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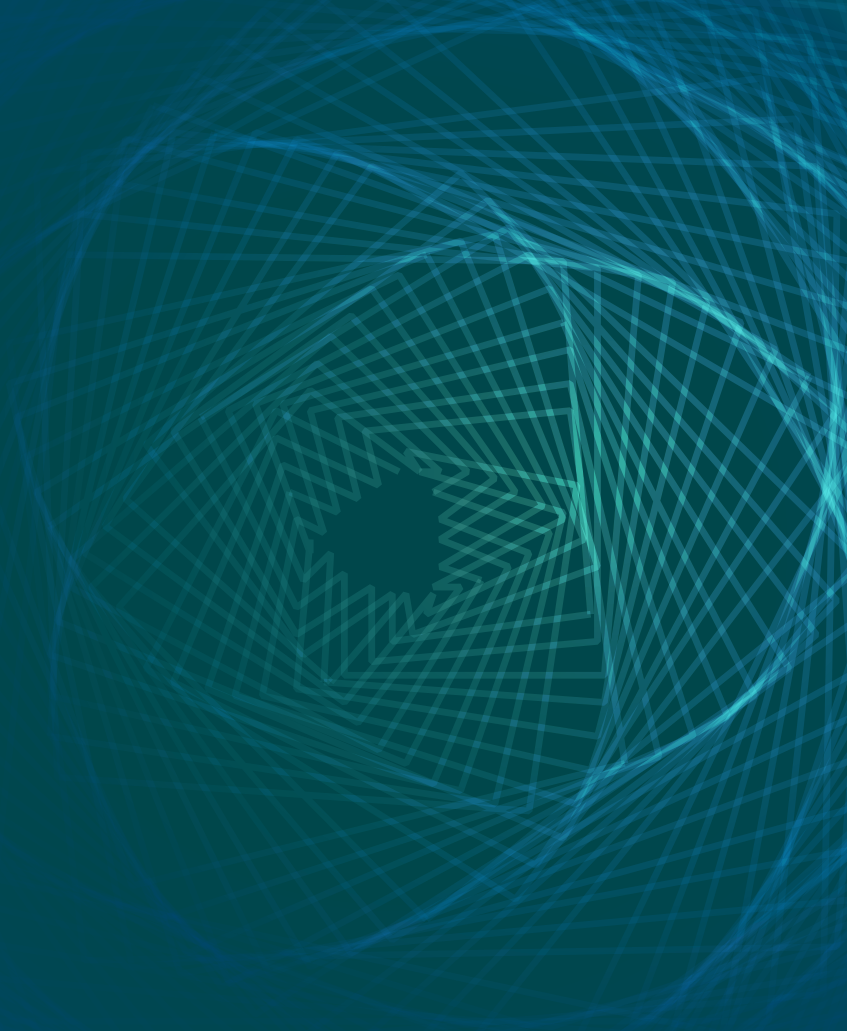

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The Learner's Engagement and Mobile Learning Environment: A Proposal of an Integrated Model

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Abstract

The emergence of mobile technology has changed the way humans behave and act. Learning behavior is an essential aspect that required investigation regarding this technology. Since its inception, mobile technology in the learning context has yet to receive enough attention. The idea of employing the least effort or least energy to fulfill a need is a crucial notion in mobile learning. The lazy user model illustrates that the user selects a fulfillment based on the identified user need, user state, and overall effort related to the use of technology. According to the model, the user will most often choose the solution that fulfills a need with the least effort. This paper aims to enrich research in this field and propose an initial framework that considers achieving learning outcomes by enabling learners' engagement within the design characteristics of the mobile learning environment. The paper identifies existing shortcomings in the literature and paves the way for advanced research to better understand how mobile learners act based on the lazy user model to achieve mobile learning engagement.

Keywords: lazy user model, principle of least effort, user's need, learning outcome

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Introduction

With the phenomenal growth of digital use in education and learning due to the COVID-19 pandemic, it is necessary to understand how learners react to learning. This intriguing phenomenon highlights learners' tendency to choose digital information sources over other sources that may require a more significant effort from them.

Technology adoption and user acceptance models have been extensively investigated and applied within various information system disciplines. However, several studies have criticized these first-generation technology adoption models and call for a revisit of their framework following the fast development and trends of technology and its impact on human behavior. Most technology adoption models remain robust and highly cited in the literature. However, many studies raised concerns that these models are no longer effective and relevant for the emerging new technological and technology-mediated products in the evolving environment characterized by improved internet access, a greater desire for instancy, augmented and virtual reality, autonomous technology, the internet of things, facilitated information processing, and ubiquitous computing (Lowe et al., 2019). The emergence of many new technological markets and their impact on human behavior

required further investigation on how human behavior interacts with the new technology, devices, and digital platforms.

Furthermore, Röcker (2010) claimed that existing technology adoption models could not explain users' behaviors. Perceived ease of use and perceived usefulness, for example, might be outdated in their application for today's technology; because these emerging technologies have far surpassed their predecessors in terms of functionalities and use contexts. Therefore, these traditional variables may not be sufficient in explaining users' adoption behaviors in today's technology context (Röcker, 2010). It is imperative to understand the learner's experience with technology beyond just acceptance or adoption and to explore the learner's engagement and learning outcome within the mobile learning context. This gap still exists in the literature and has not been fully exposed.

The objectives of the paper are twofold. First, it seeks to review past research on the lazy user model in the context of user acceptance and the adoption of technology. Second, it will discuss how the lazy user model can be utilized to understand online education and learners' preferences in terms of usability and learning.

Theoretical and Conceptual Foundations

The Principle of Least Effort

The model is grounded in the principle of least effort introduced by Zipf (1949). He asserted that human behaviors are dictated by the need to choose a path with the least resistance to perform a desired activity and obtain the desired outcome. This principle aims to minimize the rate of work. For example, a learner may search for the meaning of a word in a dictionary app rather than in a traditional paper dictionary. The two paths lead to the same result, but the learner has found the meaning of the word using the minimum average rate of work.

The paths of least effort considered by a learner are only probable paths. The learner would also attempt to minimize the effort of estimating and taking the path itself. Therefore, it is coherent to assume that a learner logically prefers a smartphone over a PC or laptop because it requires less effort to perform the same activity to acquire learning. In this instance, using a smartphone to solve a learning task would generally require less effort with more advantages such as availability, mobility, and convenience. This specific characteristic is hardly captured by other technology adoption theories and models such as the theory of reasoned action (TRA), the technology adoption model (TAM), the unified theory of acceptance and use of technology (UTAUT), the technology-task fit (TTF), and diffusion of innovation (DOI). This makes it a characteristic that is imperative to investigate the emerging technology.

Moreover, past studies asserted that the principle of least effort is eminent in the learning selection process. This principle of the learning process was studied heavily to investigate human behavior in information processing, where it was applied to explain the reasons for the selection and use of information (Chang, 2016) and to the learning process (Men et al., 2017). In an earlier study, Liu and Yang (2004) found that the principle of least effort prevailed in the students' selection and distance education, which was translated into their preference for online information source support and geographical and temporal convenience. In addition, Men et al. (2017) stated that the

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learning coverage in Massive Open Online Courses (MOOC) observed this principle. Zhu and Lei (2018) adopted the principle of least effort to suggest that modern English learning has become less inflectionally diversified, while Rysová and Rysová (2018) used the principle to explain linguistic preference in discourse connectives.

The Lazy User Model

Collan and Tétard (2011) proposed the lazy user model, which was derived from the lazy user model. The model focuses on the needs and characteristics of the user in the dynamic process of selecting a solution among several competing solutions. Furthermore, it explains the decision-making process of users in choosing solutions that would fulfill their needs by using the least effort (Collan & Tétard, 2011; Tétard & Collan, 2009). Table 1 provides a sample of the lazy user model application in the literature.

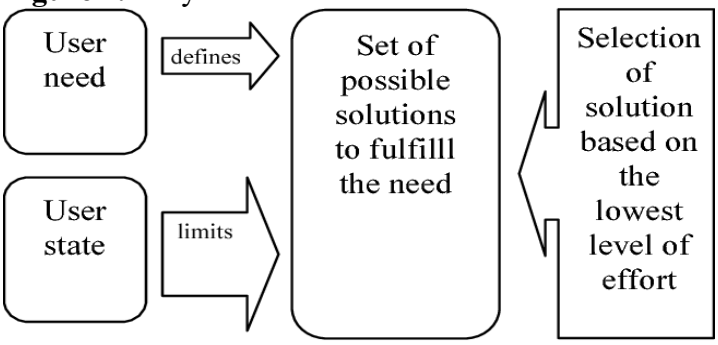
Table 1. A Sample of the Lazy User Model Application in the Literature

Literature	Research area	User	Solution Selection Process
Frank et al. (2018)	digital technologies	Electronic program guide users	switching cost
Niasin & Belkhamza (2021)	mobile shopping	shoppers	online shopping
Pinto et al. (2019)	transportation	commuters	transportation
Mizrachi, (2015)	education	students	learning
Merschbrock et al. (2015)	construction industry	construction designers	digital construction design
Kunene & Diop (2018)	Healthcare management	healthcare consumers	Personal Health Records (PHRs) use
Collan & Tétard (2011)	business	customers	Switching suppliers

According to the lazy user model, each solution has a specific amount of effort required, and the availability of resources is also taken into consideration when selecting a solution. This argument explains the two elements that determine the solution selection: *user need* and *user state*. *User need* refers to the information needed and its urgency, while *user state* refers to the circumstances of the user at the moment of the need (Collan & Tétard, 2007, 2011). These circumstances differ depending on various factors, such as the user's location, available devices, when the need should be met, and other resources that enable the user to act (Frank et al., 2018). If taken together, the selection dynamically changes according to each context and the available resources to fulfill the users' needs. This process asserts that the user may change the solution if the state changes (Tétard & Collan, 2009). Table 1 illustrates this process. From a system user perspective, the model also presents a hypothetical situation where a user prefers using an existing system over a newly introduced system, thus passively disusing the new system, regardless of its utility (Grobler & van der Merwe, 2020).

Collan and Tétard (2011) attempt to explain how a user selects a solution. In addition to the circumstances discussed above, they observed that the learning process is an essential factor for a user to accept a solution.

Figure 1. Lazy User Model



Source. Collan & Tétard, 2011

The Concept of Mobile Learning

There are various definitions of mobile learning in the literature in recent years, and they especially differ for e-learning and other previous and current technology-supported teaching and learning. Mobile learning posits describing, designing, implementing, and evaluating how mobile computing devices can facilitate education, training, and performance support (Grant, 2019). It is regarded as establishing an environment to facilitate learning. Therefore, mobile learning is often highlighted by its positive characteristics such as mobility, immediacy, convenience (Kynäslahti, 2003; Cheon, Lee, Crooks, & Song, 2012), and contextuality (Kearney et al., 2012).

Table 2. The Distinction Between E-Learning and Mobile Learning

Category	E-learning	Mobile learning
Location	lecture in classroom or internet labs learning	learning anywhere, anytime
Device used	Personal computers or laptops Larger screen size Higher processing capability	Mobile devices such as smartphones and tablets. Limited screen size and relatively lower processing capability
Pedagogical Change	More text, graphics-based instructions Lecture in the classroom or in internet labs	More voice, graphics, and animation-based instructions Learning occurs in the field or while mobile
Instructor to Student Communication	Time-delayed (students need to check e-mails or websites) Passive communication Asynchronous Scheduled	Instant delivery of e-mail or SMS Instant communication Synchronous Spontaneous
Student to Student Communication	Face-to-Face Audio-teleconference common e-mail-to-e-mail Private Location Travel time to reach the internet site Dedicated time for group meetings Poor communication due to group consciousness	Flexible Audio- and video-teleconference possible 24/7 instantaneous No geographic boundaries No travel time because of wireless connectivity Flexible timing on a 24/7 basis Rich communication due to one-to-one communication and reduced inhibitions
Feedback to Students	Asynchronous and at times delayed Mass/standardized instruction Benchmark-based grading Simulations & lab-based experiments	Both asynchronous and synchronous Customized instruction Performance & improvement-based grading Real-life cases and on the site experiments

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Grant (2019) examined the many definitions of mobile learning and described them based on four categories: (1) relationship to distance education and e-learning, (2) exploitation of technologies and devices, (3) mediation with technology, and (4) the nomadic nature of the learner and learning. Table 3 summarizes these categories.

Table 3. Definitions of Mobile Learning

Category	Characteristics
Relationship to distance education and e-learning	Uses resources, experts, and information searches when the learners need them Analogous to web-based learning
Exploitation of devices and technologies	Highlights the uses of devices and networks to support teaching and learning
Mediation with technology	Focus on how interactions with environments and individuals are mediated (or facilitated) using mobile computing devices and mobile data services
Nomadic nature of the learner and learning	Learners not in a predetermined or standard location Learning anytime, anyplace, and between areas of life Ubiquity of learning across contexts

Source. Grant, 2019

These categories are important in defining mobile learning because they enable researchers to outline *what is* and *what is not* mobile learning research. Mobile learning should not be taken as an ambiguous term that may catch any notion unsystematically (Grant, 2019). Thus, the term should be regarded as a theoretical operationalization for research and recognized for its design characteristics that are essential to mobile learning environments.

What makes Grant's categories on mobile learning definitions so valuable is realized in two points. First, these categories are described regarding assumptions, limitations, and comparisons to previous technology-supported learning topics, which enhance their relevance to mobile learning. Second, it builds on the earlier seminal work of Winter (2006), which detailed four perspectives of mobile learning definitions.

Design Characteristics for a Mobile Learning Environment

Clark (2019) noted that many studies he has reviewed have either not relied on frameworks to design or implement mobile learning, or failed to report a framework. The mobile learning field has yet to present a known framework to support the integration of mobile devices in education. Viberg et al. (2018) has given a critical justification. They asserted that the overall development of mobile technologies was not initially designed for learning purposes, which may impact the potential effectiveness of its integration into education.

Table 4. Summary of Design Characteristics of a Mobile Learning Environment

Design Characteristics	Description
Learner is mobile	A learner employing key learning characteristics of learner autonomy, self-regulation, self-directedness, and metacognition
Device is mobile	A mobile device such as a tablet, smartphone, and imminent wearable technologies with the ability to access data networks and data services that may act as a scaffold and as social, metacognitive, or cognitive tools
Data services are persistent	Persistent data and network services, including Wifi and cellular networks but also considers developing networks and connections for Bluetooth, radio frequency identification (RFID), and near field communications (NFC)
Content is mobile	Learning contents, including formal instruction or training, resources, media, and data; learning goals for informal learning environments that are primarily at the direction of the learner; or performance and decision supports to aid individuals at the time of need
Tutor is accessible	A tutor, such as a teacher, facilitator, mentor, peer, coach, networked expert, intelligent tutor, or pedagogical agent
Physical and networked cultures and contexts impact learning or learner	A description of how physical and networked cultures and contexts impact the learner and the characteristics of the learning
Learner is engaged	A description of the method(s) for how the learner engages with the characteristics of the mobile learning environment for formal, informal, or semi-formal learning

Source. Grant, 2019

Mobile Learner's Engagement

Engagement is one of the most important aspects of the learning process. It is defined as active involvement in course activities with continuous efforts to attain desired learning outcomes (Richardson & Newby, 2006), and it is a crucial factor that affects learner's persistence and learning efficiency (Dixon, 2015).

Bosch (2016) discussed three different forms of engagement: affective, behavioral, and cognitive. He defines effective engagement as the emotional attitude and defines behavioral engagement as the commitment of the learner to be involved in the process of learning. Cognitive engagement is defined as the willingness to employ the effort necessary to understand complex ideas and master challenging skills. Emotional engagement refers to the reactions to learning process enablers, such as teachers, classmates, and academics. Finally, psychological engagement refers to the sense of belonging and relationships that learners have with teachers and peers (Christenson & Anderson, 2002).

Quinn (2005) described engagement as a situation when learners are captured, heart and mind, in learning and are cognitively and effectively connected to the learning experience. Based on this definition, White (2010) considered engagement a vital element in the learning environment. Benrnachi et al. (2020) asserted that the outcome of digital media and devices could help to assist further to understand how features of the context-specific learning objects influence the learner's cognitive engagement and learning outcomes. Moreover, the learning process is needed to guide connectivity with learning providers. This would enable learning providers to support learners, as they drive their engagement with mobile learning.

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Framework Development

The evolution of wireless technologies and mobile device applications has facilitated the use of mobile devices in the teaching and learning process and allows easy access to people, resources, and information regardless of location. Learning is, above all, a human behavior. Therefore, based on the above conclusion, the learner will logically prefer mobile learning over other means or e-learning, as the use of mobile devices would require less effort to perform the same learning task, with more advantages such as availability, mobility, and convenience. While the objective of mobile learning remains the same as other means of e-learning, the process selection and behavioral intention of use may differ significantly. Table 2 highlights some of these differences.

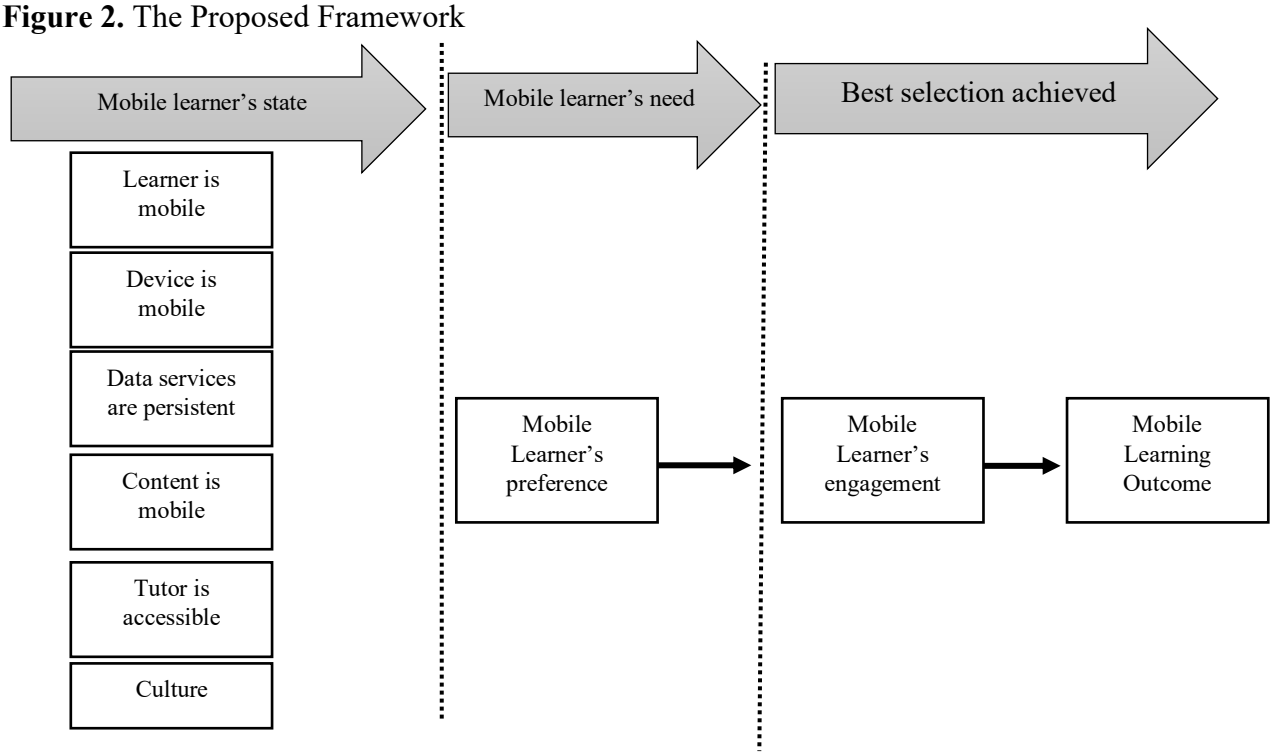
The lazy user model is one of the technology adoptions models that specifies the user's actual and external beliefs and attributes and, ultimately, the decision-making process that stems from beliefs and intention to behavior or action (Dählmann & Sauer, 2019). However, this solution selection process is strongly correlated to the user's learning process at the time of selection, which can also be generally applied to learning in a broader context. The need to investigate the solution selection in the learning process is because of what the mixed results literature has revealed. Mizrachi (2015) has posed the following question: *Are students changing their study behaviors and learning styles as electronic books, journals, and resources become more prevalent in academic libraries?* The answer to this question is not that simple. According to Mizrachi (2015), we cannot assume that the current situation involving learner selection will remain unchanged; therefore, frequently tracing the attitudes and behaviors of the learner is imperative to continually assess the adoption of emerging technologies in the learning process.

In a similar learning environment, the learner's selection seems to be related to what Dold (2016) called *user preference*. A preference for a mobile device in a mobile environment may limit the sources of learning for the learner during the selection process. The idea of preference was raised in Coens et al. (2011), where they investigated user preference to see if it influences learning. Similarly, Connaway et al. (2011) investigated two questions. First, why does a learner choose one information source over another? Second, what factors could contribute to his or her selection of information sources? Dold (2016) concludes her review by noting that a learner's preference for library access is straightforward; she confirmed that the principle of least effort drives the learner when seeking information.

From the above discussion, this paper proposes a framework that considers achieving learning outcomes by enabling learner's engagement within the design characteristics of the mobile learning environment. By facilitating this environment, the learners will act as theorized by the lazy user model, thus defining their needs and limiting their state to achieve the best solution of having mobile learning engagement. The following figure illustrates the proposed framework.

It should be noted that the core requirement for mobile learning is having unique active ingredients within a learning environment (Grant, 2019; Herrington et al., 2010). Grant (2019) reviewed previous design characteristics and introduced them to reflect a planned learning design. They help to inform practice by informing design. The proposed framework adopts these design characteristics as the key enablers of the mobile environment that instill both learner's state and learner's need to facilitate the solution selection. This selection process is reflected in achieving the learner's engagement and, therefore, the desired learning outcome.

Figure 2. The Proposed Framework



Conclusion and Future Work

The evolution of mobile technology has changed the way humans behave and act and facilitates the use of mobile devices in the teaching and learning process. The learner logically prefers mobile learning over other means of e-learning, as the use of mobile devices requires less effort to perform the same learning task and has more advantages, such as availability, mobility, and convenience. This paper has proposed a framework that helps to better understand the learner's interaction with mobile technology to achieve learning. The traditional e-learning environment differs due to different settings and characteristics. It was imperative to adopt a robust design characteristic that was suitable for mobile technology and encouraged learner engagement to achieve the learning outcome. This paper may serve as a general guideline for further research that considers achieving learning outcomes by enabling learner's engagement within the design characteristics of the mobile learning environment. The paper also identifies existing shortcomings in the literature and paves the way for advanced research to better understand how mobile learners act based on the lazy user model to achieve mobile learning engagement. Hopefully, this research framework may be further enhanced and operationalized empirically to achieve its objective.

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