The impact of business intelligence system (BIS) on quality of strategic decision-making

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CHRONICLE	ABSTRACT
	This study aims to investigate the impact of Business Intelligence Systems (BIS) on the quality of strategic decision-making in top-level management. The independent variables in this study are Data Quality, Data Visualization, and BI Management, while the dependent variable is the Quality of Strategic Decision-Making. Additionally, the study explores the moderator variable, BI Scope, to further understand the relationship between BIS and the quality of strategic decision-making. By providing valuable insights into the relationship between BIS and the quality of strategic decision-making, this study contributes to the existing body of knowledge on business intelligence and strategic decision-making. The findings show that BI Management, BI Scope, Data Quality, and Data Visualization have substantial and favorable correlations with the quality of strategic decision-making. Effective BI Management techniques contribute to higher decision-making quality, emphasizing the necessity of BI resource management. The study also underlines the importance of BI Scope as a moderator variable, demonstrating its impact on the connection between BI and quality of decision-making. In addition, the research shows that Data Quality and Data Visualization have a considerable influence on strategic decision-making quality. Using effective visualization tools and ensuring high-quality data improves the results of decision-making processes. The interaction impact between BI Scope and Data Quality, on the other hand, was determined to be non-significant.

1. Introduction

Business intelligence (BI) systems have recently emerged as a result of recent breakthroughs in MIS and technology (Gurcan, Ayaz, Menekse Dalveren, & Derawi, 2023). In order to allow consumers to act immediately on insights, BI works to collect data and translate it into trends and visuals (Orji et al., 2023). As a result, BI is seen as a unique class of information technology (IT) capabilities that are tied to a company's capacity to offer decision-makers high-quality information (Kulkarni, Robles-Flores, & Popovič, 2017). Organizations are urged to collect, comprehend, and use data to assist decision-making and enhance business operations because managers must have the appropriate information at the appropriate time and location (Khder & Abu-AlSondos, 2021). At the same time, there is continuous pressure from management to justify the contribution of BI.

Any business could benefit from improved decision-making through the use of BI (Niu, Ying, Yang, Bao, & Sivaparthipan, 2021). Because it gives knowledge workers the chance to have real-time access to the information and analyze it effectively and intuitively, BI also offers the organization high-quality information that is essential in the decision-making process (Al-Okaily, Teoh, & Al-Okaily, 2023). As stated in the study by (Arnott, Gao, Lizama, Meredith, & Song, 2019), there are usage

patterns for BI systems in the organization that need to be investigated because their inputs assist senior management in making strategic decisions while also assisting employees at lower management levels in carrying out their daily duties.

1.1 Research Problem

There is a dearth of study on how BI and analytics impact decision-making, despite the fact that BI is one of the booming trends that big businesses have adopted to support managerial operations (Khder, Abu-Alsondos, & Bahar, 2021). Chief information officers have made BI systems a major priority, however (Wieder & Ossimitz, 2015) found that little is known about how to manage these systems successfully after adoption. As a result, organizations must evaluate and assess their BI systems. The researcher concluded that there is a particular gap in BI practices that requires special attention after using BIS for a number of years, considering several conversations with colleagues who are specialists in maintaining BIS, as well as a collaborative assessment that included senior managers. Given that the quality of strategic decision-making at all management levels can be considered a key competitive advantage and that any gap in one of them will have an impact on the entire organization, this gap is related to the impact of BIS on that quality.

1.2 Research Significance

Not all businesses are equally successful in establishing BI capabilities, despite continued investments in BI systems and their growing significance (Hatamlah, Allan, Abu-AlSondos, Shehadeh, & Allahham, 2023; Kulkarni et al., 2017). The practical significance of the successful deployment of a BI system and the crucial impact of such a system on the caliber of strategic decision-making in the organization, thus, enhanced the importance of this study. By offering an assessment and evaluation of BI practices within organizations considering the top management level and the caliber of strategic decision-making, this study's significance also extended to the researcher's place of employment. The researcher's efforts to increase the number of studies on the impact of BIS on the quality of strategic decision-making in particular and BIS in general as there aren't many studies on these topics, as far as the researcher is aware, give rise to this study's scientific significance.

1.3 Research Model

The researcher relied on the previous studies of (Hatamlah et al., 2023; Wieder & Ossimitz, 2015) for building the main structure of the model and selecting independent and dependent variables. The independent variables in this study are Data Quality, Data Visualization, and BI Management, while the dependent variable is the Quality of Strategic Decision-Making. Additionally, the study explores the moderate variable, BI Scope, to further understand the relationship between BIS and the quality of strategic decision-making.
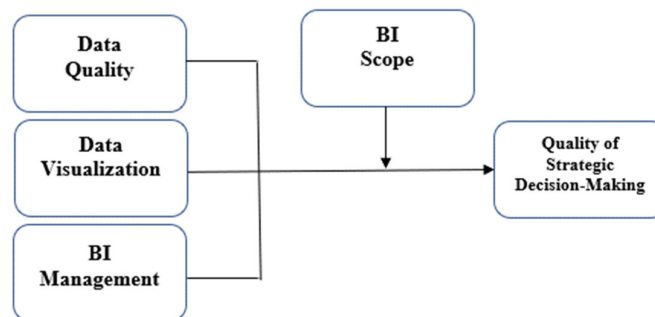

Fig. 1. Framework of the study

2. Theoretical Framework

2.1 Business Intelligence (BI):

Organizations must assume greater responsibility for the environmental impact of IT as a result of current IT developments (Al-Okaily et al., 2023) (Aquinas. In many organizations, managing the massive amounts of produced data and making it accessible to decision-makers and analysts at all organizational levels is the top priority of IT administrators. The requirement for management to establish a data-driven organization is the cause of this transition (Gaardboe, Nyvang, & Sandalgaard, 2017). Gaetner Group coined the name "business intelligence" in the middle of the 1990s, but the idea behind it dates back to the 1970s and systems for data reporting and management information systems (MIS) (Sharda, Delen, Turban, Aronson, & Liang, 2014). According to Delen et al. (2018) the primary goal of BI is to convert data into pertinent and meaningful information for businesses and decision-makers. such that they "do not need to rely on gut feelings, guesses, or experiences", which gives the decision-maker information. According to (Sharda et al., 2014), business intelligence (BI) is a stack that is used to enable gathering, analyzing, displaying, and disseminating business information (Alawadhi, Zowayed, Abdulla, Khder, & Ali, 2022; foud Ali, Zowayed, Showaiter, Khder, & Ali, 2022; Hassan, Aldoseri, Saeed, Khder, & Ali, 2022). For the

construction of the right technological infrastructure and the use of BI for organizational benefit, BI capability in obtaining, absorbing, and strategically leveraging new information is essential (Niu et al., 2021).

The first is that BI tools enable the integration of data across systems and presentation of it through one system, saving time for both data dealers and BI users. There are three significant differences between BI systems and other integrated management systems. The ability of BI to automate as many data utilization processes and tasks as possible—data processing that takes place in the background and does not require the usage of local computers—is the second attribute. The ability of BI tools to visually portray data is the third key feature, which helps users identify the information they need more quickly (Ilvonen, 2019). Reporting BI systems, Analysis BI systems, Monitoring BI systems, and Prediction BI tools are the four primary BI systems that are typically utilized in businesses (Doshi, Hiran, Mijwil, & Anand, 2023). While analysis BI systems offer information on the reasons behind a certain event, reporting BI systems concentrate on creating business documents that contain valuable information on what has already occurred at a particular moment in time. However, BI monitoring solutions let firms keep an eye on information in real time. Last but not least, the BI Prediction tool aids in predicting potential outcomes for business-based data that is available on industry trends (Gauzelin & Bentz, 2017).

By speeding up decision-making and enhancing performance, BI systems add direct and indirect value to businesses (Popovič, Hackney, Coelho, & Jaklič, 2012). Executives are the first group that BI serves; they require it for strategic information. Analytical users are the second group, and operational users are the third group, using it for often occurring short-term choices (Hassan et al., 2022).

2.2 Definition of Business Intelligence (BI)

According to (Wieder & Ossimitz, 2015), the word "business intelligence" (BI) is used in academia and research to refer to a number of information management techniques and information-seeking activities, as well as the information that results from these actions. Business intelligence (BI) is a broad word that encompasses infrastructures, tools, databases, analytical tools, applications, and processes to enable interactive access to data, enable data modification, and provide business managers and analysts with the capability to do suitable analyses. According to (Sharda et al., 2014)"The process of BI is based on the transformation of data into information, then to decisions, and finally to actions. According to (Hassan et al., 2022; Pejić Bach, Zoroja, & Čeljo, 2017), a wide range of technologies and applications useful for retrieving and analyzing a large amount of information with the goal of generating knowledge useful for making an effective business decision" are referred to as business intelligence systems (BIS).

According to a recent definition of business intelligence (BI), large-scale systems that integrate IT, data reporting, and analytic processes are used to support organizational decision-making (Arnott et al., 2019). The term "BI system" is also used to describe computerized techniques and procedures for transforming data into information, which is then transformed into business (Gauzelin & Bentz, 2017). According to (Ain, Vaia, DeLone, & Waheed, 2019), a BI system is also frequently recognized as a technology solution suite that enables organizations to combine and analyze huge amounts of data in order to understand their possibilities, strengths, and weaknesses.

BI is a system that allows consumers to understand the meaning behind current company information by presenting it in a way that is simple to consume (Quaddus & Woodside, 2015). According to (Gurcan et al., 2023), BI is also defined as a technology that consists of systems and procedures that are used to transform raw data into evocative and practical meaningful information. This information enables successful analysis of a company and its competitive environment. BI is also described as a method and a product that can be utilized to create usable data that enables firms to thrive in the global economy and predict the actions of the business environment (Chen & Lin, 2021).

2.3 The Importance of Business Intelligence (BI)

For many years, BIS has been a top concern for IT directors, and as a result, the market for BI software products has continued to expand. Business Analytics (BA) and Big Data management, two recently emerging BI trends, have also contributed to the market's ongoing expansion for BI software (Wieder & Ossimitz, 2015). In order to gain competitive advantages, businesses have invested a significant amount of money in BI systems during the past ten years(Kulkarni et al., 2017). To be able to compete in the global economy, BI tools must be used in strategic and operational decision-making (Aziz, 2020). According to (Gauzelin & Bentz, 2017), BI promotes the gathering of competitive information and streamlines organizational strategic planning, which are then used to the strategic decision-making process inside a specific organization or business.

Giving management the capacity to extract data for business-related information that can be used to support operational and tactical decisions is the goal of BI analysis (Sharda et al., 2014). The organization will be able to make better decisions with a complete understanding of these choices thanks to BI (Popovič et al., 2012). This will boost operational effectiveness and revenue while also increasing stakeholder and customer satisfaction.

Technology, data, and analytics are viewed by executives as a transformative force in business. In order to assist reporting and strategic decision-making, many firms are implementing BIS and analytics (Rikhardsson & Yigitbasioglu, 2018). In

conclusion, business intelligence (BI) systems are cutting-edge technological tools that emerged as a result of recent advancements in data science and IT. These advancements were motivated by an organizational desire to narrow a decision-making gap and become more competitive in the global economy. The value of a BI system derives from its capacity to not only collect and report data, but also to transform that data and information into insightful knowledge that can support decision-making.

2.4 The Quality of Decision Making

The assurance of efficiency and effectiveness in the analysis of decision-making problems is made possible by decision-making quality (Li, Lin, Ouyang, & Luo, 2022). Making decisions is a daily process that happens in all spheres of our lives, including our homes, workplaces, and executive offices. While managers and leaders at the top of the organizational hierarchy typically make crucial decisions (Aziz, 2020), this is not always the case. The process of finding and choosing a solution or course of action that can add value for stakeholders is known as organizational decision-making.

Processes that result in high-quality decisions are referred to as decision quality (Neal & Spetzler, 2015). The effectiveness of decision-making depends on making judgments faster while maintaining higher precision (Niu et al., 2021). Good decisions are based on decision quality, and high-quality decisions should satisfy six key criteria, according to (Spetzler, Winter, & Meyer, 2016): "Setting the right frame; Considering alternatives; Gathering meaningful data; Clarifying values and trade-offs; Using logical reasoning; and Committing to Action."

The following set of elements can be considered to improve the quality of decision-making: environmental factors, organization strategy, ethics, empowerment, information and feedback, programs, options, risk avoidance, resources, and opportunities. Managers believe that the amount of information at their disposal affects the caliber of their decisions (Negulescu & Doval, 2014). Different decision-makers will employ various strategies, which will affect the caliber of their decisions (Campbell and Clarke, 2018). Another aspect that affects decision-making quality is experience and past choices, which might have an impact on managers' future choices (Hatamlah et al., 2023).

2.5 The Importance of Quality of Decision-Making

One of the biggest competitive advantages for a person or a firm to have is the capacity to make timely judgments with consistently good results, hence it is critical to look at decision-making processes and how to improve decision quality(Al tarawneh, Alqaraleh, Ali, & Bani Atta, 2023; Shniekat, AL_Abdallat, Al-Hussein, & Ali, 2022). When used properly, it can make it possible to capture the greatest value possible in complicated and uncertain situations (Neal & Spetzler, 2015). Many firms struggle with making strategic decisions in a fast-paced business environment (Al-Okaily et al., 2023). According to(Ali & Oudat, 2021), high-quality efficient and effective decision-making typically leads to better levels of organizational skills and can be viewed as a crucial competitive advantage.

Management entails making decisions on how to organize and run a firm in all its forms. The quality of the decisions made by organization managers can determine whether an organization succeeds or fails (Gurcan et al., 2023). As a result, the effectiveness of decision-making inside an organization is crucial (Negulescu & Doval, 2014). The efficacy and success of an organization are significantly influenced by the caliber of its strategic decision-making. Therefore, management must provide the instruments that help improve the decision-making process within their firm's additional attention and effort.

2.6 Strategic Decisions

Strategic decisions are those that affect an organization's long-term course in order to raise the likelihood that it will succeed; these decisions are significant because of the resources they commit, the actions they take, or the precedents they set (Papadakis & Barwise, 2012). Strategic decision-making is regarded as crucial because it involves fundamental choices that are influencing firms' futures. According to (Acciarini, Brunetta, & Boccardelli, 2021), a strategic choice is one that aims to plan the organization's future over the long term and is significant in terms of the management's actions and resources committed. Organizational growth is the primary focus of strategic decisions, which are made in accordance with the mission and vision of the firm (Papadakis & Barwise, 2012). According to (Acciarini et al., 2021), there are four different categories of strategic decision-making: analytical, heuristic, expert, and random choice.

Because strategic decision-making focuses on the objectives, these decisions are essential for operations in contemporary economies. To achieve and maintain its competitive edge, the company focuses on setting and planning its goals and objectives at the strategic level (Eisenhardt, 1999). According to (Gurcan et al., 2023), "strategic decisions explore the goals and priorities for the response." The ability to successfully make strategic decisions allows the business to maintain a competitive edge and align its internal processes with its external environment. Additionally, it enables companies to endure difficulties and risks. On the other side, bad strategic choices result in the collapse of an organization. According to (Alhaj et al., 2023; Shniekat et al., 2022), top management creates the framework for this type of decision-making, which is influenced by top management's behavioral variables. Managers have the ability to affect the outcome of strategic decisions by the decision-making process they employ.

2.7 Data Quality

Data and information are closely intertwined. Data representation of pertinent facts is referred to as having high data quality. In the context of business intelligence (BI), the distinction between data (quality) and information (quality) is particularly clear. To convey complicated and competitive internal information to decision-makers, BI combines knowledge management, data collection, and storage with analytical tools. Providing high-quality information for managerial decision-making is the primary goal of BI. According to (Wieder & Ossimitz, 2015), the hierarchical link between data and information suggests that data quality is an antecedent or prerequisite, but not a guarantee, of information quality

This illustrates how high-quality data can be used to obtain quality information. If data are appropriate for use in operational operations, decision-making, and planning, they can be viewed as having good quality (Ali & Oudat, 2021; Li et al., 2022). Both internal and external company data are transformed into information that can assist businesses in achieving objectives, opportunities, and corporate position (Wieder & Ossimitz, 2015). As a result, high-quality data can be used to obtain quality information. As a result, data play a crucial role in the installation of BIS. They must be of high caliber because their existence is unavoidable. Consequently, a hypothesis is proposed as follows:

H₁: *Data quality has a positive impact on the quality of strategic decision making.*

2.8 Data Visualization

Data visualization, which can offer a distinctive and effective way to convey the information, is a summary of the data presented in graphical forms as diagrams, charts, curves, etc. (Sinar, 2015). By looking at the dashboard, the manager will gain an understanding of the situation inside the company. The management made the decision as a result of the information displayed on a dashboard or in another way. Only a well-designed dashboard customized to the user's demands can assist the management in strategic making decisions with acceptable outcomes. strategic Decision-makers can track the main performance indicators of the company by using data visualization, which allows users to build graphs, charts, widgets, and ad hoc reports. Therefore, the hypotheses are proposed as follows:

H₂: *Data Visualization has a positive impact on the quality of strategic decision making.*

2.9 BI Management

Theoretically, (Wieder & Ossimitz, 2015)asserted that BI management (managing BI systems' implementation, support, and purpose and strategy) has a favorable impact on data and information quality as well as the scope of BI (the number of business functions or processes that BI tools can support). In order to successfully integrate corporate strategy and BI software into BI systems and to guarantee the achievement of BI process-related goals, BI management capabilities should be considered (Ahmad et al., 2023).

In order for BI management to be successful, IT and business must coordinate throughout the BI cycle (Wieder & Ossimitz, 2015). Companies can reap the potential benefits of BI applications if IT department resources and business needs are coordinated through effective BI management (Wieder & Ossimitz, 2015). Therefore, BI management will have an impact on BI scope, and strategic making decisions, in addition to directly affecting objectives attainment, which is quality strategic decision making in terms of BI process. Consequently, the following hypotheses are put forth:

H₃: *BI management has a positive impact on the quality of strategic decision making.*

2.10 The Moderating Role of BI Scope

According to (Wieder & Ossimitz, 2015), BI scope is a variation in the numerous applications used or implemented at distinct stages of business activities. In terms of purpose or role, function, functional breadth, and level of sophistication, the various software packages available in support of BI systems vary (Peters & Wieder, 2013). According to the BI scope, the BIS is fit for each individual's goals and is simple to accept and apply (Wieder & Ossimitz, 2015). Two changes to the BI scope are anticipated as a result of improved BI management. First, the immediate effects of the BI system's improved performance. According to (Wieder & Ossimitz, 2015), effective BI management will also increase the trust that users have in the technology, leading to a larger uptake of BI apps across all business functions. Therefore, it is anticipated that the broad and diverse uses of BI will be able to assist the organization or business in making a strategic decision. Consequently, the following hypothesis is put forth:

H₄: BI scope has a positive impact on the quality of strategic decision making.
H₅: *The effect of Data quality on the quality of strategic decision making is moderated by BI scope.*
H₆: *The effect of Data Visualization on the quality of strategic decision making is moderated by BI scope.*
H₇: *The effect of BI Management on the quality of strategic decision making is moderated by BI scope.*

2.11 The Relationship Between BIS and Quality of Strategic Decision-Making

According to (Salo & Allwood, 2021), the effectiveness and efficiency of the strategic decision-making process are related to decision quality. Top management's enforcement of rules that prioritize the use of information in strategic decision-making will be a sign of higher organizational capacities. According to (Gurcan et al., 2023), BIS has the power to raise the standard of the information used in strategic decision-making. BIS provides the required assistance for processing data and making the right strategic decisions (Khder & Abu-AlSondos, 2021), but decision quality may be constrained if businesses are unable to apply BIS at the proper level (Arnott et al., 2019). According to (Visinescu, Jones, & Sidorova, 2017), the study of strategic decision quality in the context of BIS will contribute to closing the knowledge gap. By fostering and improving the quality of strategic decision-making within the firms, the use of BIS can be useful (Wieder & Ossimitz, 2015).

In order to support and enhance strategic decision-making across a wide range of business activities, BIS provides the capability to evaluate business information (Elbashir, Collier, & Sutton, 2011). BIS aids in the development of insights and offers managers important data and information that enhances the caliber of their strategic choices (Rikhardsson & Yigitbasioglu, 2018). According to (Delen et al., 2018), BIS possesses in-depth knowledge of the critical factors for high-quality strategic business decisions. Additionally, it speeds up decision-making, which leads to performance that is superior in the marketplace (Li et al., 2022). There are numerous examples of firms that successfully implemented BIS and saw improvements in their strategic decision-making and decision-making quality. Nevertheless, gauging BIS performance is difficult. "The number and quality of decisions made as a result of insights generated via the BIS tool" is one of the measures companies employ (Djerdjouri, 2020). Making strategic decisions is essential to the success of any firm. Organizations that are engaged in the strategic decision-making process must consider each component's unique strengths while ensuring adequate integration and balance among them. Strategic decision-making of the highest caliber will produce decisions of the highest caliber for the entire organization. In order to better comprehend this link and the extent of its impact on strategic decision-making, it is crucial to research and assess the quality element of BIS's impact on strategic decision-making.

Wibiayu and Siallagan (2022) investigated how BI dashboards affected the decision-making process. This study intends to investigate how employees at the Indonesian Food and Drug Authority (FDA) feel about data visualization. This study found that by giving staff members a quick overview of current data, BI dashboards could aid in quicker and more accurate decision-making. Additionally, this study concluded that data filtration is the most crucial feature included in BI dashboards for the Indonesian FDA. This study concentrated on the dashboard component of business intelligence (BI), which is crucial for BIS end users. (Popovič et al., 2012) investigated how BIS affected and had power over decision-making at Uppsala University. The purpose of this study is to look into how BIS adaptation may affect how decisions are made in educational institutions. The study found that because decision-making activities require less time to produce better-quality decisions, the BIS has a positive impact on the decision-making process at Uppsala University.

Wieder and Ossimitz (2015) used a mediation model to investigate the effect of BI on the caliber of decision making. This study intends to investigate how BI management affects managerial decision-quality while considering the mediating roles of data, information, and BI scope. This study found that the mediators of data quality and information quality had a strong indirect impact of BI management on the quality of managerial decision-making. Although the impact of BI on decision-making was not as dramatic as anticipated. (Visinescu et al., 2017) looked at the improvement of decision quality and the function of BI. In this exploratory study, the quality of decisions made within the framework of BI will be explored and examined. The perceived quality of decisions is directly impacted by the level of BI use, issue space complexity, and information quality. This study found a substantial direct relationship between perceived decision quality and the degree of BI use, the complexity of the problem domain, and the information quality. Additionally, it was discovered that when information quality is high, the amount of BI use has a higher positive impact on perceived decision quality than it does when information quality is low.

BI capabilities, the impact of top management, and the mediating roles of user involvement and analytical decision-making orientation were all explored by (Kulkarni et al., 2017). This study uses a multiple mediator model to examine how top management influences the growth of a company's BI capabilities. This study clarified the functions of user involvement and an analytical approach to decision-making as propagating mechanisms that express top management sponsorship in favor of the growth of BI capabilities. (Gauzelin & Bentz, 2017) examined how BIS affected organizational performance and decision-making. This study intends to investigate how BI affects organizational performance and decision-making with a focus on how it will affect Small and Medium-sized Enterprises (SMEs). The study found that BI adoption significantly improves the functional, operational, and overall effectiveness of SMEs, but there are always concerns about the implementation costs of BIS, which the majority of SMEs cannot pay. (Hatamlah et al., 2023) looked at how BI affected the standard of decision-making in an Indonesian fertilizer firm. This study uses Indonesia's fertilizer industry as a case study to examine and assess the elements that affect the effectiveness of decision-making. By using BI management, BI scope, data quality, content quality, and information quality as evaluating criteria, the researcher concentrated on understanding the aspects influencing the effectiveness of decision-making. The study concluded that the main element affecting how well decisions are made is BI management.

3. Research Methodology

3.1 Study Design

This research is both descriptive and analytical. Its goal is to research how the quality of strategic decision-making is affected by the implementation of BIS. In order to create a model for assessing the impact of BIS as an independent variable on the caliber of strategic decision-making as a dependent variable, the study began with a literature review and expert interviews in the BI area. The three key BIS components that were the focus of this study were Data Quality, Data Visualization, and BI Management. The measurement tool was enhanced using professional judgment. Following that, a survey was conducted, and information was gathered from staff members who actively use BIS and participate in strategic decision-making. The data were coded using Smart PLS.4. Validity and reliability were then examined, and a descriptive analysis was conducted. Finally, using regression analysis, the relationship between the variables was examined. Well-known academics with substantial experience and scientific competence conducted a thorough evaluation covering all the study constructs in order to test questionnaire clarity and create a cohesive research questionnaire. Based on their insightful suggestions, certain survey items were changed to improve the research tool and make it more accurate.

3.2 Unit of Analysis

Employees who actively use BIS, are involved in organizational strategic decision-making, were accessible at the time of questionnaire distribution, and were prepared to participate in the survey make up the survey unit of analysis. The questionnaire was disseminated in 500 total copies. Due to the nature of the questionnaire and the quantity of managerial responsibilities, the sample size is seen as being restricted.

3.3 Data Collection

Utilizing specially created questionnaires that reflected the study's aims and objectives, data were gathered from employees that actively utilize BIS and participate in the process of making strategic decisions.

3.4 The Questionnaire Design

The questionnaire focused on the caliber of strategic judgments and devoted to top management. Two sections made up this questionnaire. The first section includes the demographic information on age, education, work history, and organizational position. The following independent factors, dependent variables, and moderator variables are included in the second part: Dependent variable (Quality of strategic decision making), independent variables (BIS: data quality, data visualization, BI management), moderator variable (BI scope). The Questionnaire was adapted from previous studies.

3.5 Data Analysis

This analysis made use of the Cronbach alpha and composite reliability, as well as outer loadings, discriminant validity, the arithmetic mean, standard deviation, item significance, and importance level. Throughout the duration of our research, we made use of SmartPLS 4, a piece of software that enables users to carry out partial least squares structural equation modeling (PLS-SEM). PLS-SEM made it possible for us to investigate the intricate connections between latent variables. We devised a measurement model in order to evaluate the dependability and validity of our measures. Specifically, we looked at three aspects of validity: convergent validity, discriminant validity, and internal consistency.
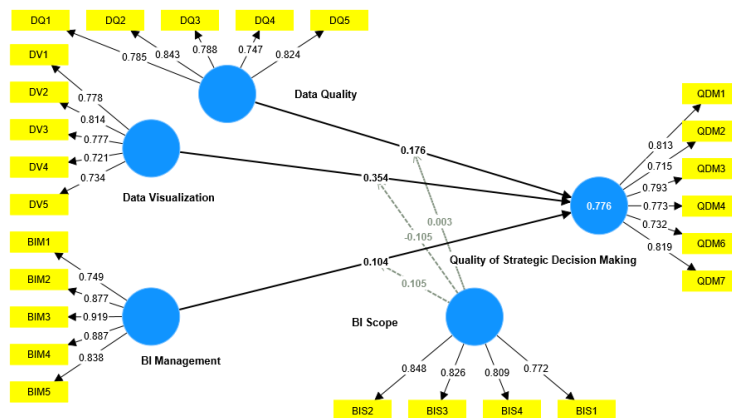

Fig. 2. PLS4, Measurement Model

3.6 Validity and Construct Reliability

The reliability and consistency of a construct may be evaluated using Cronbach's alpha (Hair, Risher, Sarstedt, & Ringle, 2019). We may use it to determine whether the questions used to measure the five constructs (BI Management, BI Scope, Data Quality, Data Visualization, and Quality of Strategic Decision Making) are all attempting to get to the same underlying notion. Cronbach's alpha values over 0.7 are often accepted in the business context, as seen in table no.1. This shows that the questions you used to evaluate each construct are valid and accurately reflect the notion being measured. One other way to evaluate the consistency of a construct's constituent parts is via its composite dependability. It provides information about how effectively the components combine to provide a valid measurement of the construct. Table 1 displays appropriate composite reliability (rho_c) values for all constructs in business research (rho_c > 0.8). This indicates that the items used to measure each construct are valid and accurate.

How much of the observed variability in the items can be attributable to the concept rather than measurement error is shown by the average variance retrieved. In other words, it shows how effectively the build accounts for the typical dispersion of its components. Our research shows that all of the structures we examined had AVE values greater than 0.5, which is universally accepted in the corporate world. This indicates excellent convergent validity, since a large proportion of the observed variability in the items is captured by the construct. The results of Cronbach's alpha and composite reliability, as well as AVE, indicate that the research components are internally consistent and legitimate for use in the commercial world.

Table 1
Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
BI Management	0.907	0.910	0.932	0.733
BI Scope	0.831	0.832	0.887	0.663
Data Quality	0.857	0.862	0.897	0.636
Data Visualization	0.825	0.836	0.876	0.586
Quality of Strategic Decision Making	0.866	0.869	0.900	0.601

3.7 Outer loadings

The outside loadings for each item are shown in Table 2, which can be found inside the structures. All of the items have outer loadings that are more than 0.7, which indicates that the degrees of connection strength between these items and their respective constructions are satisfactory (Hair et al., 2019). This shows that the items accurately measure the constructions for which they were designed.

Table 2
Outer loadings

	BI Management	BI Scope	Data Quality	Data Visualization	Quality of Strategic Decision Making
BIM1	0.749				
BIM2	0.877				
BIM3	0.919				
BIM4	0.887				
BIM5	0.838				
BIS1		0.772			
BIS2		0.848			
BIS3		0.826			
BIS4		0.809			
DQ1			0.785		
DQ2			0.843		
DQ3			0.788		
DQ4			0.747		
DQ5			0.824		
DV1				0.778	
DV2				0.814	
DV3				0.777	
DV4				0.721	
DV5				0.734	
QDM1					0.813
QDM2					0.715
QDM3					0.793
QDM4					0.773
QDM6					0.732
QDM7					0.819

3.8 Discriminant validity

The correlation coefficients between the various constructs are shown in Table 3, which analyzes the discriminant validity of the relationships between them. According to (Hair et al., 2019) findings, the coefficients point to distinctness among the constructs as well as positive associations ranging from moderate to strong. These results provide support to the generally recognized criterion for discriminant validity in our research, showing that the measures capture unique features of the targeted constructs (Fornell & Larcker, 1981).

Table 3
Correlation coefficients

	BI Management	BI Scope	Data Quality	Data Visualization	Quality of Strategic Decision Making
BI Management	0.856				
BI Scope	0.533	0.814			
Data Quality	0.642	0.574	0.798		
Data Visualization	0.438	0.686	0.531	0.765	
Quality of Strategic Decision Making	0.560	0.805	0.634	0.760	0.775

3.9 Structural Model

In addition to this, we developed a structural model in order to investigate the connections that exist between latent constructs (Hair et al., 2019). Our research approach was significantly aided by the useful insights that were offered by SmartPLS,4, which were included into our measurement and structural models. This is to explain all the results of the hypothesis.
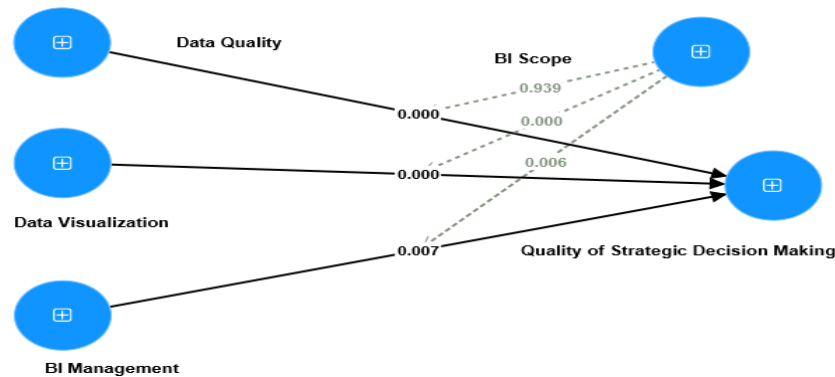

Fig. 3. PLS4, Structural Model

4. Hypotheses Test and Discussion

This study's foundation is the examination of study hypotheses. The following are the outcomes of the analysis and testing of the research hypotheses:

The hypotheses were investigated using basic linear regression. The T statistics and p-values in Table 4 help assess the significance of the connections between variables. In our study, we used BI Scope as a moderator variable. Here's an instant explanation:

BI Management → Quality of Strategic Decision Making: A T statistic of 2.696 shows a reasonably high association between BI Management and Quality of Strategic Decision Making. The corresponding p-value of 0.007 indicates that this link is statistically significant, even when the moderator variable, BI Scope, is considered.

BI Scope → Quality of Strategic Decision Making:

As a moderator variable, BI Scope has a strong and very significant link with the Quality of Strategic Decision Making. The T statistic of 6.732 and the p-value of 0.000 both show that BI Scope has a substantial moderating influence.

Data Quality → Strategic Decision-Making Quality: The T statistic of 3.590 reveals a reasonably high association between Data Quality and Strategic Decision Making Quality. The p-value of 0.000 indicates that this association is extremely significant, regardless of the moderating influence of BI Scope.

Data Visualization → Quality of Strategic Decision Making: Similarly, the T statistic of 7.753 indicates a high association between Data Visualization and Quality of Strategic Decision Making. Despite the moderating influence of BI Scope, the p-value of 0.000 supports the strong importance of this association.

BI Scope × BI Management → Quality of Strategic Decision Making: Even after accounting for BI Scope's moderating function, the interaction effect between BI Scope and BI Management on Quality of Strategic Decision Making is statistically significant (T = 2.753, p = 0.006).

BI Scope × Data Visualization = Strategic Decision Making Quality: Given the moderating influence of BI Scope, the interaction effect between BI Scope and Data Visualization on the Quality of Strategic Decision Making is also statistically significant (T = 4.407, p = 0.000).

BI Scope × Data Quality = Strategic Decision Making Quality: In contrast, the interaction impact of BI Scope and Data Quality on the Quality of Strategic Decision Making is not statistically significant (T = 0.077, p = 0.939), indicating that the moderating influence of BI Scope is not significant in this instance.

In conclusion, although BI Scope functions as a strong moderator for certain connections, such as BI Management and Data Visualization, it does not regulate the link between BI Scope and Data Quality.

Table 4
The summary of the path coefficients

	Original sample	Sample mean	STDEV	T statistics	P values
BI Management → Quality of Strategic Decision Making	0.104	0.105	0.039	2.696	0.007
BI Scope → Quality of Strategic Decision Making	0.363	0.358	0.054	6.732	0.000
Data Quality → Quality of Strategic Decision Making	0.176	0.176	0.049	3.590	0.000
Data Visualization → Quality of Strategic Decision Making	0.354	0.358	0.046	7.753	0.000
BI Scope × BI Management → Quality of Strategic Decision Making	0.105	0.102	0.038	2.753	0.006
BI Scope × Data Visualization → Quality of Strategic Decision Making	-0.105	-0.105	0.024	4.407	0.000
BI Scope × Data Quality → Quality of Strategic Decision Making	0.003	0.004	0.037	0.077	0.939

R-square

Table 5 shows that the independent factors in the model account for around 77.6% of the variance in the Quality of Strategic Decision Making. This means that factors like BI Management, BI Scope, Data Quality, and Data Visualization all have a significant impact on the efficacy of strategic decision-making. The complexity of the model is reflected in the modified R-square value of 0.770, which offers a somewhat more cautious assessment of the model's ability to explain observed phenomena. The overall significance of the independent factors in explaining the heterogeneity in Quality of Strategic Decision Making is shown by these findings.

Table 5
The results of the R Square

	R-square	R-square adjusted
Quality of Strategic Decision Making	0.776	0.770

5. Conclusions

As employees outside of management are less exposed to such tools, organizations must raise awareness of BIS use among other employees in a way that maximizes benefits of such systems through proper utilization and use. BIS integration among the organization's many divisions and business units will maximize potential for achieving competitive performance. It has been noted that when a business is bought, it frequently uses different tools and takes some time to get used to the new system. By sharing BI reports and dashboards that assist collaborative decision-making and provide insights that boost specific collaborative initiatives like supply chain, it is encouraged to expand the benefits of using BIS to trusted partners and suppliers.

BIS is regarded as a source of competitive advantage, so senior management must pay special attention to it and be committed to taking actions prompted by the use of BI tools. Higher levels of organizational capacities will be reflected in top management's actions in enforcing regulations that prioritize the use of information in decision-making. In order to get a competitive edge, there was a large investment made in BI systems (Kulkarni et al., 2017). By giving intelligence to the data management and analytics process in a way that enhances the quality of strategic decision making, BIS enables managers to quickly access Crucial Information, provide insights, and narrow knowledge gaps. Even though BIS makes decision-making an intelligent process, BI is still an interactive system that is greatly influenced by users. As such, a number of crucial factors need to be considered, including age, educational attainment, experience, individual differences, and technological comfort.

6. Recommendations

Organizations shall increase awareness of the use of BIS among other employees in a way that maximizes gains of such systems by proper utilization and use as employees outside management have less exposure to such tools. Integration of BIS between different departments and business units in the organization will maximize capabilities in achieving competitive performance. It's noticed that in the case of acquisition, the newly acquired business mostly is using different tools and needs time to integrate with the new system. By sharing BI reports and dashboards that assist collaborative decision-making and provide insights that boost specific collaborative initiatives like supply chain, it is encouraged to expand the benefits of using BIS to trusted partners and suppliers.

Acknowledgements

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