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Predicting teachers' generative and receptive use of an educational portal by intention, attitude and self-reported use

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ABSTRACT

This study takes off where most acceptance studies stop, namely by investigating the link between acceptance and different aspects of actual usage of an educational portal. Both receptive (logins, downloads and pageviews) and generative use behavior (uploads and reactions) of 864 teachers was collected on two occasions, and linked to their responses on an acceptance questionnaire based upon C-TAM-TPB. Two research questions were put forward: (1) which dimensions of actual use are predicted by attitude, intention and self-reported use; and (2) can C-TAM-TPB discern uploaders from non-uploaders. Regression analyses showed that receptive use (logins, downloads, pages viewed) was predicted by attitude, intention and self-reported use (variance explained in the range .13–.16). Generative use (uploading and reacting) was not explained by these self-reported measures (Adj. R^2 .01 and .04). Uploaders scored higher on all use parameters and almost all scales. A logistic regression showed that the more positive teachers' attitudes towards the portal and the higher their perceptions of control; the more likely they will upload information. This study is a call for more research on the factors that influence different dimensions of actual educational technology use, and should be an onset for more research on the link between intention and behavior in different settings, user populations, and technologies.

1. Rationale

While introducing novel educational technologies to teachers, institutions are unsure as to whether the newly introduced technology will be adopted by the teachers, and used in the way the technology was designed to. For example, in the case of digital learning environments (DLE) that draw heavily on user-generated content, it is important to know (1) how teachers use the DLE: purely receptive (reading, consulting, downloading) or also generative (sharing knowledge or learning material), and (2) what actions can be undertaken so that teachers would make full use of the technology. These questions can be addressed through an acceptance study in which teachers' perceptions of a new technology are assessed. Guidelines to enhance use of the technology can then be devised based upon the findings of the acceptance study.

Acceptance studies have been applied in a range of settings, such as business (e.g. Venkatesh, Morris, Davis, & Davis, 2003), health care (e.g. Pynoo et al., 2013) or education (e.g. Bourgonjon, De Grove, De Smet, Van Looy, Soetaert, & Valcke, 2013; De Smet, Bourgonjon, De Wever, Schellens, & Valcke, 2012; Pynoo et al., 2011a), studying a plethora of technologies, and hereby revealing interesting insights. However, they are also limited (Bagozzi, 2007) in that (a) technology use is regarded as a unidimensional phenomenon without taking the goal into account; and (b) the intention-behavior linkage is in most studies assumed, as actual use is in most studies not measured. This study aims to address these limitations by measuring different dimensions of educational technology use and by verifying which of them are significantly correlated with use intentions. Hereby, a distinction will be made between receptive use (logging in, browsing and downloading) and generative use (uploading, reacting on uploaded material) of the technology.

This study will contribute to the field of research in two respects: by coupling self-reported data to actual use and by explicitly taking into account that one technology can be used for very different purposes. As such, the results of this study should not only be valuable for researchers interested in explaining or predicting different aspects of teachers' ICT-usage, but also system administrators or portal owners who drawn on the users' of their technology to share information or knowledge.

2. Theoretical background

2.1. Technology acceptance

Acceptance models emerged from two distinct research traditions: on the one hand from base social psychology theories such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and

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the Social Cognitive Theory (Bandura, 1986), and on the other hand from sociology with the Diffusion of Innovations Theory (Rogers, 1995). An overview can be found in Venkatesh et al. (2003) or in Pynoo et al. (2013).

In the past, researchers put much effort in the search for the optimal set of variables to explain and predict acceptance. This resulted in a large number of models that were subsequently refined and modified. One line of models has dominated the field of research, those stemming from the Theory of Reasoned Action, with the Technology Acceptance Model (Davis, 1986; Davis, Bagozzi, & Warshaw, 1989), the Theory of Planned Behavior (Ajzen, 1991) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) as most influential models or theories. UTAUT was conceived as the ultimate acceptance model, in which the most influential acceptance models were literally unified. According to UTAUT, technology acceptance (operationalized as behavioral intention and/or use) is regarded as a function of four core predictors: performance expectancy, effort expectancy, social influence and facilitating conditions. These predictors correspond with those in TAM and TPB, respectively perceived usefulness and perceived ease of use (TAM), and subjective norms and perceived behavioral control (TPB). There is one exception: attitude is omitted from UTAUT. With respect to attitude, there is a remarkable difference between acceptance research in educational settings and acceptance research in business (e.g. Venkatesh et al., 2003) or healthcare (e.g. Pynoo et al., 2013) settings. For educational researchers, attitude (or attitudes towards computers) is regarded as a key construct (e.g. Hermans, Tondeur, van Braak, & Valcke, 2008; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Sang, Valcke, van Braak, & Tondeur, 2010; Shapka & Ferrari, 2003; van Braak, 2001), although some authors debate the role of attitude as mediating variable (Nistor & Heymann, 2010; Teo, 2009a); whereas in business or healthcare settings it is regarded as a redundant in the presence of performance and effort expectancy (Venkatesh et al., 2003). Fig. 1 provides an overview of some recent acceptance studies in educational settings with in-service teachers. The technologies studied are either supportive educational technologies (such as DLE's) or computers in general. These studies are summarized in Table 1. Commonly, perceived usefulness is identified as the best and most consistent predictor of acceptance. The influence of perceived ease of use, subjective norms and perceived behavioral control on acceptance is in general less strong and inconsistent over the different studies. Next to these predictors stemming from TAM and TPB, self-efficacy, job relevance and technological complexity were also identified as predictors of acceptance (Gong, Xu, & Yu, 2004; Hu, Clark, & Ma, 2003; Teo, 2009a, 2009b).

In view of the significance of attitude for educational researchers and the review of the literature on educational technology acceptance studies (Fig. 1), it was decided to rely on a combination of the Technology Acceptance Model (TAM) – with attitude – and the Theory of Planned Behavior (TPB) for the purpose of this study. This model is depicted in Fig. 2.

2.2. Measures for acceptance

Acceptance models aim to explain or predict as much of the variance in use or user acceptance as possible. User acceptance can be defined as "the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support" (Dillon & Morris, 1996).

In sharp contrast with the large number of models that were developed and subsequently refined stands the relatively low attention for the identification of the most appropriate measures for acceptance. Several ways to measure technology acceptance have been proposed in the past. The most common operationalizations of acceptance are listed below.

2.2.1. Use

Use, either observed or self-reported, can be operationalized and measured in multiple ways, and actual use of a technology can be considered as a proof of acceptance. In most TAM-studies, observed use is either not measured, or only in a small number of respondents (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). In the past, observed use has been measured as duration of use (Venkatesh et al., 2003), number of logins (Pynoo et al., 2011a) or by recording the actions a subject undertakes while completing a task (Shapka & Ferrari, 2003). A problem with observed use is

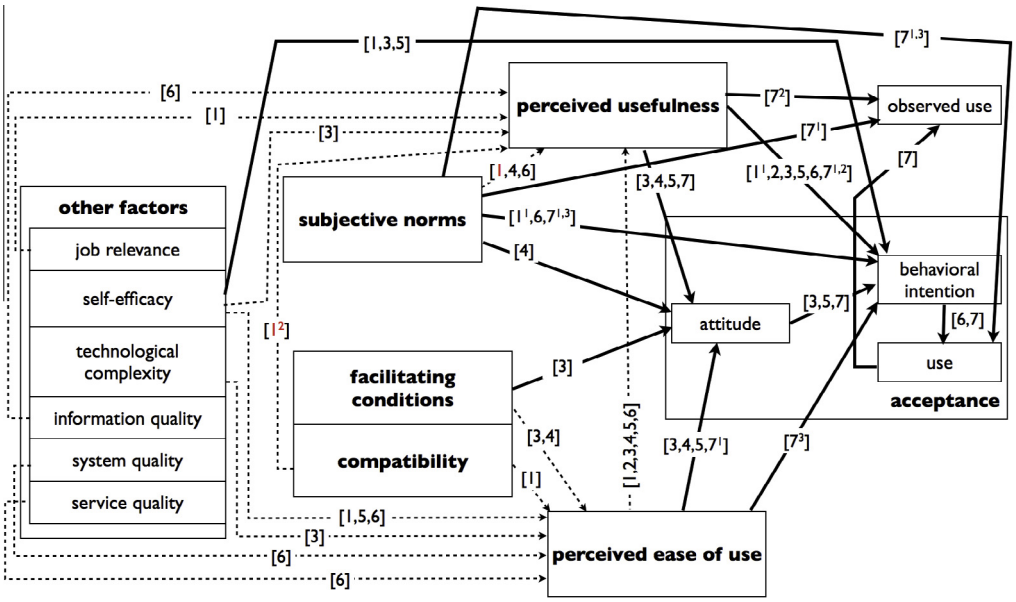

Fig. 1. Integration of the studies on teachers' acceptance of educational technologies (adapted from Pynoo, 2013). *Notes:* Numbers [1] to [7] refer to the studies in Table 1; red numbers: negative influence; Superscripts studies 1 & 7: ^{1,2,3} effect at T1, T2 or T3, no superscript: effect on all measurements; dotted lines: indirect influence on acceptance. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)