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Informal tools in formal contexts: Development of a model to assess the acceptance of mobile technologies among teachers



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ABSTRACT

Traditionally, mobile learning has been more strongly developed within the field of informal education. However, in the past few years there has been a growing interest for the integration of these technologies in the formal education field. Among the key elements needed to successfully achieve this integration process is the acceptance of mobile technologies by the teaching body.

In this paper we propose to identify the determining constructs that explain the teachers' intention of using mobile technologies. To this end we have designed a research model based on the Technology Acceptance Model (TAM), expanded with constructs from other theories. The resulting model was subjected to a content validation process performed by a committee of experts.

Lastly, we selected nine constructs for the development of the research model and we formulated 13 hypotheses that describe the relationships among them. Further studies on the research model to extend its validity and reliability are suggested.

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1. Introduction

Over the past few years, mobile technologies have experienced an important expansion process and the consolidation of their popularity as devices used in day-to-day activities (Fundación Telefónica, 2014). This quick expansion has caused an increase in the fields that have shown interest in the advantages derived from the integration of these resources. Thus, the concept of mobile learning (mLearning) emerged in the educational field aiming to make the most out of mobile devices as learning tools.

This new methodology has been reinforced lately thanks to the incorporation of two devices, smartphones and tablets, which have strengthened the advantages inherent to mLearning, such as the individualization of the content, the increased flexibility of the learning process, the adaptability, the access to the information and the multimedia support, helping to overcome problems related with the autonomy or, in the case of the tablets, with content creation (Rossing, Miller, Cecil, & Stamper, 2012).

Traditionally, mobile learning has been more strongly developed within the field of informal education, where we can find

experiences in settings such as museums (Wishart & Triggs, 2010). This phenomenon is mainly due to the fact that mLearning entails a more contextual, individualized and situated learning (Traxler, 2009).

The integration of processes and resources from informal education into formal education can contribute to offer educational solutions to help schools adapt to the needs of an ever-changing society that demands a more flexible and individualized education, and to locate the students at the center of the teaching–learning process and offer them more control (Conde et al., 2012). As a consequence of this, there are a growing number of experiences on the use of mLearning as a bridge between informal and formal education (Dabbagh & Kitsantas, 2012).

The educational application of these technologies promotes communication and the student's autonomous learning, and it allows us to take the teaching–learning process out of the classroom, thus enabling learning anytime, anywhere. This causes the barriers between formal and informal education to debilitate, demanding the development of new methodological strategies (Sharples, Amedillo Sanchez, Milrad, & Vavoula, 2009) which contribute to opening up the schools to the outside world, creating bonds between schools and families and between teachers and students which allow teachers to guide the students' learning process inside and outside the classroom (Mills, Knezek, & Khaddage, 2014).

Currently, we can find experiences related to the integration of

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mobile devices in all stages of the formal education system, from the teaching of language and literature in pre-primary and primary education (Beschoner & Hutchison, 2013; Hutchison, Beschoner, & Schmidt-Crawford, 2012) to the creation of personal learning environments (PLE) (Conde González, García Peñalvo, Alier, & Piguillem, 2013), including the use of tablets as an only working tool in zero-paper environments (Hesser & Schwartz, 2013) or as a support for augmented reality (AR) applications in secondary education (Navarro, Galindo, & Fonseca, 2013).

However, despite the growing interest, the integration of mLearning strategies in formal education institutions and processes is still at a primary development stage, given that the initiatives are isolated, they rarely have any continuity and in some cases they do not yield the expected results (Sánchez Prieto, Olmos Miguellán, García Peñalvo, & Torrecilla Sánchez, 2014).

One of the cornerstones of the integration of new technologies in the teaching–learning process is their acceptance by the teachers involved in said process (Chen, Looi, & Chen, 2009). To this end, it is important to know the key elements that lead to technology acceptance so we can diagnose, predict and intervene in the appropriate situations.

With the objective of exploring and identifying the factors that determine primary teachers' acceptance of mobile technologies, we have proposed a model based on the Technology Acceptance Model (TAM) (Davis, 1989), which, based on the literature consulted, we have expanded by adding constructs and relational hypotheses from other models and theories such as Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003) or the Theory of Planned Behaviour (TPB) (Ajzen, 1985). After drafting the original proposal, and aiming to ensure the validity of its content, a validation process was carried out by a group of experts from different fields.

In order to present said model, this paper will have the following structure: we will begin by describing the TAM model and its use as a tool to study technology acceptance processes in the educational field, then we will focus on presenting our model by explaining the foundation of the selected construct and describing the content validation process, as well as the ensuing changes in the model. Lastly, we will present some brief conclusions where we will indicate the future steps in the process.

2. The TAM model

Since Davis (1986) formulated it, the TAM model has followed an intense evolution process over the years, until it became the reference model it is nowadays (Marangunié & Granié, 2014).

In this section we will describe said process, from its direct antecedents to the current situation and the more frequent uses of the model in education.

2.1. Origin and evolution

The main antecedent on the TAM model is the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). This theory, born within the field of social psychology, intends to predict a person's behavior through their behavioral intentions, understood as the subjective probability of an individual performing a given behavior, instead of their attitudes, which represent "A person's general feeling of favorableness or unfavorableness toward some stimulus object" (Ajzen, 1985, p. 156) and whose effect on behavior would be mediated by said behavioral intention (see Fig. 1).

For Ajzen and Fishbein, behavioral intention is determined by the attitude toward the behavior and the subjective norm, which is the social or organizational pressure toward the performance of a behavior as perceived by an individual (Wu & Chen, 2005).

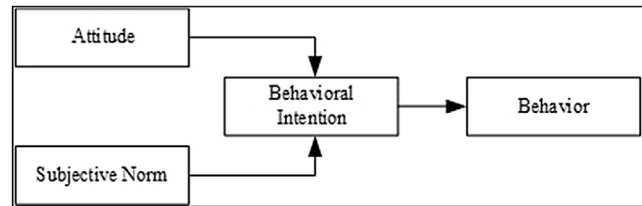


Fig. 1. Theory of reasoned action (Fishbein & Ajzen, 1975).

Davis elaborated a simplified proposal from this theory's assumptions, adapted to analyse the information system (IS) adoption process, and maintaining the concept of behavioral intention (BI) as a direct antecedent of the behavior, which in this case is the actual use (AU) of a given information system.

Just like in the TRA, this behavioral intention would be determined by the individual's attitude, which would in its turn be conditioned by the usefulness and the ease of use of the information system as perceived by the individual (see Fig. 2).

Davis defines perceived usefulness (PU) as, "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320).

On the other hand, perceived ease of use (PEU) is understood in this model as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 320). This construct would also influence the perceived usefulness, although there is some disagreement on this point among the scientific community (Hernández García, 2008).

The resultant proposal drafted by Davis has as its main advantage its simplicity and theoretical soundness, constituting a robust model which is able to explain a high percentage of the variance, which is why it is such an extended model (King & He, 2006).

However, the TAM also presents a series of limitations, among which the following stand out (Hernández García, 2008; Legris, Ingham, & Colletette, 2003):

- *Lack of consideration of external variables:* Including factors such as previous experience, perceived enjoyment or facilitating conditions.
- *Dependence on self-reports:* This dependence occurs when measuring the use of the system, which limits the reliability of the model and it hinders the study of the relationship between the BI and AU of the system (Agudo-Peregrina, Hernández-García, & Pascual-Miguel, 2014).
- *Low levels of variance in exploratory studies:* In this type of studies, the explanation of behavioral intention can, on occasion, be relatively low.

Since its origin, and aiming to overcome these limitations, the model has evolved, sometimes including new constructs. Generally, the modifications made on the TAM can be grouped in the following categories (King & He, 2006):

- *Inclusion of external precursors:* Such as previous experience and self-efficacy.
- *Incorporation of factors suggested by other theories:* Some authors add constructs from other theories aiming to increase the model's predictive ability.
- *Inclusion of contextual factors:* Factors from the environment of the organization, the individual or the information system, such as: gender, culture, or the characteristics of the technology.
- *Measurement of final elements:* This group refers to the measurement of attitude, perceived use and actual use.

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