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Does the technology acceptance model predict actual use? A systematic literature review

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ABSTRACT

Context: The technology acceptance model (TAM) was proposed in 1989 as a means of predicting technology usage. However, it is usually validated by using a measure of behavioural intention to use (BI) rather than actual usage.
Objective: This review examines the evidence that the TAM predicts actual usage using both subjective and objective measures of actual usage.
Method: We performed a systematic literature review based on a search of six digital libraries, along with vote-counting meta-analysis to analyse the overall results.
Results: The search identified 79 relevant empirical studies in 73 articles. The results show that BI is likely to be correlated with actual usage. However, the TAM variables perceived ease of use (PEU) and perceived usefulness (PU) are less likely to be correlated with actual usage.
Conclusion: Care should be taken using the TAM outside the context in which it has been validated.
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1. Background

The technology acceptance model (TAM) was proposed by Davis [9] and Davis et al. [10] as an instrument to predict the likelihood of a new technology being adopted within a group or an organisation. Based on the theory of reasoned action [18], the TAM is founded upon the hypothesis that technology acceptance and use can be explained in terms of a user's internal beliefs, attitudes and intentions. As a result it should be possible to predict future technology use by applying the TAM at the time that a technology is introduced. The original TAM gauged the impact of four internal variables upon the *actual usage* of the technology. The internal variables in the original TAM were: *perceived ease of use* (PEU), *perceived usefulness* (PU), *attitude toward use* (A) and *behavioural intention to use* (BI). The original TAM used BI as both a dependent variable *and* an independent variable, with BI being used as a dependent variable to test the validity of the variables PU and PEU and as an independent variable when predicting actual usage [9,10]. Fig. 1 illustrates the original TAM model.

Venkatesh and Davis [51] subsequently proposed a revised TAM, referred to as TAM2, which did not include *attitude towards use* and incorporated additional variables such as *experience* and *subjective norm*. However, the core ideology of the model remained unchanged.

The variables within the TAM are typically measured using a short, multiple-item questionnaire (see Fig. 2). When included, *actual usage* is usually measured in a similar way through self-reported variables. Since its inception, the TAM and its revisions have been applied to a variety of technologies, such as text editors [9], business intranets [23] and the Web [17]. Whenever the TAM is validated for internal consistency, it scores very highly against whatever measure is used [9,47,20]. As a consequence, the results of applying the TAM are often accepted as being accurate predictors of usage and adoption. However, the *behavioural intention to use* a particular technology is more frequently measured than the *actual usage*. For example, a study conducted by Keung et al. [30] found that the TAM predicted that a particular technology was likely to be adopted within the company in question. However, a year later the authors found that the technology was not being used. The TAM was re-applied at the later time and the results from this study were very different from the initial TAM assessment. Therefore, there is a question as to whether the TAM can act as an accurate predictor of *actual usage* rather than *behavioural intention to use*. If the TAM is *not* an accurate predictor of *actual usage*, then there is an obvious problem if organisations rely on the positive results from applying the TAM to justify the introduction of new technologies. The study by Keung et al. [30] was investigating the use of a pre-prototype of a technology where the use of that technology was optional. Therefore, it is possible that the TAM will produce different results if the users being questioned have (a) used the technology being tested previously and (b) a choice in whether to use the technology.

There have been two recent meta-analyses of the TAM. King and He [31] considered the relationships among the three main TAM variables: *perceived ease of use*, *perceived usefulness* and *behavioural intention to use*. Schepers and Wetzels [43] investigated the impact of moderating factors and subjective norm on the relationships among the TAM variables. In contrast, the aim of this study is to investigate whether the TAM is an accurate predictor of *actual use*. It is an extension to the previous review conducted by Legris et al. [36], which compared those studies that evaluated the TAM against *actual usage* with those that evaluated it against *behavioural intention to use*. The *actual usage* of a technology can be measured using both objective and subjective forms. Objective measures are usually generated from logs of usage generated by the software itself. For example, one study used tracking tools and logs within the software being evaluated to objectively measure the overall system usage and the usage of a particular feature of the software [8], while another study used similar computer-recorded measures to log the number of times the server was accessed that was running an electronic process guide [13]. One study measured the usage of electronic supermarkets objectively by using the number of log-ons to the system, the number of deliveries ordered and the number of dollars spent with the store [21]. In comparison with objective measures of actual usage, subjective measures of usage are based upon the opinion of each individual subject, usually via a completed questionnaire. Examples of subjective measures of technology use include self-reported usage measures of the frequency or intensity of using the particular technology. In Legris et al.'s study all but one of the primary studies that measured *actual usage* employed self-reported usage rather than objective measures of *actual usage*. Straub et al. [46] investigated the relationship between the two types of *actual usage* measure and reported that self-reported measures of TAM variables (such as PU and PEU) appear to be related to self-reported measures of *actual usage* but show a much weaker relationship with objective measures of *actual usage*.

This review aims to further investigate the findings of Straub et al. [46] and assess whether the TAM is an accurate predictor of *actual usage* when employing objective and subjective forms of usage measure. It also aims to investigate if other factors may influence the results of a TAM study, particularly mandatory technology usage or prior use of a technology. This will be achieved

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