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Conceptual Framework on the Factors Influencing Users' Intention to Use Dashboards in the UAE

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Abstract
Purpose: Dashboards have emerged as the most sought-after software by corporates and individuals, with UAE-based organizations being no exception. However, the intention to use them at the individual level in the country has been found to be at low levels. In this regard, the overriding aim of this study is to investigate the factors influencing users' intention to use dashboards in the UAE.
Design/methodology/approach: A quantitative research approach will be used, where the correlational research design will be adopted. Therefore, intended data will be collected through a web-based survey questionnaire from a sample of 184 respondents selected through purposive sampling. The sample will comprise high-rank officers in six government and semi-government organizations based in Dubai and Abu Dhabi.
Findings: It is anticipated that the findings of this research will benefit dashboard developers in determining the features and functionalities to consider when designing dashboards. The study may also help organizations and managers in making prudent decisions concerning dashboards' design and functionalities. Overall, the findings of this study are expected to make it easier to understand the currently overlooked issues of dashboard acceptance and use and enhance their adoption and use at the individual level.
Research limitations/implications:
The research will significantly enrich the scanty body of literature on users' intention to use dashboards. Also, by introducing new variables (risk as a multi-dimension), this research will contribute to theory development whereby it will extend the Technology Acceptance Model (TAM).
Practical implications:
This research will provide evidence-based knowledge that can help dashboards developers in determining the features and functionalities to consider when designing dashboards so that they can be fully embraced by the users. The insights gained from this study may also help organizations intending to introduce dashboards in making prudent decisions concerning the type, design, and functionality of the dashboard to adopt. In general, the knowledge gained will be helpful in enhancing the adoption and use of dashboards in the UAE at the individual level.
Originality/value: This study is seeking to test a research framework on factors influencing users' intention to use dashboards in the UAE, a framework that has been developed based on

the Technology Acceptance Model (TAM) and then extended by introducing risk as a multi-dimension. As a result, this study is expected to contribute to the extant body of knowledge on technology acceptance by introducing a model with more predictive power on dashboard acceptance in the UAE.

Keywords: Dashboards, technology acceptance, intention to use, TAM

Introduction

The need for making prompt but quality and fact-based decisions has significantly warranted the development and adoption of decision support systems (DSS). This is because of the complexity characterizing the modern business environment whereby relevant stakeholders, mainly the top management, are required to amass and analyze complex and large volumes of data to gain insights/ business intelligence that can guide their decisions (Hermann, 2020). As noted by Martins, Caldeira, and Sá (2020), high-rank decision-makers are nowadays required to make quick and quality/ accurate decisions within a short time window for the decisions made to be effective. This is the case despite numerous challenges hampering effective decision making such as amassing and analyzing a large volume of data and then presenting it in easily digestible bits. To address this problem, many organizations have of late been embracing data visualization software or visual tools (commonly referred to as dashboards), which provide real-time visibility (graphical displays) of the organization's performance based on the selected key performance indicators (KPIs) (Smartsheet, 2019).

The rising popularity of dashboards in the corporate world as a decision support tool has been attested in various studies, with a recently conducted study showing that dashboards and scorecards are currently among the most-sought software by individuals and corporates (Ghaffar, 2020). According to Martins and Brandão (2022), the growing popularity of dashboards as a decision facilitating tool can be attributed to the increasingly growing body of evidence confirming that dashboards, especially business intelligence (BI) dashboards, are effective decision support systems. According to Safsouf, Mansouri, and Poirier (2021), dashboards facilitate decision-making in an organization by providing time-constrained C-level executives and other high-rank personnel with critical business intelligence in easily digestible bits and in a visual way. This is achieved by presenting a combination of numbers, KPIs, and at times the performance scorecard on a single screen, tailored to the needs of the respective decision-maker. By doing so, dashboards enable decision-makers to make sense of enormous volumes of data and come up with real-time fact-based decisions. As a result, the executives are able to, for example, identify weaknesses or rather areas of improvement, detect expansion opportunities, and most importantly, have an at-glance view of the current organization performance (Safsouf, Mansouri, & Poirier, 2021).

Interestingly, in spite of the rising popularity of dashboards due to the numerous benefits they present to the user and the organizations at large, evidence shows that users' acceptance/use of dashboards is still at low levels. In studies conducted by Bastedo et al. (2017) and Feth and Schmitt (2020), it emerged that despite the growing adoption rate of dashboards by organizations, employees' interest and usage of dashboards were not as high as expected. In the UAE, internal information from various organizations shows that despite the increasing adoption of dashboards by most organizations, a significant proportion of the employees rarely use them and instead prefer to stick to the old techniques of making and guiding their decisions. This is a common problem even in my current organization, where a relatively large number of employees do not use dashboards, thus making it necessary to solicit answers as to what exactly influences users' intention to use dashboards. The motivation behind this study is to

find answers to what exactly influences users' intention to use or not to use dashboards despite the numerous benefits they present to them and the organization at large.

Finding answers to this question from the available literatures proved futile because no study has been conducted to establish the factors that influence users' intention to use dashboards. Indeed, the available scanty body on knowledge on dashboards adoption and use is mainly published in non-scholarly sources of information such as blogs and websites. Besides that, there have been major inconsistencies in the results of various studies seeking to examine the factors influencing the adoption and use of other decision support tools related to dashboards such as business intelligence (BI) systems. Even though findings made concerning the factors influencing users' intention to use other decision support systems such as BI could be extrapolated in the context of dashboards, hence deemed applicable, there was a likelihood of making the wrong assumptions because the two technologies differ relatively in terms of functionality and other features (Wahdain & Ahmad, 2014). This observation insinuates that making such a generalization may be fallacious and misleading, hence warranting a new study to determine the exact factors influencing users' intention to use dashboards (Gefen, Karahanna, & Straub, 2003; Wahdain & Ahmad, 2014).

In this regard, this study seeks to fill in the identified literature gap and solve the identified research problem using TAM and then enhancing the predictive power of the proposed research model by introducing perceived risk as a multi-dimension. Though some studies have previously extended TAM by introducing perceived risk, none of them had integrated TAM with risk as a multi-dimension at the time of writing this research. Therefore, this study seeks to extend the available body of knowledge on technology acceptance by introducing the risk multi-dimension. It also contributes to the available body of literature by seeking to explain the factors influencing the adoption and use of dashboards, specifically in the UAE, an area that has so far not been explored. In particular, the overriding aim of this study is to determine the factors influencing users' intention to use dashboards in the UAE.

Literature Review

Several theories and models have been developed to explain factors influencing the adoption and use of new technologies, especially information-related technologies, at the individual level. The most dominant theories include the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT), Protection Motivating Theory, and DeLone and McLean Information Systems Success Model (ISSM). Following a critical review of these models and theories, TAM emerged as the most applicable model in the context of this study hence was picked as the theoretical base for this study. The wide usage and empirical evidence of this model from various studies on users' usage and intention to use decision support systems and other technologies was the primary factor guiding the adoption of TAM. To enhance its predictive power further in explaining the factors that influence users' intention to use dashboards in government and semi-government organizations based in the UAE, the model was extended by introducing risk as a multi-dimension. Doing so also helped in overcoming the issue of TAM being excessively simplistic, which is the core criticism leveled against this model.

Technology Acceptance Model

TAM was first presented by Fred Davis as a modification of a previous popular theory, Theory of Reasoned Action (TRA), which was developed by Fishbein and Ajzen (1975) and published in his 1986's doctorate proposal (see figure 1 below). It was specifically designed to model end-users ' acceptance and adoption of information systems (IS) or computer

technologies. Unlike TRA, which was designed to explain general behaviors, TAM dealt specifically with the factors that determine technology acceptance and user behaviors across a wide variety of information systems and populations (Lim, 2018; Wallace & Sheetz, 2014). Davis broke TRA's attitude construct into two user-motivation variables: perceived ease of use (PEU) and perceived usefulness (PU), as indicated in figure 1 below. He established that these two variables heavily influenced the intention to use an e-mail system and a data editing technology. PEU is defined as the extent to which the target user of new technology believes that using it will be seamless or effortless. PU, on the other hand, is defined as the target users' subjective belief that a new technology or system will improve their job performance and lives. These beliefs are influenced by other factors that Davis termed as external variables (Lim, 2018; Wallace & Sheetz, 2014).

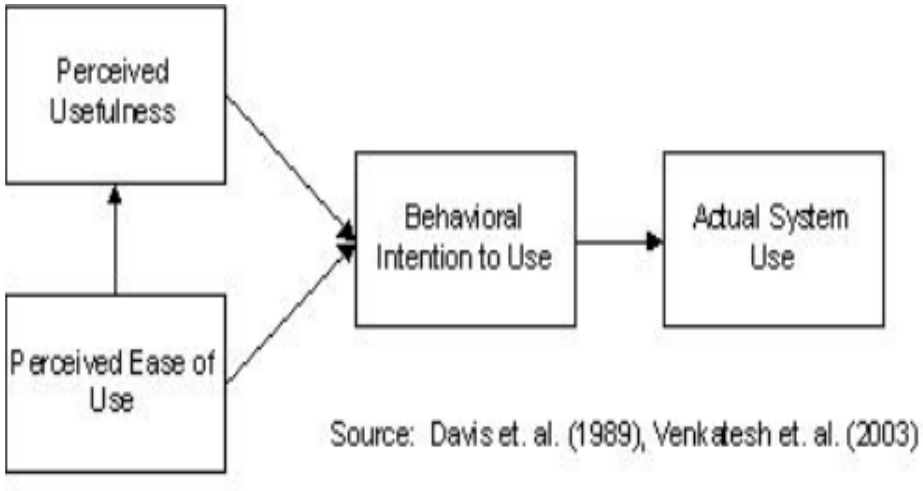

Figure 1: Original TAM by Davis (1989)

TAM has been applied in various studies and proven to be a useful theoretical model in explaining users' behaviors in information system acceptance. The simplicity of this model, though criticized by some scholars as being too simplistic, and the empirical support it has received has made the model popular among information system researchers. Some of the domains in which TAM has been widely used and found to have high a predictive power include the electronic and internet banking sector (Olakitan & Charles, 2014; Kassim & Ramayah, 2015), mobile payment and electronic payment (Anggar Riskinanto, Bayu Kelana, 2017; Dastan & Gurler, 2016; LAI, 2016; Ming-Yen Toeh et al., 2013), e-earning (Elkaseh et al., 2016; Punnoose, 2012), e-commerce (Juniwati, 2014; Renny et al., 2013), mobile and electronic health records technology (Hoque, 2016), and e-government (Chomchalao & Naenna, 2013; Rabaai, 2015). On average, the model has been found to have a 40% accuracy rate in predicting users' intention to accept and use a new system (Ahmad, 2018; Jen et al., 2009).

Conceptual Framework

Following a comprehensive review of the identified research problem, extant empirical literature, and the four dominant theories and models of technology acceptance at the individual level, the researcher concluded that TAM was the most suitable framework upon which this study can be founded. The wide application and supporting empirical evidence of this model were the primary reasons why TAM was perceived as the most suitable foundation for this research. This framework's predictive/explanatory power concerning users' intention to adopt a dashboard was further enhanced by introducing four new perceived risk multidimensional

construct variables. Doing so has helped in providing a holistic view to guide the decision of embracing dashboards as a decision-aid tool. These variables have not been examined in any other past study testing the applicability of TAM in predicting users' intention to adopt new technology. Unlike a few studies that have included risk in TAM, this study has included risk as a multi-dimension construct where four dimensions (perceived functional risk, perceived time loss risk, perceived financial risk, and perceived informational risk) were perceived applicable in predicting what influences users' decision to embrace dashboards. Figure 2 below illustrates the research model developed for this study.

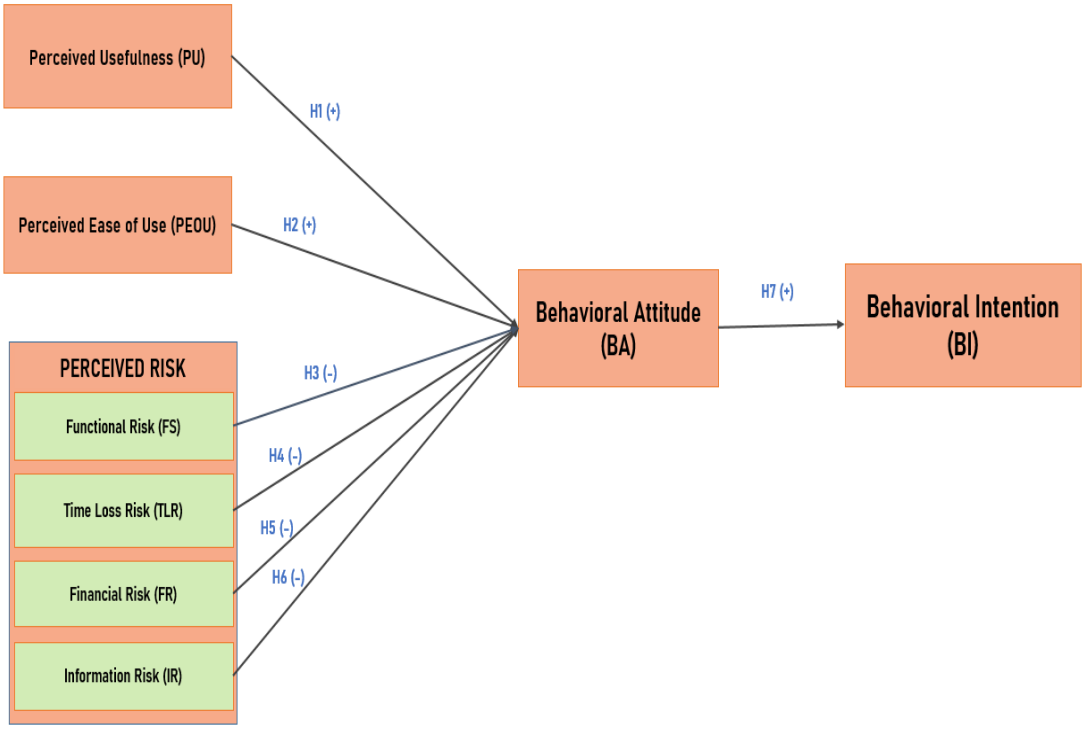

Figure 2: Research Framework

As illustrated in the figure above, this research seeks-to test 7 hypotheses, which show the relationship between 8 variables. The model comprises of 7 independent variables, namely perceived ease of use, perceived usefulness, perceived functional risk, perceived time loss risk, perceived financial risk, perceived informational risk, and behavioral attitude, while the behavioral intention is set as the dependent variable. The relationship between these variables and the supporting literature has been critically (but briefly) reviewed in the following sub-sections. A summary of the variables used in this study has also been provided in the table below.

Hypothesis Development

Perceived usefulness

Perceived usefulness (PU) is one of the two primary constructs of the TAM model. It is defined as the individual's subjective evaluation of a new system's utility or ability to improve his/her job performance and life (Davis, 1989). This definition implies that PU is mainly concerned with task-related productivity and effectiveness in operations using a new system. In this case, the target user must compare the new system to the previous one to see which one offers more advantages. For instance, in the context of banking, customers are likely to compare a new 24-hour access internet banking system with the traditional face-to-face

transactions that involve queuing in a banking hall. If they perceive the system as more advantageous in terms of convenience and making their job easier, their probability of accepting and using the system is high (Kassim & Ramayah, 2015).

The influence of this construct on the behavioral intention to adopt and use new technology has received significant attention from IS researchers, and most of them have found it to be a direct predictor of users' intention to use a new system. As reported by Šumak et al. (2011), PU has been demonstrated in many past studies as the primary precondition for behavioral intention and technology acceptance. It has also been shown to positively impact attitude towards use (Šumak et al., 2011). Several other studies have also shown the construct to be a significant predictor of users' intention to use a technology (Lin & Wang, 2012; Zheng, Zhao, & Stylianou, 2013, Sagnier et al., 2020). These findings suggest that when users perceive dashboards as useful to their job performance, they will show a stronger intention to adopt and use them. It is, therefore, hypothesized that:

H1: Perceived usefulness has a positive impact on behavioral attitude towards the intention to use dashboards.

Perceived ease of use

Perceived ease of use (PEU) is another fundamental construct of TAM. It is defined as the extent to which the target user expects a new system to be relatively easy to use or effortless (Davis, 1989). In the context of dashboards, PEU/EE would be the degree to which users would consider them easy to understand and apply them in their daily activities. Previous studies show that PEU and PU tend to complement each other. For instance, Venkatesh and Davis (2000) observed that if a system is considered effortless, it can improve job performance. They also discovered that when a system is less complex to operate, users are likely to develop a positive attitude towards it and subsequently the intention to use it. Similarly, Teo and Noyes (2014) discovered that PEU was a strong determinant of the intention to use technology among pre-service teachers. Tan Tan et al. (2014) also found PEU to be significantly influential in Malaysian learners' behavioral intention to accept and use mobile learning applications. These findings suggest that when users perceive specific technology as easy to use, the probability of that technology being accepted is significantly high (Garrison, 2021). In this view, this study will test the following hypothesis.

H2: Perceived ease of use has a positive impact on behavioral attitude towards intention to use dashboards.

Functional risk

Functional risk is defined as the potential of a system to cause losses due to a specific deficiency or malfunctioning (Lee, 2009). An example includes sudden and regular breakdowns in services when a user is performing a task, meaning that his/her performance is adversely affected. Functional risk is strongly connected to other risks because if a system malfunctions, the user is likely to incur financial, time, and information losses. Past studies show that function risk is a key predictor of intention to use a system (Littler & Melanthiou, 2006; Zhou, Law, & Yung, 2021). In a study that investigated the influence of risk on the intention to use online banking, it was established that malfunctioning websites reduced customers' willingness to use the system (Littler & Melanthiou, 2006). Consistent with this finding, Featherman and Pavlou (2003, as cited in Lee, 2009) established that repetitive website breakdowns and disconnections reduced the perceived usefulness of online banking. These observations suggest that users' intention to use dashboards will be negatively affected in case dashboards experience frequent malfunctions. Therefore, it is hypothesized that:

H3: Perceived functional risk (PFR) negatively influences user's attitude towards intention to use dashboards

Time loss risk

Time is identified as one of the most critical considerations that users make when deciding to use an online system and has been found to be a significant determinant of users' online behaviors (Ab Hamid & Cheng, 2020; Lee, 2009). If a customer is in a hurry, he/she is likely to buy over the internet to save time. Similarly, time-sensitive customers or target users of a system are likely to be concerned about the potential time risks involved in implementing, training how to use, and troubleshooting a new system. Such customers are also likely to do whatever they can to minimize the risks of losing time using a system and are unlikely to use a system they consider having high time loss risk and maintenance costs (Ab Hamid & Cheng, 2020; Lee, 2009). This observation suggests that if dashboards consume a significant amount of time to implement, train, and troubleshoot, they are unlikely to attract users' interests. To this end, the next hypothesis tested is:

H4: Perceived time loss risk (PTLR) negatively influences users' attitudes towards using dashboards.

Financial risk

Financial risk refers to the potential of incurring monetary loss due to technical and transaction issues caused by a new system. In the banking sector, research indicates that one of the reasons that cause consumers to reject online banking and electronic payment systems is the perceived financial risks involved in online transactions (Ab Hamid & Cheng, 2020; Lee, 2009). While off-line transactions involve a clerk to validate the owner, account number, and the correct amount of money transacted, online banking has no such protections. Therefore, some users may feel insecure and uncertain about the system, thus preferring off-line banking. Although this observation was made in the online banking context, it can also be applied in the dashboard acceptance context because the target users are unlikely to accept the technology if they consider the risks of losing money when implementation and using it to be high. Accordingly, the following hypothesis is proposed:

H5: Perceived financial risk (PFIR) negatively influences users' attitude towards intention to use dashboards.

Informational risk

Information risk is associated with users' perceived privacy when using technological innovation. It is defined as the degree of uncertainty regarding controlling personal information and preventing unauthorized access and use (Featherman & Pavlou, 2003). This definition implies that when the information risk is high, the potential loss of control over one's confidential or personal information is high. The extreme manifestation of this risk is when an unauthorized entity spoofs a user and uses his/her identity to engage in fraudulent activities. For instance, if a criminal manages to access a user's online banking portfolio illegally, his/her financial information can be compromised, leading to a significant loss of money. To this end, information/privacy risk is identified as one of the most critical dimensions of perceived risk (Chen, Biamukda, & Tran, 2020). A study conducted by Hanafizadeh and Khedmatgozar (2012) revealed that performance, privacy, security, time, and financial risks are key determinants of the intention to use online banking. They identified security and privacy concerns as some of the greatest barriers facing electronic banking. Similarly, Chen and colleagues (2020, pp. 34) observed that informational privacy risk had a strong negative effect

on users' intention to use and continue sharing their property in a sharing economy. As a result, this study hypothesizes that:
H6: Perceived information risk (PIR) negatively influences users' attitudes towards intention to use dashboards.

Behavioral attitude

Behavioral attitude is defined as users' desirability to adopt and use a new system (Rabaa'i, 2016). The construct is broadly divided into attitudes towards the object and behavioral attitudes (Fishbein & Ajzen, 1975 as cited in Rabaa'i, 2016). The latter is defined as an individual's assessment of a specific behavior. In the technology acceptance model, attitude is regarded as the mediating factor of perceived ease of use and usefulness and the intention to use a new technological innovation. Davis (1989) argued that the attitude of the target user towards a system is a precursor to behavioral intention to use. Users' feelings about the system usually influence this intention. If they are unhappy about the system or feel uncomfortable using it, they are unlikely to continue using it and will consider seeking an alternative. The influence of attitude and behavioral intention to use new technology has received significant attention from researchers, and most of them have confirmed that the construct is a significant predictor of intention to accept and use a new system (Rabaa'i, 2016). These findings indicate that if users' attitude towards a new system is positive, they are likely to accept and use it. Therefore, this study hypothesizes that:
***H8*:** Behavioral attitude has a positive impact on users' intention to use dashboards.

Methods

This research adopts a quantitative approach, where the correlational research design has specifically been used. The choice for this research method was guided by the philosophical stance (positivism research philosophy) adopted or rather guiding this research, where the research problem can best be approached objectively and through inductive reasoning. Coming up with generalizable research results on the factors influencing users' intention to use dashboards in the UAE requires collecting data from a relatively large sample, as is the case for this study. The correlational research design was perceived to be most suitable because it involves testing relationships between variables. It is worth noting that this study is cross-sectional, and that the intended data will be collected in one shot.

In this regard, intended data will be collected through web-based survey questionnaires. The sample will comprise high-rank employees expected to use dashboards. This is because the aim of this study is to measure users' intention to use dashboards, not their intention to continue using dashboards. Once collected, the data will then be cleaned and organized using the Statistical Package for Social Sciences (SPSS) 26.0 and then analyzed using the partial least squares structural equation modeling (PLS-SEM) data analysis software.

The data will be analyzed in a two-phase process, namely, (1) the assessment of the measurement model (outer model assessment) and (2) the assessment of the structural model (inner model assessment). The first phase will involve assessing the reliability and validity of the reflective constructs as well as the validity of the formative constructs. Some of the assessments that will be performed during the assessment of the measurement model include internal consistency (composite reliability), indicator reliability/factor loadings, convergent validity, and discriminant validity test. The second phase of data analysis (assessment of structural model) will be performed to provide variance explanation of dependent/endogenous constructs, assessing effect sizes and predictive relevance of the model. Some of the tests that will be performed during this phase include: assessing the structural model for collinearity

issue, assessing the path coefficient, testing the value of R2, assessing the effect size of f2, and assessing the predictive relevance of Q2.

Findings

It is anticipated that the findings of this research will benefit dashboard developers in determining the features and functionalities to consider when designing dashboards. The study may also help organizations and managers in making prudent decisions concerning dashboards' design and functionalities. Overall, the findings of this study are expected to make it easier to understand the currently overlooked issues of dashboard acceptance and use and enhance their adoption and use at the individual level.

Discussion and Conclusion

There is a scanty body of knowledge on factors influencing the adoption and use of dashboards at the individual level, not only in the UAE context but across the globe. As a result, this study has relied on the research on the adoption of decision support systems such as BI systems to identify possible factors influencing users' intention to use dashboards in the UAE in government and semi-government organizations. In this regard, this study has proposed a research framework that will seek to test the effect of the constructs of TAM, extended by introducing perceived risk as a multi-dimension construct. Extending this model is expected to enhance the predictive or rather exploratory power of the proposed model. It is also anticipated to improve the understanding and explanation of the proposed model by applying it to the factors influencing users' intention to use dashboards in government and semi-government organizations in the UAE.

Theoretical Implications

The theoretical contribution of this study is enriching the currently elusive body of literature on dashboards adoption and use at the individual level. Another theoretical contribution of this study is that it will introduce new variables and relationships to the existing models of technology acceptance.

Practical and Social Implications

The practical implications of this study include providing evidence-based knowledge on factors that influence users' intention to use a decision-aid tool in the UAE, a piece of knowledge that may be helpful to dashboards developers and organizations intending to introduce dashboards. In particular, the insights gained can help developers know what features to include in a dashboard when developing/designing them. It can also help managers and organizations in making better choices concerning dashboard designs and functionality. Overall, the insights gained can play a leading role in enhancing the adoption and use of dashboards at the individual level.

Limitations and Suggestions for Future Research

This research only focuses on the sample in government and semi government sector. The results might be varied when different industry involve. Suggestion for future research the expansion of the research can be done by different industry and different countries which the perception and implementation of the system will be different.

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