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Investigating use continuance of data mining tools

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ABSTRACT

While improving decisional quality is important to businesses, continued use of DMTs is a critical issue for managerial personnel. This problem mainly concerns the willingness of an individual to participate in the behavior. It can be further defined in a routine-based working behavior. This problem essentially involves three key issues, task fit, technology use, and habit. This study therefore integrates task-technology fit (TTF) model, expectation–confirmation mode (ECM), and habit, to examine the determinants of continued use of DMTs. Prior studies have focused on intention to use DMTs in the first time and only considered part of the three issues for identifying the determinants. 285 respondents from managerial personnel were collected to empirically evaluate this research model. The three issues are all important in influencing continuance use intention of DMTs. In particular, the task-technology fit indicates a direct effect on two factors of the technology use issue, user satisfaction and perceived usefulness, and an indirect effect on continuance use intention. User satisfaction and perceived usefulness, and habit are the key predictors of continuance use intention.

1. Introduction

Data mining (DM) is a type of data analysis technology which is widely applied in a variety of business functions, including sales, marketing, and customer relations (Davenport & Harris, 2007; Kohavi, Rothleder, & Simoudis, 2002). Software providers have integrated related DM functions, such as data warehousing and data analytics, and launched data mining tools (DMTs) in market to aid users in fulfilling the work of data analysis. DMTs can be used to predict future trends and behaviors based on the historical data, allowing businesses to make proactive, knowledge driven decisions (Sharma, Goyal, & Mittal, 2008). In particular, company's employees can employ DMTs to spot sales trends, develop smarter marketing campaigns, and accurately predict customer loyalty in a building of long-term customer relationships (Strong, Dishaw, & Bandy, 2006).

Researchers on DMTs have focused on the development of various algorithms to improve efficiency (Han & Kamber, 2006). However, the critical determinant of successfully using DMT is to reduce the gap between human beings and technologies, not just to enhance the efficiency of DM functions (Davenport & Harris, 2007; LaValle, Hopkins, Lesser, Shockley, & Kruschwitz, 2010). An understanding of individual's user behaviors toward DMTs is the key to successfully use DMTs (Huang, Liu, & Chang, 2012). However, existing studies, as in a very few manner, are mostly focused on the first-time use of DMTs. For example, Huang and Chou (2004) examined the adoption of web-based DMTs in B2C virtual firms, as DMTs considered an organizational innovation, in terms of the effect of internal and external factors. However, the long-term viability and eventual success of using an information system depend on its continued use rather than its first-time use (Bhattacherjee, 2001a; Venkatesh & Goyal, 2010; Venkatesh, Thong, Chan, Hu, & Brown, 2011). Based on the innovation diffusion theory (IDT), users reappraise their earlier acceptance status during the confirmation stage so that they can decide whether to continue or discontinue use of an innovation (Rogers, 2003). Heavy users of information technology (IT) are those who continue to use them in their routine context, making the driving force of long-term productivity for an organization (Kim & Malhotra, 2005; Venkatesh et al., 2011).

More specifically, DMTs are a special type of decision tool for company's employees in terms of providing the decision support for various business activities. It is mainly used to create/accumulate valuable knowledge from a huge amount of raw data for a decision's purpose and then is able to help employees to predict future economic behaviors (Strong et al., 2006). This implies that the users of DMTs are mostly focused on a high level of managerial personnel for a decision purpose. Next, as business decisions are always associated with an unstructured form, decision makers are responsible to make a high quality decision as they may have high degree of freedom to resort to the support of various IT tools. Accordingly, we consider users of DMTs in this study

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that are those who are managerial personnel and intend to use DMTs in a voluntary mode. Further, decision making, in essence, is a knowledge-based problem solving process and needs to be constantly refined in terms of the new knowledge input until a better form of solutions. The continued use of DMTs in a routine context is particularly important to drive the final benefits in terms of a high quality decisions (Huang et al., 2012).

As many studies have discussed the continued use in various information systems (IS) settings, such as Internet based technology and traditional IS, however, they fail to address the issue of continued use of DMTs. As previously stated, DMTs are a decision-supported technology tool used for management personnel in a voluntary manner. Two major concerns thus arise for individual motivation of the continued use of DMTs: task-driven behavior (Chen, Chiang, & Storey, 2012; Huang et al., 2012) and technology-driven behavior (Foshay, Mukherjee, & Taylor, 2007). Task-driven behavior may refer to two types of tasks: equivocality and interdependence, the former including ill-defined, ad hoc, non-routine, or multi-answer business problems and the latter including the business problems with more than on business function, unit, or company. Technology-driven behavior is defined as the DMT technology use by users, including information usefulness, efficiency performance, and satisfaction. Further, as the use DMTs is in a voluntary mode, a major concern in the literature to explain the behavior of continuance use is self-driven behavior (Barnes, 2011; Chiu, Hsu, Lai, & Chang, 2012; Limayem & Cheung, 2008; Xu, Lin, & Chan, 2012). Self-driven behavior or habit may refer to a special kind of mind-set, cognition, and belief, enhancing the perceptual readiness for habit-related activation (Verplanken & Aarts, 1999).

Many researchers have applied task-technology fit (TTF) concept to examine user's intention of IS continuance use in their workplaces in terms of an IS assisting an individual to perform his/her portfolio of tasks (Larsen, Sørebø, & Sørebø, 2009; Lin, 2012; Zhou, Lu, & Wang, 2010). For the technology-driven behavior, a post-acceptance model, expectation confirmation model (ECM), seeks to explain user's intention toward IS continued use from a technology-use perspective (Premkumar & Bhattacherjee, 2008; Venkatesh et al., 2011). For the self-driven behavior, habit is considered as an important precursor of user's continuance intention of IS as it is associated with other technology-based factors (Barnes, 2011; Kim, Malhotra, & Narasimhan, 2005). The findings of these studies all showed a positively significant effect on continuance intention of IS use in terms of their different aspects. Empirically, this implies that a combination of these perspectives may increase the explanatory power for continuance intention to use.

As discussed above, we can realize that the major concern of TTF is to investigate user behavior by the *macro-level* perspective and that of ECM is by the *micro-level* one. The former explores what external factors drive users to adopt IS in their organizations, and the latter and habit are about internal beliefs of an individual for gaining the motivations. Neither is dispensable for completely indicating the prerequisites of continuance intention to use. From both of the empirical and theoretical arguments, an integration of TTF, ECM, and habit concepts tends to well improve the explanatory power of continuance intention to use. This study thus proposes a comprehensive research model to address the problem of continuance intention to use DMTs. We further examine key drivers from the three theories.

Previous studies have discussed the issue of IS continuance use by either a single perspective, such as ECM or technology acceptance model (TAM) (Barnes, 2011; Lee, 2010; Premkumar & Bhattacherjee, 2008), or an integrative perspective, such as TTF with TAM (Chang, 2008, 2010; Yen Davis, Wu, Cheng, & Huang, 2010), and habit associated with some factors from TAM, in terms of Internet based technology or traditional IS (Barnes, 2011; Chiu et al., 2012; Kang & Lee, 2010). There are few studies to investigate the problem of continued use of DMTs in a robust manner to consider three perspectives. We will elaborate on the relevant theories later. The remainder of this paper is organized as follows: Section 2 for literature review, Section 3 for the research model and hypothesis development, and Section 4 for research design, Section 5 for data analysis, Section 6 for findings and discussions, and Section 7 for conclusions and suggestions.

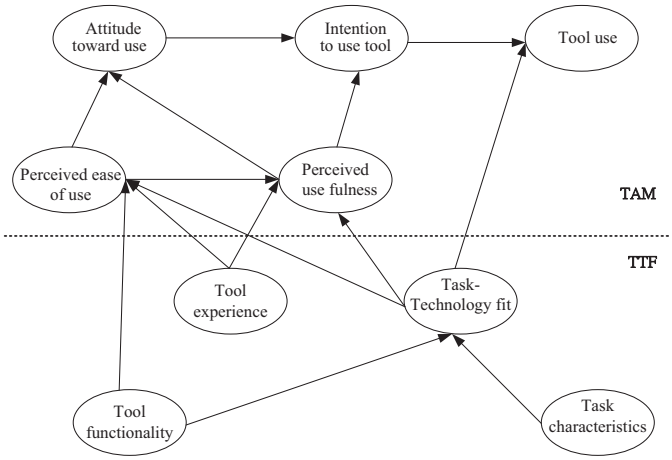

Fig. 1. The integrated TAM/TTF model.

2. Literature review

2.1. Task-technology fit model

Goodhue and Thompson (1995) developed a technology-to-performance chain (TPC) as a model to link between IT and individuals, prompting users to make more effective use of IS from an individual perspective. TTF model plays an important role in the field of IS/IT use and has been applied extensively in subsequent research (Lin & Huang, 2008; Lin, 2012; Yen et al., 2010). Task-technology fit is the degree to which the features of technology match the requirements of task and assist an individual in carrying out his or her tasks. TTF model proposes that task-technology fit is a function of three components: task characteristics, technology attributes, and individual traits. In turn, task-technology fit both directly impacts performance and indirectly influences performance through precursor of utilization. Utilization is also proposed to directly influence performance. In this model, technology attributes refer to the technology used by individuals to perform their tasks and task characteristics refer to the actions carried out by individuals in turning inputs into outputs (Goodhue & Thompson, 1995). Further, while the task for modeling the problems in the decision-based software for their solution is a great concern for users, Strong et al. (2006) defined task characteristics as the tasks that are related to the usage of modeling tools, such as SPSS and Microsoft project. We use this definition for our study in a similar research context and rename task characteristics as task modeling. In general, TTF model has focused on the task modeling and technology functions, and how these two fit together to influence performance.

Dishaw and Strong (1999) subsequently drew on TPC and combined two major models: the TAM (Davis, 1989) and the TTF model (Goodhue & Thompson, 1995), into a comprehensive model shown in Fig. 1. In the combined model, TTF constructs may both be the function of perceived usefulness (PU) and perceived ease of use (PEOU), and also represent the direct effect on technology utilization. The combined model can provide insight for practitioners to design a useful software tool to meet user's task requirements.