# Utilitarian and intrinsic motivations to use mobile learning technologies: An extended technology acceptance model

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Students are increasingly utilizing mobile learning applications (m-learning apps) in various contexts. They can access their content from anywhere, anytime. This research explores the students' perceptions about learning technologies in a higher educational context. It integrates the Technology Acceptance Model's (TAM) constructs with "perceived enjoyment" to better understand their dispositions to engage with educational apps. The data was gathered through an online survey questionnaire among 317 research participants who were following full time university courses in a Southern European country. The findings suggest that the students were motivated to use learning apps. Their perceived usefulness, ease-of-use and enjoyment were having a significant effect on their intentions to continue using them in the future. This contribution implies that "perceived enjoyment" construct can be combined with TAM to shed more light on the users' intrinsic motivations to use mobile apps for educational purposes.

CCS CONCEPTS • General and reference~Document types~Surveys and overviews • Information systems~Information systems applications~Mobile information processing systems • Human-centered computing~Ubiquitous and mobile computing~Empirical studies in ubiquitous and mobile computing

**Additional Keywords and Phrases:** Technology Acceptance Model, mobile learning, perceived enjoyment, educational apps, higher education.

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## 1 INTRODUCTION

Previous research explored the students' intentions to use education technologies [1-4]. Many researchers relied on measures that were tried and tested in academia [5-7]. Very often, they used constructs that were drawn from information communications technology literature and adapted them to investigate perceptions and attitudes toward use of technologies in different settings, including in primary, secondary and tertiary educational levels. Various authors have often discussed about the pros and cons of utilizing technologies in education [4, 8]. In the last two years, there was an increased focus on technology adoption in education. More researchers

sought to investigate the students' engagement with remote learning technologies including learning management systems, conferencing technologies, and mobile apps, particularly since the outbreak of COVID-19 [3, 4].

Notwithstanding, the majority of students are using their own mobile devices including tablets and smart phones to access educational apps to continue their learning journey at university [5, 8, 9, 10]. Individuals may use mobile devices to access content (instrumentality) when they are out and about (mobility) [11]. Mobile technologies provide immediate access to a wide array of online information including educational content, images and videos (e.g. via YouTube, TicToc and Instagram, among others) [3]. Of course, there are many factors that could influence the students' motivations to use mobile technologies in higher education [1, 12, 13].

This contribution builds on previous theoretical underpinnings as it investigates higher education students' perceptions, attitudes and intentions to engage with mobile technologies [14-17]. It explored their utilitarian and intrinsic motivations to use m-learning apps to continue their learning journey during COVID-19.

The methodology relies on constructs that were tried and tested in academia. The survey featured measuring scales from TAM's perceived ease-of-use, perceived usefulness, attitudes and intentions the [18, 19]. However, it differentiates itself from previous research as it integrated them with a perceived enjoyment construct [20, 21], to examine the students' interactive engagement with m-learning apps.

The researchers presume that students may hold different perceptions and attitudes toward the use of these immersive educational technologies [3] as opposed to traditional learning approaches [21]. Notwithstanding, many students were pressurized to migrate from face-to-face and blended learning methodologies to a fully virtual environment during different waves of COVID-19 pandemic. In this light, this research provides a snapshot on the university students' willingness to continue using these ubiquitous technologies and their software, in a post-COVID-19 scenario.

## 2 LITERATURE REVIEW

### 2.1 The technology acceptance model

A review of the relevant literature reported that generally individuals hold positive attitudes toward certain technologies. Very often they consider them as user-friendly, easy-to-use or "free of effort" [23, 24]. Many commentators argued that individuals will probably engage with education technologies if they felt that they were easy-to-use [2, 25]. Various researchers reported that the individuals' perceptions on the ease-of-use of education technologies will have a positive effect on their perceived usefulness and on their attitudes toward them. The individuals' attitudes refer to the degrees to which persons hold favorable or unfavorable beliefs about subjects or toward certain behaviors [26]. In a similar vein, this study hypothesizes that:

H1: There is a positive and significant relationship between the students' perceived ease-of-use of m-learning apps and their perceived usefulness.

H2: There is a positive and significant relationship between the students' perceived ease-of-use of m-learning apps and their attitudes towards them.

On the other hand, individuals may not always like to engage with specific technologies. They might find them complex, complicated or may think that they are difficult to use [18]. Hence, there may be different reasons why they may not have positive attitudes towards technologies. Usually, people use technologies for utilitarian reasons (23, 27, 28, 29] or for hedonistic purposes as they find them entertaining [30, 31]. TAM's key constructs

were often focused to determine the extent to which individuals believe that specific technologies could improve their job performance.

Thus, TAM has frequently been utilized in educational research to better understand the students' perceptions about the usefulness of certain learning technologies. The original TAM version (TAM1) hypothesized that the individuals' perceived usefulness of technologies is a significant antecedent of their attitudes towards them, to determine whether they have supported them in achieving their learning outcomes [3, 4]. Therefore, this research hypothesizes:

H3: There is a positive and significant relationship between the students' perceived usefulness of m-learning apps and their attitudes toward them.

A good number of researchers confirmed that their participants' attitudes toward education technologies were affecting their intentions to continue using them in the future [3]. These studies were also consistent with Ajzen's [31] theory of planned behavior (TPB), as attitudes toward the technology is one of the most important factors that determines the users' intentions to use them [3, 7, 11]. This argumentation leads to the following hypothesis:

H4: There is a positive and significant relationship between the students' attitudes toward m-learning apps and their intentions to use them.

### 2.2 Perceived Enjoyment from the Usage of Technology

The individuals' acceptance of technology can be influenced by intrinsic factors. Individuals may seek non-utilitarian, gratifications including enjoyment, when they engage with certain technologies. This is in line with the User Gratifications Theory (UGT) [30]. UGT seeks to explain why and how individuals are intrigued to use innovative technologies to satisfy social and psychological needs. Individuals also seek emotional gratifications from media technologies. They may use their mobile devices on a habitual basis and/or when they have time to spare [20].

Previous research reported that perceived enjoyment can influence the individuals' behavioral intentions to continue using education technologies like mobile devices [15, 21]. Similarly, this research hypothesizes that:

H5: There is a positive and significant relationship between the students' perceived enjoyment toward m-learning apps and their intentions to them.

Figure 1 provides a clear illustration of the proposed research model. It depicts the hypotheses of this empirical study.

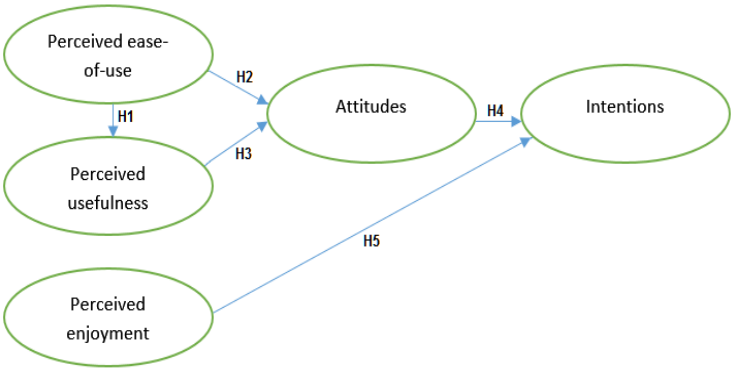


Figure 1: The research model and the formulation of hypotheses.

## 3 METHODOLOGY

### 3.1 The questionnaire's measures

The questionnaire's design, layout and content were consistent with this contribution's underlying research questions and with its stated hypotheses. The survey's measures were adapted from key theoretical underpinnings relating to TAM's 'perceived usefulness', 'perceived ease-of-use' and 'attitudes toward technology adoption' [23, 24] and with the relevant literature on perceived enjoyment of utilitarian devices [20, 21, 30]. Previous studies confirmed that the reliability of TAM constructs [6, 18, 21, 23, 24] and of perceived enjoyment construct [20. 21]. The constructs and the items that were adopted in the survey instrument are featured in Table 1.

Table 1 The survey questionnaire's constructs and their corresponding items

| **Construct** | | **Items** |
|---|---|---|
| Perceived Usefulness<br><br>(Davis, 1989) | PU1 | The mobile learning apps are useful for my course program. |
| | PU2 | The mobile learning apps increase my chances of learning. |
| | PU3 | The mobile learning apps help me learn things more quickly. |
| Perceived Ease-of-use<br><br>(Davis, 1989) | PEoU1 | Learning how to use the mobile learning apps is easy for me. |
| | PEoU2 | My interaction with the mobile learning apps is clear and understandable. |
| | PEoU3 | The mobile learning apps are easy to use. |
| Attitudes<br><br>(Davis, 1989) | ATT1 | The use of the mobile learning apps is frustrating for me. (R) |
| | ATT2 | I get bored quickly when I use the mobile learning apps. (R) |
| Perceived Enjoyment<br><br>(Camilleri and Camilleri, 2019) | PE1 | The use of the mobile learning apps is fun. |
| | PE2 | The use of the mobile learning apps is exciting. |
| | PE3 | The use of the mobile learning apps is interesting. |
| Behavioral Intention<br><br>(Davis, 1989) | BI1 | It is very likely that I shall continue using the mobile learning apps in the future |
| | BI2 | Probably, I will use mobile learning apps in my daily life. |
| | BI3 | I will use mobile learning apps as frequently as possible. |

The questionnaire consisted of 17 multiple choice questions including three demographic ones, that were placed in the latter part of the survey. The participants disclosed information about their 'age' and 'gender'. They also indicated their 'experience with m-learning technologies'. The respondents could complete the questionnaire in less than ten minutes. The responses were coded on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree) with 3 signaling a neutral position.

### 3.2 Data capture and analysis

The research participants were registered students in Southern European university. There were more than 11,000 students who were pursuing full time, part time and distance learning courses in this higher education institution (HEI). The university's registrar disseminated this study's survey questionnaire and a cover letter that informed research participants about the aims and objectives of this empirical investigation. It also provided them useful guidelines on how to complete the questionnaire. After two weeks, there were 322 responses to the survey. The researchers scrutinized the returned questionnaires and checked for incomplete responses. There were five questionnaires that were not included in the analysis as they had missing values. Hence, the research sample of this study consisted of 317 valid responses.

The responses were uploaded onto IBM SPSS statistical software. The researchers evaluated the socio-demographic profile of their respondents and explored the descriptive statistics. They confirmed the reliability of their constructs. Moreover, they carried out a principal component analysis (PCA) to reduce the dimensionality of the dataset, and to detect any underlying structure among the measures. PCA also confirmed the validity of their chosen measures. Only factor loadings that were above the 0.5 benchmark were considered in the analyses. In conclusion, this research investigated this contribution's hypotheses through stepwise regression analyses that also shed light on the coefficients of determination and on the significance of the relationships.

## 4 RESULTS

### 4.1 The research sample

The frequency table reported that there were one hundred eighty-six (n=186) females and one hundred thirty-one (n = 131) males who participated in this study. The respondents were classified into five age groups (18-23; 24-29; 30-35; 36-41 and over 42 years of age). Most of the research participants were between 18 and 23 years of age (n = 255), this group was followed by those between 24 and 29 years of age (n = 48). The majority of respondents (n = 311) revealed that they have been using the m-learning technologies in the past year.

### 4.2 The descriptive statistics

Generally, the respondents indicated that they agreed with the questionnaire's statements as there were high mean (M) scores that were above the midpoint (3). There was only one value (that represented a behavioral intention item) that was slightly below 3 (M = 2.95). Moreover, the standard deviation values (SD) indicated that there were small variances in the participants' responses. These values varied from 0.867 to 1.42. Overall, there was a normal distribution in the dataset except for ATT2.

### 4.3 The principal component analysis

The Kaiser Meyer Olkin test reported a KMO of 0.714. Therefore, the sampling adequacy was acceptable as it was 0.67. Bartlett's test of sphericity revealed that there was sufficient correlation in the dataset to run a principal component analysis (PCA) since $p < 0.001$. Therefore, a PCA assessed the validity of the constructs and provided a factor solution of salient components that shared relevant similarities (and differences).

A varimax rotation was used to reconstruct this study's seven composite factors. The items with the highest loadings were used to identify the factor components. The values of the factor loadings were more than 0.5. Hence, they indicated that there were highly significant correlations. Table 2 illustrates the findings from PCA. It features the extracted components, their respective eigenvalues, percentages of variance, cumulative percentages of variances as well as the values that represented Cronbach's alpha for every construct.

Table 2. The findings from the principal component analysis

| Component | Initial Eigenvalues | | | Rotation Sum of Square Loadings | | | Cronbach's Alpha |
|---|---|---|---|---|---|---|---|
| | Eig. | % of Var. | Cum. % | Eig. | % of Var. | Cum. % | |
| 1 Perceived Usefulness (PU) | 6.560 | 24.569 | 24.569 | 3.122 | 18.027 | 18.127 | 0.89 |
| 2 Perceived Ease-of-use (PEoU) | 3.226 | 13.393 | 37.962 | 2.190 | 12.840 | 30.967 | 0.83 |
| 3 Behavioral Intentions (BI) | 2.218 | 12.381 | 50.343 | 1.852 | 10.525 | 41.492 | 0.79 |
| 4 Perceived Enjoyment (PE) | 1.432 | 7.991 | 58.334 | 2.000 | 9.744 | 51.236 | 0.81 |
| 6 Attitudes toward technologies (ATT) | 0.998 | 5.272 | 63.606 | 1.639 | 8.297 | 59.533 | 0.77 |

The factors components accounted to almost 64% of the variance. The Cronbach's alpha values that were higher than 0.7 for all constructs (i.e. the recommended threshold). The alpha coefficient ranged from 0.77 (for ATT) to 0.89 (for PU).

### 4.4 The multivariate regression analyses

A stepwise procedure was used to investigate whether there were significant correlations, where the p-value had to be less than 0.05 benchmark. Therefore, the insignificant variables were excluded from this research's empirical investigation.

The first four hypotheses were related to the TAM, whilst the fifth hypothesis investigated the effects of perceived enjoyment on intentions to use m-learning apps. The following results represent the strength and the significance of the hypothesized relationships.

H1: The results from the linear regression analysis revealed that perceived ease-of-use anticipated the perceived usefulness of these mobile technologies, where the adj. $r2 = 0.498$ and the t value = 7.255). This relationship was significant as $p < 0.001$. H2: There was also a positive and significant relationship between

the students' perceived ease-of-use of m-learning apps and their attitudes towards them, where the adj. r2 = 0.284 and the t value = 3.884. This relationship was significant as $p < 0.05$.

H3: The students' perceptions on the usefulness of the m-learning apps had a positive and significant effect ($p < 0.05$) on their attitudes, where the adj. r2 = 0.319 and the t value = 5.557. H4: The students' attitudes towards the m-learning technologies had a positive and significant effect ($p < 0.05$) on their intentions to use them. The adj. r2 = 0.114 and t = 2.014. H5: Moreover, there was also a positive and significant relationship between the students' perceived enjoyment from the use of m-learning apps and their intentions to continue using them as adj. r2 = 0.401 where t value = 6.905. The measurement of significance indicated a confidence level of 98.3% (where $p = 0.017$).

### 4.5 Discussion

This study's descriptive statistics indicated that there were high means scores toward the survey's statements. Hence, the students held positive attitudes towards m-learning apps. They also perceived their ease-of-use. The findings suggested that they enjoyed engaging with mobile technologies and that they considered them as useful tools to improve their learning outcomes. Moreover, these results revealed that, in the main, they were willing to continue using them.

PCA confirmed that the students' felt that the mobile apps were useful for their course program. The perceived usefulness construct was the most important factor component. Evidently, mobiles apps (that are available through tablets and smart phones) supported them in their learning journey and helped them to enhance their existing knowledge on the topics that they studied. The students relied on these devices to engage in synchronous and asynchronous learning during different waves of COVID-19. The PCA results also reported that the students' intention was to keep using them in the foreseeable future as they considered the m-learning apps as easy-to-use, fun, interesting and exciting.

The stepwise regression revealed that there were positive and significant relationships among the hypothesized relationships of this study. This research validated the relationships within TAM's original model. The most significant relationship was reported between perceived ease-of-use and perceived usefulness of m-learning apps. This study found that these constructs were also affecting the participants' attitudes towards these technologies, and that this latter construct was, in turn an antecedent of their behavioral intentions to continue using them. Thus, this study confirmed that higher education students were using educational apps for utilitarian motivations.

Nevertheless, the findings indicated that the research participants were enjoying their engagement with m-learning technologies. The study suggested that their perceived enjoyment was the most important factor that predicted their intentions to continue using them. The students' perceptions on the usefulness of m-learning apps, their ease-of-use and their attitudes towards them, had lower effects on their intentions to use them, when compared to perceived enjoyment - behavioral intentions link.

## CONCLUSIONS

During COVID-19, educational apps have supported many students in their learning journeys [1, 9, 13]. They enabled them to access learning management systems and also to engage in synchronous conversations with other individuals [3, 4].

One may argue that the m-learning paradigm is associated with constructivist approaches [8], including with discovery-based learning. Key theoretical underpinnings suggest that the use of ubiquitous technologies including smart phones and tablets, can improve the delivery of quality, student-centered education [21, 33].

Recently, there is an increased focus in academia on the utilization of m-learning technologies in different contexts [1, 8, 14, 15]. Various studies are integrating key constructs from information technology research including from TAM [23] or from UTAUT [18, 19, 34], among others, to explore the students' readiness to engage with mobile apps. In many cases, various contributions posited that today's students are perceiving the usefulness and the ease-of-use of these innovations in the realms of education.

A thorough review of the literature revealed that for the time being there are few studies in academia that have integrated a perceived enjoyment construct with TAM's original factors including perceived ease-of-use, perceived usefulness and attitudes toward use (of m-learning apps). Hence, this contribution addresses this knowledge gap in the extant literature. In sum, its study is consistent with its underlying research questions.

This research investigated higher education students' perceptions, attitudes and intentions to use m-learning technologies during the third wave of COVID-19. The research participants indicated that they were motivated to use m-learning apps to continue their learning journey during the pandemic. Evidently, the students were still using asynchronous and synchronous resources, even when restrictions were eased. They accessed them through their mobile technologies, at home or on campus.

This research raises awareness about the potential of using mobile apps in higher educational settings, as they allow students to access course content (e.g., Moodle or other virtual learning environments) as well as video conferencing facilities from everywhere, and at any time.

The students themselves indicated that they considered these technologies as useful tools that can help them improve their learning journeys. Hence, there is scope for the university educators and policy makers to create and adopt these educational technologies in addition to traditional teaching methodologies, to continue delivering quality education [35]. M-learning apps could be developed in such a way to enhance the users' experiences [36]. This research clearly reported that their perceived enjoyment was one of the antecedents of their increased engagement with these ubiquitous technologies.

To date, there have been limited studies that integrated perceived enjoyment and utilitarian motivations to better understand the acceptance and usage of m-learning apps in higher education, albeit a few exceptions.

In this case, this study has adapted measures that were drawn from TAM and Uses and Gratifications Theory. It clearly differentiated itself from other research as it integrated perceived ease-of-use, perceived usefulness, attitudes toward technologies with a perceived enjoyment construct [20, 21], to understand which factors were affecting their intentions to use m-learning apps. The hypotheses were tested through stepwise regression analyses. The number of respondents that participated in this study was adequate and sufficient for the statistical purposes of this research. However, future research could investigate other factors that are affecting the students' engagement with m-learning apps. For example, researchers can explore other intrinsic and extrinsic motivations of students. They could examine their effects on their intentions to use these technologies.

Qualitative research could elaborate further on the students' opinions, beliefs and personal experiences with m-learning apps. They may distinguish among different types of apps, including quizzes, serious games and simulations, among others Inductive studies could clarify how, where, when and why mobile apps are utilized as blended learning resources for the delivery of student-centered education in various disciplines, and in

different levels. They can also shed more light on the strengths and weaknesses of integrating them in the curricula and course programs of specific subjects.

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**Authors' background**

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