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Differences between prospective, existing, and former users of interactive whiteboards on external factors affecting their adoption, usage and abandonment

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ABSTRACT

An introduction of an innovative technology such as interactive whiteboard (IWB) in classrooms offers new opportunities for improving educational practices. Every new educational technology has to be adopted by teachers that have to adapt it in a creative way in order to fully utilize IWB's potential in instructions. The adoption is a result of various factors, whose impact differs across different technology adoption phases. The main objective of this study is to develop and validate an instrument, allowing simultaneous assessment of external factors that affect users' perceptions about performance expectancy and effort expectancy during different technology adoption stages. To understand differences in factors in different adoption stages, a moderating variable user type was proposed. To test the proposed model, quantitative-qualitative research in the form of an online questionnaire was conducted. Empirical data gathered from 1040 teachers were primarily analyzed using the structural equation modeling approach. The results of this study showed that user interface quality, personal innovativeness and perceived pedagogical impact are factors that affect teachers' perceptions in all adoption stages. With regard to the proposed moderating variable, this study demonstrated significant differences in several causal effect sizes. A qualitative analysis was conducted to further explain the main reasons for abandoning IWB.

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1. Introduction

There and Back Again, the title of the memoirs of the fictional character Bilbo Baggins, can be recognized as a parable describing the use and abandonment of many educational technologies. Bilbo Baggins was a respected middle aged Hobbit, living peacefully in line with the habits of the Shire, who disrupted his life with an adventurous journey to Lonely Mountain. During the journey he acquired wealth, experience and wisdom, at the cost of his community's respect.

The problem with education is that almost nobody is really satisfied with it, and regardless of what is done in classrooms, schools at any historical moment succeed at supplying brilliant minds at the one end, and not so brilliant ones at the other end, with the average majority between both extremes. Schools (as

institutions, their curricula, teaching content, methods and technologies) are constantly swinging from something-centered to something-based in a search for a magic wand to produce students equipped with something that is being fashionably named "21st century skills." In the proposals for such a magic pill, words like innovation and creativity connected with Information and Communication Technologies (ICT) are top-rated ingredients, however rarely they are used in the same sentence with the word wisdom.

ICT found its way into schools in the early 90s and can be recognized as an important educational tool improving the teaching effectiveness and consequently enhancing students' learning (Jang & Tsai, 2012). However, teaching and learning processes can be enhanced only by a teacher with skills for the effective infusion of ICT and supportive pedagogy to mediate interaction and development of students' creativity and thinking skills (Wood & Ashfield, 2007), including interactive whiteboards (IWBs). IWBs were initially developed for and used in the business sector, and not applied to schools until the late 1990s (Cui, Huimin & Lina, 2012). The introduction of IWBs into education was closely related and

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depended on the policymakers and manufacturers, who made strong claims that the use of IWBs can and will ‘transform’ teachers’ (Gillen, Staarman, Littleton, Mercer, & Twiner, 2007). Particularly in the UK, there has been a massive influx of IWBs into schools (Bennett & Lockyer, 2008). The trend affected other countries such as Turkey (renovation of 40,000 schools and 620,000 classrooms with IWBs with touchable pens (Celik, 2012)), Taiwan (Jang & Tsai, 2012), and others. Several countries have invested a lot of resources into projects for integrating the IWB into education. In 2010, England had the highest IWB penetration rate (73%) followed by Denmark (50%) and the USA (35%) (Türel & Johnson, 2012).

IWBs were deployed into many public schools before any research about their effectiveness in the learning process was conducted. Because of the huge investment in IWBs and their massive exposure to students, a number of recent studies have examined the impact of IWBs on teaching and learning in primary and secondary classrooms (Schroeder, 2007). Although there are several studies that report positive effects of the IWB when used in the classroom, their true success depends on how they are used by teachers in the learning process (Kelley, Underwood, Potter, Hunter, & Beveridge, 2007; Türel & Johnson, 2012). For the successful implementation of IWBs and their effective use in instructions, teachers need ongoing technical support and proper training (Hall & Higgins, 2005), which is not always feasible due to time and budgetary constraints. It is therefore important for the school to develop an IWB culture, which is the prerequisite for the proper realization of the importance of teacher training, practice and development time, teacher confidence, school principals, adequate infrastructure, mentoring, and technical support (Abuhmaid, 2014; DiGregorio & Sobel-Lojeski, 2010). Specific teaching skills and materials designed for IWBs are preconditions for creating added value in educational practice while using the technology (Koenraad, Çelik, Higgins, & Hillier, 2015). One of the major problems in the effective use of IWBs during instruction is the lack of digital education resources, in which teachers get education material that is effectively inadequate or not tailored to their needs (Somyürek, Atasoy, & Özdemir, 2009). Teachers often do not manage to take advantage of IWB’s features from the basic form of application to more sophisticated uses in teaching and learning, on their own (Koenraad et al., 2015). In existing literature, a study reports that many teachers actually do not fully exploit the potential of the IWBs and are using IWBs just as an expensive replacement for blackboards or presentational tools (De Vita, Verschaffel, & Elen, 2014). These practices indicate the possibility of IWBs becoming just another example of unsuccessful technology innovation in education (De Vita et al., 2014).

In the past decade, the introduction of IWBs was optimistically supposed to be the most significant change in the classroom learning environment (Higgins, Beauchamp, & Miller, 2007). Many benefits were suggested, giving IWBs the power to transform education towards high ends in a range from technology replacement to motivation and the enrichment of instructions with various instructional strategies and techniques. IWB as an innovative teaching tool was to replace traditional blackboards or whiteboards as well as information and communication technology (ICT) such as televisions, videos, overhead projectors, and personal computers (Hall & Higgins, 2005; Jang & Tsai, 2012). IWBs were regarded as one of the most revolutionary instructional technologies for different educational levels (Türel & Johnson, 2012), which should introduce several pedagogical benefits such as facilitating the integration of new media in a regular classroom, enhancing the scope of interactivity and learner engagement in lessons (Koenraad et al., 2015), facilitation and stimulation of dialogue (Dostal, 2009). Features such as multiple visualizations, multimedia presentations, animations and interactive content make IWB an innovative tool

that can significantly change instructional environments. The application of IWBs and its features such as image presentation in sharp colors, image annotations, etc. during instruction can enhance the learning process (Smith, Higgins, Wall, & Miller, 2005) and much more. With the use of IWBs, students were to be better motivated and stimulated in discussions about subject’s topics and challenged in solving problems (De Vita et al., 2014). It was expected that the use of IWB would enhance teaching quality and learning efficiency (Jang & Tsai, 2012).

Despite the initial optimistic promises, problems were reported early on: one of the most frequent issues raised by teachers, was the need for (more) adequate training in order to use IWBs to their full potential in addition to technical difficulties while placing and using IWB equipment in classrooms. One of the major reported drawbacks was the return to frontal teaching because of the fixed position of an IWB in a classroom (Fekonja-Pekljaj & Marjanović-Umek, 2015). Other reasons for not using IWBs during instruction are: IWBs were not installed in each classroom (Slay, Siebörger, & Hodgkinson-Williams, 2008), a lack of time needed for preparing the teaching materials (Higgins et al., 2007), lack of professional training (Slay et al., 2008), technical issues (Slay et al., 2008); including the cost of installing an IWB content (Jang & Tsai, 2012), students’ confusion on learning content as a result of inappropriate use of IWBs (Jang & Tsai, 2012), and others.

After IWBs were promoted in schools, little is known of elementary school teachers’ use of IWBs and why they chose to integrate or not integrate the technology into their teaching (Jang & Tsai, 2012). There are different factors that can impact the successful implementation of IWB in instructions, such as time, previous experiences, as well as the motivation of students and teachers, management support, financial support and several others. Previous research on educational technology adoption and abandonment, including IWBs, reported a high rate of abandonment because of the increased complexity, where teachers were not able to satisfy their teaching needs, resulting in a low acceptance level as well as the technology’s abandonment (Aldunate & Nussbaum, 2013). Only if all issues regarding the use of IWB for instruction were properly addressed, could IWBs really be a technology that would enable teachers to produce innovative interactive lessons (Gillen et al., 2007), living up to its initial optimistic forecasts.

Existing research on the use of IWBs is mainly based on qualitative data and little research was conducted employing quantitative measures for examining teacher’s reasons for using or not using IWBs (Jang & Tsai, 2012). Furthermore, to the best of our knowledge, no study exists that would analyze the factors influencing teachers’ perceptions about using IWBs in classrooms and simultaneously comparing the impact between prospective users, adopters and former users that have tried to use IWBs and eventually abandoned them.

The main objectives of this study are as follows:

1. To develop an instrument that will allow a simultaneous assessment of factors affecting teachers’ perceptions about performance expectancy and effort expectancy while using a certain educational technology (in this study, IWB) among different types of users (prospective users, existing users and former users).
2. To analyze and compare user types in terms of the factor’s effect sizes of individual factors that affect teachers’ perceptions while using IWBs, in order to understand which dimensions are more important for a certain user type.
3. To investigate the main reasons why teachers have decided to abandon the use of the IWB during instruction after they have used the technology. There are different factors, impacting

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