

Top Management's Role in Promoting Decision Support Systems Efficiency: An Exploratory Study in Government Sector in Saudi Arabia

Abdullah Ibrahim Alkrajji, King Fahd Security College, Riyadh, Saudi Arabia

ABSTRACT

Despite overwhelmingly positive reviews for decision support systems, the IS literature has produced inconsistent results regarding the role of top management and the effectiveness of these systems. IS researchers are concerned with there being a widening gap between research and practice, leading to the current study, focusing on the relevance of these two constituencies. This study employs the Delphi methodology in relation to Saudi Arabia to investigate the reality of the decision support systems in governmental organizations and the diverse issues related to making effective use of them by increasing the role of top management. The findings revealed that there is an absence of a role for IT in the decision-making process, and that there is a lack of robust data warehouse systems capable of supporting organizations' top management with high-quality information. The study revealed various required reforms of various governmental and institutional arrangements and obligational aspects of the efficiency of decision support systems.

KEYWORDS

Decision Support Systems, Decision-Making Process, Government, Implementation, Information Infrastructure, Organizations, Saudi Arabia, Top Management

INTRODUCTION

Background

In today's contemporary organizations, the role of top management has become increasingly complex due to the fast-paced, dynamic, and changing business environment (Loonam & McDonagh, 2005; Bansal & Agarwal, 2015; Momoh et al., 2010). Organizations exist within a global framework and experience continuous technological change. Thus, organizational design has become less static than it previously was (Loonam & McDonagh, 2005). Therefore, this requires a new approach centered on the effective exploitation of all the available tools (Bansal & Agarwal, 2015). The term "top management" (TM) can refer to an individual or to a team of executives who are responsible for directing the organization and controlling the strategic decisions that align an organization's business with its environment (Carpenter et al., 2004). TM spans the boundary between an organization and the environment within which it operates and leads the strategic decision-making process to maintain an organization's development and market its competitive advantages (Liu et al., 2015).

TM currently views strategic information technology (IT) solutions such as Decision Support Systems (DSSs) as both a crucial asset for efficient organizational-related information services, and

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a cost-effective decision-making support to manage rising costs. The purpose of DSSs is to provide support to and enable the improvement of managerial decision-making (Arnott & Pervan, 2005). DSSs are “executive mind-support systems” involving a high degree of human-computer interaction in support of “the behavioral aspects of decision-making and extensions of the analytical capabilities of decision makers” (Chen & Lee, 2003, p. 147).

Despite the positive impact of DSSs on organizations shown in theory, the findings of the empirical literature in regard to the effectiveness of DSSs and to their interaction with an organization’s TM have hitherto been inconsistent. Within the DSS literature, Arnott (2006) noted that Information Systems (IS) researchers are concerned with the widening gap between theory and practice in regard to the role played by organizations’ TM in relation to effective DSSs and efficient management. In addition, Arefin et al. (2015) stated that, although the link between the decision-making organization’s TM and DSS capabilities is obvious, it has hitherto remained largely unexamined in the related literature. Further, some scholars (e.g., Kulkarni et al., 2017; Arnott, 2006) have pointed out that IS research on the role played by the TM in developing the organizational capabilities of DSSs has failed to garner continued interest. Therefore, both IS theory and practice have failed to explore the reality of DSSs and the diverse antecedents of their effective use by means of emphasizing the TM’s role.

The Significance of the Study

Little information pertaining to DSS applications in developing countries and their overall organizational effectiveness has hitherto been available. Thus, this study focuses on DSSs in the Saudi government organization context, with the goal of determining the most influential variables between TM and DSSs. It does so by attempting to understand whether the TM in the Saudi governmental sector would be capable of effectively using DSSs—and the antecedent conditions needed for TM to develop decision-making process capabilities geared toward making DSSs efficient. In doing so, this study raises the following questions:

1. How can DSSs increase TM efficiency in the Saudi governmental sector?
2. What is the reality of DSSs in the Saudi governmental sector?
3. Is the Saudi governmental sector TM capable of effectively using DSSs?
4. What issues affect the TM’s role in promoting the efficient use of DSSs in Saudi governmental organizations?

The research questions listed above were investigated and the required empirical data were gathered through five rounds of data collection employing the Delphi method. The data were gathered from a sample consisting of 20 experts selected in Saudi Arabia from four pertinent categories of experts. This study is unique due to the nature, scope, and method of the investigation—it is the first to examine the reality of DSSs and the TM’s role toward the efficient use of DSSs within the Saudi governmental sector. In doing so, it addresses a gap in the literature about the role played by TM in relation to DSSs efficiency in governmental organizations, particularly in developing countries. Therefore, several underlying reasons motivate this important study:

- **First:** Although TM is expected to be effective in dealing with digital space leadership challenges (Van Wart et al., 2017), the interaction between TM and IT systems “remains at the very nascent stages of development” (Avolio et al., 2014, p.105). Some scholars (e.g., Van Wart et al., 2017; Arnott, 2006) have called for a study of the “antecedent conditions” needed for TM to enhance IT system efficiency, which have remained largely unexamined in the IS-related literature. Avolio et al. (2014) emphasized that there is a recursive relationship between the TM and the building of IT capabilities and that, therefore, scholars should consider not only the ways in which IT

systems mediate and impact TM processes but, most importantly, also how TM influences the development of IT system capabilities;

- **Second:** Globalization and internationalization have made it necessary to understand the ways in which decisions are made by TM in different parts of the world—and the reasons why DSS development is particularly interesting and challenging to TM (Walters et al., 2003; Martinsons & Davison, 2007). For example, Van Wart et al. (2017) highlighted a lack of literature exploring the antecedents that enable some TM teams to be more effective than others in increasing their IT systems' efficiency. Van Wart et al. (2017) furthered their discussion and pointed out that IS research has shown a tendency to be neutral about the quality of IT system adoption and has not directly focused on the differences that exist among individual decision makers—although TM teams do differ;
- **Third:** One of the key issues affecting developing countries concerns poor management (Kester et al., 2011). Strategy and management research have indicated the risks associated with poor management can be effectively reduced by understanding how decision-making practice is fostered in an organization, including its correlation with its outcomes (Sutcliffe & McNamara, 2001; Papadakis & Barwise, 2008);
- **Fourth:** Information management can be crucial for developing nations (Stone & Menou, 1994), which have less control over performance-related factors. Azad et al. (1998) posited that information management could act as an equalizer of “the absolute and comparative economic advantages of individual countries” (p. 122).

This paper is organized as follows:

- First, the literature on the concept of DSS and on the issues enhancing the role played by TM teams in building organizational DSS capabilities is reviewed;
- Second, the research methodology adopted is presented and justified;
- Third, the research findings are presented and explained;
- Fourth, some reported issues are discussed and recommendations are made;
- Fifth, some implications of this research in terms of its contributions to theory and practice are provided and directions for future research are suggested.

LITERATURE REVIEW

Arnott and Pervan (2005) defined DSSs in relation to the development and deployment of information systems aimed at supporting and improving managerial decision-making. In this regard, by employing analytical methods, models, and knowledge, DSSs help decision-makers to define issues or opportunities and to find and adopt solutions through the exploration, analysis, and selection of various decision alternatives, particularly in relation to unstructured and semi-structured tasks (Elbeltagi, 2002, p. 69).

Over the five decades of their existence, DSSs have progressed from being a radical innovation to significantly impacting organizational nature and performance (Arnott and Pervan, 2005). Power (2008) stated that, due to their initial popularity, the term DSS was used to indicate a diverse set of systems. Previous studies (e.g., Hosack et al., 2012; Power, 2008; Arnott & Pervan, 2008) illustrated the broad historical progression of DSSs (i.e., from model-driven to data-driven, to communication-driven, to document-driven, to knowledge-driven, and, finally, to web-based-driven), concluding that the major DSSs emphasized the manipulation of quantitative models by accessing and analyzing database information in support of decision making.

While model-driven DSSs are of a personal (or individual) nature, data-driven DSSs are ad hoc organizational ones (Hosack et al., 2012). Data-driven DSSs (a.k.a. data-oriented DSSs) draw upon the potential for manipulation and analysis through different tools of functionality (e.g., On-line

Analytical Processing; OLAP) presented by the large collections of historical data that are stored by organizations. The analyses conducted by data-driven DSSs have the potential to assist managers in both designing and evaluating alternative solutions—and in monitoring the progress of the adopted ones (Arnott, 2004, Arnott & Pervan, 2005).

Although DSSs enable the swift processing and analysis of information (Kulkarni et al., 2017), they remain the tool least frequently employed by organizations in the context of strategic decision-making (McIntosh et al., 2011). To make their judgments, strategic decision makers tend to employ their own intuition and traditional tools as their primary sources (Arnott, 2006). Various scholars (e.g., Martinsons & Davison, 2007; Arnott, 2006; Walters et al., 2003) noted that the theoretical applications of DSSs radically differs from its practical ones, and are only of limited assistance to management decision making; therefore, an organization's investment in a DSS does not always yield positive results (Kulkarni et al., 2017).

İşik et al. (2013) emphasized that DSS capabilities are moderated by the decision-making organization, which—in turn—has a direct impact on DSS success and explains the inconsistency between DSS effectiveness theory and practice. Arefin et al. (2015) and İşik et al. (2013) called for further consideration to be given to the correlation between the decision-making organization and effective DSS capabilities.

In this regard, the match between the decision-making organization and DSS capabilities pertains to how the DSS fits the goals of an organization in terms of the outcomes of its decisions (Clark et al., 2007, p. 586), as it is judged based upon their effectiveness (İşik et al., 2013). Understanding the match between the organizational decisions' effects and DSS effectiveness is key to an organization's ability to leverage its system to achieve success (Arnott, 2004). According to İşik et al. (2013), the decision-making organization is made up of the many extensively physical and social antecedents that influence its TM's decision-making behaviors.

For example, the iterative processes proposed by decision-making models and theories have been criticized by behavioral research, suggesting a limited influence of rationality (Hosack et al., 2012). Organizational decision-making models illustrate that an organization's actual decision-making is the result of many psychological, political, and bureaucratic pressures—and may therefore be irrational. Therefore, decision-making is often devoid of neat step-by-step procedures based upon the relevant available information (Alter, 2004). Hough and Duffy (1987) argued that, when making its decisions, the TM must balance sets of facts (e.g., concurrent and interconnected issue networks), and use both their intuition and rationality while at the same time, considering the various financial constraints, constituency demands, and their own and their organization's belief system. In cases in which change is necessary, an organization's belief system can act as an inhibitor—and can lead to painful challenging and restructuring processes.

While the effects of information quality on DSSs' ability to fulfill their potential benefits has gained popularity in the IS research (Alshibly, 2015), less attention has been paid to the influence wielded by management filters and organizational culture on the success of DSSs (Van Wart et al., 2017). Management filter quality pertains to the fact that the results of managers' decisions tend to be affected by natural human bias in relation to specific problems and solutions. The information absorbed by managers is sifted by a series of such filters—which cause them to reject any information that fails to conform to their personal biases (Arnott & Pervan, 2005). In relation to their culture, organizations generally lack the capabilities and competencies needed to act decisively, which leads to strong resistance to the adoption of innovations suited to meet the needs of businesses (Hosack et al., 2012; Arnott & Pervan, 2005). Accordingly, the decision-making process tends to strike a balance between the interests of various groups within an organization, rather than to enact the optimal solution to a problem (Hosack et al., 2012).

İşik et al. (2013) also explained two more reasons for the failure of DSSs in an organization. They reported decision types and information-processing needs as the most widely studied dimensions of the match between the effects of an organization's decisions and DSS effectiveness; this is due to

the fact that the decision-making organization is made up of a combination of the types of decisions made and of the TM's information-processing requirements. Decision types are linked to the decision-making organization's effects because a decision's level of complexity influences the performance of the analytical methods used in decision-making—which, in turn, has an impact on the degree of DSS effectiveness.

Information-processing needs are also relevant to the organization because decision-making involves processing the required information—it is therefore difficult to separate information-processing needs from decision-making. A recent study conducted by Arefin et al. (2015) emphasized that the match between the decision-making organization and DSS success is determined by the correlation between process and product. The decision-making process is made up of the methods used by the organization in its approach to developing the information and intelligence infrastructure that can improve business performance to succeed in the global economy. The output is information that can help organizations predict the behaviors of their stakeholders with some degree of reliability. Table 1 summarizes some of the issues (reported in the literature) affecting the TM's role in the efficient use of DSSs.

RESEARCH METHOD

This paper is focused on the reality of DSSs and on the antecedent conditions for the TM's role in relation to the efficiency of DSSs in governmental organizations within the context of Saudi Arabia—the most rapidly developing country. The Delphi method, as a research approach, is

Table 1. Issues affecting the TM's role in promoting the efficient use of DSSs

No.	Challenge	Brief Description	Studies
1	Rationality issues	The rationality of organizational decision-making processes is limited. An organization's actual decision making is the result of many psychological, political, and bureaucratic pressures; therefore, decision-making is often devoid of neat step-by-step procedures based upon the relevant available information (as required by TM).	Hosack et al. (2012) and Alter (2004).
2	Management filter issues	TM decisions tend to be affected by natural human bias in relation to specific problems and solutions; the information absorbed by the TM team is sifted by a series of filters—causing the rejection of any information that fails to conform to the personal preconceptions of its members.	Arnott and Pervan (2005).
3	Organizational culture issues	Traditionally, organizational decision-making processes are aimed at striking a balance between the interests of the various groups within an organization, rather than enacting the optimal solution to a problem.	Hosack et al. (2012) and Arnott & Pervan (2005).
4	Decision-making process issues	The process of making decisions is composed of the methods that an organization uses in its approach to the development of an information and intelligence infrastructure suited to improve business performance to achieve success in the global economy. However, decision types are linked to the decision-making organization's effects because decision complexity influences the performance of the analytical methods employed in decision-making—which, in turn, has an impact on DSS effectiveness levels.	Arefin et al. (2015) and Işık et al. (2013).
5	Information-processing-need issues	Information-processing needs are also relevant to the decision-making organization because decision-making involves processing the required information—it is therefore difficult to separate information-processing needs from decision-making ones. Information processing enables organizations to predict their stakeholders' behaviors with some degree of reliability.	Arefin et al. (2015) and Işık et al. (2013).

employed to facilitate communication and integration among experts in order to reach a consensus and a convergence of opinions in relation to a particularly complex issue (Stefanou & Skouras, 2015; Duan & Coakes, 2010; Linstone & Turoff, 2011; Okoli & Pawlowski, 2004; Linstone & Turoff, 2002).

Over the course of its 50-year development, the Delphi method has been used as an exploratory theory which builds on complex and interdisciplinary subjects frequently focused on a number of new (or future) trends (Linstone & Turoff, 2011; Rowe & Wright, 2011; Akkermans et al., 2003). In addition, the Delphi method's popularity in (and applicability to) IS research is well established. The method, which involves setting up a communication medium between a group of IS experts (Becker et al., 2015; Duan & Coakes, 2010; Okoli & Pawlowski, 2004), is aimed at forecasting, identifying, and prioritizing the relevant issues of a complex IS problem (Becker et al., 2015).

Becker et al. (2015) revealed that although there is no specific procedure for carrying out an empirical research enquiry based on a Delphi method, there is a general guideline that is usually followed by researchers. This guideline encompasses various principles—such as choosing the targeted participants or experts, the line of inquiry (e.g., the questions to ask the participants), phases, and goals—to be followed in order to collect feedback from the participants. It is also important to build prediction and conceptualization from the participants' feedback—and thereafter provide the participants with the results of the previous phase with the goal of generating consensus among the participating experts. These principles can be used in an iterative, interactive, and structured process suited to consolidate the opinions of expert groups (Keller & Heiko, 2014). A rigorous execution of the Delphi method process will also lead to valid and reliable results (Keller & Heiko, 2014; Hasson & Keeney, 2011; Landeta, 2006).

Participants

Most studies to have used the Delphi method did so with a panel of between 10 and 18 experts in order to avoid the risk of contamination of the aggregate response by individual bias (Akkermans et al., 2003; Okoli & Pawlowski, 2004; Nakatsu & Iacovou, 2009). Okoli and Pawlowski (2004) stated that the Delphi method also crucially requires the selection of qualified experts with a deep understanding of their field of study. Therefore, the phenomenological approach adopted in this research does not strongly emphasize sample size; rather, its focus is directed upon participant ability to enrich a study with in-depth information (Dong et al., 2009); as such, a careful participant selection was required (Sanders, 1982).

In order to identify and recommend the participants best suited to increase the overall reliability of both the Delphi process and the empirical results, the author drew upon his personal contacts and his close relationships with experts in areas related to DSSs in Saudi Arabia (Keller & Heiko, 2014). The participants were selected based upon their personal experience in government sector administration and decision-making in Saudi Arabia. The panel ended up being composed of 20 experts drawn from four relevant fields of expertise: six academics; six IT managers employed in governmental organizations; six IT company executives; and two members of a DSS group in Yessar (the Saudi e-government program established in 2005 to transform the country into an information society). Table 2 presents a breakdown of the participant demographic and of their expertise, which justified their selection to participate in this study. To broaden the explanatory nature of this study, it was considered beneficial for the groups to include a mix of experts and fields of expertise.

The research on the Delphi method contained a variety of mechanisms for administering questionnaires. For example, one involved the use of brainstorming during informal meetings in which the panelists are required to respond to open-ended questions of either an inductive and deductive nature (McGuire & Cseh, 2006). Another method involved asking the participants to respond individually to a structured, close-ended questionnaire (Rossouw et al., 2011). The researcher opted to apply the Nominal Group Technique (NGT)—based on an individual and anonymous approach—to ensure that a broad range of subjects would be considered and that group bias would be prevented (Okoli & Pawlowski, 2004). According to Rowe and Wright (2011), controlled and anonymous expert feedback can help in the convergence of individual responses.

Table 2. Participant demographic and expertise

Participants	Participant Category	Specialization	Position	Expertise
Participant 1	Academic	Business Administration	Professor	Government consultant in an administrative system
Participant 2	Academic	Business Administration	Associate Professor	Government consultant in an administrative system
Participant 3	Academic	Information systems	Professor	Government consultant in IT affairs
Participant 4	Academic	Information systems	Associate Professor	Government consultant in IT affairs
Participant 5	Academic	Information systems	Associate Professor	Government consultant in IT affairs
Participant 6	Academic	Computer Science	Assistant Professor	Government consultant in IT affairs
Participant 7	Govt. organization	IT	CIO	25 years of IT affairs experience
Participant 8	Govt. organization	IT	CIO	23 years of IT affairs experience
Participant 9	Govt. organization	IT	Senior Manager	Expert in data warehousing
Participant 10	Govt. organization	IT	Senior Manager	Expert in data warehousing
Participant 11	Govt. organization	IT	Senior Manager	Expert in data warehousing
Participant 12	Govt. organization	IT	Senior Manager	Expert in data warehousing
Participant 13	IT companies	IT	CEO	27 years of IT affairs experience
Participant 14	IT companies	IT	CEO	22 years of IT affairs experience
Participant 15	IT companies	IT	Director of Project Management	20 years of IT projects
Participant 16	IT companies	IT	Senior Manager	Expert in business intelligence
Participant 17	IT companies	IT	Senior Manager	Expert in business intelligence
Participant 18	IT companies	IT	Senior Manager	Expert in data warehousing
Participant 19	Yessar	IT	Senior Manager	Expert in business intelligence
Participant 20	Yessar	Business Administration	Senior Manager	Expert in the process of decision making

The participants also revealed that, due to time constraints, they preferred the NGT method over informal meetings, as the Delphi process involves several rounds of questionnaire sessions. Okoli & Pawlowski (2004, p. 11) noted that the Delphi method is significantly “notorious for the elapsed time required for data collection.” In addition, the participants generally expressed their preference for email contact over other forms of online communication (e.g., shared folders or online conference meetings). The participants therefore concurred that they would receive, and respond to, content and instructions sent by email. This enabled the researcher to make follow-up telephone calls to ensure instantaneous and continuous discussion aimed at clarifying any issues.

Data Collection

The estimated time set aside for the data collection was five months, from August to the end of December 2016. Five questionnaires were designed and delivered to the participants in succession (see Table 3). Each panelist took approximately one week to fill out and return each questionnaire, and a further three weeks were then required for the analysis. The questionnaires were administered—and the responses analyzed—following the guidelines laid down by Okoli and Pawlowski (2004). These involved two general sessions (1. brainstorming and 2. narrowing down the issues identified to those considered the most important) to achieve a consensus and convergence between the participants before the following questionnaire would be sent to them. During the ‘narrowing down’ sessions, the researcher combined (and summarized) the participants’ feedback and submitted it to them for agreement and comments. Through the use of email and phone calls, this particular research design ensured that participant feedback was almost instantaneous and continuous. At the end of each round, a report detailing its results was sent to the participants for comments. Table 4 presents the questions or the agenda for each round.

DELPHI METHOD ANALYSIS

First Round: Orientation

During the orientation round conducted with the panelists, the main task was to define TM in Saudi governmental organizations; this was aimed at avoiding any confusion concerning the meaning of the term, and to describe its role in the decision-making process. The answers drawn from the brainstorming session revealed an almost complete agreement between the panelists concerning the identity of the Saudi governmental organizations’ TM; i.e., those individuals holding the highest positions in the organizations; thus, being responsible for all internal management aspects in terms of planning, organization, coordination, and control. During the brainstorming session pertaining to the first round’s second question, the participants revealed that TM was in complete control of the decision-making process—including, as Participant 1 stated:

All constraints and controls relating to the organization’s activities, tasks, and responsibilities.

The panelists also reported that the correlation between the TM’s role and the efficiency of the decision-making process depends on a number of factors, including:

- 1. The features of the problem being addressed (e.g., volume, difficulties, importance, clarity, and the availability of rules and legislation);

Table 3. The questionnaire rounds of the Delphi method

Subject	Round	Round Name	Duration
The reality of DSSs and the issues surrounding the TM’s role in promoting the efficient use of DSSs in Saudi governmental organizations	1	Orientation	One month
	2	DSS reality	One month
	3	Decision-making process challenges	One month
	4	DSSs and TM capabilities	One month
	5	TM and issues related to the effective use of DSSs	One month

Table 4. The main agenda of the Delphi-method questionnaire rounds

Questionnaire Round	Agenda	
1	1	What do we mean by TM in Saudi governmental organizations?
	2	What are the roles of and the relationship between the TM and the decision-making process in Saudi governmental organizations?
2	3	What is the reality of DSSs in the Saudi governmental sector?
3	4	What are the challenges affecting decision-making process quality in Saudi governmental organizations?
4	5	Is the Saudi governmental sector's TM capable of making effective use of DSSs?
5	6	What are the issues affecting the efficiency of the TM's role and the success of DSSs in governmental organizations?

2. The relationship between the TM and the organization (i.e., if priority is given to the TM's interests, as is usually the case in Saudi governmental organizations, it will pay more attention to any issues that intersect with those interests, while ignoring any that go against them);
3. The TM's capabilities (i.e., natural decision making and leadership, and a deep understanding of the core business and any related issues);
4. The availability of information and knowledge (i.e., the availability of information drawn from various internal and external sources, and the ways knowledge management is able to support such sources);
5. The support available to the TM (i.e., the competency and effectiveness of the associated employees and consultants).

Second Round: DSS Reality in Saudi Governmental Organizations

When asked to report their experiences of success stories in the implementation of DSSs in support of TM decision-making in the Saudi governmental sector, the panelists revealed that they had never experienced any actual such DSS application implementations. Regarding Business Intelligence (BI) systems, participant 19 commented:

Even though BI is implemented in some major organizations, its role is very limited to the provision of some statistics but not to support strategic decisions.

The panelists reported that there had been a deep-rooted challenge to the building up, integration, and aggregation of the essential data for the development of the data warehouse required for the implementation of DSSs. Participant 7 indicated:

Government organizations lack robust data warehouse systems capable of supporting organizations, TM, and other integrated systems with adequate amounts of high quality information.

The panelists pointed at three major issues hindering the implementation of advanced technologies in Saudi Arabia such as DSS:

1. Saudi Arabia is still a developing country, and is lacking in several important aspects—such as skilled professionals; therefore, the cost of developing advanced IT applications is very high;

2. The participants stated the fact that the operation of most Saudi government agencies is based on individualistic working practices due to the sole decision-maker culture and to the difficulties in terms of inter-agency coordination and cooperation. The practice of exchanging experiences and knowledge between agencies is almost totally absent in Saudi Arabia;
3. Saudi Arabia lacks an effective formal national reference for leading and supporting the nationwide development of advanced IT solutions.

Third Round: Challenges to the Decision-Making Process in Saudi Governmental Organizations

When the panelists were asked about the most relevant challenges hampering the quality of the decision-making process in Saudi governmental organizations, they reported various key issues. These included:

1. The sole decision-maker culture. Participant 3 explained:

TM tends to centrally control any strategic decisions when responding to any needs and issues that arise.

Based on such culture, another issue stemmed from each department attempting to fulfill its own needs, problems, and opportunities in isolation. Participant 8 highlighted:

a low level of consideration for organizational strategy.

2. The lack an effective oversight and accountability system; Participant 3 mentioned:

The accuracy and integrity of the decision-making processes are not always crucial to the TM.

Saudi governmental organizations are not for-profit organizations; therefore, the most important measures of productivity are missing from their agenda. Participant 13 explained:

Government organizations lack Key Performance Indicators (KPIs) to measure productivity; therefore, the current judgment system is ineffective in relation to TM efficiency and decision-making support systems.

3. Deficiencies affecting governmental organizations, arrangements, and obligations. The panelists noted the existence of governmental legislative systems of regulation, rules, and procedures—but were of the opinion that these can, as Participant 6 stated:

at times, be conflicting, overlapping and ambiguous, or do not always offer public organizations an alternative model to help resolve emerging conflicts and tensions.

In addition, as Participant 9 commented:

TM is periodically given the authority to overrule these systems.

Fourth Round: The TM's Capability to Effectively Use DSSs

When the participants were asked whether the Saudi governmental sector TM was capable of making effective use of DSSs, they stated that this was a complex issue. They affirmed that Saudi governmental organizations were not yet ready for the implementation and the effective use of DSSs. This was due to different governmental, organizational, and institutional arrangement and obligation issues. These included, of course, “the TM and their capabilities,” as stated by Participant 8. The panelists described the ways in which certain cultural and social aspects—rather than competency—played a major role in the selection of the TM of Saudi governmental organizations. This issue (along with a lack of national accountability systems) had a negative impact on the development of systemized decision-making processes capable of being converted into DSSs. Accordingly, Participant 3 reported:

The relationship between development of the organization and the TM is controlled by the general interests of the TM.

Therefore, the “TM's personalized objectives” (as described by Participant 7) played a major role in the ways in which it would interact with the issues and decision-making processes within the organization. The participants concluded that, owing to competency issues, the quality of TM in Saudi governmental organizations in general would be a major challenge to DSS application.

Fifth Round: TM and Issues Related to the Effective Use of DSSs

The fifth and final round of data collection pertained to the issues surrounding TM, and the use of DSSs in order to increase the TM's appreciation of their efficiency. In this regard, the panelists raised an interesting point when they explained that, at the time, the relationship between the TM's role and the building of DSS capabilities was determined by the understanding of the relationship between TM and three key elements:

1. The organization itself;
2. The information infrastructure; and
3. The IT infrastructure.

The participants assumed a direct correlation between the building of IT system capabilities in an organization and the TM's relationship with the elements listed above. Participant 15 clarified that:

Saudi government organizations are not for-profit; therefore, there are no real and valuable incentives for the TM to do a better job.

Issues such as the poor administrative and national management systems, the lack of national oversight and accountability systems, and a poor national leadership system have (in general) resulted in two kinds of TM:

1. First, bureaucratic TM (the most common type), which directs an organization in traditional ways, keeping the administrative and management systems shrouded in mystery;
2. Second, exceptional TM (the least common type), which is capable of promoting the administrative and management systems and of improving an organization's overall performance.

Accordingly, the TM's style in an organization may be indicative of the level of the relationship between them. The panelists pointed out different means and issues that can be used to expose

how healthy the relationship between the TM and an organization is. For example, as Participant 4 explained, these factors may include:

The extent of the TM's understanding of the organization's core business, the organization's strategic objectives, the future of the organization, and the current and future, internal and external challenges of the organization.

and, as stated by Participant 20:

The TM's willingness to be transparent and open to the external environment.

The participants viewed the relationship between the TM and the information infrastructure as a key indicator of the building of effective information infrastructure capabilities. As pointed out by Participant 11:

TM that considers the development of information infrastructure capability to be strategically important to the survival of the organization.

This would result in an organization successfully implementing and subsequently assimilating the IT support systems. The panelists also stressed a direct correlation between IT system efficiency and the TM's relationship with the IT infrastructure. The panelists noted (as Participant 16 stated) that the relationship between the TM and the IT infrastructure can be understood:

[As the] extent [to which] the TM looks at IT in the organization as a strategic asset to which the business processes should be aligned to achieve strategic business objectives.

Accordingly, the participants explained that decision-making processes make up a multi-dimensional framework that needs to build consensus through national arrangements. In this round, the author created a multi-dimensional framework of such governmental, organizational, and institutional arrangement and obligation issues based on the empirical data collected in the previous rounds. The issues identified were then sent to the participants for comments and corrections. Table 5 summarizes and explains all the agreed-upon issues, congregated into a six-group multi-dimensional framework. In addition, Table 5 presents some recommendations (based on the panelists' perspectives) to overcome the issues reported. Figure 1 presents six suggested reform strategies suited to address these challenges.

DISCUSSION

The aims of this research were twofold:

1. First, to examine the reality of DSSs; and
2. Second, to examine the issues surrounding the TM's role in promoting the efficient use of DSSs in Saudi Governmental organizations.

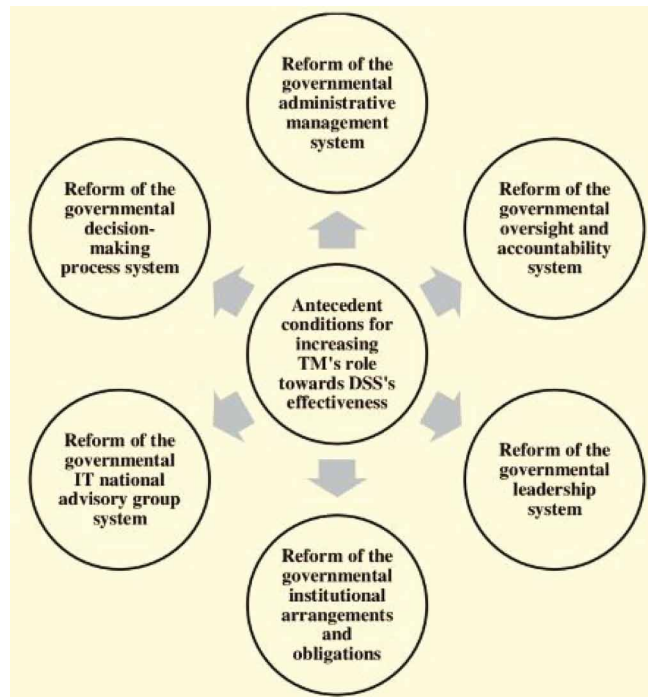
The researcher administered five rounds of questionnaires to collect the required research data from a sample of 20 experts. The discussion between the participants highlighted how, in Saudi governmental organizations, TM was made up of the individuals who held the highest positions in an organization and that they fully controlled the decision-making process. The findings revealed the almost total absence of a role for IT in the decision-making process. The panelists stated that, in

Table 5. Issues related to increasing the role played by TM toward DSS efficiency in Saudi governmental organizations

No.	Issues	Description
1	Governmental administrative management system	<ul style="list-style-type: none"> • The panelists agreed that, in Saudi Arabia, bureaucracy dominated the governmental sector. One major trait of bureaucracy is over-centralization. • Over-centralization results in low-level managers merely enforcing TM commands, rather than being more independent in their decision making. Subordinates rely excessively on the TM in their daily routine tasks, causing the TM to become engaged in administrative trivialities, rather than spending its time focusing on more important issues and development. • The participants asserted that need for reform in the governmental administrative management system, as the decision-making process would require it to be highly dynamic.
2	Governmental oversight and accountability system	<ul style="list-style-type: none"> • According to the participants, Saudi governmental organizations were viewed as black boxes. • The panelists agreed that the government did not have proper professional oversight and accountability tools, and that no empowered civil society organizations played this role. • The panelists questioned whether the TM had a deep understanding of the core business of the agencies and of its challenges, and whether it could therefore draft their agenda based on it. • The participants asserted the need for a professional and effective oversight and accountability national system, and stated that it would be important to regularly evaluate the TM based on core business productivity.
3	Governmental leadership system	<ul style="list-style-type: none"> • The panelists noted that the TM's staffing was not always based on competency due to various cultural issues. This led to further questions concerning the relationship between TM and governmental organizations in developing countries in order to understand issues surrounding development. • The selection of the TM appointed to lead governmental organizations should be based on various characteristics and capabilities related to business leadership, technological cognition, and awareness, as well as a deep understanding of the organization's core business's aims and challenges. There should be a national system to evaluate TM performance (e.g., its actions and reactions throughout the decision-making process and its impact on the organization's development and performance).
4	Governmental institutional arrangements and obligations	<ul style="list-style-type: none"> • Saudi governmental organizations were hampered by complicated sets of rules and regulations. This led to control, as orders could gradually change as they were passed down the ranks. • The administrative culture of Saudi governmental organizations was characterized by unsystematic flows of information, and control and supervision issues. • Due to a failure to undertake a complete examination of all possible correlations, there was little acknowledgement of DSSs by TM. Instead, the TM tended to select quick fixes aligned to its practices, and ignored any alternatives, pertaining to the most effective solutions, that required additional information. There were a number of further issues, including (1) the gap between internal and external organizational knowledge in support of decisions, (2) a lack of skilled employees capable of offering comprehensive solutions, and (3) the high cost of external expertise and training courses. • Organizations needed to gain an understanding of how DSSs could provide a competitive advantage by identifying needs which closely corresponded to the decision-making process. Organizations would need to consider re-engineering their business structure, process, and culture to preemptively implement factors suited.
5	IT national advisory group system	<ul style="list-style-type: none"> • Saudi Arabia lacked a government agency tasked to support advanced IT solutions and administrative practices. The implementation and the effective use of DSSs would require a national advisory group and the engagement of DSS expertise in the process of developing the required IT infrastructure, and building up the essential decision-making skills. • Saudi governmental organizations, in general, were similar in terms of their support systems, and (albeit less so) in their core business systems. Through a national advisory group for IT development, the government should bring together researchers, academics, and practitioners to develop the required national standards, schemes, methods, and infrastructures to consolidate the efforts whilst reducing costs and failure rates.
6	Decision-making process system	<ul style="list-style-type: none"> • The most significant issue faced by an organization was the failure to understand the decision-making process, particularly in relation to evaluation. There was a lack of standardized approaches to support the decision-making process, which resulted in a poor diversity of required skills. • There was a need to configure such initiatives in consideration of the complex nature of the strategic planning that accompanies the systemic organizational changes associated with such projects. The effective use of DSSs would involve: (1) studying the inherent uncertainties within an organization; (2) building a DSS infrastructure, comprising both the tangible and intangible assets of a business to deal with uncertainties; and (3) increasing the potential for risk-based decision-making. • The panelists agreed that there was a need for formalization in researching relevant information in order to support decision-making, rather than relying on ad-hoc approaches that tended to generate conflict. The most frequent challenges were linked with: (1) the sourcing and validating of information; (2) the preemptive forecasting of problems; and (3) the identification of problems and business issues. Reliance on an ad-hoc approaches to decision making affected the credibility and quality of problem analysis—thereby causing ambiguity in the identification of alternative solutions.

theory, DSSs could enhance the credibility and the quality of decision-making—which, in turn, would improve the overall administrative efficiency of Saudi government organizations. The panelists noted that the DSSs' capability of decreasing the issues associated with ineffective management—i.e., high levels of bureaucracy; centralization; poor productivity; a lack of transparency; and wasting resources and budgets—would foster improvements in administrative efficiency.

Figure 1. Reform strategies aimed at increasing the TM's role in the improvement of DSSs efficiency in Saudi government organizations



Yet, the panelists agreed that the Saudi governmental organizations' TM was incapable of understanding the requirements essential for the enhancement of the decision-making process quality, the building of DSSs capabilities, or the effective use of future DSSs. There was a convergent agreement between, and consensus among, panelists that the simple fact of having a DSS in place was insufficient for the realization of its associated benefits, leading to a need for insight into the responsibilities—requiring a shift in governmental, organizational, and institutional arrangements and obligations. Thus, the empirical data demonstrate that the current state of the Saudi government represents one of the largest challenges hampering the development of effective DSS capabilities in its agencies. The participants pointed at the Saudi governmental organizations' lack of both a national oversight and accountability system and of KPIs suited to the measurement of the productivity and efficiency of decision-making systems. The strategic decisions were dominated by a sole decision-maker culture and the personal interests of the TM. Therefore, the TM's decision-making process was characterized by a mix of impulsive, hasty, and unilateral decisions—furthermore, it produced inconsistent results terms of decision effectiveness (Arefin et al., 2015; Işık et al., 2013).

Moreover, the participants explained that the Saudi administrative management system was outdated due to the over-centralization of the bureaucratic administrative management system; therefore, the decision-making process could not fairly, seamlessly, and quickly proceed through the hierarchical system of such organizations (Kester et al., 2011). According to the panelists, the decision-making process tended to be based on a hierarchical approach that ran through various levels of administration. However, both senior and lower management tended to be indirectly excluded from key decisions (e.g., policymaking, budget allocation, and organizational strategy). This led to a lack of clarity concerning their responsibilities and accountability. If not heavily regulated, systemized, and monitored, this hierarchical approach could cause unclear, duplicated, and missing lines of reporting responsibility in some areas of decision-making. Furthermore, the participants expressed the view that

Saudi governmental organizations in general lack the required informational infrastructures capable of supporting decision makers with considerable amounts of high-quality information; and therefore, the conclusion indicated a difficulty in adopting DSSs (Arnott, 2004, Arnott & Pervan, 2005).

Nevertheless, from the last round of data collection, the researcher drew six reform guidelines for different national arrangements and issues in order to increase the role played by TM in building DSSs capabilities in organizations (see Table 5 and Figure 1). The panelists asserted that the effective use of DSSs would require a reform of the Saudi governmental organizations' institutional administrative culture to allow strong governmental control and supervision, sufficient coordination and planning, and systematic flows of information through and between interrelated organizations. Further, the panelists agreed that the implementation of DSSs, among other things, would require a reform of the IT national advisory group system and the establishment of a national program to develop the infrastructures necessary for the development of the decision-making process system in Saudi governmental organizations.

CONCLUSION

This study investigated the reality of the DSSs in Saudi governmental organizations and the various issues enhancing the role of TM in the effective use of DSSs. The study revealed a number of necessary national reforms of various governmental and institutional arrangements and obligational aspects in order to enhance the role of TM in the implementation and effective use of DSSs. Consequently, this research fills a knowledge gap by examining specific contextual variables within a developing country—i.e., Saudi Arabia—and provides data needed to empirically assess the overall effectiveness of DSSs and the role played by TM, as illustrated below.

Implications of the Research

This research contributes to the field at different levels. At the theoretical level—although the DSS literature has highlighted various issues (see Table 1) adversely affecting the TM's interaction with the decision-making process and thus limiting the effectiveness of DSSs in organizations—the findings of this study refer to further issues related to different governmental, organizational, and institutional arrangements and obligations, which are grouped into a multi-dimensional framework (see Table 5).

In addition, while some of the issues summarized in Table 5 are consistent with the findings of previous studies; this study provides new insights linked to decreases in both the role played by TM in efficient decision-making processes and the effective use of DSSs in the Saudi governmental sector. For example, the findings showed the lack of a national oversight and accountability system geared to regularly evaluate the TM's role based on strategic decisions and business productivity; this is a new challenge linked to a reduction of the role played by TM in creating efficient DSS applications. Another finding of interest is that the TM's staffing system was not always based on competency due to various cultural issues; therefore, TM might disregard some optimal solutions due to personal interests.

This study also presents a comprehensive list of recommendations and reforms aimed at increasing the role played by the TM in building effective DSS capabilities in the governmental organizations of developing countries such as Saudi Arabia. This will enable other researchers to relate their views to those reported herein. Consequently, the results and discussion of this study have filled a gap in the literature, which had hitherto focused solely on the application of DSSs in developed nations.

At the practice level, the results provide national policymakers—in particular, those of developing nations—with a better understanding of the current issues and national reforms required in order to increase the role played by TM in building DSS capabilities in governmental organizations with the aim of better judging and developing suitable intervention strategies.

Research Limitations and Future Work

It is worth noting that this study's findings are based on qualitative data bound within the context of Saudi governmental organizations. Therefore, it may be difficult to generalize them to broader contexts (Eisenhardt, 1989)—despite the clear similarities between developing countries (poor management and low quality decisions resulting in less-than-ideal outcomes). Therefore, future research could transpose the issues and possible national reforms identified by this study into large-scale survey questionnaires suited to provide an opportunity for their verification in wider contexts. In addition, this research went beyond its declared scope when it identified TM as a bottleneck hindering the overall development of governmental organizations in developing countries—particularly with regard to the development of digital transformation infrastructure. The panelists stressed that the effectiveness of the role played by TM in building IT system capabilities is determined by the relationship between TM and the following three key elements:

1. The organization itself;
2. The information infrastructure;
3. The IT infrastructure.

These relationships are unclear, particularly within the governmental organizations of developing nations. Therefore, further research is needed to examine them.

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Abdullah Ibrahim Alkrajji is an Associated Professor in the Department of Information Technology and Communications, King Fahd Security College (KFSC), Riyadh. He holds a BSc in computer science in 1996 from King Saud University (Riyadh, Saudi Arabia), a MSs in computer science in 2002 from Florida Institute of Technology (Melbourne, Florida, US), a PhD in Information Systems (IS) from Loughborough University (Loughborough, UK). During his career, Dr. Alkrajji has participated in various educational and information systems projects and developments. His subjects of interest in the area of IS including Organizational aspects of information systems, Information Systems Evaluation and Integration, Information Systems for Development and Sociotechnical of IS Adoption and implementation. His research work appears in the Journal of Medical Systems, Wide-Campus Information Systems, and the Journal of Enterprise Information Management. He is in the editorial review board for several journals.