructs, social influence and instrumental cognitive constructs, to explain the effects of various determinants on perceived utilities and behavioral intention. Subjective norms and images are the two determinants of perceived utilities that represent influential social processes (Venkatesh & Bala, 2008). They suggest that the effect of the subjective norm on perceived usefulness and behavioral intention will decrease over time as users gain more experience with technology.

In addition to the subjective norm, defined as the extent to which others felt that a reference person should use the target technology, other constructs in the TAM2 model include image, importance to the job, production quality of the technology, demonstrability of the results and perceived ease of use.

- Perceived ease of use: is the extent to which an individual believes that using ICT will be effortless (Davis, 1989);
- Subjective norm: is defined as the degree to which a person perceives that the majority of individuals important to them think they should or should not use technology (Venkatesh & Davis, 2000a);
- Image: is the degree a person perceives that the use of such an innovation will enhance their position within their social system (Moore & Benbasat, 1991);
- Importance to the job: can be defined as the extent to which a person believes that the technology in question is relevant to their business (Venkatesh & Davis, 2000a);
- Output quality: is the degree to which a person believes that the ICT performs job-related tasks (Venkatesh & Davis, 2000a);
- Demonstrability of the result: it is the measure according to which a person considers that the results obtained with a system are palpable, observable and transferable (Moore & Benbasat, 1991).

By combining TAM2 (Venkatesh & Davis, 2000) and the Determinants of Perceived Ease of Use model (Venkatesh, 2000), in 2008 Venkatesh & Bala developed an integrated model of technology acceptance called: TAM3. In this model, the authors propose three theoretical extensions beyond TAM2 and the model of the determinants of perceived ease of use and presents a comprehensive model of the determinants of ICT adoption and use.

The TAM3 model presents three relationships that were not empirically tested in Venkatesh (2000) and Venkatesh and Davis (2000). The authors suggest that experience moderates the relationships between (1) perceived ease of use and perceived utility; (2) technology anxiety and perceived ease of use; and (3) perceived ease of use and behavioral intention (Venkatesh & Bala, 2008).

2.6. The UTAUT Model

UTAUT was successfully applied in research examining technology adoption in the higher education sector (Nikolopoulou et al., 2020). UTAUT is applicable in the context of distance learning and information technology and communication. Learning/technology and has been reported as the optimal model for distance learning (Nikolopoulou et al., 2020; Venkataraman & Ramasamy, 2018).

UTAUT argues that four key constructs, performance expectations, effort expectations, social influence, and facilitating conditions, are direct determinants or predictors of intention and use (Venkatesh & al., 2003).

Expected performance or perceived usefulness is the extent to which a person believes that using the system will help to achieve job performance benefits, the expected or perceived effort corresponds to the degree of simplicity related to the use of the system, social influence is the extent to which an individual believes that others should use the new system, enabling conditions is the extent to which an individual feels that an organizational and technical infrastructure exists to support the use of the system (Venkatesh et al., 2003).

Subsequent research on the UTAUT model has given way to the UTAUT2 model. The UTAUT 2 approach is based on the suggestions of Johns (2006), who suggests that specific contexts can lead to changes in theories in a diversity of manners. Specifically, UTAUT 2 introduces three new indicators: hedonic motivation, price value, and habit (Venkatesh, 2015). Hedonic motivation is defined as the enjoyment or pleasure obtained from using a technology (Venkatesh et al., 2012), the value of the price refers to the cognitive value of users (trade-off between the perceived benefits of the technology and the monetary cost of using the systems) (Venkatesh & al., 2012), habit is the extent to which people automatically tend to adopt behaviors as a result of learning. (Venkatesh & al., 2012).

3. Presentation of the Hypotheses and the Research Model

Over the past few years, we have seen significant investments in digital learning technologies. Despite these investments, learning technologies can be poorly adopted, abandoned, or rejected by learners (Mehta & al., 2019), which is why learner motivation and engagement remain topics of interest to researchers (Mehta et al., 2019; Zhu et al., 2018). As such, understanding the intent of students to use e-learning systems is critical to ensure their success and continued adoption by students, instructors as well as educational institutions.

In this section, we will present the hypotheses and the research model answering the problematic and the main questions through eight hypotheses.

3.1. The use of ICTE in higher education: state of the art in Morocco

To respond to the main challenges (such as improving the quality of training, improving the governance of the system, improving the employability of graduates, aligning with international

standards), the Moroccan State is committed to a process of integrating ICTE in higher education.

The roadmap (2009-2013) is structured around the following main areas: infrastructure development, training, development of digital educational resources and improvement of uses. This last axis, which is rather transversal in nature and relates to change management, aims to ensure the improvement of the quality of learning and the monitoring of teachers' professional development, which will have a definite effect on the development of learners' skills.

As part of the integration of ICT in the educational sphere, Morocco has deployed innovative projects such as e-gov, Moroccan Virtual Campus (development of distance learning in higher education in Morocco), MARWAN (Morocco Digital), INJAZ program (which aims to equip students enrolled in the Master, engineering students and doctoral students with a laptop and an Internet connection).

In addition, an ambitious national program has been implemented since 2006 to generalize educational technologies in education. This is the initial strategy GENIE (Generalization of ICT in Education).

The main objectives of these programs are:

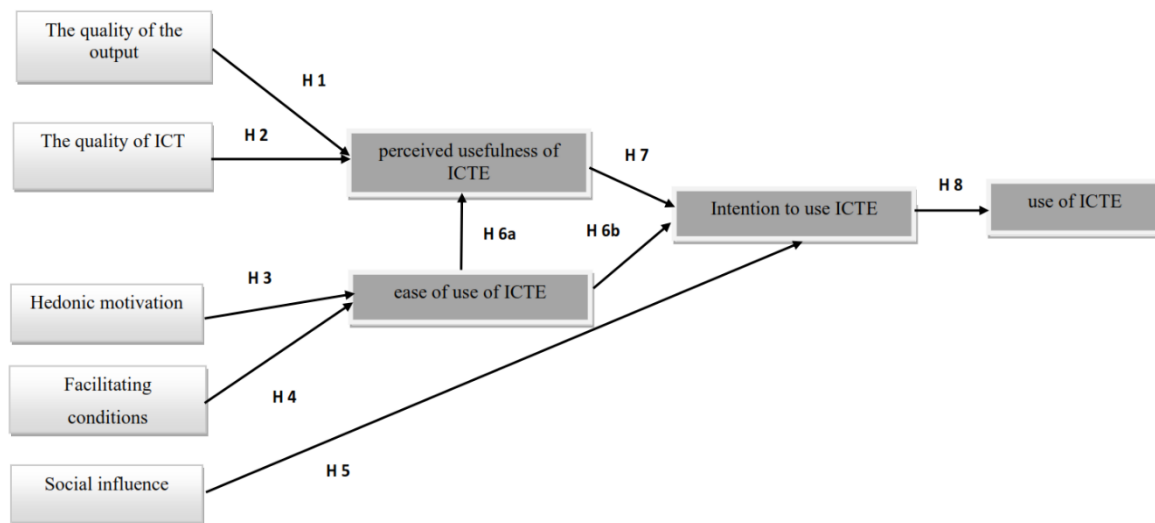
- Strengthening ICT training;
- To continue the development of digital resources and services accessible to teachers, administrators and learners;
- Promote the availability of digital services and resources internally and externally;
- Supporting the production of digital educational content;
- Upgrading digital infrastructure;
- Fostering research and innovation.

3.2. Conceptual Model

The Technology Acceptance Model (TAM) aims to explain and predict the success or failure of adopting an ICT through variables related to perception (perceived usefulness or ease of use) and attitudes which will generate behavioral intentions to use it (Davis, 1986). Perceived usefulness is "The extent to which an individual believes that the use of a particular system would improve their performance" (Davis, 1986). Perceived ease of use is "The degree to which the use of technology will be effortless".

Although other theories have been applied to study user acceptance of new technologies by users, the technology acceptance model (TAM) (Davis, 1989) has been widely used in the literature (Venkatesh & Bala, 2008). Venkatesh and Bala (2008) synthesized the research on TAM into their TAM3 model, which proposes that individuals' use of an ICT solution is prompted by their intention to use the technology, which is influenced by their perception of the usefulness and ease of use of the technology. While the UTAUT model aims to explain the intention of the ICT user and, subsequently, to monitor the behavior of their use.

Figure 1: Integrated search model.



Source : Authors

3.3. Research Hypotheses

Having presented the literature review that we have mobilized in this first part, which covers all the interactions between the different theoretical concepts that are part of our research problematic on the adoption and use of ICT, In this section we will present our hypotheses from the TAM, TAM2 and UTAUT and UTAUT2 models in which we have chosen the variables that we think are the most interesting for the technologies used in higher education institutions for educational purposes, which are: the quality of the output of the ICTE, the hedonic motivation, the facilitating conditions, the social influence, the ease of use, the perceived usefulness, the intention to use and the actual use of the technology. The choice of the latter is explained in each hypothesis.

H1: Quality of outcome has a positive impact on the perception of usefulness of ICTE.

Output quality in the TAM2 model was concerned with how well the technology functions necessary to accomplish specific tasks (Venkatesh & Davis, 2000b). Research has shown that many teachers working within the online learning environment have been concerned with various technical aspects of learning management systems and other educational learning management systems (Wingo & al., 2017).

H2: The Quality of ICTE is positively related to the perceived usefulness of ICTE.

ICT design features have been identified as critical to the successful implementation of e-learning initiatives (Bhuasiri & al., 2012; Brown & Charlier, 2013; Moreno & al., 2017). More specifically, the availability of features to support interactions among students and between teachers and students was highlighted as essential to the learning process (Brown & Charlier, 2013).

H3: the intention to use ICTE is significantly influenced by hedonic motivation.

Hedonic motivation or perceived pleasure is defined as the perception of pleasure resulting from the use of technology. Hedonic motivation may be related to the learner's perceived usefulness of online learning by facilitating information exploration in an online environment, particularly in cultures where the extrinsic motivation of TAM does not explain learner behavior (George Saadé & al., 2009; Mehta & al., 2019). Nevertheless, e-learning lessons that are engaging, well designed, and interesting are also likely to be perceived as useful by online learners (Mehta & al., 2019; Roca & Gagné, 2008).

H4: Enabling conditions positively influence the perceived ease of use of ICTE.

The facilitating conditions reflect the enabling organizational framework of the IT infrastructure perceived as a facilitator for use by individuals (Venkatesh et al., 2003). (Mtebe & Raisamo, 2014) define enabling conditions as the availability of resources to support the adoption and use of online learning in a given institution. In the context of online learning, resources include the availability of online devices, a reliable broadband connection, and other related resources. Therefore, the student's decision to use online learning systems is influenced by their perception of the availability of services and support resources to provide online learning.

H5: The intention to use ICTE is positively influenced by social influence.

Social influence is defined as the degree to which an individual perceives the importance of other people's belief that they must use a specific technology (Venkatesh et al., 2003). In terms of concepts, the social influence encompasses the role of subjective norms, social factors and image, as suggested by the authors Venkatesh et al. (2003) in their UTAUT model.

H6 a: the relationship between perceived ease of use and perceived usefulness of ICTE is positive.

H6 b: The relationship between perceived ease of use and intention to use ICTE is positive.

Perceived ease of use is one of the most popular concepts in ICT adoption studies since its introduction in the adoption studies since its introduction in the technology acceptance model (Davis, 1989). (Davis et al., 1989) defined perceived ease of use as the degree to which a person believes that using a system will require no effort. The researchers used this variable to predict the intention to use various technologies such as e-learning (Chiu et al., 2007).

Research has shown that the use of educational technology has an impact on teachers' satisfaction with online teaching. (Shea et al., 2005) conducted a survey of 913 faculty members and determined through factor analysis and multiple regression that technology barriers were highly correlated with faculty satisfaction levels online. Similarly, (Tabata & Johnsrud, 2008) found in a study of 2,048 participants that teachers' beliefs about their technology use skills were significantly correlated with their intention to participate in online teaching.

H7: The perceived usefulness of ICTE is positively related to the intention to use ICTE.

The perceived usefulness is the degree of an individual who thinks that the use of a specific technology would enhance his or her performance. Performance expectancy, one of the most important determinants of intention to use technology, is a teacher's belief that using the system will help him or her improve performance on the job (Venkatesh et al., 2003).

H8: The relationship between the intention to use ICTE and the use of ICTE is positive.

The use of e-learning technology is unquestionably recognized as an important and integral part of the educational process. There is a great deal of research is being conducted to explain the extent to which e-learning systems are effectively usable and acceptable. A considerable amount of research has focused on the factors that influence learners' intention to use e-learning in an academic environment and how academic environment these influences can be explained.

4. Data and Methodology

4.1. Data

The objective of this research is to identify the determinants of ICTE adoption by private higher education students in Morocco. We opted for the convenience sampling technique for reasons of convenience and practicality (Malhotra & al. 2007). This choice is justified by a desire to test our hypotheses on a population that is rather difficult to see.

Sampling is a process of defining a sample in a research study. It involves studying a selected part in establishing conclusions applicable to the entire group. In other terms, sampling is a

precise selection of people targeted to conduct an interview, focus group, survey or questionnaire.

The objective of this data collection is mainly to support the testing of our hypotheses and research proposals. In this sense, the resulting data analysis will mobilize demanding statistical methods, such as confirmatory factor analysis and structural equations that require a significant sample size. El Akremi and Roussel (2003) summarize the rules of thumb for determining sample size as follows:

When the theoretical model studied includes mediating and especially moderating variables, large sample sizes seem to be necessary: $N > 300$ or even 500.

We managed to interview 400 individuals with an equal share of men and women (41% and 59% respectively).

The structure of the final sample is detailed in the following table:

Table 1: gender

	Frequency	Percentage	Valid percentage	Cumulative percentage
Men	164	41,0	41,0	41,0
Female	236	59,0	59,0	100,0
Total	400	100,0	100,0	

Source : Authors

Table 2: level of education

	Frequency	Percentage	Valid percentage	Cumulative percentage
1st year	84	21,0	21,0	21,0
2nd year	78	19,5	19,5	40,5
3rd year	101	25,3	25,3	65,8
4th year	85	21,3	21,3	87,0
5th year	52	13,0	13,0	100,0
Total	400	100,0	100,0	

Source : Authors

4.2. Methodology

Like any other discipline, ICT researchers also use structural equations which have a variety of uses, it is considered very powerful in terms of precision of results and in terms of validation of measurement scales. Similarly, Baumgartner and Homburg (1996) pointed out that structural equations allow for the development of research based on the examination of multifaceted constructs, the interaction between the construct and its measurement, and the explanation of the phenomenon under study. Thus, this method offers a coherent approach and valid models for our research.

LISREL (*Linear Structural Relationships*) allows specifying, estimate, compare and evaluate models in order to confirm a theory. LISREL is therefore a confirmatory method (the objective of our research) which requires a strong theoretical background in order to think in terms of models and hypotheses. The specification of the model is a crucial phase in the modeling work. In this way, the sequence of our questionnaire is structured in such a way as to respect the architecture of our research model by keeping the same structure, which will make it possible to test our hypotheses and provide elements of an answer to our problem.

Table 3: explanation of the themes

Topics	Explanations
Introduction	Presentation of the objective of the study, reminder of the definition of information and communication technologies for education and distance learning.
Perceived usefulness	The use of ICTE allows to complete online course tasks more quickly and faster. The use of ICTE improves performance in online courses.
Quality of ICTE output	The quality of the results received from the e-learning ICTE is great. The ICTE provides information that is easy to understand. The information content in the e-learning system is very strong.
Quality of ICTE	The steps to accomplish a task in ICTE follow a logical sequence logic. The organization of the information on the screens of the ICTE is clear. The TICE reacts quickly to the busiest hours of the day.
Easy to use	Learning to use ICTE is easy for students. Interaction with the ICTE is clear and understandable. ICTE easy to use.
Hedonic motivation	The computer and ICTE make learning more interesting. Learning with computers and ICTE is enjoyable. look forward to those aspects of learning activities that require the use of ICTE.
Social influence	Teachers think that student should participate in ICTE activities. Classmates and family members are very positive about the use of ICTE.
facilitating conditions	The learner has the necessary knowledge and resources to use ICTE.
intention of use	Intend to use ICT to prepare for the exam and coursework. The intention to use ICT to do a variety of things, from downloading lecture notes to participating in discussion forums for e-learning. The intention to participate regularly in e-learning.

Source : Authors

Several methods of questionnaire administration are used, such as face-to-face, telephone, mail or the Internet. In the context of our research, the responses to the quantitative survey are collected through the online administration of the questionnaire. This technique is increasingly used in management science studies because of its multiple advantages. According to Gavard-Perret et al. (Gavard-Perret et al., 2012), the choice between these methods depends on three criteria: the cost of collection, its duration and the quality of the information collected.

5. Results and Discussion

Within this section, we introduce the results of the analysis of the collected data in order to test the hypotheses of this study. Specifically, our aim is to present the results of the quantitative analysis of our final panel (400 respondents), incorporating the results of the SPSS 23 AMOS 23 software descriptive analysis and the measurement and structural model evaluation. The aim is to identify the determinants that influence the adoption and use of ICT by private higher

education learners in Morocco. For the following step, the results will be interpreted and discussed.

Two main objectives of this quantitative study are to validate the measurement scales of the different variables under study and to test the hypotheses of the conceptual research model.

5.1. Reliability and Validity Analysis

In order to test the measurement scales of all the variables in our model, we started by checking the normality of the sample, then we evaluated their factorial contributions and their SMC (Squared Multiple Correlations), then we evaluated the goodness of fit of the measurement model and ended with the results of the T-test.

Reliability of measurements: the Jöreskog Rhô (or Rhô (ρ)) is frequently used to measure reliability during the confirmatory phase. It is an internal consistency coefficient calculated using the factor contributions of the indicators.

Its analysis as Cronbach's alpha, which has a value greater than 0.7 or 0.8, gives a good reliability of the construct. Above this value, Jöreskog's Rhô is guaranteed as not being sensitive to the number of items.

Convergent validity is determined by three criteria (Roussel et al. 2002):

- The t-test for each of the factor contributions (significant relationship between a latent variable and one of its indicators) must be significant ($> |1.96$). Student's T-test is provided by the AMOS software under the name of Critical Ratio (CR)).
- Each indicator must share a larger variance with its construct as well as the associated and the associated measurement error. The square of the contribution of the factor must therefore be greater than 0.5 because this coefficient represents the percentage of variance of the item returned by the construct.
- This criterion can be associated with the mean variance extracted, which is a rho of convergent validity (Fornell and Larcker, 1981). It must be greater than 0.5 to verify convergent validity.

Table 4: Confirmatory factorial statistics

ITEMS	FACTOR CONTRIBUTIONS (LAMIDAS)	SQUARED MULTIPLE CORRELATIONS (SMC)	SCALE STATISTICS
PU1	0,854	0,713	Alpha of Cronbach = 0,937 ρ of Jöreskog = 0,950 ρ of convergent validity = 0,733
PU2	0,853	0,651	
PU3	0,888	0,793	
PU4	0,867	0,687	
PU5	0,888	0,790	
PU6	0,845	0,623	
PU7	0,793	0,557	
QO1	0,835	0,702	Alpha of Cronbach = 0,951 ρ of Jöreskog = 0,959 ρ of convergent validity = 0,702
QO2	0,785	0,529	
QO3	0,859	0,752	
QO4	0,834	0,616	
QO5	0,870	0,779	
QO6	0,814	0,583	
QO7	0,877	0,790	
QO8	0,824	0,597	
QO9	0,873	0,779	
QO10	0,803	0,560	
QO11	0,688	0,429	Alpha of Cronbach = 0,973 ρ of Jöreskog = 0,907
QT1	0,750	0,540	
QT2	0,814	0,516	
QT3	0,829	0,696	
QT4	0,803	0,499	
QT5	0,843	0,708	
QT6	0,675	0,312	

EU1	0,887	0,842	ρ of convergent validity = 0,621
EU2	0,883	0,556	
EU3	0,900	0,875	
EU4	0,797	0,385	
HM1	0,878	0,781	Alpha of Cronbach = 0,888 ρ of Jöreskog = 0,924 ρ of convergent validity = 0,753
HM2	0,881	0,609	
HM3	0,853	0,717	
HM4	0,801	0,544	
SI1	0,919	0,796	Alpha of Cronbach = 0,873 ρ of Jöreskog = 0,915 ρ of convergent validity = 0,729
SI2	0,783	0,593	
SI3	0,917	0,792	
SI4	0,893	0,761	
FC1	0,822	0,725	Alpha of Cronbach = 0,839 ρ of Jöreskog = 0,932 ρ of convergent validity = 0,774
FC2	0,859	0,525	
FC3	0,870	0,773	
FC4	0,778	0,582	
IU1	0,833	,658	Alpha of Cronbach = 0,852 ρ of Jöreskog = 0,901 ρ of convergent validity = 0,694
IU2	0,824	,574	
IU3	0,894	,813	
IU4	0,880	,783	
IU5	0,854	,643	
IU6	0,853	,638	
IU7			
	0,836	,660	Alpha of Cronbach = 0,936 ρ of Jöreskog = 0,950 ρ of convergent validity = 0,729

Source : Authors

Perceived usefulness (PU), Quality of ICTE output (QO), Quality of ICTE (QT), Easy to use (EU), Hedonic motivation (HM), Social influence (SI), Facilitating conditions (FC), Intent to use (IU).

The evaluation of the skewness and kurtosis coefficients are included in the interval [-3; +3], allowing us to conclude that there is no violation of the normality condition of the distribution. In addition, in view of these results, it should be concluded that the items of the variables are indeed to be retained because their coefficients of determination (SMC >0.5). In addition, Cronbach's Alpha is greater than 0.7, Jöreskog's coefficient > 0.7 and the coefficient of convergent validity > 0.5 which affirm the validity and reliability of the measures. In addition, all absolute values of the T test are well above 1.96.

5.2. Analysis of the Structural Equation Model and test of the hypotheses

In this section, we will present the synthesis of the results of our model, by presenting the global model given by AMOS V 23 as well as the validated and rejected hypotheses.

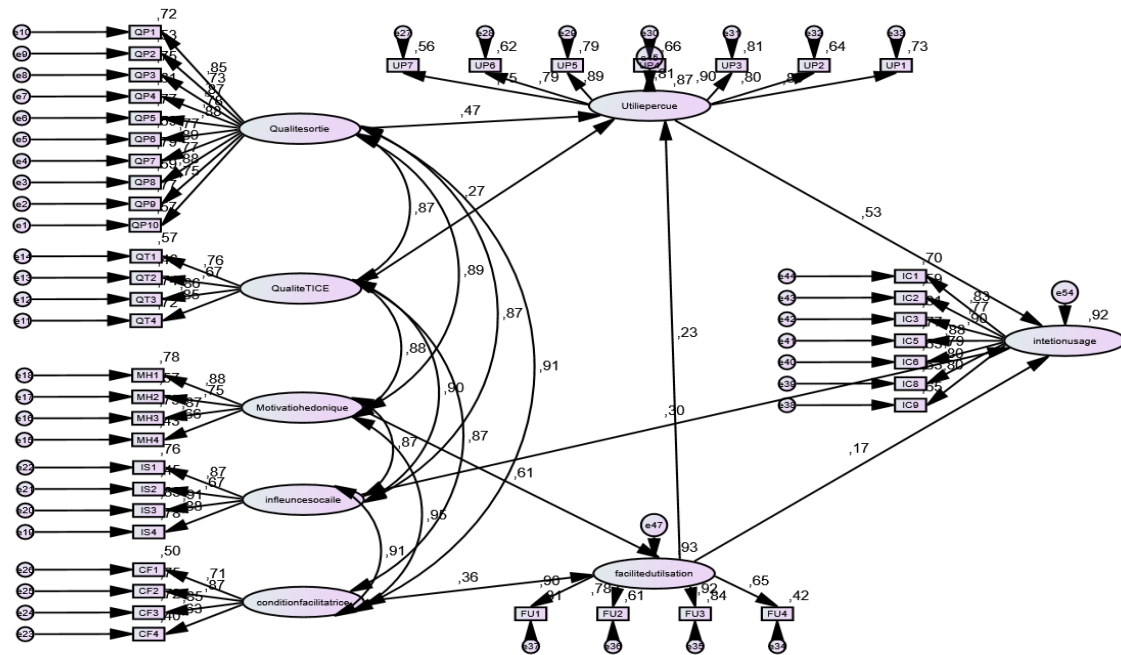
Table 5: T-test results of the Global model

			ESTIMATE	S.E.	C.R.	P
Ease of use	<---	Hedonic motivation	,579	,134	4,306	***
Ease of use	<---	Social influence	,088	,049	1,781	,075
Ease of use	<---	Enabling condition	,272	,152	1,793	,073
Perceived usefulness	<---	Output quality	,617	,095	6,494	***
Perceived use	<---	ICTE Quality	,285	,068	4,199	***
Perceived usefulness	<---	Ease of use	,313	,098	3,182	,001
Intention of use	<---	Ease of use	,524	,089	5,890	***
Intention of use	<---	Perceived usefulness	,657	,069	9,569	***
QualP_Item10	<---	Output quality	1,000			
QualP_Item9	<---	Output quality	1,378	,073	18,942	***
QualP_Item8	<---	Output quality	1,040	,064	16,182	***

		ESTIMATE	S.E.	C.R.	P
QualP_Item7	<--- Output quality	1,343	,070	19,288	***
QualP_Item6	<--- Output quality	1,012	,063	16,186	***
QualP_Item5	<--- Output quality	1,331	,070	19,009	***
QualP_Item4	<--- Output quality	1,055	,064	16,567	***
QualP_Item3	<--- Output quality	1,355	,072	18,692	***
QualP_Item2	<--- Output quality	1,055	,069	15,300	***
QualP_Item1	<--- Output quality	1,371	,076	18,156	***
QualTICE_Item4	<--- ICTE Quality	1,000			
QualTICE_Item3	<--- ICTE Quality	1,037	,048	21,822	***
QualTICE_Item2	<--- ICTE Quality	,641	,042	15,126	***
QualTICE_Item1	<--- ICTE Quality	,957	,054	17,832	***
MovHéd_Item4	<--- Hedonic motivation	1,000			
MovHéd_Item3	<--- Hedonic motivation	1,369	,090	15,279	***
MovHéd_Item2	<--- Hedonic motivation	1,039	,076	13,685	***
MovHéd_Item1	<--- Hedonic motivation	1,496	,097	15,471	***
InfSoc_Item4	<--- Social influence	1,000			
InfSoc_Item3	<--- Social influence	1,040	,039	26,675	***
InfSoc_Item2	<--- Social influence	,607	,038	15,834	***
InfSoc_Item1	<--- Social influence	,952	,038	24,885	***
CondFac_Item4	<--- Facilitating condition	1,000			
CondFac_Item3	<--- Facilitating condition	1,388	,099	14,072	***
CondFac_Item2	<--- Facilitating condition	1,407	,098	14,327	***
CondFac_Item1	<--- Facilitating condition	1,042	,085	12,308	***
UP_Item7	<--- Perceived usefulness	1,000			
UP_Item6	<--- Perceived usefulness	,823	,050	16,444	***
UP_Item5	<--- Perceived usefulness	1,126	,059	19,015	***
UP_Item4	<--- Perceived usefulness	,857	,050	16,977	***
UP_Item3	<--- Perceived usefulness	1,125	,058	19,233	***
UP_Item2	<--- Perceived usefulness	,813	,049	16,666	***
UP_Item1	<--- Perceived usefulness	1,102	,061	18,097	***
FacUti_Item4	<--- Ease of use	1,000			
FacUti_Item3	<--- Ease of use	1,445	,094	15,312	***
FacUti_Item2	<--- Ease of use	1,043	,077	13,623	***
FacUti_Item1	<--- Ease of use	1,455	,096	15,080	***
ItenComp_Item7	<--- Intention of use	1,000			
ItenComp_Item6	<--- Intention of use	,775	,042	18,634	***
ItenComp_Item5	<--- Intention of use	,814	,044	18,494	***
ItenComp_Item4	<--- Intention of use	1,069	,051	21,125	***
ItenComp_Item3	<--- Intention of use	1,049	,048	21,959	***
ItenComp_Item2	<--- Intention of use	,728	,041	17,664	***
ItenComp_Item1	<--- Intention of use	,987	,050	19,632	***

Source : Authors

Figure 2: Global model measurement results.



Source : Authors

According to (Anderson & Gerbing, 1988), to accept or reject a hypothesis with a low probability of failure (p-value), frequently 5%, it is necessary to calculate the t-values that enable us to estimate the impact of chance on the outcome of the hypothesis. The factorial covariance is significant when the t values are more than 1.96 or lower than -1.96. In this study, and according to the table above, we can conclude that seven hypotheses are highly significant at $p < 0.001$, two are not significant.

Table 6: hypotheses

	hypotheses	Conclusion
H1	Quality of outcome has a positive impact on the perception of usefulness of ICTE.	Confirmed
H2	The quality of ICTE is positively related to the perceived usefulness of ICTE.	Confirmed
H3	The intention to use ICTE is significantly influenced by hedonic motivation.	Confirmed
H4	Enabling conditions positively influence the perceived ease of use of ICTE.	Rejected
H5	The intention to use ICTE is positively influenced by social influence.	Rejected
H6a	The relationship between perceived ease of use and perceived usefulness of ICTE is positive	Confirmed
H6b	The relationship between perceived ease of use and intention to use ICTE is positive.	Confirmed
H7	The perceived usefulness of ICTE is positively related to the intention to use ICTE.	Confirmed
H8	The relationship between the intention to use ICTE and the use of ICTE is positive.	Confirmed

Source : Authors

5.3. Discussion

In recent years, we are witnessing a massive use of ICT (smartphone, PC...) by university students. Their use in the context of their studies as learning support tools can potentially contribute to the teaching of students around the world (Nikolopoulou & al., 2020). University students used their mobile phones, for example, to consult course resources or supplementary

information on the Internet, to manage group exercises and to interact with teachers (Anshari & al., 2017; Nikolopoulou & al., 2020). Furthermore, at present the importance of e-learning is recognized as a powerful and transformative instrument for the extension of traditional learning methods and the capacity building for education and training in the Western countries and the rest of the world (Alfraih & Alanezi, 2016; Mikhaylov & Fierro, 2015; Tarhini et al., 2017). E-learning offers learners flexibility of time and place and can also be a form of education that incorporates motivational self-direction, interaction, effectiveness and the use of technology. Distance learning is the acquisition and use of distributed knowledge delivered primarily through electronic means (Janda, 2016; Tarhini & al., 2017; Tetteh, 2016).

The primary objective of our study is to investigate the major factors that may influence or discourage the adoption of ICT as a means of online learning in private higher education institutions in Morocco. The conceptual model was developed using the TAM model together with its expansions and the (UTAUT2) model. This study has successfully provided, theoretically and empirically, support for the importance of UTAUT2 as a utilitarian theoretical model for understanding learners' intentions to adopt e-learning technology in the Moroccan setting. Specifically, the findings showed that learners' intention to use ICTE for e-learning was significantly influenced by the quality of ICT production, perceived usefulness, quality of ICT, ease of use and hedonic motivation. Contrary to our expectations, social influence and enabling conditions did not influence the intention to use.

Our results demonstrate that perceived usefulness is a determining factor for the intention to use ICT for e-learning. Thus, the learners who perceive ICTE as useful for their learning are more likely to apply e-learning. Which is consistent with findings from the primary technology acceptance literature (Davis et al., 1989; Venkatesh et al., 2003, 2012) and previous studies on online learning (Chang et al., 2017; Safsouf et al., 2020). Thus, students in private Moroccan higher education establishments planned to use ICTE for e-learning because they considered that ICTE was useful for achieving their goals. Therefore, in order to encourage more users of e-learning, teachers need to improve the quality of their ICT contents by offering sufficient and up-to-date information that responds to learners' needs. As with web technologies, in Morocco, private higher education institutions can also enhance their services in e-learning at no extra cost by exploiting the lower cost of technology, leading to greater take-up by learners.

The results indicate that there is a positive correlation between ICTE quality and ICTE's perceived usefulness. These findings are consistent with Rudhumbu's (2021) results, which also indicated that institutional characteristics have a significant impact on university students' behavioral intentions to persist in technology-mediated distance education (TDE) during COVID-19 and beyond (Rudhumbu, 2021).

Research results also showed that ease of use influenced students' intention to use of students to accept and use the ICTE and e-learning support system. Ease of use has been shown in the literature to have a significant impact on the intention to use ICTE (Alalwan et al., 2015; Tarhini et al., 2017). Consequently, in order to encourage the use of e-learning, the system developers should provide a system that is easy to use.

This study investigates whether hedonic motivation has a significant impact on the intention of users to use ICTE for e-learning. Hedonic motivation refers to the enjoyment and satisfaction experienced by the user. The results showed that this variable is crucial for the intention to use ICT, which is consistent with the findings of (Adedoja & al., 2013; Bakar, 2014; Elkaseh & al., 2015; Masa'deh & al., 2016; Tarhini & al., 2017). This is also consistent with the UTAUT and UTAUT2 proposals. Therefore, higher education institutions should develop and implement anything that makes ICT more fun and motivating to attract students' attention and encourage them to use it.

The social influence is the extent to which a person feels it is important that 'other people' think they should use a technology. Within the context of ICTE, the attitudes of teachers and

educators can influence the attitudes and beliefs of others. The findings of the study showed social impact does not directly influence students' intention to use ICTE for their e-learning practice. In fact, the influence of the social impact may differ on an individual according to such factors as their culture, their age and their education. The results of this research are not consistent with the findings of other research conducted in different contexts such as the results of (Elkaseh & al., 2015; Masa'deh & al., 2016).

In addition, the results demonstrated that the level of facilitation of the conditions for the use of an e-learning system does not have a sufficient impact on the students' intention to use the e-learning system. This hypothesis is not supported by a very low estimate in explaining students' behavioral intention to use ICTE in their instructional practices, which, as well, is inconsistent with some (Bakar, 2014; Masa'deh & al., 2016).

The results of our research are consistent with the results of safsouf (2020), in order To enhance learners' experience satisfaction with the e-learning platform, the course quality and content should be revisited to produce a course that is rich, highly interactive and pleasurable with a variety of different assessments (Safsouf & al., 2020).

ICTE has touched almost every aspect of our world today, from business to education. Their influence has changed the daily life of many people. The increasing introduction of ICT in universities is currently a proof of this. Thus, universities are trying to adapt to the needs of today's society, to prepare for future challenges, opportunities and benefits of new technologies. Academic institutions have been providing distance programs for many years and there has been a significant amount of research and development associated with establishing effective practices and procedures in off-campus teaching and learning. However, the use of technology has broadened the scope of this activity, and whereas in the past, off-campus instruction was an option for students who could not travel to campus, today significantly more students are able to choose this option through technology-facilitated learning settings. As a result, the use of ICT in university teaching practice is considered a necessity. These force the university institution to reconsider the educational practice. Digital information and communication technologies play an increasing role in university teaching processes, which requires the development of new learning spaces and environments and new roles and functions for teachers.

As a result, for practitioners and policy-makers, it has become imperative to understand the critical elements that may inhibit or impact the adoption of ICT to improve student learning.

This study has many implications for theory, methodology and practice. Conceptually, a main outcome of this research is to provide a research design that provides a greater understanding of the drivers of users' behavioral intention to use e-learning technologies in Morocco.

This study provides a better understanding of the characteristics of students in Morocco, and this may help decision makers, academics, and specialists to understand what learners want from learning management systems. This can assist management in implementing such a system in the most effective way and enhance their future strategic technology decision-making, because they can decide what approach is best for their students before introducing a specific technology. In addition, to the e-learning system programmer.

This study gives the views of Moroccan University students on the main influences on the adoption and acceptability of a learning management system, thus helping them to understand how they are able to adopt a learning management system and can make improvements to their learning management systems. As well, they can understand the motivations and factors that lead to their acceptance of the technology's use.

6. Conclusion

It is essential to understand the behavioral intention of students to use ICTE systems in the quest for success, on the one hand, and the permanent adoption of these technologies in their training,

on the other hand, in the same way as instructors and universities. Thus, several models were used to examine the determinants of users' behavioral intention to use a specific technology including the Technology Acceptance Model (TAM) (Davis, 1989), the Theory of Planned Behavior (TPB) (Ajzen, 1991), the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), the Unified Theory of Technology Acceptance and Use (UTAUT) (Vankatesh et al., 2003) and the Unified Theory of Technology Acceptance and Use (UTAUT2) (Vankatesh et al., 2012) that we have mobilized as part of the framework in our paper.

For the collection of data, we have mobilized a questionnaire that we have administered to 400 students of the Moroccan private higher education and in order to be able to test our research hypotheses we have used the method of structural equation and have recourse to dedicated software for the analysis of these data.

This study provides a better understanding of the characteristics of students in Moroccan private higher education institutions, that may help managers, teachers and specialists understand what students want from ICTE. This can help managers implement the most effective technology for learning and enhance their approach to technology decision-making. They can decide in the future on the most appropriate approach for their learners before implementing any new technology. In addition, for the e-learning system developer, this study presents the views of Moroccan University learners on the major factors influencing the adoption and acceptance of e-learning systems, which will assist in identifying how they could make improvements to their ICTE.

Since user behavior can vary according to the level of cultural, social, situational, belief and acceptance of the technology, and the results of this study are specific to the context of private higher education institutions in Morocco, it would be more typical to examine whether our developed model can be applied in the context of Moroccan state universities in order to study the peculiarity of public education, or to see if there are differences between the regions of the Kingdom. Our model can also be studied in other Arab or African countries or those with similar economies, such as from other developed or least developed countries. It will be useful to assess the strength and applicability of the research model in different countries.

Consequently, additional research could repeat our research with monocultural and multicultural samples. Moreover, future studies could expand our study to include other possible constructs of interest to increase the explained variance of UTAUT2. Furthermore, future research could take into account individual differences, such as culture and demographic characteristics, and then broader demographic characteristics, which would provide a more complete picture of the dynamic nature of each technology.

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