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Determinants of E-Learning Adoption among Moroccan University Educators: A Literature Review and an Extended UTAUT2 Perspective

Hassan EL IDRISSI BOUZIDI, (*Adjunct Professor*)
Department of Information Systems
Valencia College, Orlando, USA

Hind KABAILI, (*Full Professor*)
Department of Information Systems
ISCAE, Casablanca, Morocco

Correspondence address:	Department of Information Systems Valencia College, Orlando, USA
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Determinants of E-Learning Adoption among Moroccan University Educators: A Literature Review and an Extended UTAUT2 Perspective

Abstract:

This literature review examines the determinants of e-learning adoption by university instructors in Moroccan higher education through an extended Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) framework. In response to rapid digital transformation and increasing instructional demands, the study synthesizes research on personal, institutional, and socio-technical factors shaping instructors' engagement with digital learning environments. Following PRISMA 2020 guidelines, peer-reviewed studies (2010–2025) were systematically screened from Scopus, Web of Science, and Google Scholar. The analysis integrates socio-technical perspectives emphasizing learner diversity (Saykili, 2018), change management approaches supporting sustainable innovation (DeRouin et al., 2005), and critiques of pedagogical limitations in current e-learning solutions (Pange & Pange, 2011). While UTAUT2 provides a robust structure for explaining technology adoption, it does not explicitly theorize professional aspiration as a determinant of sustained integration. The framework is therefore extended through three constructs: Learning Value, Aspiration, and D-Fit Choice. Aspiration is conceptualized as a higher-order construct composed of Motivation and Expectation, reflecting instructors' long-term professional orientation and anticipated academic outcomes. Findings suggest that adoption extends beyond expectancy-based determinants to include professional aspiration, socio-technical alignment, and pedagogical relevance as critical drivers of sustained digital implementation. The study contributes to a context-sensitive understanding of digital transformation and informs strategic institutional decision-making.

Keywords: E-learning adoption; Online education, Blended Learning, UTAUT2; Technology acceptance; Higher education; Digital pedagogy; Socio-technical systems; Learning technology integration; UTAUT2 extension; Contextual relevance (Morocco).
Paper Type: Theoretical Research
JEL Classification: I23, O33

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1. Introduction

This article presents a literature review guided by the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), explicitly focused on e-learning adoption by university instructors in Moroccan higher education. Its purpose is to synthesize theoretical and empirical research in order to clarify the determinants shaping instructors' behavioral intention and sustained use of digital learning environments.

Although e-learning has become structurally embedded in higher education systems worldwide, its effective appropriation by instructors remains uneven. In Morocco, adoption is influenced by infrastructural disparities between urban and rural institutions, uneven internet connectivity, evolving digitalization policies, limited institutional support mechanisms, and persistent pedagogical preferences for face-to-face instruction. While national strategies promote digital transformation, institutional implementation remains heterogeneous. Access to platforms therefore does not automatically result in sustained pedagogical integration.

Research on e-learning adoption has largely centered on students, with comparatively limited attention to university instructors as autonomous professional decision-makers. Existing studies frequently emphasize technological usability or individual attitudes, while giving less consideration to professional aspirations, perceived pedagogical value, and the alignment between digital tools and instructional identity. In the Moroccan context, where institutional environments and professional culture strongly influence instructional practices, these dimensions warrant systematic analysis.

To address this gap, the review adopts UTAUT2 as its primary analytical framework due to its integrative structure and demonstrated explanatory power across contexts. However, while UTAUT2 accounts for determinants such as performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit, it does not fully capture pedagogically grounded motivations specific to instructors. The framework is therefore extended through three complementary constructs: Learning Value, Aspiration, and D-Fit Choice. Learning Value refers to the perceived pedagogical and professional benefits of e-learning use. Aspiration conceptualizes long-term professional orientation through its dimensions of motivation and expectation. D-Fit Choice captures the perceived alignment between digital tools and instructional practices. These additions enrich UTAUT2 by incorporating dimensions directly linked to pedagogical meaning and professional positioning.

The study pursues three integrated objectives. First, it synthesizes major learning theories, behaviorism, cognitivism, constructivism, and connectivism, to clarify their relevance to digital teaching environments. Second, it compares leading adoption models, including TAM, TPB, DOI, and UTAUT2, to justify the selection of UTAUT2 as the most appropriate framework for analyzing instructor adoption, while clarifying the distinction between initial acceptance (first use) and sustained adoption (continued use). Third, it proposes a context-adapted extension of UTAUT2 for Moroccan higher education by incorporating Learning Value, Aspiration, and D-Fit Choice as theoretically grounded constructs.

By situating the analysis within the Moroccan structural context and refining UTAUT2 to account for pedagogical and professional determinants, this review offers a coherent and context-sensitive framework for understanding e-learning adoption by university instructors. It provides a theoretical foundation for future empirical research and supports institutional strategies aimed at strengthening sustainable digital integration.

2. Methodology

To ensure comprehensive retrieval of relevant peer-reviewed literature, a structured search protocol was implemented. The strategy combined controlled vocabulary with Boolean operators to maximize both precision and coverage. Searches were primarily conducted in Scopus, which yielded 1,230 records, complemented by 30 additional sources. The time frame was restricted to the last decade (2015–2024).

The search employed targeted keywords and subject terms related to digital and blended education, including *E-learning*, *Online Teaching*, *Teachers*, *Professor*, *Learning Theories*, *Blended Learning*, *Distance Education*, *Digital Learning*, *Higher Education*, *Instructional Methods*, *TPACK*, and *Flipped Learning*. Boolean operators (AND/OR) and the LIMIT-TO (EXACTKEYWORD) function refined the query to ensure that only publications explicitly tagged with these terms were included. This approach captured a wide spectrum of perspectives and contexts while maintaining topical relevance.

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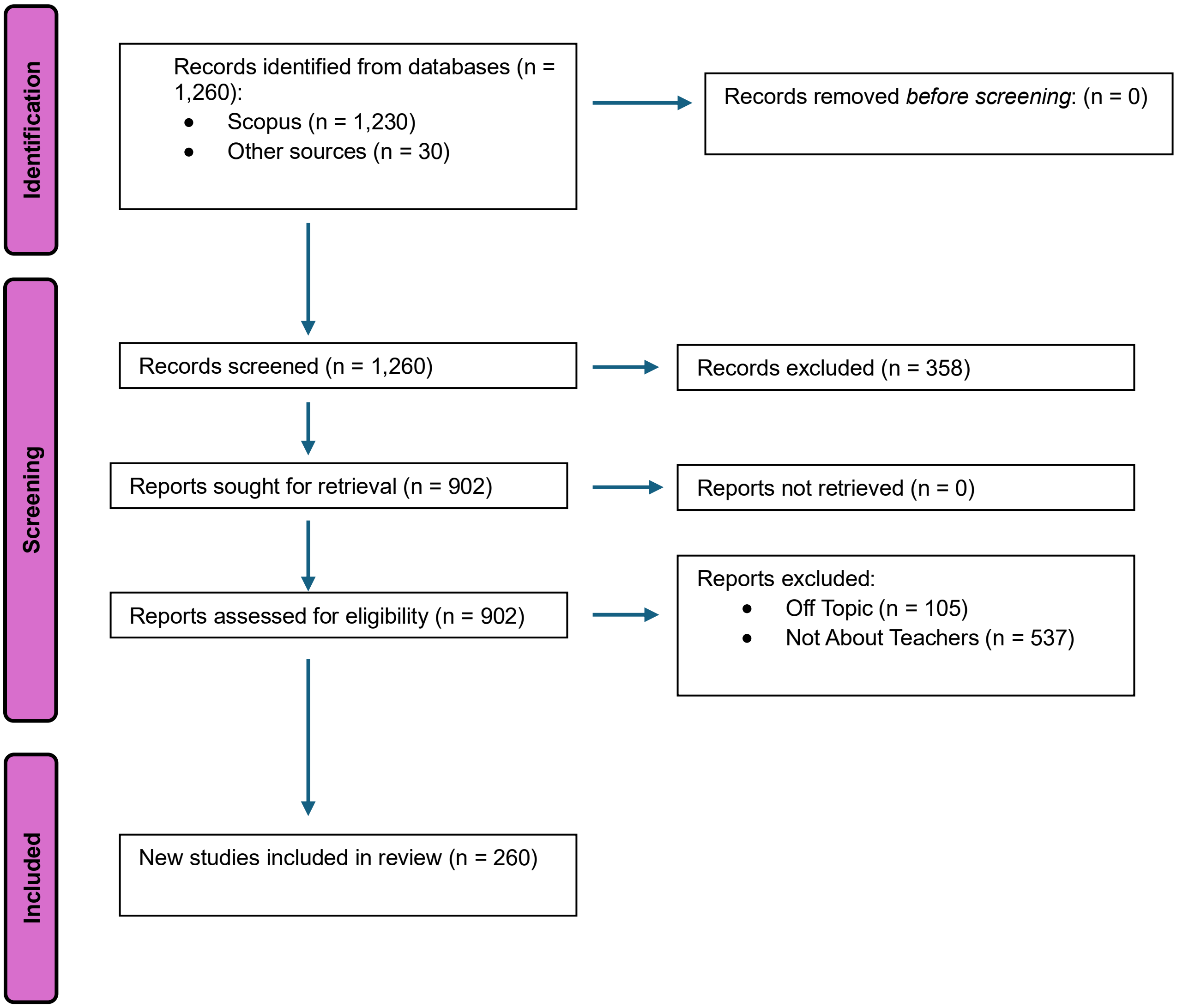
(TITLE-ABS-KEY("e-learning" OR "elearning" OR "online teaching" OR "online learning"
OR "blended learning" OR "distance education" OR "digital learning"
OR "flipped learning" OR TPACK OR "technology pedagogy content knowledge"))
AND (TITLE-ABS-KEY(teacher* OR lecturer* OR professor* OR "higher education"))
AND (PUBYEAR > 2014 AND PUBYEAR < 2025)
AND (LIMIT-TO(EXACTKEYWORD, "E-learning") OR LIMIT-TO(EXACTKEYWORD, "Blended Learning")
OR LIMIT-TO(EXACTKEYWORD, "Online Teaching") OR LIMIT-TO(EXACTKEYWORD, "Distance Education")
OR LIMIT-TO(EXACTKEYWORD, "Digital Learning") OR LIMIT-TO(EXACTKEYWORD, "Higher Education")
OR LIMIT-TO(EXACTKEYWORD, "TPACK") OR LIMIT-TO(EXACTKEYWORD, "Flipped Learning")
OR LIMIT-TO(EXACTKEYWORD, "Instructional Methods"))
AND (LIMIT-TO(DOCTYPE, "ar"))      -- article
AND (LIMIT-TO(SRCTYPE, "j"))       -- journal
```

Articles were included if they (a) were published in peer-reviewed journals, (b) were written in English, and (c) focused on teachers' use of e-learning in relation to pedagogical or theoretical frameworks. A complementary search of Arabic and French sources was also undertaken to broaden coverage. After applying inclusion and exclusion criteria, the initial 1,260 records were reduced to 260 articles for in-depth review.

This semi-systematic search approach followed established reporting practices such as PRISMA (Haddaway et al., 2022). The selection process is documented and visually represented in **Figure 6**.

Figure 6: Identification of records, screening and Inclusion (Prisma)



Source : Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

3. Learning Theories

Drawing inspiration from Flaherty and Phillips (2015) and anchored by Carl Gustav Jung's perceptive observation, "The shoe that fits one person pinches another; there is no universal recipe for living that suits everyone," this study champions a dynamic and adaptable teaching methodology. This approach is crafted to meet the needs of a versatile contemporary education and honors the mixt demographic, cultural, and experiential profiles of learners, while also considering their differing levels of familiarity with online learning environments. Our exploration begins with an elucidation of E-learning, followed by an in-depth review of both traditional and contemporary learning theories.

E-learning represents a modern educational paradigm that has witnessed considerable terminological evolution since its conceptual emergence. This evolution is intrinsically linked to the innovative melding of technological advancements with pedagogical practices. The lexicon surrounding e-learning is rich and varied, with each term denoting specific facets and nuances inherent to the field. For instance, "online learning" connotes a pedagogical approach predominantly driven by the Internet, while "virtual learning" emphasizes the simulation and often the immersion aspects of digital educational environments. Conversely, "distance learning" predominantly focuses on the capacity of this modality to transcend geographical constraints.

3.1.Definitions of E-Learning:

E-learning is a concept with blurred boundaries. Its definition can vary depending on factors such as the country, the perspective of authors, media representations, and the specific research field. This variability reflects the dynamic nature of e-learning, which evolves alongside advancements in technology and changes in educational practices over time. E-learning originated as a blend of traditional face-to-face instruction and distance education, incorporating elements from both approaches. Essentially, e-learning refers to educational scenarios where digital resources are utilized for teaching and learning purposes, often involving some level of physical or temporal distance between instructors and learners (Jézégou, 2012). This complexity underscores the diverse ways in which e-learning is understood and implemented across different contexts and settings.

E-learning has become an essential component of contemporary education in the 21st century. Just like society, the definition of e-learning is continuously evolving, making it difficult to reach a consensus within the scientific community. The understanding of e-learning varies among professionals due to their specific approaches and interests. E-learning champions the application of network technologies to streamline the conception, distribution, conveyance, and implementation of learning endeavors, free from temporal or spatial limitations. Learners enjoy the autonomy to immerse themselves in educational materials at their leisure, devoid of the necessity for real-time interaction with instructors. (Al-Samarraie et al.,2016)

Furthermore, e-learning has been linked to different interpretations, and alternative terms like computer-based learning, technology-based training, and computer-based training which have been used interchangeably. Intriguingly, these terms were in use prior to the emergence of e-learning in the mid-1990s or the more recent term online learning. (Sangrà et al.,2012)

El Alfy et al. (2017), Holmes and Gardner (2006) posit that e-learning enables access to educational resources in a manner unrestricted by location and flexible with respect to time. Litteljohn and Pegler (2007) delineate e-learning as a comprehensive term inclusive of computer-mediated learning, engagement of learners through web-based platforms, and instructional activities delivered via the web. Horton (2011), in his conceptualization, characterizes e-learning as a variant of distance education that leverages computer-based technologies, information communication technologies (ICTs), and learning management systems. These definitions coalesce around a central theme, accentuating the pivotal role of information technology as an indispensable element in the learning process. Furthermore, they underscore the evolving diversity in the nature and extent of contributions made by e-learning activities.

In e-learning, learners influence the pace and order of their learning experience, as well as their responses to the different stimuli presented by the subject content. By engaging with the system and content, learners satisfy their quest for knowledge and experience a sense of accomplishment (Chou et al. 2005).

The vocabulary associated with e-learning forms a complex mix, shaped by the diverse preferences and fields of study of researchers. This blend makes finding a universally accepted definition challenging. In academic discussions, terms like e-learning, distance education, online learning, and web-based education overlap extensively. Initially, distance education was primarily about providing educational opportunities over geographical distances but has since expanded to include various forms of learning like e-learning, online collaborative learning, virtual learning, and web-based learning. Although these approaches vary, they all facilitate interactions between learners and instructors across time or space, supported by a range of educational resources. (Moore et al., 2011)

The rapid evolution of ICT has catalyzed the emergence of various digital learning environments, including LMS, VLEs, and computer-based training systems, yet terminological inconsistencies persist. Moore, Dickson-Deane, and Galyen (2011) emphasized the conceptual ambiguity surrounding terms like "e-learning," "online learning," and "distance learning," underscoring the need for definitional clarity across instructional technologies. Similarly, Martín-Blas and Serrano-Fernández (2009) noted that "e-learning systems" often serve as umbrella terms encompassing diverse platforms such as LMS and VLEs

After reviewing various definitions, we have chosen to adopt the following definition for our study: E-Learning is defined as "all forms of electronically supported learning and teaching, which are procedural in nature and aim to facilitate knowledge construction through the integration of individual experiences, practices, and knowledge of the learner. Information and communication systems, whether networked learning environments or standalone setups, serve as specific tools to implement the learning process." (Tavangarian et al., 2004).

The timeline of e-learning adoption charts the evolution of this educational technology from its inception with mechanical devices to the sophisticated digital platforms of today.

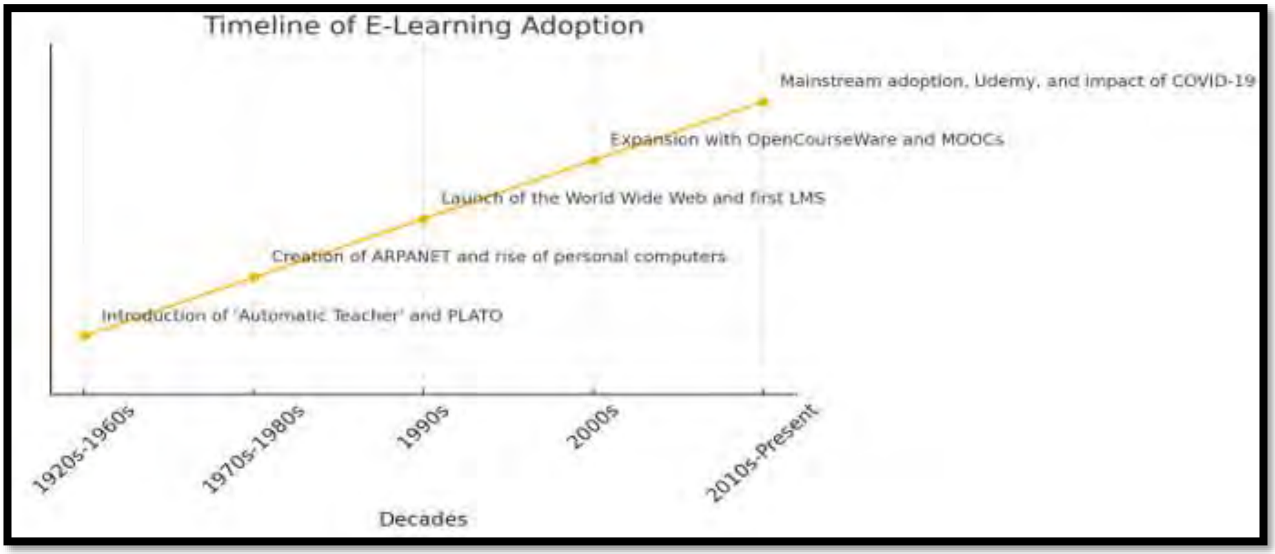
Table 1: Timeline of E-Learning adoption:

Year	Milestone	Details
1924	First Mechanical Teaching Machine	Sidney Pressey developed a mechanical device intended for education, though it failed commercially.
1957	Teaching Machine	B.F. Skinner's invention aimed to reinforce learning via repeated drills.
1960	PLATO System	This University of Illinois innovation was among the first computer-based systems, fostering interactive learning.
1970s	ARPANET and Email	These technologies revolutionized communication, laying foundational technologies for e-learning.
1980s	Rise of Personal Computing	The introduction of IBM PC and Apple Macintosh expanded technology access, boosting e-learning.
1989	Invention of the World Wide Web	Tim Berners-Lee's creation significantly enhanced information accessibility, propelling e-learning forward.
1990s-2000s	Standardization of Online Education	The term "eLearning" was coined, and LMS platforms like Blackboard were developed.
2000s-2010s	Emergence of MOOCs	Platforms like Coursera and edX democratized high-quality education globally.

Source: Adapted from Cloke (2024), Growth Engineering.

These milestones highlight how e-learning has become an integral part of modern education, accommodating diverse learning styles and broadening educational access worldwide.

Figure 1: Timeline of online adoption



Source: Adapted from Collins (2022).

3.2.The main learning Theories

The objective of this research is to provide a comprehensive analysis founded on an optimal amalgamation of Technology, Pedagogy, and Content. This analysis will be grounded in the foundational tenets of Learning Theories (LTs), namely Behaviorism, Cognitivism, Constructivism, in addition to Connectivism, Collaborative Learning and Active Learning, while also exploring the intersection between Pedagogy, Technology, Content and Knowledge (TPACK). It is imperative to devise enduring solutions that transcend transient fixes for emergent challenges. A holistic approach is essential to guide stakeholders toward the adoption of a transformative teaching paradigm. To achieve thoroughness, this research will encompass various dimensions, including culture, business ethics, technological resources, infrastructures, and the prevailing pedagogical models. Change management is a critical aspect that warrants attention as well. Continuous and regularly updated professional development courses for educators, spanning not only academic institutions but also corporate entities, are indispensable for facilitating this transition. The convergence of certain domains within academia and business holds the potential to catalyze advancements in education.

3.2.1. Objectivism vs Constructivism Epistemologies:

Two fundamental epistemologies form the foundation for imparting knowledge, and their implications for education and society at large are significant.

Objectivist Epistemology, which aligns with didactic teaching methods like lectures and quizzes, asserts the existence of an objective and definitive answer or truth. It posits that technology can effectively and efficiently transmit this truth through instructional means. Throughout history, this perspective has been associated with endeavors to substitute human educators with technology, exemplified by inventions such as the Pressey teaching machine in 1926, computer-assisted learning, and the emergence of artificial intelligence (AI) in expert tutoring systems, MOOCs, personal learning environments (PLEs), and adaptive learning systems (ALS).

In contrast, Constructivist Epistemology regards knowledge as a product of human discourse, emphasizing conversation, collaboration, and debate. According to this standpoint, learning thrives on the foundation of discourse, as humans generate and share ideas and knowledge to flourish and survive. Technology, within this framework, assumes the role of a mediator and enhancer of human interaction, while acknowledging that it does not supplant or control it. The collaborative approach epitomizes the constructivist epistemology, highlighting the significance of collaborative learning and the co-creation of knowledge. (Harasim, 2017. P.122).

According to Piaget, humans acquire knowledge by internalizing their experiences and understanding them through a process of adaptation, which includes assimilation, accommodation, and achieving a balance between them called equilibration or experiencing a lack of balance known as disequilibrium. There is also Piaget's study of knowledge, known as genetic epistemology, explores the origins or genesis of knowledge. It encompasses his interest in both the philosophy of knowledge (epistemology) and the psychology of knowledge. In order to induce conceptual change, an educator aims to challenge a student's current concepts, leading to cognitive disequilibrium. The student then attempts to regain equilibrium and resolve the problem. This process of disequilibrium and subsequent restoration, known as requilibration, enables the student to construct new cognitive structures. (Harasim, 2017)

Piaget's constructivism is founded on the principle that knowledge is constructed within the learner's mind. In contrast to the traditional objectivist perspective, which views knowledge as a correspondence to reality, Piaget's constructivist view suggests that knowledge is a harmonious adaptation to reality. The learner is not a passive receptacle to be filled with the teacher's knowledge, but an active individual who creates meaning through engagement and interaction with the external world.

Research has revealed significant shortcomings in many e-learning solutions, particularly in terms of pedagogical foundations, deficiencies in teaching strategies, and maintaining learners' focus. Indeed, a course lacking adherence to the principles of learning theories, both in specific sections and/or as a whole, and failing to address the educational needs and requirements of the new generations through the integration of innovative methods and technologies, will be deficient in terms of quality. (Pange and Pange, 2011).

Unfortunately, a significant number of teachers lack a comprehensive understanding of epistemology (Objectivism vs Constructivism) and its relevance to their beliefs about learning. Only a small fraction of educators can provide a clear definition of learning and demonstrate how they incorporate that understanding into their instructional methods. This should not be interpreted as a reflection of their incompetence, but rather as a consequence of theory not receiving sufficient attention in teacher training and professional discussions. None of the learning theories are specifically tailored to support e-learning environments. As ongoing research in this field continues, new LTs are emerging. However, the prevalent approach in designing web-based learning environments and related learning materials is still the combination of multiple LTs.

In order to facilitate empirical observation and comprehension, it is crucial to establish a precise definition of learning that encompasses its manifestations in an online context. This involved exploring questions such as the nature of learning, its identification, and the underlying processes involved. Once the foundational elements and processes of learning were identified, it became possible to develop effective pedagogies, assessment procedures, and research methodologies. The urgency for a theoretical framework to clarify online learning extended beyond shaping pedagogical advancements and delineating the roles of teachers and learners. It also encompasses the establishment of evaluation rubrics and methodologies to support research in online teaching and learning.

Not only do theories offer valuable guidance for educational practices, but they also provide a deeper understanding of the underlying principles and methodologies that contribute to effective learning within a specific approach. These theories are dynamic in nature, continuously evolving and advancing in response to new information, experiences, technological advancements, socioeconomic shifts, and the ongoing debates and discussions that aim to make sense of these transformative changes. (Harasim, 2017. P.116)

The primary objective of a theory or model is to provide proposed solutions to fundamental inquiries associated with a specific phenomenon. A theory is characterized as a compilation of statements, principles, or ideas relevant to a particular subject, serving the functions of description, explanation, and/or prediction of phenomena. The definition of theory may vary across disciplines, particularly concerning the term "model." Learning theory is designed to clarify and facilitate the understanding of the processes by which individuals acquire knowledge. The principal learning theories encompass behaviorism, cognitivism, and social constructivism. According to Graham, Henrie, and Gibbons (2013), a model frequently serves as a visual representation of reality or a conceptual framework.

Given the diversity and multiplicity of existing theories, the goal of this research is not to thoroughly explain each of those theories but instead the target will be to shed light on the correlations between theorization and E-learning.

The selection of a theory to embrace exerts a profound influence on our cognitive lens, delineates our primary concerns, and serves as the compass guiding the intricacies of our praxis. Furthermore, learning theory assumes a momentous role in sculpting our prophetic panorama of the forthcoming pedagogical and epistemic landscapes. To elaborate further, it’s almost an established axiom that a course may exhibit behaviorist elements (stimulus-response) in one part, cognitivist (Information processing) principles in another, while adopting a constructivist approach in the rest (Construct new information into a pre-existing knowledge). or be contingent on the principles of only one or two LTs at most.

Learning theories have undergone significant transformations in the 20th century. Behaviorism emphasized the importance of stimulus-response relationships and tightly controlling learning through pedagogies and instructional design technologies. Cognitivist learning theory emerged as a response to behaviorism, building upon it while rejecting the idea of a closed black box. Instead, cognitivism focused on understanding the internal processes that occur between stimuli and responses, likening them to cognitive information processing in the mind, similar to a computer. Constructivism introduced a new perspective to learning theory, proposing that learners construct knowledge through physical development and maturation or through the influence of socio-cultural contexts. In constructivism, the mind is viewed as actively generating thoughts, language, and knowledge. The rise of online technologies in education has spurred rapid advancements in theories, pedagogies, and technologies that combine objectivist and constructivist epistemologies. Profit-oriented interest in learning technologies have led to the development of approaches like MOOCs, and AI learning experiences.

Embedded within the landscape of educational innovation, the adoption of cutting-edge pedagogical methods signifies a blossoming desire for new pathways in knowledge acquisition, heralding a call for transformative shifts and promoting collaborative engagement. Online platforms such as MOOCs and cMOOCs offer a rich tapestry of diverse pedagogical strategies, fostering an array of academic environments that spark a surge in learning opportunities. These platforms solidify educational goals, streamline enrollment processes, and bolster student commitment. Nevertheless, as learning management systems evolve, it is crucial for designers to

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thoughtfully integrate the varied individual traits and learning preferences of students ranging from prior knowledge and cognitive abilities to motivational levels to create a sustainable and enlightening educational experience.

The successful integration of e-learning depends on understanding the broad impact of technology across all aspects of education and recognizing the factors that influence technology acceptance. Bonk highlighted that contemporary learning has become more personalized, digital, accessible, blended, and visually oriented. (Bonk, 2016)

Linda Harasim in her 2011 book "Learning Theory and Online Technologies" identifies three distinct models, each with unique characteristics and occasionally divergent principles. These models, grounded in their theoretical and epistemological bases, lead to varying outcomes such as dropout rates, user satisfaction, and the development of analytical and active learning skills. A deeper understanding of these models enables educators to better interpret research findings, craft effective teaching strategies, and select or develop technologies that enhance online learning experiences. The three models collaborative learning (OCL), distance education delivered online (ODE), and online courseware (OC) offer diverse approaches to online education.

In online collaborative learning (OCL), communication occurs primarily through text-based platforms like web forums or computer conferencing systems. This model emphasizes the importance of collaborative discourse and knowledge construction, utilizing the internet to facilitate this interaction. Here, learners collectively address challenges related to understanding, applying knowledge, and employing analytical tools to solve problems or devise plans.

In this model, the instructor plays a crucial role by structuring courses around group discussions that focus on shared knowledge issues within the discipline. The instructor not only introduces relevant concepts and resources to foster informed debates but also models discipline-specific analytical language and intervenes to guide discussions, ensuring that students reach intellectual convergence on the topics at hand.

Meanwhile, educational institutions are increasingly adopting a blended pedagogical approach that combines ODE with collaborative methods, known as ODE + collaborativism. This model has evolved from traditional correspondence education, utilizing email to enhance the efficiency and speed of material delivery and feedback. Conversely, OC adopts a prescriptive instructional design model that emphasizes individual learning. In this approach, there is minimal interaction between peers or with instructors. Learners independently engage with course content at their own pace, typically through modular video lectures, allowing for a self-directed educational journey.

To better grasp the complexities of these terms, let's first explore the main principals, and limitations associated with each theory. This will provide a comprehensive understanding of how they can be effectively implemented or may require adaptation within e-learning contexts.

3.2.2. Behaviorism:

Behaviorism directs its attention to observable behaviors, avoiding an examination of mental or cognitive processes. Grounded in a positivist paradigm that highlights cause-and-effect relationships, behaviorism focuses on the systematic observation of students' responses to specific stimuli. Through the repetitive exposure of individuals to these stimuli, a meticulous evaluation, quantification, and ultimate control on an individual basis can be achieved. The coining of the term "behaviorism" and its advocacy are credited to Watson, who played a pivotal role, but the development of behaviorism is intricately linked to influential figures such as Ivan Pavlov. John B. Watson, an early American adopter of Pavlov's work, perceived behaviorism as a branch of

natural science. Other famed figures associated with behaviorism include B.F. Skinner and Edward Thorndike. Skinner, renowned for introducing operant conditioning, underscored the application of both positive and negative reinforcement to facilitate the acquisition of new behaviors.
Behaviorist principles are integral to e-learning, especially in imparting essential foundational or procedural knowledge through diverse computer-based training modules. These modules adhere to a behaviorist paradigm, segmenting information into digestible parts, eliciting learner responses, and providing prompt feedback. Originating with the Computer-Assisted Instruction (CAI) methodologies of the 1950s and 1960s, this approach utilized a programmed learning format to pose questions and offer immediate feedback, a method that remains prevalent in contemporary e-learning via quizzes, drills, and flashcard apps. For instance, language learning applications such as Duolingo utilize repetitive tasks paired with rewards like points, streaks, and badges to reinforce accurate translations and promote consistent practice. In a corporate setting, e-learning frequently employs behaviorist frameworks within compliance training, necessitating that learners correctly answer multiple-choice questions repeatedly to prove policy comprehension. This model allows digital tutors to provide continuous feedback and rewards, adapting learning paths to ensure mastery of behaviors. However, it is imperative for designers to incorporate reflective opportunities that draw on cognitivist or constructivist theories, particularly when educational objectives extend beyond simple memorization.

3.2.3. Cognitivism:

Theorists posit the significance of the mind's pivotal role in the learning process, emphasizing the need to comprehend the intervening occurrences between environmental stimuli and a student's responsive actions. The discipline of cognitive science, an interdisciplinary field amalgamating insights from psychology, biology, neuroscience, computer science, and philosophy, strives to explicate the intricacies of cerebral functioning and the developmental stages of cognition that underpin the processes of learning and knowledge acquisition. Benjamin Bloom (1956), a pioneering psychologist, formulated a taxonomy of learning, with his seminal work, specifically the "Taxonomy of Educational Objectives Handbook: Cognitive Domains" published in 1956, enduring as a foundational and indispensable reference within the realm of education.
Bloom, through the development of his taxonomy, significantly contributed to redirecting learning theory's focus towards aspects related to cognition and developmental psychology. Subsequently, two decades later, Robert Gagne, an educational psychologist, devised an additional taxonomy (events of instruction) that extended Bloom's conceptual framework. This taxonomy, in turn, served as the underpinning for the design of instructional methodologies within the cognitivist paradigm (Harasim, 2012).
Cognitivism has significantly shaped instructional design, especially in crafting e-learning courses aimed at enhancing learner comprehension and retention. This pedagogical approach supports a variety of contemporary e-learning strategies, including interactive tutorials, scenario-based learning, and the integration of multimedia, all designed to activate cognitive processes. For example, e-learning platforms frequently employ techniques such as chunking and sequencing, organizing content into logically progressive modules that help integrate new information into learners' pre-existing mental schemas. This method is evident in courses on complex subjects like human anatomy, which may begin with an overarching introduction followed by detailed explorations of specific systems, structured with the aid of advanced organizers such as concept maps to aid in the formation of coherent mental models. Additionally, interactive components like simulations and reflective queries are utilized to promote cognitive functions such as retrieval and

application, with feedback that goes beyond correctness, offering explanations that deepen understanding. The strategic use of multimedia and metaphors further characterizes cognitivist e-learning design, rendering abstract concepts more tangible and memorable through narrative techniques and visual supports that leverage dual coding theory. Cognitivism also advocates for memory enhancement strategies, including the use of mnemonics and spaced repetition, grounded in empirical cognitive studies. These methods are implemented in practical applications such as serious games or scenario-based simulations that immerse learners in contexts requiring the application of knowledge and decision-making, thereby reinforcing learning through dynamic engagement and problem-solving. Through these cognitivist principles, e-learning seeks not merely to enable learners to recite information but to equip them with the skills to organize, comprehend, and apply knowledge effectively.

3.2.4. Social Constructivism:

Social Constructivism, as expounded by Lev Vygotsky, John Dewey, and Jean Piaget, centers on the concept of social constructionism to clarify and elaborate on the intricacies inherent in the processes of teaching and learning. This framework perceives these processes as intricate and interactive social phenomena that involve the dynamic interplay between educators and students. Vygotsky's theoretical construct envisions the learning process as the establishment of a "zone of proximal development," wherein the teacher, learner, and the issue to be addressed converge. John Dewey, conversely, regards learning as a continuum of pragmatic social experiences, emphasizing active involvement, cooperation, and reflective interactions with peers. Dewey's impact is evident in contemporary instructional design within the social constructivist paradigm, marked by a departure from conventional lecture-based approaches towards participatory discussions guided by reflective practice. This educational shift is relevant to both traditional in-person and online learning environments. An illustration of this approach is found in Seymour Papert's incorporation of computer technology into problem-solving, an idea readily adaptable to various aspects of instructional design.

Constructivist principles are integral to the design of numerous e-learning environments aimed at enhancing critical thinking, problem-solving, and practical skills. These principles underpin a variety of e-learning courses that employ project and problem-based learning frameworks, encouraging learners to engage with real-world issues. Through the use of digital resources and collaborative interactions with peers, learners actively construct personalized and applicable knowledge. For instance, in courses on entrepreneurship, participants might be tasked with developing a business plan, necessitating interaction with multimedia resources and integration of feedback from both instructors and peers. Additionally, simulations and virtual worlds are employed to simulate real-life scenarios such as medical training with virtual patients or conducting experiments in virtual labs enabling learners to experience the outcomes of their decisions in a safe, controlled environment. This practical application of knowledge helps to deepen learners' understanding of complex subjects. Constructivist methodologies are also prevalent in collaborative online learning communities, which include discussions, group projects, and peer teaching, all fostering a communal knowledge-building process. Moreover, adaptive learning technologies within e-learning platforms tailor the educational experience, providing essential scaffolding at opportune moments to assist learners in navigating challenges. An exemplary implementation of this approach is observed in a university’s online teacher training program, which utilizes classroom scenarios to challenge trainees to devise and refine instructional strategies, culminating in the creation of a customized set of teaching tools through iterative feedback and adaptation. This example underscores the effectiveness of constructivist e-learning in facilitating authentic, dynamic, and cooperative learning experiences, even within virtual environments.

Table 2: Key Principals of Learning Theories:

Theories	Behaviorism	Cognitivism	Constructivism	Social Constructivism	Connectivism	Collaborative Learning
Key Principles	Learning is a change in observable behavior shaped by stimulus–response associations and reinforcement. Knowledge is acquired through interaction with the external environment.	Learning involves internal mental processes such as memory, motivation, perception, and information processing. The mind encodes, stores, and retrieves information.	Learners actively construct knowledge based on prior experiences and existing cognitive structures. Learning is an ongoing process of meaning-making.	Knowledge is co-constructed through social interaction, dialogue, and shared experience. Learning occurs within cultural and social contexts.	Learning occurs through networks of information sources, digital tools, and social connections. Knowledge is distributed and continuously evolving in digital environments.	Learning occurs through cooperation and shared problem-solving. Interaction among learners enhances critical thinking, creativity, and collective knowledge construction.

Source: Author's own elaboration.

3.3. Learning theories adapted to E-Learning

E-learning is widely perceived by scholars as a digital revolution and a transformative advancement in education (Martínez-Cerdá et al., 2020). It has attracted significant scholarly attention (Vasconcelos et al., 2020; Vershitskaya et al., 2020), with some researchers viewing it as a comprehensive solution to various educational challenges (Biggs, 2003).

Numerous theories have developed, the majority of which stem from the primary learning theories explored earlier. In 1986, the Graduate School of Education at the University of Toronto made history by delivering the first fully online credit university course (Harasim & Smith, 1986).

Understanding educational theories and instructional approaches is fundamental for designing effective learning environments and improving student outcomes. Learning theories offer a structured foundation for understanding how students engage with content, process information, and construct knowledge. Their application in virtual and online educational settings enables the creation of meaningful, learner-centered experiences. By aligning instructional design with theoretical models, educators can ensure effective cognitive engagement, promote collaboration and interaction, and improve overall learning outcomes. Furthermore, considerations of accessibility and usability are essential to ensure that emerging educational technologies are inclusive and responsive to the diverse needs of all learners.

In studying virtual environments, recent research by Marougkas and colleagues has identified five educational approaches, one instructional methodology, five core learning theories, and a prominent theoretical framework. These include constructivism, experiential learning, gamification, Dewey's theory of learning by doing, flow theory, the Cognitive Theory of Multimedia Learning (CTML), design thinking (DT), learning through problem solving (LPS), scientific discovery learning (SDL), social constructivism, cognitive load theory (CLT), and the

Technological Pedagogical Content Knowledge framework (TPACK) (Marougkas et al., 2023).

Table 3: Learning theories and educational approach

Authors	Theory / Approach / Methodology	Type
Sedlák et al., 2022	Cognitive Load Theory (CLT)	Theory
Meyer et al., 2019	Cognitive Theory of Multimedia Learning (CTML)	Theory
Bendeck Soto et al., 2020; Megat et al., 2020; Xu & Ke, 2017; Zhang et al., 2017	Constructivist Learning	Educational approach
Kamińska et al., 2017	Design Thinking (DT)	Educational approach
Li et al., 2022; Pande et al., 2021; Pirker et al., 2017	Experiential Learning	Methodology
Akman & Çakır, 2019	Flow Theory	Theory
Chang et al., 2018; Remolar et al., 2021	John Dewey's Theory of Learning by Doing	Theory
Sedlák et al., 2022	Learning through Problem Solving (LPS)	Educational approach
Sedlák et al., 2022	Scientific Discovery Learning (SDL)	Educational approach
Southgate et al., 2018	Social Constructivism	Theoretical framework
García-Bonete et al., 2018	Technological Pedagogical Content Knowledge (TPACK) Framework	Theory
Ou K-L et al., 2021; Wilson et al., 2017; Zhang et al., 2017	Gamification of Learning	Educational approach

Source: Adapted from Marougkas et al., 2023

Educational learning theories provide foundational explanations of how individuals acquire knowledge, develop skills, and internalize attitudes. Major paradigms, including behaviorism, cognitivism, constructivism, and humanism, inform instructional design, assessment strategies, and learner support mechanisms (Matovu et al., 2022). Understanding cognitive and social dimensions enables educators to tailor instruction, address diverse needs, and foster engagement and achievement (Kong, 2021). In digital environments, these theories underpin pedagogically sound and technologically effective design.

Recent research links emerging technologies to established learning theories. Leung et al. (2018) examined how VR interfaces align with constructivism, situated learning, embodied cognition, and social cognition. Marougkas et al. (2023), through a Scopus-based review, identified experiential learning, gamification, flow theory, learning through problem solving, and TPACK among the most frequently applied pedagogical models of the past decade.

Constructivism posits that learners actively construct knowledge through meaningful engagement with tasks and contexts (Hein, 1991), drawing on Piaget's emphasis on environmental interaction. However, in online settings, excessive instructor dependence and uneven prior knowledge may constrain autonomy. Experiential Learning (ExL), formalized by Kolb (1984), conceptualizes learning as a cyclical process involving experience, reflection, conceptualization, and experimentation, integrating cognitive and emotional dimensions. Flow theory describes deep engagement arising from optimally challenging tasks with immediate feedback (Csikszentmihalyi, 1990), though its individual focus may overlook sociocultural influences.

Gamification incorporates game-based elements to enhance motivation and interaction, yet poorly aligned mechanics may distract from learning objectives (Varela-Aldás et al., 2020). The Cognitive Theory of Multimedia Learning (CTML) advocates dual-channel processing through integrated verbal and visual inputs but offers limited insight into collaborative or immersive contexts (Mayer, 2005). Dewey's experiential "learning by doing" model emphasizes active participation (Dewey, 1938), though virtual environments may lack the physical and social cues necessary for deep engagement. Similarly, social constructivism foregrounds dialogue and collaboration in knowledge construction (Vygotsky, 1978), yet online diversity and unequal peer access can hinder shared understanding.

Scientific Discovery Learning (SDL) promotes inquiry-based experimentation to deepen conceptual understanding but often requires resource-intensive simulations. Cognitive Load Theory (CLT) categorizes cognitive load into intrinsic, extraneous, and germane types, guiding instructional design to minimize irrelevant processing and enhance meaningful integration (Marougkas et al., 2023). Design Thinking (DT) advances human-centered problem-solving through empathy and iterative prototyping, though virtual implementation may face communication and resource constraints. Learning Through Problem Solving (LPS) similarly connects theory to real-world application, fostering practical skills and critical thinking.

By the late 1990s, organizations increasingly adopted online, self-paced courseware as an alternative to traditional instruction. Within online learning networks, two major perspectives emerged: connectivist learning, formally introduced in 2004, and collaborative learning theory, which evolved over three decades through research and practice (Harasim, 2017, p. 90). Together, these perspectives reflect the ongoing theoretical evolution shaping digital education.

3.3.1. Connectivism:

Connectivism was introduced by George Siemens in a 2004 blog post on *elearnspace.org* (Siemens, 2004) and further supported by Stephen Downes in 2005 on *OLDaily* (Downes, 2005). Emerging alongside the early development of Massive Open Online Courses (MOOCs), connectivism sought to explain learning in a digitally networked age. Siemens conceptualized it as a synthesis of chaos, network, complexity, and self-organization theories, arguing that learning occurs in fluid environments where knowledge is distributed across networks rather than confined within individuals. He defined learning as actionable knowledge that may reside externally, in organizations, databases, or digital systems, and maintained that the ability to form connections between specialized information nodes is more critical than existing knowledge itself (Siemens, 2004). The theory is fundamentally driven by the dynamics of information flow (Picciano, 2017). From a connectivist perspective, learning centers on network intelligence, where digital systems identify and organize connections for learners, potentially reducing reliance on traditional teacher-centered structures. This vision promoted decentralized, network-centric courses in which knowledge emerges from the interplay of distributed connections rather than hierarchical instruction.

Siemens contended that traditional theories, behaviorism, cognitivism, and constructivism, were insufficient for the digital age because they overlooked technology's transformative role in shaping how knowledge is stored, accessed, and manipulated (Siemens, 2004). However, Bates challenges the claim that technology's educational influence is recent, arguing that learning technologies have shaped human development for millennia and that 20th-century learning theories both influenced and were influenced by technological advancements such as automation and electricity (Bates, 2015b, section 6.2).

Technological evolution further reinforced this debate. Early automated teaching machines of the

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1920s evolved into Computer-Aided Instruction (CAI) in the 1980s and later into courseware in the 1990s, reflecting a shift from "teaching machines" to increasingly sophisticated systems resembling "thinking machines" (Harasim, 2017, p. 93).

Practically, connectivism has significantly shaped online learning, particularly MOOCs, professional networks, and social media integration. Early connectivist MOOCs emphasized decentralization, learner autonomy, and distributed knowledge sharing across blogs and social platforms. Personal Learning Networks (PLNs), supported by platforms such as LinkedIn and Twitter, illustrate how individuals cultivate professional growth through networked interaction. Contemporary e-learning environments extend beyond traditional Learning Management Systems (LMS), incorporating adaptive and recommendation technologies that personalize content and optimize learning pathways. By positioning learners as active nodes within expansive knowledge networks, connectivism reframes education as continuous, distributed, and adaptive, while also suggesting the value of integrating its principles with other learning theories to enhance overall effectiveness.

3.3.2. Online Collaborative Learning (OCL):

The development and advancement of Online Collaborative Learning (OCL) on the other hand exemplifies the practical application of inductive reasoning. Over a span of three decades, OCL theory has evolved through extensive practice and research. Since the early 1980s, OCL, in its various forms and applications, has been the predominant educational approach for learning networks. Consequently, this pedagogical approach has garnered widespread recognition and acceptance within the learning community. (Bates, 2019)

Linda Harasim introduced the Online Collaborative Learning (OCL) theory, emphasizing the harnessing of Internet capabilities to establish learning environments conducive to collaboration and knowledge construction. As articulated by Harasim (2012), OCL represents an innovative learning paradigm that places emphasis on collaborative learning, knowledge building, and the strategic utilization of the Internet to redefine formal, non-formal, and informal education within the Knowledge Age (p. 81). In the OCL conceptual framework, the progression of knowledge construction transpires through group discourse in three distinct phases:

1. Idea generating: This initial phase entails brainstorming, gathering a diverse array of thoughts.
2. Idea organizing: Subsequent to the idea-generating phase, ideas undergo a process of comparison, analysis, and categorization facilitated through discussion and argumentation.
3. Intellectual convergence: The final phase involves intellectual synthesis and consensus formation, encompassing the acceptance of differing viewpoints—often manifesting through collaborative assignments, essays, or other joint works (Harasim, 2012, p. 82).

Online Collaborative Learning (OCL) positions the instructor not as an isolated authority but as an active facilitator in the social construction of knowledge, consistent with constructivist traditions. Unlike connectivism, which scales effectively to large networks, OCL is best suited to smaller instructional settings where collaborative problem-solving through discourse can be sustained. Rooted in social constructivism, OCL assigns the teacher dual roles as facilitator and participant within the learning community (Picciano, 2017).

The *Community of Inquiry* (CoI) framework, introduced by Garrison, Anderson, and Archer (2000), conceptualizes online and blended learning environments through three interdependent presences: cognitive, social, and teaching. Anderson, Rourke, Garrison, and Archer (2001) subsequently called for deeper examination of each presence. Designed to guide interactive course development, the CoI model emphasizes meaningful engagement between instructors and learners through structured dialogue and collaborative inquiry. Over time, it has become a dominant paradigm for designing online and blended courses that foster interaction via tools such as discussion boards, blogs, wikis, and videoconferencing (Picciano, 2017).

The evolution of computer networks, from simple file-transfer systems to platforms enabling collaborative communication, catalyzed the emergence of connected classrooms and fully online courses. These developments enabled asynchronous seminars, discussions, and group projects, reshaping instructional methodologies to leverage digital collaboration across time and space.

Beyond OCL and CoI, additional theoretical perspectives, including Activity Theory, multimodal and multimedia learning, and Network Theory, have contributed to understanding technology integration in education.

Practically, OCL manifests in group projects, discussion forums, peer review, learning communities, and simulations. Digital collaboration tools support asynchronous teamwork, resource sharing, and collective problem-solving. Discussion forums deepen understanding through critical exchange, while sustained online communities foster belonging and motivation. Simulations and role-playing further operationalize OCL principles by engaging learners in collaborative decision-making within realistic scenarios.

Overall, OCL transforms e-learning by embedding interaction, cooperation, and community at the core of instructional design, privileging collective intelligence and active engagement over passive content delivery.

Table 4: Principals, limitations and challenges associated with each theory

Theory	Main Principles	Strengths	Weaknesses	E-Learning Applications
Behaviorism	- Stimulus-response learning- Reinforcement and conditioning- Observable outcomes	- Clear, measurable goals- Effective for skill mastery- Immediate feedback and motivation	- Ignores internal cognitive processes- Limited higher-order thinking development- Extrinsic motivation dependence	- Quizzes and drills- Skill-based training modules
Cognitivism	- Mental organization- Information processing stages- Active engagement	- Focus on understanding and memory- Facilitates problem-solving and critical thinking- Structured learning experiences	- Can be less effective without practical application- May overlook emotional aspects of learning	- Interactive tutorials- Scenario-based learning
Constructivism	- Learning through experience- Building on prior knowledge- Social interaction in learning	- Deep understanding and transfer- Engages and motivates learners- Develops practical and higher-order skills	- Can be less structured, leading to inefficiency- Challenges in assessment- Not suitable for all learners or content	- Project-based learning- Collaborative tools and forums
Connectivism	- Networks and connections- Filtering and sensemaking- Learning how to learn (metaskills)	- Harnesses collective knowledge- Encourages lifelong learning- Empowers learner autonomy	- Potential lack of depth in knowledge- Overwhelm and need for self-direction- Technological and access barriers	- MOOCs- Social media integrated learning- Use of personal learning networks

Source: Author's synthesis based on reviewed literature.

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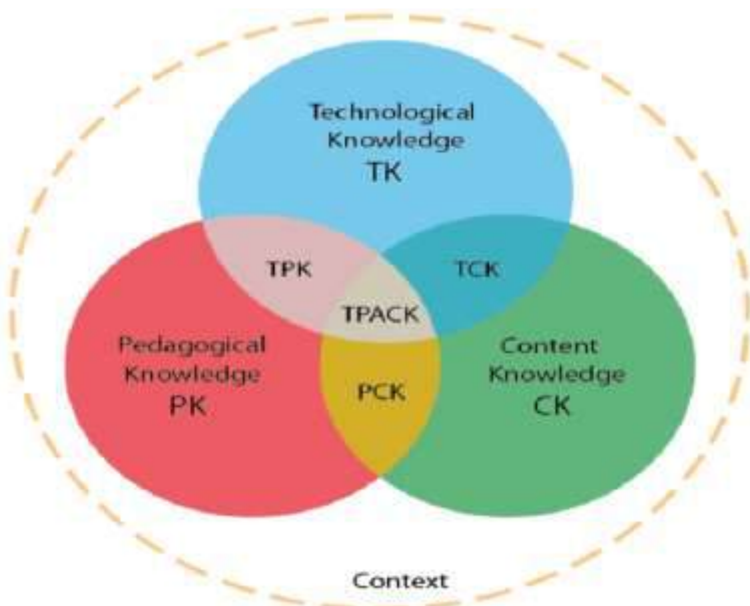
3.3.3. TPACK model:

Formulated by Punya Mishra and Matthew J. Koehler at Michigan State University in 2006, the Technological Pedagogical Content Knowledge (TPACK) framework articulates three critical knowledge dimensions that educators must synthesize to effectively integrate technology into instruction. These dimensions are: technological knowledge, which involves proficiency with diverse digital tools and platforms; pedagogical knowledge, encompassing the theories, techniques, and strategies of teaching; and content knowledge, relating to a deep understanding of the subject matter at hand. The TPACK framework highlights the critical intersections of these domains, positing that successful technology integration in education demands a sophisticated and harmonized application of technological, pedagogical, and content knowledge. This model has gained substantial traction and now underpins much of the discourse and practice within the domain of educational technology, shaping how educators craft technologically enriched learning environments.

Figure 2: The TPACK framework.



Source: Adapted from Saad, Milad, Barbar, and Abdul-Reda (2012).

3.3.4. Other Learning Theories:

- ***Activity Theory:***

Activity Theory, stemming from the work of Vygotsky and later developed by Engeström, provides a comprehensive framework for understanding human activity within socio-cultural contexts. In education, Activity Theory elucidates the dynamic interactions between individuals, tools, and the broader socio-cultural milieu, offering insights into technology integration processes and their impact on learning outcomes.

- ***Multimodal and Multimedia Learning:***

Multimodal and multimedia learning theories recognize the diverse ways individuals perceive, process, and construct knowledge through various sensory modalities. By leveraging multiple modes of representation, technology can enhance learning experiences, catering to diverse learning preferences and fostering deeper engagement with educational content.

- ***Network Theory:***

Network theory offers a lens through which to examine the interconnectedness of actors, resources, and interactions within educational ecosystems. In the context of technology integration, Network theory elucidates the complex relationships among educators, students, technologies, and learning environments, shedding light on the diffusion of innovations and collaborative practices facilitated by technology-mediated interactions.

Activity Theory, multimodal and multimedia learning, and Network theory offer valuable insights into the utilization of technology in education. By employing these theoretical frameworks, researchers and practitioners can gain a deeper understanding of technology integration processes and design more effective educational interventions. Continued exploration and application of these perspectives are crucial for advancing our understanding of technology-enhanced learning environments and optimizing learning experiences for diverse learners. Bower, M. (2019).

Nowadays, a course must also incorporate one or more of the latest technologies such as AI, AR, gamification, and the flipped classroom. Additionally, it should also utilize systematic and conventional teaching tools like forums, group discussions, and a variety of media formats (such as PowerPoint, videos, images, and documents).

Revamping educational curricula can be realized by immersing students in digital community dialogues that encompass diverse theoretical and practical facets. This method unveils vast opportunities as students and educators interact with colleagues, academic experts, scientists, and professionals from various domains. Adopting such online conversation forums is a gateway to revolutionizing classrooms, syllabi, and teaching methods, moving beyond the constraints of solely test-centric models.

The emergence of open-source knowledge and content has given birth to broad non-profit databases containing a wealth of data, insights, and educational tools, including course guides and lesson outlines. Yet, in the absence of robust theoretical and teaching frameworks, there's the potential pitfall of educators merely sourcing or duplicating material, leaning on lecture-based methods instead of facilitating students in knowledge creation and content generation. While the idea of open content is praiseworthy, its execution demands thoughtful consideration.

Additionally, the exciting strides in and exploration of sophisticated qualitative and quantitative research instruments, like latent semantic evaluation, text extraction, and data exploration, present a bright horizon for the realm of education. These tools promise revolutionary shifts in both comprehension and application of learning.

- ***Social Learning Theory:***

Within the framework of Social Learning Theory, two fundamental concepts are central to the learning process: modeling and self-regulation. Modeling entails intentional imitation facilitated by active observation, allowing individuals to derive principles from observed behaviors and develop new behavioral patterns. This process distinguishes modeling from mere replication of other behaviors. Self-regulation, arising from these interactions, signifies individuals' proactive involvement with their surroundings rather than passive response to stimuli. In this dynamic interplay, individuals not only observe and imitate others but also exert influence on their environment, thereby shaping their behavior through an ongoing exchange between internal cognitive processes and external environmental cues.

3.4. Analytical synthesis

Educators must ascertain the learning theories and pedagogical approaches that they deem appropriate for addressing the realities of the Knowledge Age. Until they accomplish this, they will face challenges in effectively implementing these theories in their classrooms. Amidst educational paradigm shifts and transformative changes, teachers, trainers, and faculty encounter a perplexing situation as they are tasked with adapting their practices. The lack of explicit guidance regarding the implications of these transformations and the strategies to develop and employ pedagogies aligned with the evolving educational landscape further compounds the complexity of their role.
The convergence of Semantic Web Technologies (SWT) with pedagogical theories and teaching/learning practices constitutes a discernible trend in the progress of educational technologies. Semantic Web Technologies (SWT) comprise a set of standards, frameworks, and tools designed to transform the traditional web into a "web of data." By embedding machine-readable metadata and semantic annotations into web content, SWT enables information to be structured in a way that allows computers not only to retrieve data but also to interpret its meaning. This trend involves integrating and applying teaching/learning theories to enhance the effectiveness of educational processes. The scholarly exploration in this domain has witnessed notable expansion, likely attributed to the increasing significance of diverse technologies in the design and implementation of pedagogical applications (Dicheva, 2008, pp. 47–65, as cited by Alfaro et al., 2021).

4. From Acceptance to Adoption: Evolving Models for E-Learning

4.1.Clarifying the Distinction Between Acceptance and Adoption in IS Research

While often used interchangeably, the concepts of technology acceptance and technology adoption represent distinct stages in the user engagement process. Clarifying this distinction is essential for both theoretical accuracy and empirical rigor in Information Systems (IS) research. This section outlines the conceptual boundaries between acceptance and adoption, emphasizing their implications for model selection, measurement, and interpretation in studies of technology use.

4.1.1. What is Acceptance?

Technology acceptance refers to the psychological state in which an individual forms a favorable attitude and intention toward the potential use of a particular technological system. It is a complex cognitive and affective construct shaped by beliefs regarding a system's perceived usefulness, ease of use, social influence, and enabling conditions (Davis, 1989; Venkatesh et al., 2003). These perceptions are often measured through self-reported Likert-scale items and have been central to widely validated models such as the Technology Acceptance Model (TAM), its later extensions (TAM2, TAM3), and the Unified Theory of Acceptance and Use of Technology (UTAUT, UTAUT2). Within these frameworks, behavioral intention serves as a proximal predictor of actual system use (Venkatesh et al., 2012), making acceptance a critical, though intermediate, step in understanding technology uptake. However, while acceptance reflects motivational readiness, it does not guarantee behavioral enactment. As Benbasat and Barki (2007) emphasized in their critique of TAM's dominance, high behavioral intention does not necessarily translate into real-world usage, particularly when structural, environmental, or organizational barriers remain unaddressed. This underscores a crucial conceptual distinction between technology acceptance and technology adoption.

Whereas acceptance is primarily concerned with attitudinal dispositions and perceived value, technology adoption encompasses the broader behavioral, contextual, and organizational processes that lead to the effective integration and sustained use of technology. Adoption involves multiple stages, from awareness and trial to routinization and institutionalization, and it is influenced by variables that extend beyond individual cognition, such as infrastructure availability, managerial support, policy alignment, peer influence, and cultural or environmental fit (Rogers, 2003; Tornatzky & Fleischer, 1990). This broader scope is captured in models such as the Diffusion of Innovation (DOI) theory and the Technology–Organization–Environment (TOE) framework, which view adoption as a multi-level phenomenon influenced by innovation attributes (e.g., relative advantage, compatibility, observability), organizational readiness, and external pressures. Moreover, Taherdoost's (2018) comprehensive review of acceptance and adoption models highlights the evolution of the field from purely rational, cognitive paradigms (like TAM and TRA) to more nuanced frameworks that incorporate emotional, social, and environmental components. These include the Motivational Model, which accounts for intrinsic factors such as enjoyment, and Social Cognitive Theory, which emphasizes reciprocal interactions between individuals, their behavior, and the environment.

To reconcile the gap between intention and behavior, Godoe and Johansen (2012) proposed the Technology Readiness and Acceptance Model (TRAM), integrating the system-specific dimensions of TAM with personality-oriented traits from the Technology Readiness Index (TRI) developed by Parasuraman (2000). The TRI includes four psychological dimensions: optimism and innovativeness (as enablers), and discomfort and insecurity (as inhibitors), which significantly influence how users perceive technological systems. Empirical findings demonstrate that optimism and innovativeness are positively correlated with both perceived usefulness and ease of use, whereas insecurity and discomfort negatively affect these perceptions. This integration offers a more holistic view of technology acceptance, accounting for both general predispositions toward technology and specific cognitive evaluations of system characteristics. However, even when individuals demonstrate high acceptance, driven by positive personality traits and favorable system perceptions, actual adoption may not occur in the absence of contextual facilitators such as training, infrastructure, or leadership support. Godoe and Johansen's findings reinforce the idea that adoption is not merely an extension of acceptance, but a separate outcome influenced by both internal motivations and external constraints. Several other scholars emphasize the decisive role of environmental and situational factors in shaping technology adoption. For instance, Mallat et al. (2009) argued that "context" functions as the primary determinant influencing users' engagement with mobile learning, suggesting that adoption decisions are heavily conditioned by the surrounding technological, institutional, and social environment. This perspective aligns with subsequent research highlighting that acceptance is not only a function of individual perceptions but is also embedded within broader contextual realities.

4.1.2. What is Adoption?

According to Rogers (2003) and Burton-Jones & Straub (2006), adoption is the real, visible process of introducing, utilizing, and incorporating a technology into daily life. Adoption, in contrast to acceptance, goes beyond simple intention to include tangible behavioral engagement. This includes both the initial uptake of a system and its continued, regular use over time. Instead of depending only on self-reported intentions, it is usually verified by objective metrics like system logs, login frequency, or the depth of feature use (Sharma et al., 2004). Although individual

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willingness is still crucial, adoption is also influenced by organizational support, resource availability, and larger contextual factors that either facilitate or impede actual use (Rogers, 2003). In fact, adoption is the behavioral manifestation of acceptance; adoption is unlikely to occur in the absence of positive attitudes and intentions, adoption is thus the behavioral realization of acceptance, but intention by itself does not ensure actual use if structural or situational barriers continue (Dwivedi et al., 2019).

According to Granić's (2023) comprehensive review, over five decades of research have produced a wide range of theoretical frameworks aimed at explaining and predicting individual behavior related to technology acceptance, adoption, and continued use. The table below offers a structured summary of the most influential "Technology Adoption at Individual Level" models, emphasizing their chronological evolution and theoretical interconnections rather than evaluating their explanatory strength or empirical robustness. Each model is categorized by its core independent variables, or "predictors", and their relationship to two key outcomes: behavioral intention and actual usage.

Table 5: Key Theories and Models of Individual-Level Technology Adoption and Their Core Predictors

Theory/Model	Core Independent Constructs / Predictors	Dependent Construct - Behavioral Intention	Dependent Construct - Actual Behavior/Adoption
Innovation Diffusion Theory (IDT) by Rogers in 1962, 1995	Relative advantage, Compatibility, Complexity, Observability, Trialability	-	Adoption
Perceived Characteristics of Innovating (PCI) by Moore and Benbasat in 1991	Voluntariness of use, Image, Relative advantage, Compatibility, Ease of use, Result demonstrability, Trialability, Visibility	-	Adoption
Social Cognitive Theory (SCT) by Bandura (1986, 2001)	Environmental influences, Cognitive and personal factors	-	Individual behavior
Computer Self-Efficacy Model (CSEM) by Compeau and Higgins in 1995	Outcome expectations, Computer self-efficacy, Affect, Anxiety	-	Usage
Theory of Interpersonal Behavior (TIB) by Triandis in 1980	Social factors, Affect, Perceived consequences, Facilitating conditions, Habits	Behavioral intention	Behavior
Model of Personal Computer Utilization (MPCU) by Thompson, Higgins, and Howell in 1991	Social factors influencing use, Affect toward use, Long-term consequences of use, Facilitating conditions for use, Complexity of use, Job fit with use	-	Behavior
Theory of Reasoned Action (TRA) by Fishbein & Ajzen in 1975	Attitude toward behavior, Subjective norms	Behavioral intention	Behavior
Theory of Planned Behavior (TPB) by Ajzen in 1985, 1991	Attitude toward behavior, Subjective norms, Perceived behavioral control	Behavioral intention	Behavior
Decomposed Theory of Planned Behavior (DTPB) by Taylor and Todd in 1995	Attitude toward using, Subjective norms, Perceived behavioral control	Behavioral intention	Usage behavior
Technology Acceptance Model (TAM) by Davis, Bagozzi, and Warshaw in 1989	Perceived usefulness, Perceived ease of use, Attitude toward using	Behavioral intention	Actual system use

Augmented TAM (A-TAM) by Taylor and Todd in 1995	Perceived usefulness, Attitude toward using, Subjective norm, Perceived behavioral control	Behavioral intention	Behavior
Extended TAM (TAM2) by Venkatesh and Davis in 2000	Perceived usefulness, Perceived ease of use, Subjective norm	Intention to use	Usage behavior
Model of the Determinants of Perceived Ease of Use (MDPEU) by Venkatesh in 2000	Perceived usefulness, Perceived ease of use	Behavioral intention to use	Actual system use
TAM3 by Venkatesh and Bala in 2008	Perceived usefulness, Perceived ease of use, Subjective norm	Behavioral intention	Use behavior
Motivational Model (MM) by Davis, Bagozzi, and Warshaw in 1992	Intrinsic motivation, Extrinsic motivation	Usage intention	Usage behavior
Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. in 2003	Performance expectancy, Effort expectancy, Social influences, Facilitating conditions	Behavioral intention	Use behavior
Extended UTAUT (UTAUT2) by Venkatesh, Thong, and Xu in 2012	Performance expectancy, Effort expectancy, Social influences, Facilitating conditions, Hedonic motivation, Price value, Habit	Behavioral intention	Use behavior

Source: Author's synthesis based on reviewed literature.

Following Eason's (1991) ergonomic framework, these predictors are thematically grouped into three domains: (1) individual factors (e.g., attitudes, self-efficacy, habits), (2) task and technological attributes (e.g., perceived usefulness, complexity, compatibility), and (3) social and environmental influences (e.g., subjective norms, facilitating conditions, observability). While models such as TAM and UTAUT emphasize behavioral intention as a mediating variable, others like IDT conceptualize adoption as a direct outcome.

Thus, the table serves not only as a comparative schema but also as a visual representation of the theoretical convergence and divergence within "Technology Adoption at Individual Level" research. By linking the triadic structure of adoption predictors to behavioral outcomes, it provides a valuable resource for scholars and practitioners seeking to interpret, adapt, or extend existing models. This synthesis supports the advancement of more integrated and context-sensitive approaches to understanding technology adoption.

Shard, Kumar, and Koul (2024) conducted a systematic review of e-learning adoption in higher education, critically assessing both its empirical contributions and conceptual limitations. Although Scopus-indexed publications provided broad coverage, the review was disproportionately weighted toward studies from developed countries, limiting insights into challenges in developing contexts where infrastructural and socioeconomic barriers are more acute. The authors stress that e-learning in higher education is distinct from other levels due to its cognitive demands, disciplinary specialization, and learner autonomy. They identified 85 adoption variables, with perceived usefulness, ease of use, learner attitude, computer/internet self-efficacy, and facilitating conditions most frequently studied, while pedagogical factors such as learning and teaching styles were rarely examined, exposing a gap in integrating instructional theory. The review also shows how a few highly cited works, such as Hamidi and Chavoshi's (2018) mobile learning case study, have disproportionately shaped the field, though citation patterns and reliance on established journals risk marginalizing innovative or context-specific contributions. Crucially, the authors highlight a persistent blind spot: while intention, usage, and initial adoption are well researched, post-adoption outcomes, such as effects on student performance, productivity, and behavioral change, remain underexplored. They call for future studies that expand into underrepresented regions, incorporate teaching and learning styles, and examine the longitudinal impacts of digital learning, underscoring the need for more contextually grounded and pedagogically informed investigations.

4.1.3. Why Distinction Matters

In sum, the distinction between technology acceptance and technology adoption is not merely semantic but holds substantial theoretical, methodological, and practical significance. While acceptance is a necessary precursor to adoption, it remains insufficient on its own. Acceptance reflects users' psychological readiness, namely, their willingness, intention, and attitudinal disposition toward using a given system, whereas adoption involves actual engagement, integration, and sustained use within real-world contexts. Consequently, implementation strategies must go beyond fostering acceptance through well-designed interfaces, training, and communication; they must also address the structural, organizational, and environmental conditions that enable or hinder actual adoption. Recognizing and responding to both dimensions is essential for predicting and facilitating successful technological uptake.

This distinction carries important methodological implications. As Burton-Jones and Straub (2006) argue, behavioral intention and actual usage are conceptually distinct and must not be conflated in research designs. Empirical evidence (e.g., Sharma et al., 2004) consistently shows that while intention reliably reflects readiness, it does not guarantee behavior. This is evident in models such as UTAUT and UTAUT2 (Venkatesh et al., 2003; 2012), which, though positioned as adoption frameworks, primarily rely on acceptance-related constructs, with behavioral intention as a proxy for future use. Their hybrid structure makes them especially appropriate in settings where strong motivational readiness may be present, yet practical adoption is constrained by contextual factors. By identifying and addressing this gap, researchers can produce more nuanced analyses that differentiate between psychological readiness and real-world use, while capturing the role of both individual and environmental determinants (Podsakoff et al., 2003). Accordingly, employing UTAUT2 to examine university professors' acceptance of e-learning is both theoretically sound and practically justified, as it isolates key behavioral drivers while acknowledging potential institutional and infrastructural barriers. Such a dual-focus approach ensures that research yields meaningful insights into both the motivational and contextual elements shaping the transition from intention to sustained adoption in educational technology environments.

Table 6: Comparing Acceptance and Adoption

Aspect	Acceptance	Adoption
Definition	Psychological readiness; intention to use	Actual, sustained use in practice
Nature	Cognitive, affective, motivational	Observable, behavioral, contextualized
Typical Measures	Self-reported intention, perceived usefulness, attitude	System log data, usage frequency, integration into workflows
Role in Models	Core construct in TAM, UTAUT, UTAUT2	Captured in extended UTAUT use behavior construct; DOI stages
Key Issues	Susceptible to CMV; may not translate into real use	Requires objective data; influenced by structural/contextual factors
Key References	Davis (1989); Venkatesh et al. (2003, 2012); Benbasat & Barki (2007)	Rogers (2003); Burton-Jones & Straub (2006); Sharma et al. (2004)

Source: Author's synthesis based on reviewed literature.

4.1.4. From Intention to Sustained Use

The need to distinguish between initial acceptance and actual adoption is further reinforced by recent research on continuance intention. Jo and Bang's (2023) integrated model, which positions continuance intention as the final dependent variable, incorporates a range of critical constructs, including ICT skill, ICT infrastructure, system quality, information quality, perceived usefulness, perceived ease of use, top management support, and service quality. Their approach highlights the complexity of sustained technology use and underscores the importance of moving beyond mere acceptance to examine the factors that influence long-term engagement. Among these, perceived usefulness, a core element of TAM, emerges as the most significant predictor of continuance intention, underscoring the importance of users' beliefs in the system's ability to enhance performance. In contrast, perceived ease of use does not show a significant effect, suggesting that for experienced users, system utility outweighs usability, challenging long-standing assumptions in TAM (Davis, 1989).

The study further demonstrates that both perceived usefulness and ease of use are significantly shaped by system quality and information quality, key components of the IS Success Model (DeLone & McLean, 2003). System quality, reflected in functionality, responsiveness, and reliability, positively influences both user perceptions. Even more influential is information quality, where attributes such as accuracy, completeness, and relevance strongly enhance both the perceived value and usability of ERP systems. These findings reaffirm the critical role of high-quality system output in shaping positive user attitudes. At the organizational level, the model highlights top management support, as conceptualized in the TOE framework, as a key facilitator of continuance intention. Executive involvement fosters long-term engagement by signaling strategic importance, securing necessary resources, and motivating users (AlBar & Hoque, 2019). Interestingly, while ICT skill and infrastructure are traditionally viewed as essential for adoption, they do not significantly predict continuance. This likely reflects the maturity of the ERP environment studied, where baseline capabilities are already in place and no longer drive behavioral differences. Notably, service quality, often emphasized in IS literature, does not significantly affect continuance intention. The authors suggest this may be due to users' growing independence and declining reliance on external support as ERP systems mature, indicating a shift in user priorities from service-related factors to intrinsic system attributes.

Overall, the model demonstrates strong explanatory power, accounting for 67.9% of the variance in continuance intention. The study challenges conventional assumptions about usability and service support while offering an innovative synthesis of TAM, TOE, and the IS Success Model to better understand post-adoption behavior. Practically, it calls on ERP stakeholders to prioritize executive support, system performance, and high-quality information output over interface simplicity or external service provision. In doing so, Jo and Bang's work advances the ERP literature toward a more nuanced and realistic understanding of sustained system use.

4.2. Comparing different IS models:

Information Systems (IS) research has drawn upon a diverse array of theoretical frameworks to understand the processes of technology diffusion, acceptance, and sustained use. Among the most influential are models that focus on individual-level adoption behaviors, including the Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991), the Technology Acceptance Model (TAM) (Davis, 1986, 1989; Davis et al., 1989), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), and its extension, UTAUT2. These models have played a central role in shaping empirical investigations of user behavior in IS contexts. Complementing

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these are broader organizational-level frameworks, such as the Diffusion of Innovations (DOI) theory (Rogers, 1995) and the Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990), which emphasize structural and environmental factors affecting technology adoption. In addition, the Information Systems Success Model (DeLone & McLean, 1992, 2003) offers a robust lens for evaluating post-adoption outcomes, particularly system effectiveness and net benefits.

While this diversity enhances analytical flexibility, it also complicates model selection (Tarhini et al., 2015). A key distinction between TRA and TAM lies in the role of subjective norms, TRA incorporates them as a determinant of behavioral intention, whereas TAM does not. Davis et al. (2000) extended TAM to address its limitations, introducing TAM2 and later TAM3, which integrate external variables influencing perceived usefulness and ease of use.

The Unified Theory of Acceptance and Use of Technology (UTAUT) synthesized eight prior models, proposing four core constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, alongside four moderators (gender, age, experience, voluntariness) and two outcome variables (behavioral intention and use behavior) (Venkatesh et al., 2003). UTAUT shares conceptual overlap with TAM but improves explanatory power by incorporating "moderating" factors.

Building on UTAUT, the UTAUT2 framework introduces three additional constructs, hedonic motivation, price value, and habit, and streamlines the moderators to gender, age, and experience. Unlike TAM, which centers on perceived usefulness and ease of use, UTAUT2 posits that behavioral intention is shaped by a broader set of seven independent variables (Venkatesh & Davis, 2000). To further clarify the distinctions among the various frameworks, the following section presents a concise comparative overview of the major technology acceptance and adoption models, with particular attention to their core assumptions and levels of analysis. It then articulates the rationale for selecting UTAUT2 as the foundational theoretical framework for the present study. Finally, it justifies the extension of UTAUT2 by introducing additional constructs tailored to the Moroccan higher education context, thereby enhancing the model's contextual sensitivity and explanatory power.

4.2.1. Evolution from TAM to UTAUT2: A Comprehensive Theoretical Progression

- ***Technology Acceptance Model (TAM)***

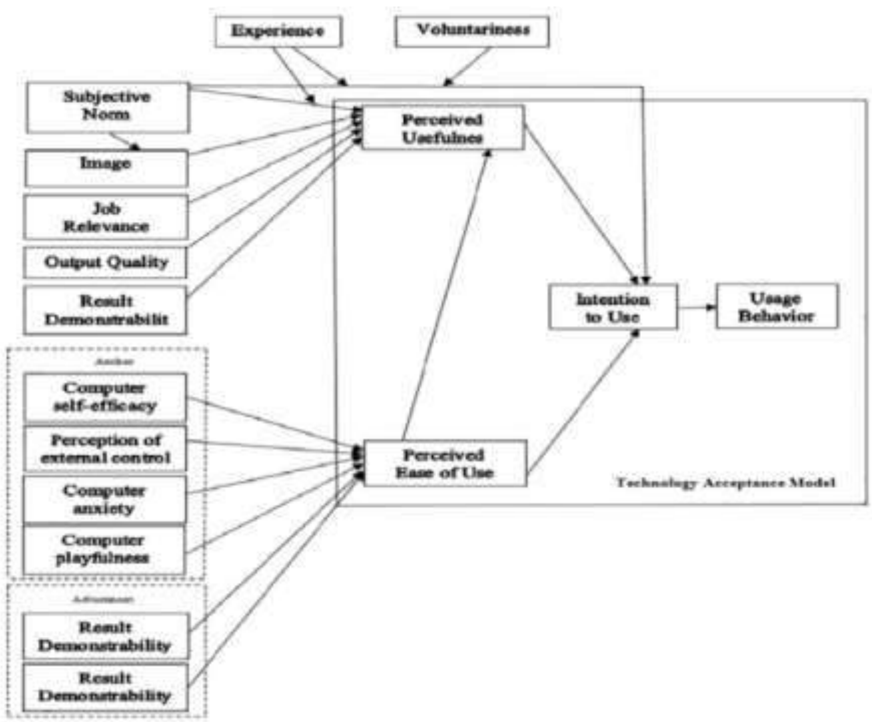
The Technology Acceptance Model (TAM), developed by Davis (1986; 1989), remains one of the most cited frameworks for understanding how individuals come to accept and use new technologies. Building on the Theory of Reasoned Action (TRA), TAM posits that two cognitive beliefs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), shape an individual's attitude toward a system, which then influences their Behavioral Intention (BI) to use it, ultimately predicting actual system use. PU reflects the extent to which a person believes that using a system will enhance their job performance, while PEOU concerns the degree of effort required. Davis's original work validated these constructs through rigorous measurement development and testing. TAM's simplicity and empirical robustness made it widely applicable, yet its early versions faced criticism for focusing narrowly on individual cognitive factors while overlooking social, contextual, and organizational influences that can affect user acceptance (Benbasat & Barki, 2007). This limitation is especially relevant in educational contexts, where adoption is rarely driven by purely rational evaluations alone. As Putra (2019) notes, the early TAM provided valuable predictive insights but required extensions to address more complex user environments.

- ***TAM2 – Addressing Social and Cognitive Processes***

Recognizing these gaps, Venkatesh and Davis (2000) introduced TAM2, extending the original model by incorporating social influence processes and cognitive instrumental processes to better explain PU and BI. TAM2 added variables such as Subjective Norm, Image, Job Relevance, Output Quality, and Result Demonstrability, acknowledging that external social pressures and the perceived fit of a system within one's work context could significantly affect perceived usefulness. For example, subjective norm captures the perceived expectations of important referent individuals (e.g., managers, peers), while image reflects the degree to which using a system enhances one's social status. These additions addressed the recognition that people's beliefs about technology usefulness are often shaped by the workplace context and peer influence, not just by individual assessment. TAM2 thus improved explanatory power in organizational settings, but it still emphasized rational decision-making more than affective or habitual behaviors that emerge over time.

- ***TAM3 – Integrating Control and Emotional Factors***

Figure 3: Technology Acceptance Model 3 (TAM3).



Source: Venkatesh, V. and Bala, H. 2008.

TAM3, proposed by Venkatesh and Bala (2008), further refined the model by systematically combining all known determinants of Perceived Usefulness and Perceived Ease of Use into one unified framework. TAM3 retained the social and cognitive instrumental variables from TAM2 and added anchors such as Computer Self-Efficacy, Perceptions of External Control, Computer Anxiety, and Computer Playfulness, recognizing that emotional and control beliefs directly shape how easy users perceive a system to be. Importantly, TAM3 explicitly incorporated experience and voluntariness as moderators, demonstrating that the strength of these determinants can vary depending on how familiar users are with the system. In effect, TAM3 advanced the model by acknowledging that acceptance is not purely a logical process, emotional comfort, perceived

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control, and even intrinsic motivation (playfulness) also influence whether people feel confident in using technology. As Putra (2019) observes, this made TAM3 more relevant for studying acceptance in contexts like education, where varying levels of digital confidence and anxiety are common.

- ***Unified Theory of Acceptance and Use of Technology (UTAUT)***

To resolve inconsistencies across multiple acceptance models, Venkatesh et al. (2003) synthesized eight major frameworks including (TAM: Technology Acceptance Model, TRA: Theory of Reasoned Action, TPB: Theory of Planned Behavior, MM: Motivational Model, IDT: Innovation Diffusion Theory, MPCU: Model of PC Utilization, UTAUT: Unified Theory of Acceptance and Use of Technology) into the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT distilled the core predictors into four determinants of user acceptance: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. It also recognized the moderating effects of gender, age, experience, and voluntariness of use, significantly increasing the model's explanatory power, explaining up to 70% of the variance in BI compared to about 40% with TAM (Venkatesh et al., 2003). UTAUT was particularly effective in structured, organizational settings where system use was often mandatory. However, its focus remained largely on rational and social factors without yet fully capturing the emotional or habitual dimensions of user behavior that are prominent in voluntary or consumer contexts.

- ***UTAUT2 – Extension for Consumer and Voluntary Contexts***

Table 7: Comparison Table: Selected Theories in IS Adoption Research

Theory/Model	Level of Analysis	Focus	Key References
TAM (Technology Acceptance Model)	Individual	Perceived usefulness & ease of use as drivers of individual adoption	Davis (1986, 1989); Davis et al. (1989)
TPB (Theory of Planned Behaviour)	Individual	Attitudes, subjective norms, and perceived behavioural control	Ajzen (1985, 1991)
UTAUT / UTAUT2	Individual	Unified predictors of individual behavioural intention & usage	Venkatesh et al. (2003)
DOI (Diffusion of Innovations)	Individual & Organizational	How innovations spread over time across individuals & organizations	Rogers (1995)
TOE Framework	Organizational	Technological, organizational, and environmental contexts influencing adoption	Tornatzky & Fleischer (1990)
IS Success Model	Post-Adoption; System & Organizational	Measures system quality, use, user satisfaction, and net benefits	DeLone & McLean (1992, 2003)

Source: Author's synthesis based on reviewed literature.

In order to better account for consumer-oriented and voluntary technology adoption contexts, Venkatesh, Thong, and Xu (2012) proposed UTAUT2, acknowledging the shortcomings of the original model. The extended model keeps the four core UTAUT constructs but adds three new variables: Price Value (the perceived trade-off between cost and benefits), Habit (the degree to which usage becomes automatic over time), and Hedonic Motivation (the intrinsic enjoyment derived from use). By adding affective, evaluative, and habitual aspects of technology acceptance, these improvements provide a more thorough framework. This conceptual improvement aligns with a growing corpus of research emphasizing mobile, self-directed, and informal learning environments. This shift is particularly evident, as Putra (2019) observes, in the growing body of research focused on learner-centered, mobile-based, and voluntary adoption contexts, such as e-learning platforms, digital tools in English Language Teaching (ELT), and mobile-assisted language learning (MALL). UTAUT2, with its expanded constructs, provides a more refined analytical lens to capture the complex interplay between behavioral, emotional, and cognitive dimensions in contemporary educational technology adoption.

4.2.2. Complementary Perspective: Additional Models in Technology Adoption Research

- ***DOI: Diffusion of Innovation***

A thorough lens for comprehending how, why, and at what rate new concepts and technologies spread both within and across cultures is offered by the Diffusion of Innovations (DOI) theory, which was first proposed by Rogers (1995) and examined by Oliveira and Martins (2011). DOI, which operates at both the individual and organizational levels, asserts that innovations spread over time within a defined social system via particular communication channels. A normally distributed adoption curve that divides adopters into five groups, innovators, early adopters, early majority, late majority, and laggards, is the result of people's differing levels of willingness to adopt innovations at the individual level. The firm-level adoption process, on the other hand, is intrinsically more complicated and usually involves a number of actors, both supporters and opponents, who have an impact on the collective innovation decision. According to DOI, an organization's innovativeness is influenced by three sets of factors: external factors (most notably the organization's openness to its environment), internal structural factors (like centralization, complexity, formalization, interconnectedness, organizational slack, and size), and individual leader traits (like openness to change). Because of its diverse viewpoint, DOI is a useful framework for examining how social, structural, and contextual factors interact to affect how technology is adopted in businesses (Oliveira & Martins, 2011).

- ***The Technology–Organization–Environment Framework:***

Tornatzky and Fleischer (1990) first proposed the Technology–Organization–Environment (TOE) framework, which Baker (2012) elaborated on. The TOE framework is a prominent organization-level theory that describes how three contextual factors work together to influence a firm's adoption and application of technological innovations. These three domains, technological, organizational, and environmental, encapsulate the internal and external elements that can either support or impede an organization's innovation processes. The framework emphasizes that adoption involves more than just the technology's intrinsic qualities; it also involves the firm's structural traits, leadership preparedness, available resources, and outside incentives or pressures. Enterprise applications, electronic data interchange, e-business, and interorganizational systems are just a few of the technologies, industries, and cultural contexts where decades of empirical research have confirmed the TOE model's adaptability and explanatory power (Grover, 1993; Kuan & Chau, 2001; Zhu & Kraemer, 2005). Its strength is its general yet adaptable structure, which enables researchers to modify particular elements within each context, like firm size, regulatory environment, or technology readiness, to fit various innovation types or national contexts. While some critics point out that the TOE framework has only slightly changed since its inception, its conceptual similarity to other theories, like the EDI adoption model and Diffusion of Innovations (DOI), indicates that TOE works well as an umbrella framework, incorporating and absorbing related constructs rather than directly competing with them. Because of this, the TOE is still one of the most reliable and popular frameworks for analyzing how organizational, technological, and environmental factors interact to determine whether IS adoption at the firm level is successful (Baker, 2012).

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- ***IS Success Model:***

The Information Systems (IS) Success Model, originally proposed by DeLone and McLean (1992) and later refined (DeLone & McLean, 2003), remains one of the most influential frameworks for conceptualizing and evaluating the effectiveness of information systems across diverse contexts. Drawing on foundational theories such as Shannon and Weaver's (1949) communication theory and Mason's (1978) information influence theory, the model addresses the fragmented treatment of IS success in earlier literature by integrating multiple dimensions into a coherent construct. The model posits that IS success is best understood through six interrelated dimensions: system quality, information quality, service quality, intention to use and actual use, user satisfaction, and net benefits. These dimensions are conceptually linked through both process and causal pathways, emphasizing that the technical and semantic qualities of a system shape usage patterns and user satisfaction, which subsequently generate individual and organizational benefits. Despite critiques, such as Seddon's (1997) argument that combining process and variance perspectives may introduce conceptual ambiguities, DeLone and McLean have defended the model's multidimensionality and stressed the importance of examining these interrelationships holistically. Researchers such as Pitt, Watson, and Kavan (1995) have underscored the necessity of evaluating IS service quality alongside technical outputs to avoid incomplete assessments. Moreover, the importance of context is highlighted by studies demonstrating that users may favor different success measures depending on system type (Jiang & Klein, 2000), while Seddon et al.'s (1999) context matrix offers guidance on selecting suitable measures aligned with research objectives.
Over the past decade, the IS Success Model has been rigorously tested, critiqued, and adapted to various settings, including e-learning platforms, enterprise systems, e-commerce, and healthcare information systems. In light of technological advancements and the growing complexity of IS impacts on business and society, DeLone and McLean revisited their original framework, incorporating empirical insights and clarifying the measurement of IS success dimensions. Notably, they advocated for the explicit inclusion of "service quality" as a distinct dimension and recommended consolidating "individual impacts" and "organizational impacts" under the broader construct of "net benefits" to maintain parsimony while acknowledging the diverse levels of analysis.
The updated D&M IS Success Model serves as a robust foundation for contemporary IS research and practice, especially in environments characterized by voluntary system use and complex stakeholder networks. As organizations increasingly invest in digital solutions, the model's emphasis on measuring not only system and information quality but also usage patterns, user satisfaction, and net benefits remains pertinent. DeLone and McLean's refinements reinforce the need to move beyond simplistic usage metrics, advocating instead for nuanced evaluations that capture the depth, appropriateness, and richness of system interactions. Their work continues to inspire empirical studies that investigate how IS delivers value at individual, organizational, industry, and societal levels (Yuthas & Young, 1998). By consolidating process relationships and contextual considerations, the model offers a coherent, flexible, and theoretically grounded framework that facilitates the development of comparable and actionable insights into IS effectiveness across sectors.

Table 8: Overview of Major IS Adoption Models

Adoption Model	Main Authors	Key Strengths	Main Criticisms / Limitations
Technology Acceptance Model (TAM)	Davis (1986); Davis et al. (1989)	Parsimonious and easy to apply; focuses on perceived usefulness and ease of use; extensively tested across contexts.	Overly simplistic; excludes contextual, social, and facilitating factors; limited explanatory power in mandatory settings.
TAM2 / TAM3	Venkatesh & Davis (2000); Venkatesh & Bala (2008)	Expands TAM with subjective norms and experience factors; addresses voluntary and mandatory contexts.	Complexity reduces parsimony; still focuses mainly on individual cognition, neglecting organizational or environmental contexts.
Unified Theory of Acceptance and Use of Technology (UTAUT)	Venkatesh et al. (2003)	Integrates eight prior models; considers performance expectancy, effort expectancy, social influence, and facilitating conditions.	May not fit all voluntary consumer contexts; too broad yet rigid in operationalization.
UTAUT2	Venkatesh, Thong & Xu (2012)	Extends UTAUT for consumer contexts; adds hedonic motivation, price value, and habit.	May overlook context-specific factors; some constructs less relevant in public education settings.
Theory of Planned Behavior (TPB)	Ajzen (1991)	Robust social psychology base; includes perceived behavioral control, attitude, and subjective norms.	Focuses on intention rather than actual behavior; weak in explaining actual system use in mandatory contexts.
Innovation Diffusion Theory (IDT)	Rogers (1962, 1995)	Explains adoption stages and attributes: relative advantage, compatibility, complexity, trialability, observability.	Descriptive rather than predictive; less emphasis on post-adoption usage and organizational influences.
Technology–Organization–Environment (TOE)	Tornatzky & Fleischer (1990); Baker (2012)	Captures contextual factors at the firm level; widely applicable for organizational IS adoption.	Lacks specificity for individual user behavior; often combined with other models for individual-level insights.
DeLone & McLean IS Success Model	DeLone & McLean (1992, 2003)	Integrates system, information, and service quality with use, satisfaction, and net benefits; multidimensional.	Combines process and variance perspectives which can confuse; requires careful operationalization.
Community of Inquiry (CoI)	Garrison, Anderson & Archer (2000)	Designed for online learning; emphasizes social, cognitive, and teaching presence; pedagogically strong.	Not strictly an adoption model; limited focus on organizational or technological constraints.
Task-Technology Fit (TTF)	Goodhue & Thompson (1995)	Highlights fit between task requirements and technology capabilities; useful for post-adoption success.	Focuses on effectiveness rather than adoption intention; requires detailed task analysis.

Source: Author's synthesis based on reviewed literature.

4.3.Foundations for Extending UTAUT2: Conceptual and Contextual Clarifications

4.3.1. From Concept to Measurement: Establishing a Theoretical and Operational Framework

Before presenting the rationale for extending the selected technology adoption model, it is necessary to address a recurring conceptual ambiguity, one that persists even within highly regarded academic literature. Specifically, the distinction between constructs, variables, and items is often misunderstood, despite being fundamental to the formulation, operationalization, and empirical validation of theoretical frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT2). This section begins by

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clarifying these key terms to establish a clear conceptual foundation for the remainder of the analysis.

Understanding the hierarchical relationship between constructs, variables, and items is crucial in theory-driven quantitative research. A construct is an abstract, latent concept derived from theory that represents a phenomenon of interest, such as performance expectancy or perceived usefulness. Because constructs cannot be directly observed, they are operationalized through variables, which serve as measurable representations tailored to the research context. These variables, in turn, are composed of one or more items—specific, observable statements or questions posed to participants, typically assessed using Likert-type scales. For instance, the construct Performance Expectancy may be captured by a variable measured through several items, including: "Using the e-learning platform improves my teaching effectiveness," "It enhances my productivity," and "It allows me to accomplish tasks more quickly." In this structure, items provide the empirical data, variables translate theoretical constructs into quantifiable indicators, and constructs anchor the theoretical framework. This multi-level approach ensures conceptual clarity, measurement precision, and analytical rigor, particularly in studies examining technology acceptance behaviors.

4.3.2. Why This Matters: UTAUT2 for Modern E-Learning Research

The progression from TAM to TAM2, TAM3, UTAUT, and ultimately UTAUT2 represents a deliberate and systematic evolution toward more comprehensive and contextually nuanced models of technology acceptance. Each successive model builds upon its predecessor by incorporating additional dimensions, extending beyond core cognitive beliefs to include factors such as social influence, perceived behavioral control, emotional satisfaction, intrinsic motivation, and habitual behavior. Despite this theoretical advancement, as Putra (2019) observes, a substantial portion of research in education continues to rely on the original TAM, thereby overlooking critical motivational and contextual determinants of adoption. This shift from a narrowly utilitarian lens to a broader framework that captures behavioral, affective, and environmental influences is particularly salient in educational contexts, where technology use is often voluntary and shaped by diverse pedagogical objectives. Hamidi and Chavoshi's (2018) study on mobile learning extends traditional technology adoption models beyond the traditional constructs of perceived usefulness and ease of use, the study underscores the critical role of extended factors, particularly trust, contextual relevance, and cultural orientation, in shaping adoption. Trust, for instance, was shown to exert a significant and positive influence on behavioral intention, while contextual features enhanced both ease of use and usefulness. Conversely, personal characteristics such as enjoyment, adaptability, and perceived benefit did not directly predict behavioral intention, but they contributed positively to cultivating a supportive culture of use. This finding highlights the importance of examining indirect pathways of influence within technology adoption models. The study also underscores that mobile learning adoption in higher education is not solely a technical matter but involves pedagogical, institutional, and infrastructural dimensions. The authors emphasize that successful implementation requires adequate resources, supportive policies, and attention to hardware accessibility. (Hamidi & Chavoshi, 2018).

Figure 4: Key Constructs and Limitations in Major Technology Acceptance and Adoption Frameworks

Source: Author's synthesis based on reviewed literature.

The present study adopts UTAUT2 to examine university professors' acceptance of e-learning, thereby offering richer, more actionable insights for institutions navigating the complex transition to digital and blended learning. In doing so, it also responds to persistent calls for enhanced methodological rigor and contextual sensitivity in educational technology research, reinforcing the theoretical development and practical relevance of these influential acceptance models.

Several factors influence whether e-learning is embraced or resisted. Valverde-Berrocoso et al. (2021) identified common ICT-enhanced instructional practices but also pointed to persistent weaknesses in educators' digital competence and early-stage training, which complicated transitions to online teaching. Resistance to technological change and anxiety among academic staff are often rooted in low computer self-efficacy, defined as the belief in one's ability to perform tasks with digital tools. Faculty members without IT backgrounds frequently report limited confidence in their digital skills, which reinforces anxiety and reluctance to adopt new technologies. By contrast, fostering positive attitudes toward computers and strengthening self-efficacy can promote skill development and reduce resistance (Saadé & Kira, 2009).

Digital competence extends beyond technical know-how to include the knowledge, skills, and attitudes needed for ethical and effective ICT use, such as problem-solving, collaboration, and information management (Arya et al., 2014). Instructors who lack these abilities risk being left behind in digital education. Misuse of tools, moreover, often reflects insufficient awareness rather than deliberate misuse, highlighting the need for targeted training initiatives (Bennett et al., 2008). Even for educators who are comfortable with technology, lack of time remains a major obstacle to meaningful ICT integration. Teachers need space for experimentation, peer exchange, and professional development, and without structured training on how and when to use digital tools, effective adoption remains unlikely (Sam et al., 2005).

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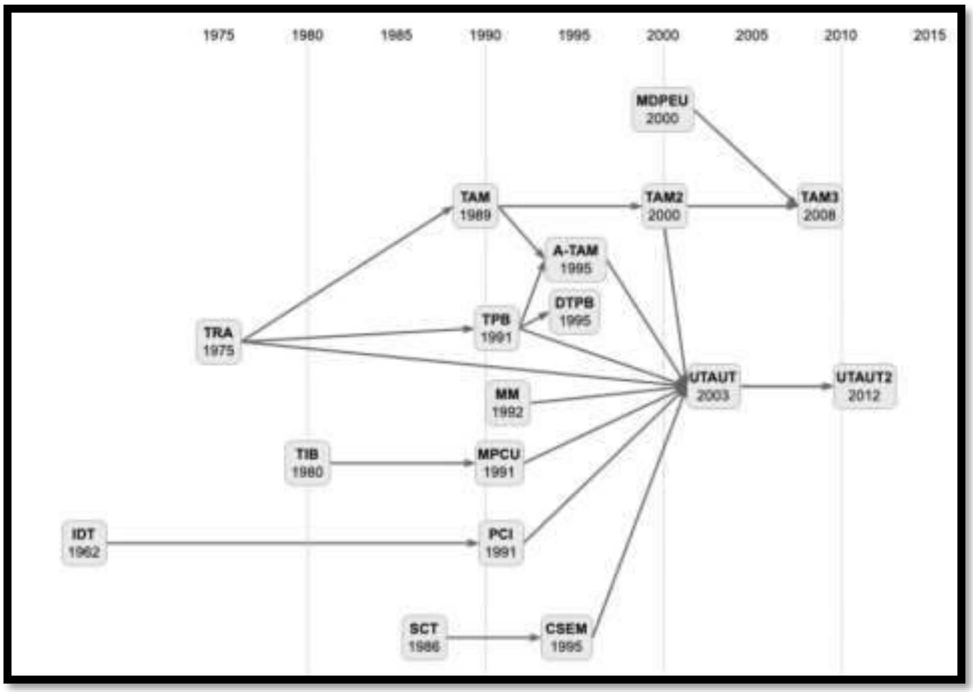
Ultimately, the success of online learning depends heavily on both learners' and educators' confidence and sense of security in using digital platforms (Ahmad et al., 2023). These insights underscore the necessity of extending UTAUT2 with constructs that can more accurately capture the motivational, pedagogical, and contextual dimensions of technology adoption in higher education.

Figure 5: A chronological account of the period along with an overview of relational linkages among the most influential technology acceptance and adoption theories and models



Source: (Granić, 2023).

Although UTAUT2 was originally formulated for technology adoption in consumer and organizational contexts, its application in education and e-learning reveals both theoretical relevance and important limitations. Meta-analyses and systematic reviews confirm that core constructs such as performance expectancy, effort expectancy, and hedonic motivation remain strong predictors of behavioral intention (Acosta-Enriquez et al., 2024). However, findings also show that these relationships vary considerably across user groups and contexts: gender moderates many of the framework's paths in e-learning (Zheng et al., 2025), while disciplinary differences (STEM vs. non-STEM) and institutional settings shape how adoption unfolds (Elshaer et al., 2024). Moreover, extensions of UTAUT2 with constructs like trust, privacy, and perceived risk (Bile Hassan et al., 2022) highlight ethical, psychological, and informational dimensions that the original model does not adequately capture. These limitations underscore the necessity of integrating pedagogically grounded constructs, such as Learning Value, Aspiration, and Fit Choice, into the framework. Doing so not only aligns UTAUT2 more closely with foundational learning theories (e.g., Social Cognitive Theory, Self-Determination Theory, Cognitivism, and Constructivism) but also strengthens its complementarity with frameworks like Technological Pedagogical Content Knowledge (TPACK), which emphasizes the intersection of technology, pedagogy, and subject matter expertise. Taken together, these theoretical and pedagogical intersections reinforce UTAUT2 as a robust yet context-sensitive framework for understanding e-learning adoption among university faculty.

4.3.3. Extending UTAUT2 with Upstream Determinants Aligned with the Moroccan Higher Education Context

While UTAUT2 (Venkatesh et al., 2012) provides a robust framework for examining technology acceptance, its explanatory power is significantly constrained in contexts where behavioral intention (BI) does not always translate into actual adoption. For example, professors may report a strong intention to use e-learning platforms, yet actual usage remains low due to systemic barriers, including insufficient infrastructure, lack of pedagogical alignment, and minimal institutional incentives. This intention–behavior disconnect underscores the need to go beyond the standard UTAUT2 constructs to account for motivational, pedagogical, and contextual realities specific to contexts such as the Moroccan Educational Sphere.

Islam Khan et al. (2015) contend that adopting information systems such as mobile learning in less developed countries requires more than technological readiness; it depends on coordinated public–private efforts, cultural alignment, and learner-centered infrastructure. Their study identifies technical barriers (limited bandwidth, inadequate support, and the digital divide) alongside socio-cultural obstacles such as low awareness, weak motivation, and negative perceptions. To overcome these constraints, they stress the need for institutional cognizance, policy engagement, inclusive design, cultural sensitivity, and strategic investment. Lessons from advanced contexts can inform practice but must be adapted to the unique social and institutional realities of developing regions.

Drawing on a multidimensional analysis of online education in Morocco, El Hilali, Mounjid, and El Bakkali (2025) argue that digital adoption, while necessary, is insufficient in isolation. Their study underscores the importance of pedagogical redesign, interactive instructional practices, and sustained institutional support as critical enablers of effective online learning. By reframing the discourse from a binary evaluation of online education's viability to a more nuanced inquiry into optimization strategies, the authors contribute a contextually grounded framework for advancing Morocco's digital education ecosystem.

Teacher preparedness emerges as a pivotal yet underdeveloped domain, with limited attention to the interplay between technological fluency, pedagogical competence, and assessment literacy. Empirical findings reveal that most educators encountered challenges in sustaining student engagement, expressed skepticism regarding the validity of digital assessments, and identified affordability and accessibility as persistent barriers to equitable participation. Reports of insufficient training and minimal institutional support further highlight systemic gaps in professional development and resource provision.

The study delineates three interdependent determinants of online learning quality: infrastructural readiness, pedagogical enactment, particularly in relation to assessment and interaction, and stakeholder attitudes and capacities. These dimensions are further mediated by contextual variables such as gender, age, and geographic location, which shape educators' adaptability and instructional strategies.

In response, the authors advocate for reliable access to digital platforms and devices, continuous professional development in online pedagogy, and robust institutional support mechanisms. At the policy level, they call on the Ministry of Education to realign funding priorities, implement feedback-driven monitoring systems, and promote hybrid instructional models that integrate the strengths of both online and face-to-face modalities (El Hilali, Mounjid, & El Bakkali, 2025).

Bouyzem and Al Meriouh (2020) highlighted multiple barriers to e-learning adoption among

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faculty at Abdelmalek Essaâdi University, including inadequate technical and institutional support, unreliable infrastructure, poor communication, limited training opportunities, low digital literacy, and resistance to pedagogical change. These obstacles were further reinforced by legal uncertainties and entrenched cultural norms. Using principal component analysis, the authors grouped the barriers into two broad dimensions: technological (e.g., computer anxiety, lack of prior experience) and institutional-psychological (e.g., insufficient support mechanisms, time constraints, and attitudinal resistance). The study also revealed low awareness of initiatives such as MarMOOC, underscoring that sustainable adoption requires not only infrastructure but also consistent institutional engagement and broader cultural change (Bouyzem & Al Meriouh, 2020).
Accordingly, three complementary constructs have been integrated into the model: Learning Value, Aspiration, and D-Fit Choice. The original UTAUT2 model (Venkatesh, Thong, & Xu, 2012) includes Price Value as a determinant of behavioral intention, this construct is less applicable in educational contexts where users are not typically making purchasing decisions. In response, several scholars have proposed Learning Value as a more relevant substitute, capturing the perceived educational benefit of using digital learning tools. Ain, Kaur, and Waheed (2016) were among the first to formally introduce Learning Value in the UTAUT2 framework, demonstrating its significant influence on learning management system (LMS) adoption. More recently, Zacharis and Nikolopoulou (2023) validated Learning Value as a strong predictor of university students' behavioral intention to use e-learning platforms in the post-pandemic context. These findings are echoed in earlier work by Alraimi, Zo, and Ciganek (2015) and Šumak and Šorgo (2016), who also emphasized the centrality of pedagogical relevance and perceived learning benefit in shaping technology acceptance. Collectively, these studies underscore the importance of contextualizing UTAUT2 for educational environments by replacing Price Value with Learning Value to better reflect users' academic motivations.
The inclusion of the construct 'Aspiration' in the enhanced UTAUT2 model is theoretically grounded in the Expectancy-Value Theory (EVT) developed by Eccles and Wigfield (2002). EVT posits that individuals' motivation to engage in a particular behavior is determined by two key components: expectancy and value. Expectancy refers to an individual's belief in their ability to succeed in a given task, closely related to Bandura's concept of self-efficacy (Bandura, 1977). Individuals with higher expectations and confidence are more likely to adopt technology effectively (Ahmad et al., 2023). Value encompasses various dimensions such as intrinsic value (enjoyment), attainment value (personal importance), utility value (future usefulness), and cost (perceived effort or trade-offs). Both high expectancy and high value are necessary to produce strong motivation. Within this framework, aspiration emerges as a goal that individuals are more likely to pursue when they believe they can succeed and when the goal is meaningful to them (Quaglia and Cobb,1996). In the Moroccan higher education context, university professors may aspire to adopt e-learning tools not simply due to their usability, but because these tools align with personal ambitions such as career advancement, international collaboration, or pedagogical innovation. Thus, Aspiration is critical in capturing motivational dynamics not addressed by the original UTAUT2 constructs.
Aspiration, as a motivational construct, extends beyond mere desire to represent a purposeful drive toward achieving a valued future state, often shaped by individual goals and personal values. It captures the extent to which individuals believe in their capacity to succeed (expectancy) and perceive their goals as meaningful and worthwhile (value). According to EVT, motivation is primarily governed by two interrelated components: an individual's belief in their likelihood of

success and the subjective importance they assign to the task. Individuals are therefore more inclined to engage in a given activity when they perceive both high expectancy and high value. In the context of technology adoption, aspiration refers to users' beliefs that digital tools can serve as enablers of personal or professional advancement. When aligned with intrinsic values such as self-enhancement, openness to change, and achievement, aspiration becomes a powerful catalyst for the acceptance and sustained use of technology. Empirical research reinforces this proposition: Bessadok and Bardesi (2023) demonstrated that students' aspirations significantly influenced their adoption of e-learning platforms, positioning these technologies as vehicles for achieving academic and career objectives. Similar findings have emerged in studies on Internet of Things (IoT) adoption (Cranmer et al., 2022) and e-learning system success (Bessadok, 2022), where aspiration was shown to drive user engagement through future-oriented motivation. In the Moroccan higher education context, where university professors often contend with institutional constraints yet aspire toward international recognition, digital fluency, and career mobility, aspiration emerges as a particularly salient motivational factor in e-learning adoption. Integrating aspiration into established technology acceptance models such as TAM, TPB, or UTAUT offers a more nuanced and context-sensitive understanding of user behavior, particularly in voluntary adoption scenarios where traditional constructs may fall short.

Gao et al. (2012) contend that while individual attributes, such as age, gender, educational attainment, and personality traits, exhibit considerable variation across users, these static characteristics alone offer limited explanatory power regarding the adoption of new technologies. They argue that reliance on such "personal characters" is insufficient, as these traits fail to account for the technological affordances and contextual conditions that shape user engagement. Instead, the authors emphasize the primacy of dynamic, situationally responsive factors, including users' aspirations, needs, interests, and subjective perceptions, which exert a more substantive influence on the acceptance and sustained utilization of innovative digital services and devices. This enriched perspective not only enhances the explanatory power of these models but also responds to ongoing scholarly calls for greater contextual and motivational depth in educational technology research.

The construct D-Fit Choice is grounded in the (D)FIT-Choice model, an extension of the original FIT-Choice (Factors Influencing Teaching Choice) framework, designed to capture the evolving motivations of educators within increasingly digital learning environments. While the original FIT-Choice scale was developed to examine the career motivations of teachers, emphasizing social influences, personal values, task perceptions, and intrinsic rewards, the (D)FIT-Choice model, developed by Martínez-Moreno and Petko (2024), expands this scope by integrating digital dimensions into the analysis of teaching-related decisions. Specifically, the model introduces three key subscales: prior experience with educational technology, perceived digital teaching competence, and the desire to contribute to the digital transformation of education. These additions provide a nuanced lens through which to assess how educators engage with digital innovation not only as a technical challenge but as a value-laden, pedagogically meaningful pursuit. In contexts such as Moroccan higher education, where disparities in digital infrastructure and institutional support persist, particularly between urban and rural institutions, D-Fit Choice becomes especially relevant. It captures the degree to which educators perceive e-learning tools as aligned with their instructional philosophy, content needs, and professional identity. Unlike traditional constructs in UTAUT2, which emphasize usability, effort expectancy, or social influence, D-Fit Choice introduces a critical layer of agency and discernment, reflecting the educator's intentional alignment between digital platforms and personal pedagogical values. By incorporating this construct, the present study acknowledges the importance of contextual and identity-based factors in technology adoption, thus enhancing the explanatory power and educational relevance of the extended UTAUT2 model.

Table 9: Added Constructs and Their Theoretical Origins

Construct	Originating Theory/Model	Purpose in Enhanced UTAUT2
Learning Value	TAM (Perceived Usefulness), Educational Value Theory	Replaces Price Value; captures pedagogical utility for teaching effectiveness
Aspiration	Expectancy-Value Theory (Eccles & Wigfield, 2002)	Reflects personal/professional goals and motivation to pursue digital teaching
D-Fit Choice	(D)FIT-Choice Model (Martínez-Moreno & Petko, 2023)	Captures digital–pedagogical alignment and teaching-related motivations

Source: Author's synthesis based on reviewed literature.

Collectively, these additions enhance the contextual validity of the UTAUT2 model by addressing its conceptual limitations and tailoring its applicability to the specific dynamics of Moroccan higher education. By capturing the correlations and interdependencies between motivation, pedagogical alignment, contextual constraints, and behavioral intention, the extended model offers a more comprehensive and theoretically grounded explanation of e-learning acceptance in environments marked by both opportunity and systemic disparity.

The success of e-learning depends fundamentally on its acceptance and sustained use by educators, whose engagement bridges technology and meaningful learning outcomes. Adoption patterns are shaped by local cultural, institutional, and infrastructural contexts, making context-sensitive evaluation essential, particularly in developing countries such as Morocco, where e-learning's potential remains underrealized. By enhancing the UTAUT2 framework with constructs that capture personal motivation, intrinsic value, and contextual realities, this study provides a more precise understanding of the factors driving teacher adoption. This enriched model strengthens theoretical discourse while offering actionable guidance for policymakers, institutional leaders, and instructional designers to design interventions that are pedagogically sound, locally relevant, and sustainable. Aligning technological solutions with educators' priorities and contextual needs is critical to maximizing the educational and societal impact of digital learning.

5. Discussion :

This study situates teachers' engagement with e-learning at the intersection of local realities and global theoretical frameworks, thereby contributing to the growing discourse on technology adoption in higher education. In line with Objective 1, which explored the factors influencing e-learning adoption among Moroccan faculty, the findings highlight the critical distinction between acceptance and adoption. Positive attitudes and behavioral intention, while necessary, are not sufficient to guarantee sustained pedagogical integration. The transition from intention to actual use is constrained by persistent barriers, including infrastructural deficits, gender disparities in digital access, and uneven institutional support. These findings resonate with recent scholarship stressing the role of post-acceptance factors, such as perceived pedagogical value, organizational support, and system quality, in shaping continuance intention and long-term engagement.

Addressing Objective 2, which assessed the relevance of the extended UTAUT2 framework in a developing-country context, the study demonstrates that adoption determinants are inherently multidimensional. While performance expectancy and effort expectancy remain central, their explanatory strength increases when complemented by contextually grounded constructs such as

Learning Value, Aspiration, and motivational indicators linked to career choice. These additions capture the lived realities of Moroccan educators and reaffirm that, despite their robustness, universalist models like UTAUT2 require contextual adaptation to reflect the institutional, cultural, and socio-economic specificities of higher education in the Global South.

In response to Objective 3, which examined the influence of personal and professional motivations, the findings underscore the decisive role of intrinsic and motivational drivers. Teachers' perceptions of the educational value of e-learning and their aspirations to enhance student outcomes emerged as powerful influences. This marks a conceptual shift from technology-centric explanations toward frameworks that foreground the educator's professional identity, pedagogical objectives, and alignment with local teaching realities. Consequently, policy interventions in developing contexts must go beyond infrastructure provision to actively foster environments that nurture motivation, recognize professional contributions, and address the risks of digital inequality.

Finally, in fulfilling Objective 4, which sought to generate practical recommendations for strengthening e-learning adoption, the study emphasizes the balance between theoretical refinement and practical applicability. Extending established adoption models with context-sensitive constructs not only enhances explanatory precision but also produces actionable insights for policymakers and institutional leaders. Key measures include sustained professional development, peer mentoring programs, and the co-design of localized e-learning frameworks. Such initiatives are essential for bridging the intention–behavior gap, ensuring that digital education is not merely acknowledged in principle but meaningfully integrated into everyday teaching practice. In doing so, they amplify the transformative potential of e-learning for improving educational outcomes and advancing equity in Moroccan higher education.

6. Limitations :

While this study provides valuable insights into the determinants of e-learning adoption in Moroccan higher education, several limitations should be acknowledged.

First, the research employed a cross-sectional design, capturing educators' perceptions at a single point in time. Although this approach offers a useful snapshot of current attitudes and behaviors, it does not account for the dynamic nature of "Technology Adoption", which evolves alongside institutional strategies, infrastructure development, and pedagogical shifts. Future research employing longitudinal designs would be better positioned to trace changes over time and assess the long-term impact of digital learning initiatives.

Second, the study relied on self-reported survey data, which may be subject to social desirability bias and recall inaccuracies. While rigorous procedures were implemented, including a pilot phase, mandatory responses, and thorough data cleaning, to enhance reliability and validity, survey-based methods inherently carry limitations. Triangulating these findings with complementary data sources such as classroom observations, LMS usage analytics, or qualitative interviews would strengthen the robustness and depth of future investigations.

Third, although participants were drawn from multiple Moroccan regions, the sample size and institutional diversity remain limited relative to the broader population of higher education faculty. As a result, the findings may not fully capture the heterogeneity of perspectives across disciplines, universities, or geographic areas. Expanding the sample in future studies would improve generalizability and enable more nuanced subgroup analyses.

Fourth, the analysis focused primarily on individual-level determinants of adoption within the extended UTAUT2 framework. While this lens illuminates key motivational and perceptual factors, such as Learning Value, Aspiration, and D-Fit Choice, it places less emphasis on systemic influences, including national policy, institutional culture, and socio-economic disparities. A multi-level approach that integrates organizational and structural variables would offer a more comprehensive understanding of adoption dynamics.

Finally, the study is situated within the developing-country context of Morocco, where infrastructural constraints, economic inequalities, and gendered digital divides are particularly pronounced. Although this contextual focus enhances the relevance of the findings for similar settings, it may limit their transferability to more developed educational systems. Comparative research across diverse national contexts would help distinguish between universal and context-specific determinants of e-learning adoption.

7. Conclusion

This study demonstrates that the transformative potential of digital education lies at the intersection of pedagogical theory, technological affordances, and contextual realities. The literature reveals that while the Knowledge Age demands a recalibration of teaching practices grounded in robust learning theories, educators continue to face significant uncertainty in operationalizing these paradigms within rapidly evolving digital environments. The integration of learning theories with semantic and digital technologies is not merely an academic exercise but a necessity for ensuring that instructional innovations translate into meaningful learning outcomes.

Equally critical is the recognition that the success of e-learning depends less on technological sophistication and more on its sustained adoption by educators, who act as the mediators between innovation and impact. Evidence shows that adoption patterns are shaped by cultural, institutional, and infrastructural factors that cannot be divorced from theoretical models of technology acceptance.

Traditional technology acceptance models explain initial system use but struggle to account for sustained adoption. This study shows that long-term adoption among university professors depends less on convenience or habit than on deeper professional drivers such as aspiration, perceived learning value, and contextual fit. By extending UTAUT2 with constructs that capture intrinsic motivation, this research provides a more granular account of the determinants of teacher adoption. In doing so, it advances theoretical discourse beyond universalist models toward a more situated understanding of technology use in education. The implications of this synthesis are both scholarly and practical. For researchers, it underscores the need to design adoption models that are sensitive to context, culture, and the lived realities of educators rather than assuming homogeneity of experience. For policymakers and institutional leaders, it highlights that effective digital education strategies must be pedagogically grounded, contextually responsive, and aligned with educators' aspirations and priorities. Future research should continue to interrogate how evolving technologies interact with local practices and value systems, ensuring that digital education is not only scalable but also sustainable and socially transformative. When pedagogy, technology, and context converge, enabled by educators as agents of change, digital learning transcends novelty to become a catalyst for educational and societal transformation.

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