TEST Engineering & Management

January - February2020
ISSN: 0193-4120 Page No. 12468 - 12475

A Conceptual model of Decision Support System for UAE Government Agencies

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Article Info
Volume 82
Page Number: 12468 - 12475
Publication Issue:
January-February 2020

Article History
Article Received*: 18 May 2019*
Revised*: 14 July 2019*
Accepted*: 22 December 2019*
Publication*: 24February 2020*

Abstract

The paper outlines the conceptual framework of Decision Support System (DSS) for better performance of UAE government agencies. This research identified three different factors namely existing factors, new potential factors and alternative factors. The existing factors are system quality and data quality. These two factors are integrated with new potential factors which is support quality and problem match. Time and organization size are identified as alternative factor to improve the performance of UAE government agencies. The DSS will be used to aid the UAE government agencies in providing better service to public and provide within government agencies with the information on how to manage corporate governance practices.

Keywords*: Decision Support System,formatting,style,styling,insert.*

I. INTRODUCTION

The nascent field of decision engineering treats the decision itself as an engineered object, and applies engineering principles such as design and quality assurance to an explicit representation of the elements that make up a decision (Authors, 2017; Janssen et al., 2016). DSS which perform selected cognitive decision-making functions and are based on artificial intelligence or intelligent agents technologies that are computer based and a lot of organizations did not fully accept the technological advancement. One of the factors that hinder the acceptance of such technology which DSS is part of is resistance of organization in accepting new technologies due to management decision, lack of skilled staffs and cost implications (Dulcic et al., 2012; Johnson et al., 2014; Noorollahi et al., 2016). A lot of research has been conducted in respect to DSS, but none of the researches covers the government agencies of the United Arab Emirates (UAE) thus necessitates the need of more researches to cover other perspectives of DSS (Samuel & Asogbon, 2016; Shibl et al., 2013b).

Similarly, researches have covered the factors that influences the adoption of such system from end user perspective, one of the limitations of such research is that, the end user may not fully understand the pros of adopting and using such systems as the managers does as they are at the driving seat of the decision making process (Ahmad & Hussain, 2016; Huston et al., 2016; Johnson et al., 2014; Shibl et al., 2013a). There is need to widen that research by looking at different

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perspectives in the government agencies of the UAE.

Another research have described that finding a suitable case study was found to be challenging, however, the case study revealed new experiences that are not found or covered by the literature yet so as to widen the perspectives (Dweiri et al., 2016, 2017; Murdoch et al., 2015; Noorollahi et al., 2016; Shibl et al., 2013b). Further researches should focus on investigating cases from different domains and on generalizing the factors affecting the adoption of the decision support system.

II. RESEARCH GAP

Decision Support System (DSS) has been the subject of increasing interest, especially in the organizations and agencies. An abundance of research has been produced on the subject. Since performance make up the significant share of the achievements of the agencies plan, it has been at the center of attention of scholarly inquiry. The substantial amount of research studies has been carried out to investigate the DSS and its applicability in different industries. Al Nahyan et al. (2019) have analyzed Fuzzy-based Decision-Support System for the Analysis of Suitability of mega project Delivery Methods. The researchers have studied the description the Decision Support System (DSS) for identifying the best delivery methods for mega projects, based on risk factors, opportunities for investments, and project constraints. In addition, the system accounts for the relative importance of various stakeholders' roles at different stages of a mega infrastructure project. A fuzzy-based multi-criterion decision-making technique used to develop the DSS assists the client to depict his/her best choices of contractual delivery methods. Amir-Heidari et al. (2019) conducted similar study Response planning for accidental oil spills in Persian Gulf: A decision support system (DSS) based on consequence modeling. The DSS was tested in both deterministic and probabilistic modes, and found to be useful for evaluation of emergency response drills and risk-based prioritization of coastal areas. Additionally, Aversa et al. (2018) analyzed the influence when decision support systems fail: Insights for strategic information systems. DSS are sophisticated tools that increasingly take advantage of big data and are used to design and implement individual- and organization-level strategic decisions. Yet, when organizations excessively rely on their potential the outcome may be decision-making failure, particularly when such tools are applied under high pressure and turbulent conditions. Partial understanding and unidimensional interpretation can prevent learning from failure. Nevertheless, the study focuses only on specific attributes of influence. Although these studies yield valuable contribution towards literary knowledge, there are still some limitations, i.e. using limited constructs in their studies. Therefore, this study provides valuable insight for the DSS in terms of performance of government agencies in UAE, perception of value attributes, factors from the performance when using DSS and it contributes to the enrichment of the research literature on this subject. Moreover, as many countries adhere to varied cultural and philosophical beliefs, agencies performances will act and behave different in different settings. Lastly, despite the significance of this creative approach within UAE economy, little research has been conducted exploring the effectiveness of using DSS in terms of government agencies performance in UAE.

III. RELATED WORKS

A. Decision Support System

As data warehouse relates to bringing data in, the procedure of decision support systems (DSS) is basically of getting the data out. DSS have during the years been defined in many near, but diverse, terms. The following is a classic definition of DSS: "Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semi structured problems (Walsh et al.,2019).Lindblom et al, (2017)

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claim that the following is a formal definition of DSS, a system under the control of one or more decision makers that assists in the activity of decision making by providing an organized set of tools intended to impose structure on portions of the decision-making situation and to improve the ultimate effectiveness of the decision outcome." However, Rose et al., (2018) argues that one should not jump to the conclusion that all DSS will support decision makers in making better decisions. Presumably, DSS is a great support for organizing and structure the information load on decision makers but as Williams et al. (2007) demonstrated, DSS can also be a foundation for mistakes when users makes routine tasks and interact with the system. Even if the focal point of a DSS is clear, the term DSS, however, is vast and ambiguous and incorporates several characteristics and various capabilities.

B. Data Warehouse

Historically, the major purpose of data warehouse (DW) has been lucidly described as establish a data repository that makes operational data manageable in a form that is meaningful for decision support systems (Santoso, 2017).The process of getting data in, "data warehousing", combines the moving of data from various data source systems into a single integrated data warehouse (Ghani et al, 2015).These data sources can reside within the organization be provided by external suppliers, or come from a business partner (Watson & Wixom, 2007).Thus, the outcome from data warehousing is applications that provide decision support capability, access to in-formation and create business insight (Turban et al., 2007).

C. Bridging DSS and DW

According to Ramamurthy et al. (2007) DW falls into the infrastructure type of innovation category, meaning that the infrastructure has to change with the DW implementation. On the other hand the investigated type of DSS is part of the user integration application (Mwaura et al, 2018) category, which means that it is simply placed on top of previous installed systems and databases. This indicates that it is not an infrastructure type of innovation. Hoffer et al. (2007) states that DSS is a type of client software that utilize data from a DW to support end-users with information. Based on this, empirical critical success factors, which are ground for DW success, would seemingly also be applicable to DSS that uses a DW. However, as described above, the type of DSS examined in this study is not using a DW but rather interconnects several data sources and clean the data without the use of going through a DW. DW relate to bringing data in and transforming it to be meaningful for decision makers and DSS concern the process of bringing this data out so it can be used and create value to the decision makers (Wang et al. 2018; Watson & Wixom, 2007). In the scope (investigating system success and perceived net benefits) of this research decision support systems and data warehouse have been seen related since they both supports the decision-making process by bringing data in and getting data out. In that consideration, critical success factors for DW could and should be applicable to the DSS area and there-fore are DW literatures as relevant as DSS literature.

IV. METHOD

This study provides a review of TQM-ITarticles published between 1997-2012.We surveyed 50 referred journals. A significantly higher number of research papers in year 2000 and about 20 percent of the reviewed articles were published in the 1990s. This paper first classifies the articles according to their journals types for making easy search method, provides a comparison of the earlier literature reviews on TQM-IT and highlights the focus on each case. Next we have classified the papers into publication type, publication region and tools & techniques, then categorization of the publication is presented in a graphical form.

All the journals in the above selected database are ofInternational repute and highly peer reviewed as well as thejournals are highly relevant to this research topic.All the database searches yielded

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from hundred publicationsthat include journals and magazines. Each of the articleswere examined to ensure that their content was relevant toTQM-IT. Searched database has not been on ajournal-by-journal basis but has rather been limited only tothe search of the whole database using 25 keywords. Thesekeywords are used in the literature survey to describeTQM-IT related practices and were therefore deemed to bethe most relevant search keyword:

V. THE CONCEPTUAL FRAMEWORK

A. System Quality

According to Taylor (2018) System Quality is the measures of the information processing system itself.This paper adopted the definition given by Wixom & Watson (2001). According to them, it takes this a bit further and selects *integration* and *flexibility* as variables that should represent system quality on the basis that, systems that integrate data from diverse sources can improve organizational decision making.Flexibility refer to data are independent of the use to which they are put, and/or if the system provides analytic and modelling capability. Integration is the ability for a system to collect data from various sources and present it in a uniform manner.

B. DataQuality

It is said by Yoo (2015) that not all systems have the ability to produce information, thus, not making it possible to use this factor. If one examines the model that Wixom & Watson (2001) presents it becomes clear that they have excluded the information system factor or rather changed it to what they call data quality. As a reference to their data quality factor they have used Wand & Wang (1996) who tries to anchor Data Quality as an onto-logical foundation. They make no difference when using the data quality and information quality notions in the same sentences. Based on previous works, this paper bracketed, merged information quality and data quality. From here on, this paper only refers to this concept as data quality even though some authors denote it as Information quality as shown in Table I.

TABLE I. SUMMARIZATION OF INFORMATION QUALITY VARIABLES

Variables	Definition
Accuracy	Occurs when the recorded value is in conformity with the actual value (Wang et al, 1995).
Comprehensiveness	Is a measure of how well the data model encompasses enough information to accommodate the current needs of all the users of a data set, as well as a broad or extensible enough to pro-vide for future user needs(Loshin, 2000).
Consistency	Occurs when the representation of the data value is the same in all cases (Wang et al, 1995)
Completeness	Occurs when all values for a certain variable are recorded (Wang et al, 1995).

C. Support Quality

Support Quality refers to the quality in support that should be provided to the users in form of training in how to use the system and the available data, but also given access to people who can assist with support (Watson & Wixom, 2007). This factor has received confident attention in the literature and especially *training* has been distinguished as exceptionally important. Yeoh et al. (2006) identified that training for end-users cannot, and must not, be ignored. Training might also hasten the perceived net benefits by *"doing rather than by talking"*. Yi & Davis (2003), in a IS general research on computer software training, imply that computer skills is key to organizational performance. More, literature evidence has described this as an effect of computer skill training (Yi & Davis, 2003). Such performance success might for that reason is

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concurrent to system success (enhanced benefits). Evidently experts have indicated that adequate training can help users speed up the adoption of the system, more-over, many experts have underscored that training should be viewed as an investment rather than a cost to acquire higher benefits because the users are accountable for making the system successful (Yeoh et al., 2006).

Wixom & Todd (2005) furthermore bear up this potential factor and has S*ervice Quality* as an external variable to user satisfaction (which is an ingredient of perceived net benefits). Subsequently, Service Quality contains several characteristics that Wixom & Todd (2005) have found. The most applicable for this study, which can be associated to giving access to people who can assist with support (as stated before), that they mention as an underlying character to Service Quality is vendor support. In table II, one could get a brief overview of the two variables and reflect upon their definition.

TABLE II. SUMMARIZATION OF SUPPORT QUALITY VARIABLES

Variables	Definition
System training	This variable refers to the importance of supporting the end-users with all the necessary training that is needed to use and understand the system.
Service quality	It is stressed by authors that to obtain user satisfaction (perceived net bene-fits), some sort of service towards the end-users when help is needed shall be available. Thus, the users should be given access to support people from the vendors.

D. Problem Match

In order to perceive any benefits, several authors mean that a clear purpose or a problem linked to the DSS is essential. This can be carefully interrelated to outcome expectations (Wixom & Todd, 2005), which indicate that underlying variables such as user expectations and a user's understanding of the system to a high degree might have an impact on the DSS success. Clark et al. (2007) have signified, through an extensive literature review that DSS needs to match the considered problem and also be equivalent to the benefits that are anticipated from the system. Furthermore, the user's knowledge about the problem space, its complexity, and the level of understanding of the problem space that the users need to perform their tasks is all an influence to the expected outcome from the system (Clark et al., 2007). Seemingly if a problem owner (user) has a distinct problem and high expectations on the DSS solving the problem, the perceived net benefits will be towered if the DSS can manage the problem and reach its climax or vice versa (Staples et al., 2002). Staples et al. (2002) further distinguish that there is for a fact a relationship between expectations and perceived net benefits. Staples et al. (2002) described the relationship as the following, if an end-user has high expectations on a system and this system does not de-liver/meet the expectations the effect on perceived net benefits will be negative. Hence, this may be a critical success factor for the perceived net benefits and therefore highly relevant in this study. Table III gives the reader a summary of the variables and a short definition. This is supposed to be used for reflective purposes.

TABLE III. SUMMARIZATION OF PROBLEM MATCH VARIABLES

Variables	Definition
Clear purpose and problem area	A defined purpose and problem that the DSS can solve is needed.
Outcome expectations and anticipated benefits	This is closely related and should arrive from the above variable, but is more centered about to what degree and which bene-fits the user expects from the system.

E. Time

Since DSS in various user organisations has been operational for different periods of time, it might be an affecting factor for the perceived net benefits.

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This since a long-time use might affect the ultimate perceived net benefits in a higher degree than a DSS use in a short period of time, and vice versa. Based on this reasoning, Time is considered since it possibly has an impact. Nevertheless, Time could not, in the context of this study, be considered as a critical success factor since a user wants perceived benefits close to proximate and not after a certain time.

F. Organization Size

In an empirical investigation of key determinants (factors) of adoption, Ramamurthy et al. (2007) recognized Organization Size to be an important determinant. This emphasizes the fact that not only is larger organization more able to afford recourses to implement a system, but they can also capitalize it better after its implementation (Ramamurthy et al., 2007). In the history others (Xu, 2003; Loh&Koh, 2004; Mabert&Soni, 2003) have also tested Organization Size as an influencing success factor. Even though this reflects upon implementation success, we still saw Organizational Size as an interesting comparative factor that could provide different outcomes in form of various levels of users perceived net benefits.

G. The Concept

The previous reviews of the literature have shown that system quality, data quality, support quality, problem match, organization size, adopted models and knowledge are highly correlated to agencies performance. As shown in Figure 1, the existing theories will be confirmed the effectiveness of DSS. In addition, based on the literature, how the factors of DSS will be identified.

Essentially, one of the key components revealed in the course of reviewing related literature for this thesis is the discovery of various efforts made to formulate a sustainable framework for DSS and performance. The researcher made a concerted effort to appraise some of these frameworks in order to build a strong foundation for the development relationship between the factors affecting DSS on agencies performance for this research work. Attempting to proffer techniques to ensure DSS as a potentially powerful approach deliver a quality service. Only a few groups of researchers have studied this topic and these researchers have not analysed all these influential factors concepts jointly.

Having studied the existing and relevant frameworks on relationship between DSS and performance as well as an in-depth appreciation of the applicable theories, this present research believes in proposing of the framework that would cater for the deficiencies identified in the already exists in previous researchers. Several studies reviewed studied only two constructs. Nonetheless, not many studies have focused on how effective influential factors integration can potentially impact upon agencies performance and prompt existing issues globally and the developing economy in particular like UAE.

However, this is the first study that proposes integrating the influential factors including system quality, data quality, support quality, problem match, organization size, adopted models and knowledge as per recommendation of previous literature review. The path diagram of the developed framework is presented in Figure 1, which shows the components of the construct within the framework. Figure 1 shows the influential factors, which are independent variables of this research represented. From the same Figure, the agencies performance is the dependent variable and the DSS and its variables are the independent variable. Lastly, this primary model contains one main hypothesis and seven branched hypotheses that are designated in Figure 1.

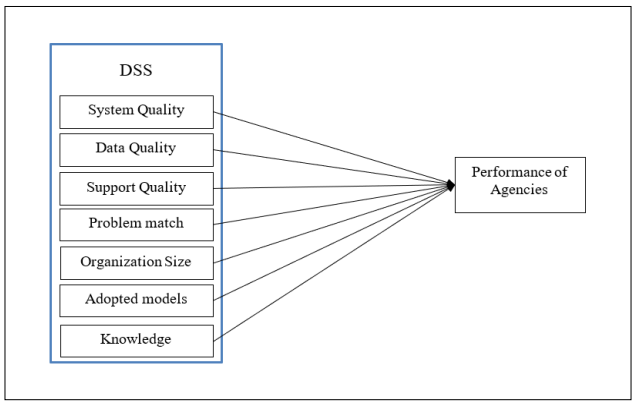

Fig. 1. The primary model

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The main hypothesis of this study is:

H: There is strong relationship between Decision Support System and Performance of government agencies in UAE. This main hypothesis is branched into seven hypotheses which include:

H1- There is relationship between system quality and performance of government agencies in UAE.

H2- There is relationship between data quality and performance of government agencies in UAE.

H3- There is relationship between support quality and performance of government agencies in UAE.

H4- There is relationship between Problem match and performance of government agencies in UAE.

H5- There is relationship between organization size and performance of government agencies in UAE.

H6- There is relationship between adopted models and performance of government agencies in UAE.

H 7: There is relationship between Knowledge and performance of government agencies in UAE.

Pulling all these together all the constructs of this study and bearing in mind the research objectives, a conceptual framework is developed as shown in Figure 1. To form this conceptual framework, seven constructs were identified the performance of the agencies when adopting the DSS's literature related to the objectives of the research.

ACKNOWLEDGMENT

The authors would like to thank UniversitiTeknikal Malaysia Melaka for their support.

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