Students' Acceptance of E-Learning Technologies: Combining the Technology Acceptance Model with the Didactic Circle

Research-in-Progress

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Abstract

Despite their advantages, *e-learning technologies* are relatively underutilized. Attitudes towards learning methods, which are gained during school years, shape learners' corresponding life-long attitudes. Hence, we believe that it is important to influence students' *Attitude toward Using e-learning technologies* during classes, in order to increase their acceptance of these technologies throughout their lives. Consequently, we seek to identify potential influence factors of students' *Attitude toward Using e-learning technologies* that can be addressed by teachers during class. To this effect, we combine the *Didactic Circle* with the *Technology Acceptance Model* (TAM). More specifically, we postulate that five *Didactic Circle-based* constructs — *Instructor's Attitude towards E-Learning Technologies*, *Instructor's Computer Competence*, *Presence of Games*, *Working in Groups*, and *Availability of Required IT-Infrastructure* — have a positive influence on the antecedents of TAM's *Attitude towards Using*, i.e., *Perceived Ease of Use*, *Perceived Enjoyment*, and *Perceived Usefulness*.

Keywords

Didactic Circle, E-Learning, Technology Acceptance Model.

Introduction

Our society is increasingly shaped by information, knowledge, and learning. Indeed, the "access to up-to-date information and knowledge, together with the motivation and skills to use these resources intelligently" are regularly seen as key factors for the success and competitiveness of companies (Commission of the European Communities 2000, p. 5). These developments have led to an increasing supply of *e-learning technologies* worldwide, that is, computer-based forms of teaching and learning that enable users to learn regardless of time and place (Iberer 2010).

E-learning technologies provide several advantages over traditional training possibilities like courses and seminars. Whereas the latter two are held by people and are bound by time and place, *e-learning technologies* are able to provide training and education to anyone, anytime and anywhere (Ong et al. 2004). Furthermore, *e-learning technologies* are regularly considered to be more cost-effective than their traditional counterparts, with many companies realizing corresponding cost benefits (Šumak et al. 2011). However, despite these advantages, *e-learning technologies* are still relatively underutilized, their success being inhibited by the lack of acceptance by learners (Ong et al. 2004).

It has been shown that a learner's positive or negative attitude towards training, education, and learning methods, which is gained during school years, shapes his corresponding life-long attitude towards these methods (Mager 1968), which is an antecedent of actual usage behavior (Ajzen 1991). Hence, we believe that it is important to influence students' *Attitude toward Using e-learning technologies* in their classes, in order to increase their acceptance of these technologies throughout their lives. Consequently, we seek

to identify potential influence factors of students' *Attitude toward Using e-learning technologies* that can be addressed by teachers during class.

In order to accomplish this, we built on the *Technology Acceptance Model* (TAM) (Davis et al. 1989; Van der Heijden 2004), the most commonly used model to explain technology acceptance (Venkatesh and Bala 2008). Since the situation under study is in a school setting, we supplemented this model with insights from didactic research. More specifically, we combined the TAM with the *Didactic Circle*, an influential model of didactic research that provides insights for lesson planning. This led us to postulate that five constructs (*Instructor's Attitude towards E-Learning Technologies*, *Instructor's Computer Competence*, *Presence of Games*, *Working in Groups*, *Availability of Required IT-Infrastructure*) have a positive influence on the antecedents of TAM's *Attitude toward Using*, that is, on *Perceived Ease of Use*, *Perceived Enjoyment*, and *Perceived Usefulness*.

The next section explains the TAM and the *Didactic Circle*. Following this, we present our research model. Finally, we outline the planned subsequent empirical evaluation of our model.

Theoretical Background

The Technology Acceptance Model

The Technology Acceptance Model (TAM) (Davis et al. 1989) has been used in numerous research articles and thus acquired a prominent status in technology acceptance literature (Chang et al. 2010). It postulates that two personal beliefs, *Perceived Usefulness* and *Perceived Ease of Use*, which are influenced by external and system-specific factors, predict the *Attitude toward Using* a technology. The *Attitude toward Using*, in turn, influences the *Behavioral Intention to Use* a technology, which, finally, predicts the *Actual System Use*. Table 1 presents classic definitions of TAM's initial constructs.

Construct	Definition
Actual System Use	Refers to a person's actual use of a technology, i.e., how often he/she uses it (Straub et al. 1995).
Attitude toward Using	"[R]efers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the [usage] behavior" (Ajzen 1991, p. 188).
Behavioral Intention to Use	"[Behavioral] Intentions … capture the motivational factors that influence a [person's] behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen 1991, p. 181).
Perceived Ease of Use	"[T]he degree to which a person believes that using a particular system would be free of effort" (Davis et al. 1989, p. 320).
Perceived Usefulness	"[T]he degree to which a person believes that using a particular system would enhance his or her job [and task] performance" (Davis et al. 1989, p. 320).

Table 1. Definitions of TAM's initial constructs

Since its initial description, the TAM has been extended and modified several times; the inclusion of *Perceived Enjoyment* as an additional antecedent was among its most prominent modifications (e.g., Moon and Kim 2001; Van der Heijden 2004). *Perceived Enjoyment* is defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh 2000, p. 351). It reflects the users' intrinsic motivations to use information technologies such as fun, enjoyment, and other positive experiences, which stem directly from the system-user interaction (Brief and Aldag 1977; Van der Heijden 2004; Venkatesh et al. 2012).

Previous studies on the acceptance of *e-learning technologies* were able to confirm TAM's postulated relationships (e.g., Lee et al. 2005). However, these findings alone are unsurprising and carry only vague implications as they lack any specific guidance. In fact, knowing that *Perceived Ease of Use*, *Perceived Enjoyment*, and *Perceived Usefulness* influence the acceptance of *e-learning technologies* is not very helpful if teachers still do not know what makes users perceive these technologies as *easy to use*, *fun*, and *useful* (cf. Ernst et al. 2013). Hence, in order to provide teachers with fruitful insights and guidance to

help them positively influence their students' *Attitude toward Using e-learning technologies*, an understanding of the antecedents of TAM's central constructs is necessary. In other words, we must investigate why SNSs are or are not perceived to be *useful*, *fun*, and *easy to use*. We postulate that the *Didactic* Circle will provide insights into this question.

Didactic Circle

The *Didactic Circle* (Figure 1[1]) is an influential model of didactic research, a scientific field that studies educational processes such as teaching and learning, and seeks to provide insights that can be used by teachers to plan lessons, workshops, etc. (Jank and Meyer 2009; Wildt 2002). It by and large postulates that successful learning processes are characterized by the five entities *Learner*, *Instructor*, *Syllabus*, *Environment*, and *Method* as well as their interplay with each other (cf. Jank and Meyer 2009; Wildt 2002).

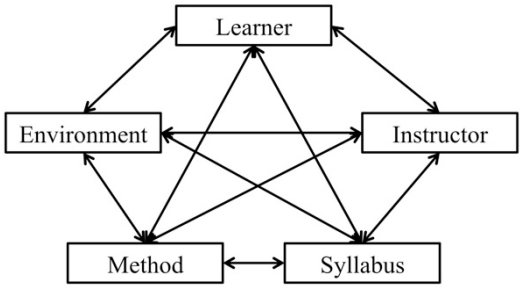

Figure 1. Didactic Circle

To understand the idea of the *Didactic Circle*, imagine two specific learning situations in a school: (1) a senior gets from his/her math and computer science teacher the assignment to do some differential calculus in the computer lab via math learning software; (2) a first-grader gets from his/her English teacher the assignment to do some differential calculus in the gym by using a chemistry set. Due to the reasonable interplay of the five previously presented entities, the *Didactic Circle* postulates a successful learning process in situation (1). In contrast, no successful learning process can be expected in situation (2).

Research Model

In this section, we draw from the theoretical foundations presented above to build our research model, which is presented in Figure 2; we first outline hypotheses based on the basic TAM, before drawing from the *Didactic Circle* to formulate specific hypotheses that apply to the *e-learning* context.

Basic TAM Relationships

E-Learning technologies can be described as *dual* information systems that are both utilitarian- and hedonic-oriented. On the one hand, *e-learning technologies* provide users with benefits that are external to the system-user interaction itself, that is, these technologies support them in their learning activities (Van der Heijden 2004). On the other hand, they are able to "provide self-fulfilling value to the user, … [which] is a function of the degree to which the user experiences fun when using the system" (Van der Heijden 2004, p. 696). This can be linked, for example, to the fact that multiple *e-learning technologies* include mini-games as incentives and rewards. TAM's *Perceived Enjoyment* and *Perceived Usefulness* capture the hedonic and utilitarian aspects of a technology, respectively (e.g., Van der Heijden 2004). Consistently with this, studies on the acceptance of *e-learning technologies* were able to confirm a positive influence of both constructs on the *Attitude toward Using* them (e.g., Lee et al. 2005). We hypothesize that:

[1] For the sake of clarity, we used an abbreviated version of the didactic circle, which only consists of the five most important entities (cf. Jank and Meyer 2009; Wildt 2002).

*There is a positive relationship between the Perceived Usefulness (**H1**)/Perceived Enjoyment (**H2**) of an e-learning technology and the Attitude toward Using it.*

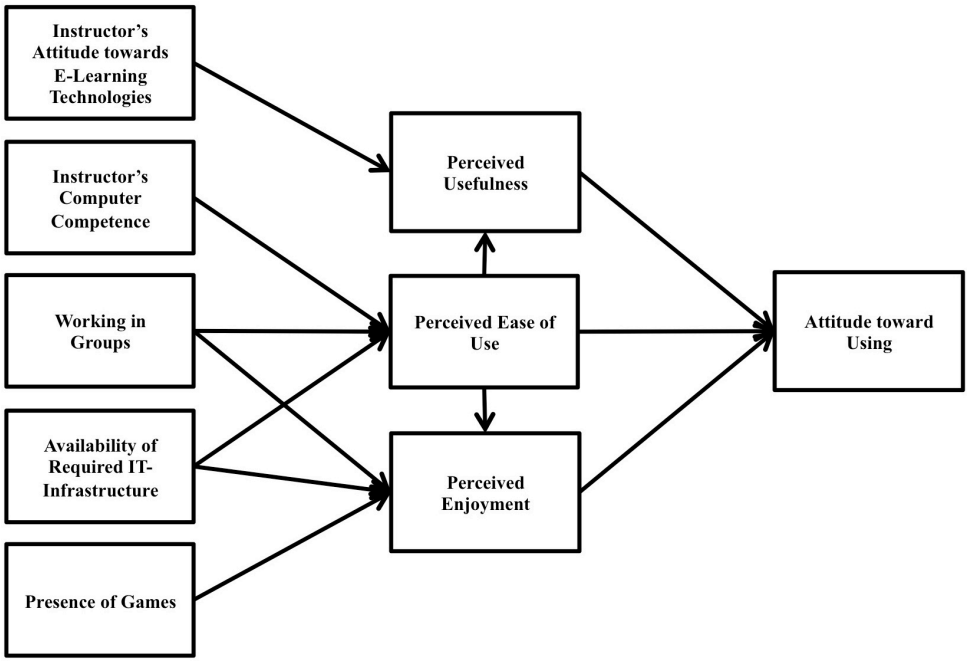

Figure 2. Research model

Additionally, in line with the initial TAM and its multiple extensions and modifications, the *Perceived Ease of Use* of an information technology is commonly accepted to be an important antecedent of *Attitude toward Using* and *Perceived Usefulness* (e.g., Davis et al. 1989). Moreover, multiple studies have confirmed that *Perceived Ease of Use* has a significant positive influence on *Perceived Enjoyment* since an easy-to-use system saves time for the user, thus allowing him/her to spend more time enjoying the experience of it (e.g., Van der Heijden 2004). We hypothesize that:

*There is a positive relationship between the Perceived Ease of Use of an e-learning technology and the Attitude toward Using it (**H3**), its Perceived Usefulness (**H4**), and its Perceived Enjoyment (**H5**).*

Combining the TAM with the Didactic Circle

As discussed earlier, a confirmation of the TAM's basic relationships alone does not provide teachers with specific guidance, i.e., it does not explain how to positively influence their students' *Attitude toward Using e-learning technologies*. In contrast, the *Didactic Circle* provides specific insights on educational processes such as teaching but has no direct connection to the acceptance of *e-learning technologies*.

Consequently, we believe that a combination of both models could provide important insights into the factors that potentially influence students' *Attitude toward Using e-learning technologies*. Indeed, we postulate that specific interplays between the two entities *Instructor* and *Method* (*Instructor's Attitude towards E-Learning Technologies*, *Instructor's Computer Competence*) as well as specific dimensions of the two entities *Method* and *Environment* (*Presence of Games*, *Working in Groups*, *Availability of Required IT-Infrastructure*) positively influence the *Perceived Ease of Use*, *Perceived Enjoyment*, and/or *Perceived Usefulness* constructs, which are the antecedents of the TAM's *Attitude toward Using* construct.

Instructor-Method: Instructor's Attitude towards E-Learning Technologies/Instructor's Computer Competence

First, the teacher's personal *Attitude towards E-Learning Technologies* is crucial. Indeed, people develop behavioral patterns according to observations on the behavior and emotional reactions of others (Sun et

al. 2008), and the attitudes of authority figures have an especially strong impact on individuals (Fulk 1993). We hypothesize that:

*There is a positive relationship between the Instructor's Attitude towards E-Learning Technologies and the Learner's Perceived Usefulness of these technologies (**H6**).*

Furthermore, although students might potentially be more experienced with computers, the teacher's own competences with computers and *e-learning technologies* are nevertheless important; these enable him/her to provide students with appropriate assistance in operating the specific *e-learning technology* in question. We hypothesize that:

*There is a positive relationship between the Instructor's Computer Competence and the Learner's Perceived Ease of Use of e-learning technologies (**H7**).*

Method: Presence of Games

Also, we postulate a positive influence of the *Presence of Games* on *Perceived Enjoyment*. Indeed, an *e-learning technology* that includes mini-games as incentives or rewards promises a higher fun factor than one that doesn't (Fu et al. 2009). We hypothesize that:

*There is a positive relationship between the Presence of Games within e-learning technologies and the Learner's Perceived Enjoyment of these technologies (**H8**).*

Environment: Working in Groups/Availability of Required IT-Infrastructure

Both the social and institutional *Environment* is important for the acceptance of *e-learning technologies:* first, the social interaction in learning groups indeed reveals knowledge gaps and problems of comprehension while simultaneously providing instrumental and emotional support (cf. Thourmond et al. 2002). It has been consistently found that *Learners Working in Groups* are able to solve problems (such as how to operate an *e-learning technology*) more effectively and efficiently, since different views towards a subject can be discussed. This also results in a deeper understanding of the learning material (Huber and Lewis 2010). Hence, *Working in Groups* can prevent the emergence of learning frustration and increase the learning *enjoyment* as well as the *Perceived Ease of Use* (Huber and Lewis 2010). We hypothesize that:

*There is a positive relationship between Working in Groups with e-learning technologies and the Learner's Perceived Enjoyment (**H9**)/Perceived Ease of Use of these technologies (**H10**).*

Second, it is important that students have access to an IT-infrastructure that fulfills the necessary hardware and software requirements to operate the *e-learning technologies* in question. Little operational reliability and long transmission times (due to slow processors, low main memory, etc.) lead to *Learner* frustrations and, hence, to negative emotions towards *e-learning technologies* (Sun et al. 2008). Also, an otherwise *easy to use* system might appear to be hard to operate due to constrained hardware and software resources. We hypothesize that:

*There is a positive relationship between the Availability of Required IT-Infrastructure for e-learning technologies and the Learner's Perceived Enjoyment (**H11**)/Perceived Ease of Use (**H12**) of these technologies.*

Outlook

We seek to test our proposed hypotheses by partnering with multiple German High Schools. More specifically, we want to instruct junior math teachers to use a yet-to-be-defined *e-learning software* to teach their students differential calculus. Thereby, different classes will present varying levels of the influence factors identified (*Instructor's Attitude*, *Instructor's Computer Competence*, *Presence of Games*, *Working in Groups*, *Availability of Required IT-Infrastructure*), resulting in differing treatment and control groups: Naturally, the teachers will have differing *Attitudes towards E-Learning Technologies* and *Computer Competences*, which can be surveyed by using corresponding Likert scales (Ajzen 1991; Ajzen and Fishbein 1980; Corston and Colman 1996; Fishbein and Ajzen 1975). Similarly, the *IT-Infrastructures* between schools will also be different and can be operationalized, for example, by

assessing whether or not the available computers meet the basic system requirements of the *e-learning software*. Finally, we will randomly assign the activation or deactivation of games inside the software as well as the presence or absence of study groups to different classes.

Following the teaching period, we want to survey all students by using questionnaires based on proven Likert scales for *Perceived Ease of Use*, *Perceived Enjoyment*, *Perceived Usefulness*, and *Attitude toward Using* (Ajzen and Fishbein 1980; Davis et al. 1989; Davis et al. 1992). The gathered data will then be used (1) to find evidence for our didactic-based hypotheses by checking for differences regarding *Perceived Ease of Use*, *Perceived Enjoyment*, and *Perceived Usefulness* between the treatment and control groups and (2) to confirm the relationships between *Perceived Ease of Use*, *Perceived Enjoyment*, *Perceived Usefulness* and *Attitude toward Using* as postulated by the *Technology Acceptance Model*.

In summary, our article proposes a research model that addresses students' *Attitude toward Using e-learning technologies*, by combining the research on didactics with the research on technology acceptance, that is, by combining the *Didactic Circle* with the *Technology Acceptance Model* (TAM). More specifically, we postulate that five didactic-based constructs (*Instructor's Attitude*, *Instructor's Computer Competence*, *Presence of Games*, *Working in Groups*, *Availability of Required IT-Infrastructure*) positively influence the antecedents of TAM's *Attitude toward Using*, i.e., *Perceived Ease of Use*, *Perceived Enjoyment*, and *Perceived Usefulness*. Overall, we provide an interdisciplinary view on e-learning technology acceptance that promises additional insights into both didactics and technology acceptance, enriching the literature on both subjects and providing invaluable information to teachers so they can improve student learning.

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