International Journal of Information Systems in the Service Sector
Volume 11 • Issue 1 • January-March 2019

Visual Analytics Adoption in Business Enterprises:

An Integrated Model of Technology Acceptance and Task-Technology Fit

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ABSTRACT

Visual analytics is increasingly being recognized as a source of competitive advantage. Yet, limited research has examined the factors deriving it organizational adoption. By integrating the technology acceptance model (TAM) with the task-technology fit (TTF) model, this research developed a model for visual analytics adoption in business enterprises. To test the research model, data was collected through a questionnaire survey distributed to 400 business professionals working in a variety of industries in Jordan. Collected data were tested and analyzed using structural equation modeling (SEM) technique. Findings of this research confirmed the applicability of the integrated TAM/TTF model to explain the key factors that affect the adoption of visual analytics systems for work-related tasks. Specifically, the results of this research demonstrated that the task, technology, and user characteristics are fundamental and influential antecedents of TTF, which in turn has a significant positive effect on the perceived usefulness and perceived ease of use of visual analytics systems. Additionally, there are significant positive effects from perceived usefulness and perceived ease of use toward users' intention to adopt visual analytics systems, and a firm relationship between perceived ease of use and perceived usefulness of visual analytics systems. Together all these constructs explain 59.9% of the variance in user's intention to adopt visual analytics systems at the workplace. Findings of this research provide several important implications for research and practice, and thus should help in the design and development of more user-accepted visual analytics systems and applications.

KEYWORDS

Business Enterprises, Decision Support, Task-Technology Fit (TTF), Technology Acceptance Model (TAM), Visual Analytics, Visual Analytics Adoption,

INTRODUCTION

In today's business milieu, visual analytics has emerged as a technological innovation offering analytical capabilities to provide users at different organizational levels with information and insights for their decision-making activities (Sharda, Durus, & Turban, 2015). Enterprises continuously accumulate an abundance of raw data, and their ability to produce smart decisions is in part based on their perspicacity and efficiency in analysing and interpreting data (Clarke, Tyrrell, & Nagle, 2016). If critical data are not presented and their insights are uncovered, it becomes increasingly likely that enterprises will make weak decisions as a result and will fall behind their competitors with greater proficiency in data analysis and management (Stodder, 2015). As enterprises are engaged with

DOI: 10.4018/IJISSS.2019010105

data-driven decision-making, this also requires that business users become comfortable with, and sophisticated in, using data to guide and inform their decisions. In this context, visual analytics role to support business decisions becomes paramount, as it enables enterprises to extract raw data and present them in a meaningful way that generates the most value (Maheshwari & Janssen, 2014). Moreover, visual analytics is prompting a cultural shift toward analytics-driven enterprises by empowering a broader range of business users to explore more data and discover new insights that they can employ readily to improve business strategies, processes, and customer engagement (Stodder, 2015).

Visual analytics is defined as a process of analytical reasoning facilitated by interactive visual interfaces (Thomas & Cook, 2006). It is emerged from the need to more deeply analyze data, and it strives to support the analytical reasoning and decision-making process by creating systems that maximize the human capacity to perceive, understand, and reason about complex, dynamic data and situations (Adagha, Levy, & Carpendale, 2015). In addition to their inviting visual interfaces, visual analytics systems often incorporate forecasting, modeling, statistical, what-if, and predictive analytics (Keim et al., 2008). These capabilities give users more power and control over analytic discovery, enabling them to progress further on their own, in a self-service fashion, rather than depending on IT developers' intervention (Chinchor, Cook, & Scholtz, 2012; Stodder, 2015). Consequently, nontechnical business users across the enterprise are enabled to analyze and drive insights from datasets of increasing size and complexity. This can be important in larger enterprises, where there are often considerable IT application backlogs, as well as in small and midsize enterprises, where there is a lack of extensive IT support for data analysis (Stodder, 2015). These capabilities are expected to enhance the flexibility and adaptability, and subsequently an enterprise's long-term competitiveness and survival.

While business enterprises are clearly motivated to deploy visual analytics technologies, what is less clear, and also of central importance, for an enterprise introducing visual analytics technology is to be cognizant with the factors driving its users to accept and adopt visual analytics systems. Despite the numerous cognitive and communicative advantages of visual analytics, enterprises have implemented visual analytics systems only to find that the systems are not used or do not contribute value to the enterprise, according to a recent survey by The Data Warehousing Institute (TDWI) (Stodder, 2015). The same survey revealed that business users still spend almost two-third (65%) of their time analyzing data in tables and text, while only 12% of respondents ranked tables as "highly" useful in helping them to glean insights and making informed decisions. It has been suggested that such failures are caused by over-reliance on IT and data scientists in the enterprise (Stodder, 2015). However, the challenges of adopting visual analytics do not merely depend on the enterprise's technological abilities, but on how well visual analytics systems and applications support or 'fit' the needs of the enterprise and the work-related tasks of its users (Chinchor et al., 2012).

Despite the growing popularity of visual analytics technology among academia and industry, insufficient empirical research has been reported on the factors that might explain its adoption among business users at the workplace (Bresciani & Eppler, 2015). To explore this issue, we integrated two well-established models of workplace technology adoption and evaluated their appropriateness to predict visual analytics adoption. Specifically, we developed and examined a model that incorporates the technology acceptance model (TAM) (Davis, 1989), which focuses on attitudes toward using a particular IT, with the task-technology fit (TTF) model (Goodhue & Thompson, 1995), which focuses on the match between user task requirements and available capabilities of the IT (Yadegaridehkordi, Iahad, & Ahmad, 2016). To our knowledge, this study is the first to suggest utilizing integrated TAM/TTF for visual analytics adoption at the workplace. The key purpose of this study is to determine the merits of these workplace technology adoption models in modeling user's acceptance of visual analytics. Findings of this study revealed interesting insights into an understanding of the visual analytics adoption among business users, and thus should be useful for researchers and practitioners when formulating appropriate strategies to increase the success rate of visual analytics initiatives in their enterprises.

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