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The acceptance of Tablet-PCs in classroom instruction: The teachers' perspectives

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ABSTRACT

Limited research has been conducted on the integration of Tablet-PCs in classroom instruction. This paper reports a qualitative study which investigates the acceptance of Tablet-PCs, seen as technological innovation, amongst teachers. The research approach intends to complement research on the acceptance of technology through a more detailed qualitative examination. Semi-structured interviews were conducted with 18 teachers during a pilot project introducing Tablet-PCs to classroom instruction at three different schools. The findings indicate diversity in the attitude of teachers towards the technology, but also with regards to the performance expectancy and the facilitating conditions.

1. Introduction

The integration of digital technologies, such as Tablet-PC (TPC), in classroom instruction is seen as a promising way to facilitate students' learning processes (Banister, 2010; Bonds-Raacke & Raacke, 2005; Enriquez, 2010). In contrast, limited research has been conducted on the acceptance of technological innovations amongst teachers. This is in fact quite astonishing, since for successful technology integration in education it is of uttermost interest why technological innovations are accepted or rejected by its users. And given teachers' key role when it comes to technology integration in a school context (Ertmer, 2005), it seems relevant to investigate factors influencing the adoption of technology from a teachers' perspective.

TPC are a relatively new format of a portable computer offering features which might be beneficial to learning and instruction in classroom settings (Twining & Evans, 2005). There is no doubt that TPC can be seen as a versatile technology with multiple applications allowing students to gather and use information in order to construct and manipulate knowledge (Moran, Hawkes, & El-Gayar, 2010). It is also claimed that the potential of TPC can easily be adopted in classroom instruction to facilitate students' learning processes (Wise, Toto, & Lim, 2006). From an instructional point of view beneficial features of TPC range from the availability of tools such as simulations, cameras and microphones, to eBooks and digital text books, to interactive learning networks and instant feedback. Furthermore, its distinguished features are a high mobility, a low proneness for software problems as well as an instant usability (Ifenthaler & Eseryel, in press). These characteristics can clearly contribute to a student-centered learning and to a more differentiated form of instruction (Ludwig, Mayrberger, & Weidmann, 2011). But despite the potential of TPC for learning and instruction researchers still need to document the impact of mobile computing technology in classroom settings in order to see whether the promised benefits of this technology can be realized (Banister, 2010; Koile & Singer, 2008).

When it comes to the implementation of TPC in education, research has been conducted in specific pockets of use. In a study on effects of homework system implemented on TPC, Kerawalla et al. (2007) reported a better understanding of learning materials, individual learning history and information of learning objectives between school and home. Another major field of research has been the use of TPC for mathematics teaching (Galligan, Loch, McDonald, & Taylor, 2010; Trouche & Drijvers, 2010) and in addition, studies have been conducted on creating interactive learning networks through the use of TPC and wireless technology (Enriquez, 2010). Furthermore, some studies report about students attitudes towards digital textbooks (Reynolds, 2011; Weisberg, 2011) while others address general questions on instructional design (Lornsen, 2010; van Orden, 2006). Integrating TPC into classroom instruction ultimately centers on students' learning as well as the effectiveness of teachers instructional methods. Yet, to be advantageous for classroom instruction, a technological innovation such as TPC needs to be accepted by teachers and students alike. Bürg and Mandl (2004) pointed out that the integration of technology often fails due to a lack of acceptance by its potential

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users. In consequence, a better understanding of key factors influencing the acceptance of TPC in a school context might improve its sustained integration. Since we can observe a proliferation of TPC in education it seems important not only to evaluate the effects of this technology on learning and instruction, but also to explore factors related to the acceptance of TPC by students and teachers (El-Gayar, Moran, & Hawkes, 2011). Regardless of the technological potential and availability of TPC, a key question is whether teachers demonstrate the behavioral intention to integrate TPC into teaching practice to deliver effective lessons for their students (Brown & Warschauer, 2006). Since the decision to use TPC in classroom instruction is in effect taken by classroom teachers (Ertmer, 2005), we need to gain an understanding of how and why teachers accept mobile computing technology as part of their classroom teaching practice. Accordingly, examining the acceptance of TPC by teachers can contribute to explaining and improving usage patterns and hence assist the full integration of TPC into the educational system.

The integration of mobile technologies into the educational system goes beyond its sole availability. Even though there is no clear definition on technology integration, one typical element cutting across the current discussion can be seen in the use of a specific technology for learning and instruction (Hew & Brush, 2007). But since a lack of user acceptance is an impediment for successful technology integration, user acceptance is a pivotal factor for all innovative technology initiatives. In this regard user acceptance can be understood as a positive adoption decision to employ an innovation by users and can be further differentiated into intended use and actual use of an innovation (Simon, 2001). Whereas the intended use is not observable, the actual use is manifested in an observable behavior. Thus, it functions as an outcome variable of the decision making process of a user towards an innovation.

As a review of the technology acceptance literature reveals some researchers believe that the acceptance of technology has hardly been achieved (Bauer & Kenton, 2005; Franklin & Molebash, 2007; Hew & Brush, 2007), whereas others suggest that it has been more successful in some cases than others (Drucker, 2006; Hughes & Ooms, 2004). Claims about the acceptance of technology are usually based on models provided by the technology acceptance literature. These models provide explanations about the adoption of technological innovations. A prevailing model for user acceptance is the Technology Acceptance Model (TAM; Davis, 1985; Davis, Bagozzi, & Warshaw, 1989). As an adaption of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975), TAM was developed as a general model to specifically explain computer acceptance (Davis et al., 1989). TAM and its derivations (Venkatesh & Balal, 2008; Venkatesh & Davis, 2000) were frequently used as research tools to investigate the acceptance of technological innovations by end users. However, it became obvious that the TAM could only predict technology acceptance in 40% of the cases (Venkatesh & Davis, 2000). This shortcoming of TAM led to the development of the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003) by integrating central elements of eight different technology acceptance models, including TAM. Fig. 1 presents the UTAUT model and depicts the relation of key constructs in terms of usage intention and behavior.

The UTAUT model hypothesizes that users' acceptance of technological innovations can be explained by a number of key determinants. While performance expectancy, effort expectancy, and social influence are direct predictors of behavioral intention and indirect predictors (through behavioral intention) of usage behavior, facilitating conditions has a direct influence on usage behavior. A definition of the UTAUT model' key determinants are shown in Table 1.

Venkatesh et al. (2003) reported that the UTAUT explains as much as 70% of user acceptance of technology. By providing a considerably better explanation of technology acceptance it can be considered superior research model than prior models. Even though the UTAUT model has been used in several domains, its application in education is still scarce. Teo, Lee, and Chai (2008) used the UTAUT as a theoretical foundation to explore the computer attitude of pre-service teachers and found perceived usefulness, perceived ease of use, social norm, and facilitating conditions as significant determinants on pre-service teachers' computer attitudes. As one of the reported limitations the authors point out that pre-service teachers views may be different from practicing teachers. In another study Weitz, Wachsmuth, and Mirliss (2006) investigated the usefulness of TPC at a university faculty, indicating that faculty members are convinced about the meaningful impact of TPC on learning and instruction while only minority is motivated to use it. Moreover, the UTAUT was applied examining university students' acceptance of TPC (El-Gayar et al., 2011; Moran et al., 2010). Results showed students' attitude as the determinant with the most direct influence, followed by facilitating conditions, performance expectancy, and social norm. These results are inconsistent with other research on technology acceptance insofar as students' attitude has a bigger direct influence on technology acceptance than performance expectancy.

For the purpose of clarity, we distinguish between theoretical frameworks, which try to understand social and psychological factors influencing user acceptance on an individual level and those emphasizing on the diffusion of a certain technology within a social system. The technology acceptance literature has a clear focus on investigating determinants influencing the acceptance of individual users at a given point, whereas the diffusion theory (see Rogers, 2003) presents a context in which the uptake of a certain technological innovation within a social system over a period of time can be examined (Dillon & Morris, 1996). Thus, its primary purpose is to provide a narrative of how a certain technology evolves from the stage of innovation to a widespread application within a social system. Insofar the diffusion theory can be distinguished from the acceptance theory, as the acceptance theory tries to explain key factors affecting the acceptance of a technological innovation on a microlevel (i.e., individual level), whereas the diffusion theory presents a framework to debate acceptance on a macrolevel (Dillon & Morris, 1996; Quiring, 2006). Diffusion theory certainly can help to gain an understanding of the uptake of technologies such as TPC in a school context over time. But since our primary research interest was on the dynamic psychological processes of users on which they base their decision about TPC, it seemed self-evident to refer to a theoretical approach conceptualizing acceptance as a dependent variable of those psychological processes. Hence the UTAUT was adopted as a theoretical framework for this study.

While the UTAUT already served as a theoretical foundation for few studies in higher education it has yet to be applied in a K-12 context. Given the crucial role of teachers pertaining to mobile technology acceptance for classroom instruction, the purpose of this study is to identify factors that influence teachers' acceptance of TPC in a school environment by using a qualitative research design. More specifically, we investigate whether the key determinants of the UTAUT influence teachers' behavioral intention with regards to TPC. As such, our approach was intended to complement research on the acceptance of technology through a more detailed qualitative examination of the topic.

2. Method

2.1. A qualitative research design

A qualitative research design was chosen for two reasons: firstly, this methodology allows the investigation of key determi-