


# Visualizing Co-citations of Technology Acceptance Models in Education

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## ABSTRACT

With the rapid development of information and communication technologies, studies devoted to technology-assisted education have been soaring up. Nevertheless, the studies on technology acceptance model (TAM) appear relatively fewer. This study, through reviewing high quality papers, analyzed the co-citations of TAM on the basis of the basic TAM and numerous extended TAMs. Co-citations of TAM were revealed and discussed in terms of citation counts, bursts, betweenness centrality, and sigma. It also reviews the basic concept underlying user acceptance models, as well as its extended TAMs in details. Future research into the TAM may resort to statistical support, as well as critical analysis. The interdisciplinary research design is also needed between computer science, education, psychology, statistics and mathematics.

## KEYWORDS

Bursts, Centrality, Citation, Sigma, TAM

## INTRODUCTION

With the rapid development of information and communication technologies (ICT), a vast number of studies have been committed to the improvements on technology assisted education (Park & Kwon, 2016). Mobile learning technology has been attracting researchers' attention in terms of formal education, among which the acceptance of mobile technologies plays an important role (Sanchez-Prieto, Olmos-Miguelanez, & Garcia-Penalvo, 2016). Although online learning courses have vastly developed towards various directions, there have been rare studies exploring the factors influencing the acceptance of online technologies. Studies on Technology Acceptance Model (TAM) aim to explore technology user adoption behaviors, to predict behavioral intentions and use of technologies (Lemay, Morin, & Bazelais, 2018).

Despite insufficient studies on the TAM of online learning technology, a number of studies have reviewed the research trend of the TAM (e.g. Venkatesh & Davis, 2000; Nagy, 2018). The issue, however, still needs to be explored from more diverse directions. In terms of mobile learning, many studies on TAM focused on external variables of TAM in order to explore the acceptance of mobile learning among learners (Al-Emran, Mezhuyev, & Kamaludin, 2018). The method to collect data is mainly questionnaire surveys mostly administered in Taiwan (e.g. Chang, Hajiyeve, & Su, 2017; Chow, 2012), followed by Spain, and Malaysia. There are also sparse related studies dispersed in other countries such as USA, Singapore, and England (Al-Emran, Mezhuyev, & Kamaludin, 2018). Based on the data retrieved from Web of Science, most of the studies were implemented in the disciplines of education, and humanities, as well as information technology and computer science. Most of

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them were conducted at the tertiary level. Considering the rapid growth of ICT and relatively fewer TAM studies, it is necessary to review the literature in order to pave a solid ground for facilitation of studies on TAM and to reveal the nature of TAM in order to show future research directions of TAM.

## LITERATURE REVIEW

The basic conception of TAM (See Figure 1) proposed by Venkatesh, Morris, Davis, and Davis (2003) was that the individual reactions to using information technology stimulated their intentions to use, which rendered the actual use of information technology. The actual use was correlated with the individual reactions to using information technology. Based on the basic conception, the TAM has experienced rapid development.

### Development of the extended Technology Acceptance Model

The TAM, adapted from the theory of reasoned action (TRA), was raised by Davis, Bagozzi, and Warshaw (1989). It was tailored to the user-specific acceptance of information system, aiming to account for general factors influencing the acceptance of technology and to explicate user behavior of a wide range of technologies (Davis, Bagozzi, & Warshaw, 1989, see Figure 2), involving perceived usefulness, perceived ease of use, attitude toward use, intention to use, and usage behavior. TAM revised TRA by replacing its attitudinal factors with two constructs of TRA, i.e. perceived usefulness (PU) and perceived ease of use (PEOU) (Lee, Ahn, & Han, 2007).

The TAM has been under continuous exploration and developed into various extensions, where some extended TAMs are dominant, i.e. TAM 2 (See Figure 3) raised by Venkatesh and Davis (2000), adding these constructs: voluntariness, experience, subjective norm, image, job relevance, output quality, and result demonstrability.

The Unified Theory of Acceptance and Use of Technology (UTAUT) (See Figure 4) was developed by Venkatesh, Morris, Davis, & Davis (2003), involving the constructs, i.e. use behavior, behavioral intention, voluntariness of use, experience, age, gender, facilitation conditions, social influence, effort expectancy, and performance expectancy.

Venkatesh and Bala (2008) proposed a TAM 3 (See Figure 5) appropriate for use in the e-business context including the influence of trust and perceived risk on the use of technology. TAM 3 was made

Figure 1. Basic concept underlying user acceptance models (Venkatesh, Morris, Davis, & Davis, 2003)

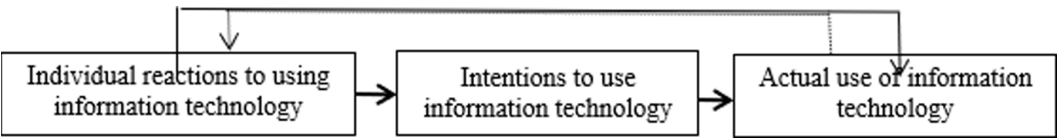
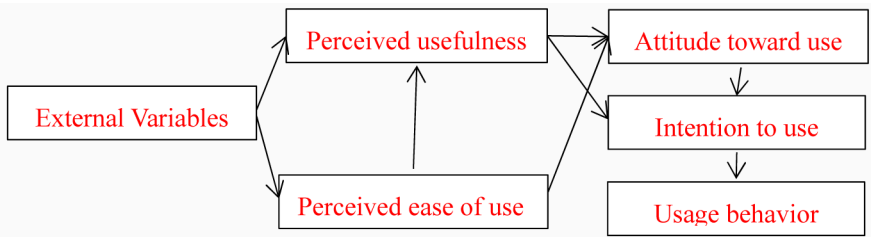


Figure 2. Technology acceptance model (Davis, Bagozzi, & Warshaw, 1989)



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