

Assessing the Impact of Data Governance on Decision Making in Saudi Arabia

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Abstract: There is currently a huge amount of data stored by Saudi Arabian organizations that requires work to make it useful. This has led to the concept of ‘data governance’ as a means of organizing data and managing its use in organizations. This research evaluates how decision making has been influenced by data governance in Saudi Arabia. Twelve interviews were conducted on two aspects of data management, data governance and data analytics, to explore how each approach affects decision making. Both interviewee groups indicated that these approaches had multiple direct and indirect effects on decision making. The interviewees mostly agreed that data governance increased confidence and trust in data and improved its quality. They viewed data governance as being likely to develop a more consistent business terminology and a set of rules and responsibilities for managing data, and that decision making would be made timelier. Despite the potential benefits of data governance for decision making, the lack of awareness about its potential makes it difficult for many Saudi Arabian organizations to benefit from its use. This study provides valuable insights for businesses considering the implementation of data governance practices to optimize their decision-making process.


1 INTRODUCTION


Data has become a key resource for organizations, but technological progress has created a huge variety of data types. Analysis of this data is necessary to help organizations remain competitive, but this analysis requires sophisticated techniques (Bento, Neto, & Côte-Real, 2022; Alsaad, 2023). Data governance (DG) is crucial for organizations’ strategic and operational decision making (Master & Management, 2007). It is needed to facilitate data flow, store and utilize information, enhance accountability, and develop strategies, all of which are dependent on, and improve, effective decision making (Bento, Neto, & Côte-Real, 2022). Organizations are becoming increasingly aware of the need for the sound DG of customer information to maintain data’s confidentiality, coherence, overall quality, and accessibility. DG is considered by many analysts as a

means of improving data quality and increasing its value to organizations (Otto, 2011; Wende, 2007). DG is also likely to lead to more reliable and effective decision making (Janssen et al., 2020). The Kingdom of Saudi Arabia (KSA) is at the forefront of a new information age, captured in its National Vision 2030. The wealth of data that the Kingdom creates and gathers can be used to foster economic growth and improve the living standards of its citizens (SDAIA, 2021).

The KSA has recently begun to standardize DG by implementing a set of protocols for data handling to enable a central body to make systematic use of the large volume of data across government departments (Sdaia.gov.sa, n.d.). DG is important for organizations and countries but the academic research highlights that it is still a newly emerging concept and needs more development for the advantages it offers

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to be available to decision makers in the KSA (Begg & Caira, 2012; Wende, 2007).

This paper addresses the need for more research by providing a systematic assessment of DG and how it affects decision making in the KSA. It examines how decision making is influenced by DG according to those directly involved in DG, as well as those affected by DG, such as analysts, artificial intelligence researchers, and other actors who use data to create products and new ideas. Section 2 discusses the background to DG and the gaps in research that this paper addresses. Section 3 describes the methodology, section 4 presents the analysis results, and section 5 draws conclusions.

2 THEORETICAL BACKGROUND AND RELATED LITERATURE

2.1 Data Governance Overview

Currently there is no universally accepted definition of DG (Benfeldt Nielsen, 2017), and most are simply based on a particular person's or organization's interests. The Data Governance Institute (n.d.) defines DG as a set of regulatory principles about the correct handling and use of data based on established models. DAMA International (2017) offers a definition more explicitly about who has authority to use and manipulate data, and how such usage is monitored and regulations enforced. DG is concerned with bringing data use into a formal organizational structure where policies and other regulatory standards (privacy protection, collection and storage, terminology etc.) are followed (Informatica, 2019). It thereby hopes to make the handling of data principled and properly managed. DG is frequently used to refer incorrectly to data management (Otto, 2011).

According to the Data Management Association (DAMA) (International, 2017), data management "is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets." Data management is primarily concerned with how data elements are defined, manipulated, stored, moved about, accessed, and structured. This positions DG at a higher level than data management, as it refers to how the latter is regulated and controlled and its use planned (Al-Ruithe & Benkhelifa, 2017).

DG is closely related to the quality of data and most organizations give one individual responsibility for both (Otto, 2011; Pierce, Dismute, & Yonke,

2008). DG and data quality are often discussed together (Otto, 2011; Weber, Otto, & Österle, 2009; Wende & Otto, 2007). One of the main goals of DG is often emphasized as being the improvement of the quality of data (Otto, 2011; Soares, 2010). In order to achieve trustworthy decision making, many organizations employ DG to enable them to control their data and ensure that its use meets ethical and legal standards (Janssen et al., 2020). DG is still a new field and requires more research to develop its potential in Saudi Arabia – a framework for DG was put forward in 2007 (Poor, 2011; Wende, 2007)

2.2 The Impact of Data Governance on Decision Making

DG is increasingly important to organizations because of its influence on both strategic and operational decision making (Master & Management, 2007). Despite its potential, organizations have yet to fully utilize data and harness its potential for business growth and profit (Ransbotham, Kiron, & Prentice, 2016). Similarly, its value to government decision making on important public issues has not been maximized (Ransbotham, Kiron, & Prentice, 2016). The value of data to organizations is impeded by problems with quality, accuracy, and accessibility, and these problems can translate into business problems. In the public sector, despite the volume of data about citizens and its potential to improve decision making, it is not used effectively to address citizens' needs because of a lack of DG (Benfeldt Nielsen, 2017). Furthermore, solutions to data problems are often short term and tackled in isolation, which further impedes effective data use (Brous, Janssen, & Vilminko-Heikkinen, 2016). To address such issues organizational involvement is required, not solely a dedicated team of IT specialists (Lee et al., 2014).

Data science is becoming ever more important to organizations and many are initiating programs to develop its use. Two case studies on asset management (Brous and Janssen, 2020) were examined to explore how DG can help make decision making trustworthy and to produce acceptable proposals. Both case studies revealed that decisions made by organizations with a DG scheme were more likely to be accepted. While it is well known that data science is a useful decision-making tool, it is dependent on the quality of the data it manipulates, and the theoretical model used to guide its methods (Brous and Janssen, 2020). Quality issues with data frequently prevent organizations from making full use of data science for decision-making purposes

(Lin, Gao, & Koronios, 2006), and they have led many organizations involved with asset management to adopt DG to control how it is used (Brous and Janssen, 2020).

The poor understanding of DG has meant that its ability to improve data science is underdeveloped and needs more research (Brous and Janssen, 2020). The emergence of 'big data' has brought with it a rise in the use of artificial intelligence (AI) approaches to processing this rich and inter-linked source of information (Janssen et al., 2020). These neural networks employ various machine learning algorithms to manipulate and process large data sets. Where such systems are used to inform decisions that affect individual citizens and the communities they belong to, any errors can result in harm and must be eliminated. This has led to the adoption of strict ethical standards and regulations. The size of current databases makes their management extremely difficult, increasing the importance of DG. In this way the quality of data can be maintained, ethical guidelines, as well as legislation, can be adhered to, and trustworthy decision making ensured (Janssen et al., 2020).

Technological advances have led to the concept of a smart city, and DG is playing an increasingly important role in such cities' management and decision making, as huge quantities of data need to be utilized to run the applications required to serve city functions (Choenni et al., 2022). The data comes from many sources, including mobiles, drones, IoT products, and robots. It also includes public sector and organizational databases and registries, and is not of uniform quality. To operate a smart city, the vast quantity of data needs to be efficiently processed and analyzed. As an example, the recording of entry and exit times on public transport was originally intended to be used to calculate the cost of travel based on the distance, but the data also contains information of great value for creating efficient public transport services. The type and quantity of vehicles can be adjusted to meet the different demands at specific times, and high citizen movement areas can be highlighted as potential crime spots for the police to monitor. The data is also highly valuable to businesses and can be used to develop applications and public services, such as sophisticated route planners that take account of safety as well as journey duration (Choenni et al., 2022).

Other applications of such data could be more environmental, and they can enable greener development policies, including tree planting to mitigate air pollution (Choenni et al., 2022). Eke and Ebohon (2020) conceive DG as the use of all

available data in a way that takes account of stakeholder interests and concerns, particularly the overall wishes of the residents for their city. This perspective emphasizes how data-driven decision making affects the lives of ordinary citizens. Such a view moves DG from a means of extracting value from data legally and responsibly, to one that also includes stakeholders in the evaluation of decisions (Eke & Ebohon, 2020). For data to be used to manage smart cities in order to properly further residents' needs, DG needs to be in place to ensure that the data used is objective, unbiased, and accurate. The algorithms used to analyze the data and inform decisions need to fairly weight the importance of equality and a fair distribution of goods and services, and the people operating the governance systems should be suitably qualified. Policy should thus be informed by accurate data, use transparent methods, be accountable, and adhere to acceptable ethical and legal standards (Eke & Ebohon, 2020).

The trustworthiness of decisions, and their impact on both operational and strategic plans, depends on good DG. There is, however, very little research on how DG affects decision making in the KSA, a shortfall that the current research aims to address.

3 RESEARCH METHODOLOGY AND DESIGN

Semi-structured interviews were conducted to understand how DG affects decision making in the KSA. The study comprised two groups of six experts working for organizations in either data analytics or DG roles. The DG interviewees were responsible for the implementation of DG in their organization as part of their professional roles, while the data analysts were involved in analysis and related data processing work. Individual semi-structured interviews and focus groups were conducted to discover how each of the two expert groups viewed the impact of DG on organizational decision making. Both groups had experience of decision making within their organizations.

Qualitative research using semi-structured interviews and content analysis typically continues with interviews until data saturation has been attained (Francis et al., 2010). In this present study, saturation occurred after twelve interviews had been conducted. Most of the interviewees were IT graduates and the details of the group members and their organizations are displayed in Table 1. This research focuses on governmental/semi-governmental and private sectors.

Table 1: This table includes the demographic information of the interviewees.

Interviewee Number	Interviewees Information		
	Organization Type	Interviewee Group Name	Interviewee Position
#1	Private consultancy company	Data Governance	Lead data governance consultant
#2	Semi-Government	Data Governance	Head of data and digital solutions
#3	Semi-Government	Data Governance	Data governance project manager
#4	Private – consultancy company	Data Governance	Data strategy manager
#5	Government	Data Governance	Data management & governance section head
#6	Government	Data Governance	Data governance department manager
#7	Private – banking sector	Data Analytics	Digital analytics manager
#8	Government	Data Analytics	Data scientist
#9	Government	Data Analytics	AI advisor
#10	Private – consultancy company	Data Analytics	Data & business intelligence senior specialist
#11	Private – consultancy company	Data Analytics	Senior analyst
#12	Private – consultancy company	Data Analytics	Business intelligence analyst

Standard ethical procedures were followed, and none of the data collected could be used to identify individuals, thereby fulfilling the anonymity requirements. Participation was voluntary, and all participants gave their informed consent before the start of the interviews or focus groups. The interviews comprised a series of pre-written questions, but both the interviewer and interviewee(s) had the opportunity to ask questions and respond during the interview, allowing topics to be explored in greater depth. The pre-written questions were carefully constructed to be objective and unbiased. Before beginning interviews with the full participant group, we carried out an initial pilot interview to ensure that the questions we planned to use were clear, comprehensive, and capable of eliciting in-depth information. The results from this pilot interview were encouraging, indicating that our questions adequately covered the areas we aimed to explore (Ritchie, Spencer, & O'Connor, 2003). Furthermore, the structure of our main questions proved effective in guiding more detailed discussions about topics raised by participants. It is worth noting that the individual interviewed during this pilot phase was chosen from the same pool of participants as those in our main study. Interviews are an appropriate qualitative research method when the aim is to obtain detailed information about people's views and attitudes related to a field of enquiry (Gaillet & Eble, 2021).

After the interviews were conducted, they were transcribed and subjected to thematic analysis. This

approach was considered suitable as it allows themes and sub-themes to be extracted from the interview/focus group transcriptions (Gaillet & Eble, 2021). The thematic analysis began with the researcher examining the data and identifying codes, which were then grouped into separate categories based on similarity. Themes and sub-themes were then extracted from the data. Interview transcription and data analysis were carried out using MS-Word and Sonix software. As the interviews were conducted in Arabic, native Arabic speakers translated the transcription data into English. The data thus obtained enabled a comprehensive evaluation of organizational decision making in the KSA and how this has been influenced by DG.

To ensure the reliability and validity of our research methods, we implemented two key strategies: triangulation and member checking. These techniques are crucial for reinforcing the trustworthiness of the findings in qualitative research (Varpio et al., 42).

Triangulation in our study meant comparing various data points to identify consistencies, differences, and complementary elements. This approach is based on the idea of using diverse sources or methods to evaluate research findings, which increases confidence in these results. As outlined by Varpio et al. (42), triangulation can include different dimensions like data, investigator, theory, and methodology. Our focus was primarily on data triangulation, involving a thorough comparison of responses from different participants to discover

common threads, discrepancies, or supplementary information.

Member checking, also known as informant feedback, respondent validation, or dependability checking (Varpio et al., 42), was another vital technique we used. This method entails sharing the data transcripts or interpretations with participants for their feedback. The aim is to validate the data analysis and increase participant involvement in the research. Typically, this process happens at two stages. First, participants review their transcripts to verify that their words accurately convey their intended meanings. Later, they assess the initial or final data analyses to confirm or critique the researchers' interpretations. This phase often involves asking participants for their insights on identified patterns or contextual factors, which enhances the interpretive process and enriches the study's findings. Top of Form

4 RESULTS & DISCUSSION

DG was found to have had a significant effect on decision making in the KSA. Both the data analytics and DG groups were of this opinion. Two example quotes from the interviewees were:

"Data governance has a high impact on decision making" (interviewee #3)

And: *"The impact on decision making should be high"* (interviewee #11).

The following sections present the results organized by the themes that emerged.

4.1 Trusted Data

Interviewees from the DG and data analytics groups mostly agreed that the adoption of DG would improve both confidence and trust in data, thereby also improving decision making. Example quotes from the interviewees on this matter were:

"Data governance will increase confidence to make decisions as the data will be trustworthy" (interviewee #9).

"...we tell our employee that this data represents reality and is actually true. They must have effective governance that creates security and confidence for the bank's employees" (interviewee #4).

As DAMA International (2017) observes, organizations are keen to make full and effective use of the huge volume of data available to them. To ensure that this data is reliable and of high quality, and that deep insights can be drawn from it, DG has now become a priority (International, 2017). Organizations are also beginning to establish 'data

warehouses' to manage the data so that their decision making and business analysis are well informed, and the insights gleaned from the data can be used in innovation (International, 2017). Certain interviewees described how the use of a centralized, secure, and trusted database functioned as a trusted source of information for their organization. This centralized data source integrated the data from multiple external sources (including other intraorganizational sources) and it was then used to provide reliable data for business reports and data analytics. Interviewee #4, for example, stated:

"We had a data warehouse project that took all the existing data from all data sources in the bank and integrated them into one reliable source (single source of facts). This place actually produces reliable data that can be used to build reports and gain insights"

In the data analytics group two interviewees reported that one of the advantages of a single, centralized data source was that more consistent data was used to inform all the departments – there was a single and trusted source of factual information. This avoided having different departments within the organization making decisions based on different data that could sometimes be conflicting:

"Why data governance is important .., you'll have a standard, so you won't have conflicting figures coming out of your different units or departments. So you'll have a single source of facts for everything" (interviewee #11).

In the data governance group three interviewees reported similar views and explained how the lack of a single source of accurate facts had resulted in a decision maker receiving different data for the same business report:

"One of the most important principles implemented by data governance team is having one single source of facts. Imagine if I had more than one source! One of the problems faced by the decision maker is when he says: "I got the same report from two different departments ... and later, the same report produces different output! This happens in most entities" (interviewee #1).

These comments illustrate why organizations need DG. It ensures that the data used to inform decisions is accurate, clear, and trusted, and this leads to greater confidence in the organizational data (Begg & Cairn, 2012). DG also increases the trust and confidence in information products as a result of it directly improving the reliability of the data used to make them and indirectly as a result of the wider trust levels across the organization (Otto, 2011; Wende & Otto, 2007).

4.2 Data Quality

Most interviewees considered DG to be associated with greater data quality: *“The impact of data governance on decision making is very high as it produces better, higher quality data, which will be reflected in improvements in the quality of recommendations we provide as analysts. It means that the decisions made based on these recommendations will be more accurate”* (interviewee #7).

“As a data governance team, we aim to raise the quality of data I work with the business team to identify the key data elements that they rely on to make decisions. I then set rules based on business inputs which are implemented by the information technology team to help me establish the dimensions of data quality” (interviewee #1). These views are consistent with the literature, where data quality is also considered to have a strong correlation with DG (Otto, 2011; Pierce, Dismute, and Yonke, 2008.).

This has led to data quality being used as a measure for evaluating the performance of DG (Khatri & Brown, 2010; Otto, 2011; Wende and Otto, 2007). In the data analytic group, nearly all of the interviewees considered data quality to be crucial and problematic when not attained. Rather than analyzing data, many analysts found themselves addressing data quality issues:

“Most of the challenges that I face relate to data quality and processing ... we work more on the steps to improve data quality” (interviewee #8).

“Sometimes, or actually almost all of the time, the data that comes in is of very poor quality. So we have to do quality checks” (interviewee #10).

Decision making throughout an organization is seriously affected by poor data quality:

“If you have data that’s ambiguous or inaccurate or duplicated, it can be misleading ... these things affect many of the tasks that someone who analyzes data performs. It’s what affects the decision making indirectly” (interviewee #10).

The efficient use of data is hindered by poor-quality data and can even result in erroneous decision making that has serious consequences. High-quality data is required to obtain the benefits of big data through analysis, and to extract value from the information contained in the data (Cai & Zhu, 2015). DG needs to ensure that the quality of data is of a suitably high standard for the areas of business in which it is used (Brous, Janssen and Vilminko-Heikkinen, 2016). The data used by an organization needs to be ‘fit for purpose’, and DG needs to ensure that it is maintained to sufficiently high standards;

this requires that binding policies and usage guidelines are in place for data management (Otto, 2011).

In the DG group, two interviewees described how it was necessary for the quality of data to be improved in conjunction with other business departments, as the DG team played a part in forming the business rules for their organization:

“Actually, yes we were involved, I speak their business language ... we convert our understanding of data to business rules so we can check data later on” (interviewee #4).

4.3 Roles and Responsibilities

The DG team were all of the opinion that the proper management of data required having clearly defined roles and responsibilities: “When you’re governing data, you must define roles and responsibilities...how do we define roles and responsibilities? ... by policies” (interviewee #3).

The interviewees were also in broad agreement with the fact that DG should involve a dedicated data steward and that owners should be properly assigned to specific data. Data stewards have comprehensive knowledge of the data and the business requirements for that data (Cheong & Chang, 2007). They also need excellent IT skills with which to produce data in a form that meets specific business requirements. Data stewards understand the terminology and definitions used by a business, and how the data will be used by the business. They can form part of the team responsible for producing business rules, definitions and terms, and quality standards (Wende, 2007).

In contrast, data owners are responsible and accountable for the data they own, and they have the authority to approve decisions about data within their field (International, 2017). One interviewee in the data analytics groups reported that the absence of clearly defined roles and responsibilities, and proper assigned authority can be detrimental to data quality. *“There is a real problem happening today in our bank ... we told branch managers that when a client comes to you, try to let him\her use a digital channel – and this is what they do. The problem is that after the client uses bank services through a digital channel, the branch manager calls the IT team to change the channel from digital to branch. They are doing this to meet branch KPIs (key performance indicators) ... they have no idea of the damage to data quality that they caused!!! I lost my customer because of what they did”* (interviewee #7).

They added: *“We raised this with the data governance team and they made the excellent*

decisions to assert that not everyone has the authority to change data. The role of the data governance team in this case was a savior” (interviewee #7).

As noted by International (2017), decision making is affected by data quality. Therefore, the role of data owners and data stewards is essential for maintaining this quality and addressing any shortcomings (International, 2017).

4.4 Common Understanding

For data to be governed properly the DG team need to understand the value and meaning of the data to the organization (Smith, 2007). When managing big data, reliable metadata must be formed to enable organizations to realize what data exists in the databases, where it came from, what it represents, who can access it, what quality standards must be maintained, as well as how the data moves through, and is integrated into, the organization’s systems (International, 2017). The DG team must be accountable for the metadata (Al-Badi, Tarhini, & Khan, 2018).

4.4.1 Business Glossary

The different uses of terminology can be confusing and lead to errors. A business glossary addresses this need for clear and well-defined terminology (International, 2017). By ensuring that consistent and accurate data description terms are used and incorporated into the business glossary, communication is improved throughout the organization and ambiguities resolved (International, 2017). This view of the importance of a data glossary was confirmed by most interviewees:

“As an organization, how do I benefit from the data that I have? ... I must classify data ... I should have metadata and a business glossary to define data attributes” (interviewee #5).

“Data governance helps decision makers in certain things such as standardization. For example, when we say the word ‘employee’ what is its definition? Is it a part-time or full-time employee?” (interviewee #2).

If data is not referred to and manipulated consistently, and with accurate terminology, errors can filter through into the reports used by decision makers. One of the data analytics interviewees stated: *“I once saw a scenario where a leader requested their teams to calculate the numbers, for example, for a sale. And two different teams provided different numbers ... and it was a huge embarrassment to the organization. And when they investigated, it turned*

out both of the numbers were right. They were just using different measures” (interviewee #10).

Furthermore, the DG group shared this view: *“...when the finance department shares a report, it is not reflecting the same information as the other sectors. The reason is that the finance department looks at it from a different viewpoint, and the method of calculating data was also different ..., so there was a conflict. This misleads the decision makers, how did he make the appropriate decision?”* (interviewee #6). These remarks highlight the importance of a business glossary to good DG (International, 2017).

4.5 Decision Time

Most interviewees considered that poor DG results in organizations not realizing the full value and potential of the data they have, which can impact decision making: *“The impact of data governance on the decisions, is cost, it’s as simple as that, it would be costly. When a decision maker makes a particular decision, usually the reason behind it is investment – it is either profit or loss”* (interviewee #5).

DG that is effective and well structured also enables decision makers to acquire information of high quality within their time constraints: *“Today we are living in a very fast-paced world. In the private sector, I would not even wait for a day or two to make a decision. It is possible for the competitor to get the opportunity and be ahead of us. In the government sector, certain decisions are supposed to be taken very quickly based on specific data, so that the country develops. So the question is how will the decisions be affected if there is no data governance? This decision is supposed to be instant – within hours, for example. If there was no data governance, time would be wasted in figuring out how to solve data quality problems, or where to get data from, or how to make sure data is reliable? And missed opportunities are costs”* (interviewee #4).

Most interviewees did not refer to DG increasing the decision time, with only two remarking on it. One of the data analytics interviewees commented: *“Data governance ensures the quality of the data, but slows down the decision-making process”* (interviewee #8). However, organizations are aware that high-quality data is more valuable than low-quality data (International, 2017). Reliable data is an advantage to employees as they can answer questions faster and with greater consistency. Employees can also use their time more effectively for the organization, by addressing customer needs, making decisions, and finding insights from the data, rather

than expending valuable time on data issues (International, 2017).

4.6 Change Management

Data in the KSA is regulated by the National Data Management Office (NDMO). This office is responsible for setting standards in national DG, data management, and personal data protection, and it set up a regulatory framework three years ago to apply these standards (Sdaia.gov.sa, n.d.). All government departments, entities, and any assigned business partners who use government data must comply with the standards set by the NDMO (SDAIA, 2021). DG remains a recent development in KSA, particularly in the government domain, and this was reflected in the interviews with the DG group.

All of these interviewees raised concerns about the lack of awareness about DG and the challenges that remain, posing barriers to its effective implementation: *“In general, the challenges that face data management offices in the government sector are always culture and change in management”* (interviewee #5).

“The regulator has to play a bigger role, and understand that there are challenges, and try to apply changes in management because this is a change happening at the level of their entity or at the level of Saudi Arabia. And this change will affect many things and everyone should be aware of it” (interviewee #4).

Two of the DG interviewees commented on the way it was being implemented. The employees responsible for implementing DG were inadequately informed about their roles, and some also considered it to be nothing more than an added workload:

“Business people do not know what roles and tasks they’re supposed to do. For example, when a data governance officer tells them: ‘According to the policy, you must classify your data before you share it’, or ‘You must define data fields’, they reply: ‘You are asking me for something that is not one of my duties and responsibilities’. So they consider it extra work. How do we overcome this issue? The leader of the entity should believe in data governance practices, he can help the data management office by assigning a data steward to ensure that data governance is implemented and that it is a part of their tasks” (interviewee #5).

The interviewees made certain suggestions to tackle these barriers to the effective implementation of DG. These included raising awareness of its function and importance through workshops and other focus-group-style meetings. Good DG practices should be filtered down from top level management,

and good leadership is required for these practices to be established successfully. Their implementation should also be done in stages, as gradual changes in data handling practices meet less resistance to change.

Finally, once established, good DG needs to be maintained through periodic checks of adherence to standards. Examples of the interviewees’ views on this matter are as follows:

“Raising awareness about data governance should be through interactions, sending emails is not enough and we should leverage the data steward to transfer knowledge. Therefore, selecting a data steward is important” (interviewee #1).

“Data governance should be flexible, especially in the early stages. The entire framework should not be applied at once, but rather in stages for easier implementation, also to measure its progress” (interviewee #2).

“I recommend that before establishing a data governance office, the regulator should conduct sessions and workshops from the top down, starting with ministries and deputies, to explain the main objectives of data governance that they want the office to achieve, and then the office will apply it gradually, then meet with the regulator next year – not to check compliance, but rather to share any lessons learned and to come up with recommendations. Then in the second or third year after going through this process with the various departments, the regulator can conduct compliance checks” (interviewee #4).

5 CONCLUSION AND FUTURE WORKS

In summary, this study presented a thorough and in-depth evaluation of DG in KSA and its impact on decision making. Qualitative data was obtained from interviews with six experts working in DG and six in data analytics. The former group were responsible for implementing DG in their organizations, while the latter were involved with analysis and data modelling.

Both groups of interviewees considered effective DG to improve the decision making of an organization, as it increases trust and confidence in organizational data and improves the clarity of useable information. Decision making is further improved by the increases in data quality brought about by good DG. Having clearly defined roles and responsibilities, particularly data stewardship and ownership, is essential for good DG. These roles

assign accountability for data quality and authority over data usage, which are both crucial components of good DG. They also help to ensure its positive impact on organizational decision making. DG also includes standardizing data and data metrics, as well as the terminology used in data analysis and reporting. The improvements in the intraorganizational consistency and clarity in reporting that come from this standardization are essential for effective decision making. A properly implemented DG framework speeds up data processing, enabling high-quality data to be produced or accessed when most needed for important decisions.

The interviewees make it clear that there are many direct and indirect benefits of good DG. However, a lack of awareness and experience has meant that KSA institutions and governmental actors face barriers when attempting to instill good DG practices. To mitigate these problems, organizations should introduce workshops to increase awareness, ensure excellent leadership provides top-down support, and implement DG gradually. This will enable organizations to obtain the considerable value that good DG can offer.

Lastly, this study's findings present several limitations that warrant further research. First, there have been limited studies on the impact of data governance in KSA, given that data governance is a relatively new field both globally (Benmoussa, Khouliji, Laaziri, and Larbi, 2018), and particularly in KSA. As a result, further research on data governance in KSA is recommended.

Second, this study's conclusions are not supported by quantitative data. Although valuable insights were gained from qualitative analysis, the inclusion of quantitative measures would significantly enhance the empirical foundation. Future studies, therefore, will seek to incorporate quantitative data for a more comprehensive and balanced analysis.

Third, the sample was drawn from a variety of sectors, including government, semi-government, and private sectors, spanning diverse business domains such as health, energy, and banking. According to interview results, the energy sector in KSA is seen as mature in terms of data governance and quality, potentially facing fewer challenges compared to other sectors. Therefore, future research should focus on specific sectors (e.g., government or private) or domains (such as health, energy, education, etc.) to gain deeper insights and more comprehensive results. To enhance the findings' generalizability, subsequent studies should aim to

increase the participant pool and extend the scope across different geographical areas.

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