RESEARCH BULLETIN
Vol.03 Issue 03 (April - June)
Received 25 JULY 2023 , Revised 28 JULY 2023
Accepted 05AUG 2023 , Published 09AUG 2023

RESEARCH BULLETIN
ISSN: (O) 1694-4860

Business Intelligence & Organizational Performance: The Role Of Decision Support

EL OUARZADI Anas[1]*; CHARAF Karim[1]

[1]ISCAE Group (Morocco)

Abstract

The sensitivity of present-day organizations to innovations in management accounting (IMA) has seen a notable rise. These innovations play a pivotal role by supplying managers with vital tools that ensure the endurance and viability of their establishments, particularly in hyper-competitive landscapes. Historically, management accounting has been a primary foundation for corporate decision- making and control. Hence, it exhibits clear ties with, and potential advantages from, business intelligence (BI) technology utilization. The study outcomes indicate a compelling research arena for those in the accounting field. Nevertheless, an examination of academic publications in both accounting and information systems periodicals exposes a gap in research focusing on this interrelation. Despite the anticipated array of benefits from BI services, there are limited models and studies evaluating the influence of BI functionalities on decisional and organizational benefits. Thus, case studies showcasing the effective use of BI and visualization tools in management accounting are of significant interest. This research endeavors to investigate the adoption of BI as an IMA and its influence on organizational performance within the context of the decision- making environment. A qualitative study conducted within a Moroccan banking institution is used in this research to illustrate the influence of Business Intelligence adoption on decision-making and organizational advantages. The study elucidates the process of BI system adoption in management accounting departments and underscores the benefits to their corporate outcomes. The objective of the findings is to exhibit a significant correlation between the adoption of BI and enhanced organizational performance.

Keyword :- Management accounting innovations; Business intelligence; Decision making; Organizational performance .

Introduction

In the present climate, numerous enterprises confront unforeseen circumstances that adversely impact their evolution and performance. In this respect, business intelligence tools emerge as a potent response to these unpredictable challenges affecting companies of all sizes [1,2]. Business intelligence systems are delineated as methods and procedures that convert information into data, which subsequently metamorphoses into business wisdom [3]. To equip business managers with relevant information, data integration and technological solutions are deployed via BI systems. The core objective of this research is to characterize Business Intelligence (BI) essentially as an assortment of technological tools including data warehouses, decision support (DS) systems ,online analytical processing (OLAP), and balanced scorecard, among others, aimed at enhancing work progression and decision-making processes [4,5]. Predominantly, BI systems are utilized to guide decision-making by providing the necessary tactical and strategic data. This assists managers in comprehending, administering, and orchestrating company operations and cycles [6]. In essence, the primary objective is to equip users with the necessary assistance to facilitate their decision-making process. Numerous benefits of organizational DS have been identified through research and literature [7,8]. Consequently, BI is perceived as one of the most significant realms of data innovation and is accorded top priority by certain executives [9]. The scant research that hones in on the effects of BI on management accounting [10,11] concludes that querying, dashboards, and visualization capabilities embedded within BI systems enhance organizational learning [11- 13], stimulate the capacity to measure performance [11,13], and promote alignment with strategy and performance gain [11,14,15]. There exists a knowledge deficit and a dearth of empirical evidence regarding the extent of BI techniques' usage in management control and their relative efficacy [10].

BI systems are typically designed to bolster decision-making within an organization [3,16]. However, research pertaining to BI systems predominantly overlooks the measurement of an individual's decision-making support [16]. Therefore, case studies exemplifying the utilization and efficacy of advanced BI functionalities in management control are eagerly sought [10].

In the ensuing paper, we scrutinize the influence of BI on decision support. This investigation aims to address the following research questions:

Q: What is the effect of business intelligence (BI) on organizational performance via decision support (DS)?

This research seeks to determine whether and how business intelligence systems contribute to the acceleration of organizational decision- making and the enhancement of end users' information processing within the corporation.

The structure of the remaining sections of this paper is as follows: Section 1 encompasses

related studies. Section 2 delves into the theoretical backdrop, discussing the significance of decision support and BI within the business realm. The formulation of the investigative framework and hypotheses is elaborated in 3rd section . Section 4 delineates the methodology. The results are reported in section 5, with an analysis of the emergent elements conducted in section 6. Lastly, section 7 concludes the study, providing a succinct recapitulation of the paper, supplemented by a discussion of the research limitations and suggestions for future research endeavors.

LITERATURE REVIEW

Given the often nebulous nature of BI, it tends to be interpreted through various theories and methodologies. On one hand, [17] advocate for two key perspectives: a managerial and a technical approach. The former emphasizes the significance of organizational decision-making, while the latter views BI as a tool underpinning this managerial process. Conversely, [18] assesses past studies and proposes a system-enabler methodology, focusing on how the company's systems (boasting diverse functionalities) can supply necessary information for decision-making.

In our research, we perceive BI as a tool intended to facilitate crucial decision-making by establishing a conducive DS environment. In terms of the Decision Support (DS) concept, we divide the benefits of outcomes into two unique categories: the advantages of DS and the gains for the organization. We comprehend DS benefits as as primary advantages realized throughout the decision-making process. Organizational benefits, on the other hand, denote all positive outcomes arising from decision results. Ultimately, DS benefits originate from the decision-making process, while organizational benefits are viewed as long-term outcomes mediated by decision support [19]. What follows is a detailed exploration of relevant research on BI tools and decision support.

Business intelligence tools

In shaping their organization's strategy, directors require particular instruments to aid their decision-making procedures throughout the entire process. BI can be beneficial from various perspectives, offering unique insights to enhance decision-makers' abilities [20]. These tools encompass numerous methods and technologies used to compile, access, and analyze data from different sources, thereby aiding decision- makers in making more effective organizational decisions [21,22]. Several techniques and advancements with DS functions have been introduced recently. [23] posited that integrating multi-criteria decision-making instruments with Decision Support (DS) systems has the potential to provide supervisors with enhanced capabilities for managing decision-making processes.

Further, different mobile, web, and email channels have been identified as assisting instruments in the process of decision-making within an organization [24]. Additionally, [25] highlighted databases, specifically data warehouses and data marts, as one of the fundamental elements of Business Intelligence (BI). Importantly, strategic utilization of BI within the company is mainly manifested in three areas: performance measurement, business activity monitoring, and reporting [26]. Conversely, [17] divided BI capabilities: analysis monitoring, and reporting.

Also, [22] validated a new taxonomy for business analysis, comprising descriptive, predictive, and prescriptive categories. Each group has distinct objectives: the descriptive group addresses business challenges and opportunities, the predictive group provides accurate forecasts, and the prescriptive group delivers optimal business decisions and actions. In a more specific review, BI is perceived as a systems-enabler approach with extensive capabilities by [18,27,28]. Their classification explored 34 criteria as BI functions, which were then clustered into six main groups:

1.Analytical and intelligent decision support (AIDS)

2.Furnishing related trials and mixing with natural data (TMND)

3.Optimization and recommended model (ORM),

4.Reasoning

5.Advanced Decision-Making Instruments (ADMI)

6.Satisfaction of Stakeholders (for additional details, refer to [18]).

Considering the aforementioned discussions, it is important to note in our study that we perceive BI as a suite of tools falling under [17]'s categorization (Analysis, Monitoring, and Reporting), particularly when engaging with interview data.

However, when formulating our hypotheses in Section 3, we rely on some functions from [18]'s categorization to postulate a relationship between BI and the DS variables under study.

Thus, within our methodology, we infer that the Business Intelligence (BI) capabilities of enterprise systems could potentially influence decision support. These functions primarily include monitoring and reporting.

Decision support

The intensifying competitive landscape necessitates astute decision-making by managers, regardless of the complexity of the situation at hand. For this purpose, organizations need specialized systems to facilitate decision- making processes. Several benefits of implementing BI systems have been documented, but encapsulating all potential advantages proved challenging. Hence, a theoretical construct was created through literature review and discussions with BI experts possessing significant IT knowledge. We categorized decision support (DS) benefits into three key improvements [29,30]: enhanced knowledge processing, reduction in decision-making time, and decrease in decision cost. The influence of BI functions could be seen in these areas.

Our study primarily concentrates on enhanced knowledge processing and reduction in decision-making time.

Enhanced Knowledge Processing

Present-day enterprises are confronted with the challenge of converting raw data into valuable information that aids business decisions [31]. In this context, data is perceived as a strategic asset, playing a crucial role in decision-making. The

capability to acquire new knowledge and information becomes critical for managers steering the organization [32,33].

Consequently, organizations need to enhance their understanding of business processes. The decision-making process, essentially, involves applying and processing data/information, resulting in a better grasp of business problems and increased information [34]. This is often seen as a vital link between decision-making and knowledge creation processes [35]. Knowledge processing is characterized as a DS benefit by [29] and is viewed through the lens of improving decision-makers' ability to handle information. Furthermore, the capacity to process data/information is often cited as the most sought-after benefit of organizational support systems. DS is also deemed significant in bolstering the decision-making capabilities of decision-makers [36].

They have the potential to stimulate the process of making decisions as they provide the ability to arrange and disseminate information, delivering fresh insights to managers [37]. "Enhanced knowledge processing" is conceptualized as the improved ability for decision-making.

Decreased Decision Time

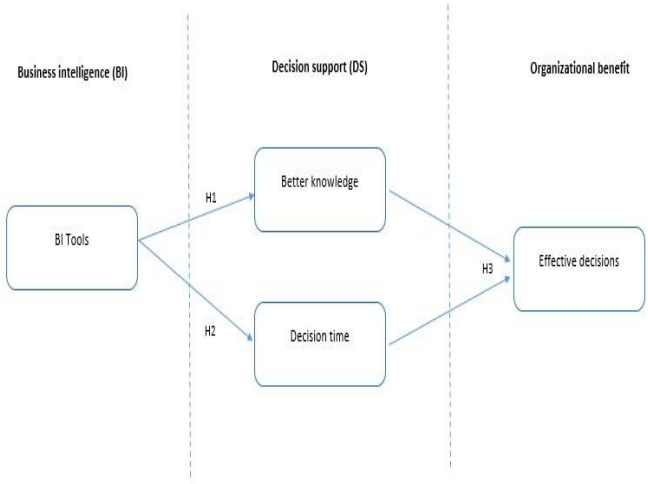
The process of making managerial decisions often amidst the intricacy and ambiguity involved in data handling. Hence, wrapping up the decision-making procedure in the least amount of time possible is deemed a critical requirement by managers [38]. According to [32], timely data preparation can enhance decision-making considerably. In fact, it could expedite data processing, thus hastening decision-making [39]. Research by [40] determined that saving time is the primary tangible benefit of DS systems. As suggested by [31], to accelerate the decision-making process, business managers need to efficiently handle the continuously expanding quantity of data and information. Likewise, hastening decision- making is a key enhancement to advancing business investigation software. The term "reduction in decision-making time" refers to any technical method that decreases the length of the decision-making procedure. This aspect has also been studied by [29,30,34] as the principal advantage of the DS.

RESEARCH METHOD AND HYPOTHESES

The investigative framework and corresponding hypotheses, illustrated in Figure 1, have been developed after a thorough review of the literature concerning BI and the concept of decision support. The model proposed is based on the idea by [17] that BI is composed of analysis, monitoring, and reporting tools. Decision support benefits, such as improved information handling and decision-making duration, are linked to decision-making.

As stated earlier, analytical capability, is recognized as a significant aspect of BI [17]. This capability facilitates data examination to aid and enhance decision-making in business operations [25]. A self-contained system was proposed by [18] that introduces analytical tools as part of a specific AIDS capability. The primary purpose of this capability is to assist decision-makers through visual reports and alert them using alarms and warnings via various channels. [41] argued that analytical instruments arm executives for decision-making by offering more comprehensive data.

Figure 1: *Proposed conceptual*



According to [8], an analytical tool leverages available data to generate valuable information that aids complex decision-making processes. Likewise, [42] found that intelligent DS improves decision- makers' ability to better comprehend information. For example, data mining, a rule of AIDS capability, aims to unearth key information that enhances managers' ability to make more accurate decisions [43].

Decision-makers must contemplate various aspects of a decision that may be influenced by other criteria. In this context, the ability to analyze ambiguous values and make multiple- criteria decisions are perceived as functions of Business Intelligence (BI) [44,45]. [18] proposed that these capabilities are termed ADMI. Managers encounter numerous challenges during the decision-making process across varying degrees of uncertainty [46], which highlights the importance of flexible thinking capability to manage a decision situation. However, the ability to organize data is fundamental in an organizational support system [47]. Since data, a vital component in the procedure of decision-making, is related to complexity and unpredictability, decision- makers need a robust DS with the inherent capacity to manage issue uncertainty, ultimately processing information in a desirable manner [33]. Considering the way multi-criteria

decision-making instruments have been devised to tackle decision problems involving multiple criteria, these can be beneficial to enhance decision-making within the organization by effectively enhancing the capacity to process information [48].

In all organizational decision-making, providing a rationale is essential for ensuring soundness to decision-makers. Therefore, within the logical operation of Business Intelligence (BI), both knowledge-based reasoning and financial analytic instruments are seen as key features of BI. This function of reasoning is designed to justify the acceptance of certain presuppositions. Simply put, the main function of this category is to either accept or reject assertions [49]. [50] suggested that analytical processes could provide expert-like insights or recommendations through knowledge processing. While it is crucial to organize data into useful information, reasoning capability can be employed to analyze problems and manage information in diverse decision situations [51]. Moreover, [24,52,53] pointed out that the

capability for reasoning within Decision Support (DS) systems can be seen as a crucial knowledge processing enhancement for decision-makers. These studies indicated a positive unidirectional relationship between the adoption of the logical operation of Business Intelligence (BI) and the advantages derived from Decision Support (DS) systems for enhanced information processing.

Based on the discussions above, in our model, enhaced knowledge processing, which is a DS benefit, is influenced and propelled by the capabilities of Business Intelligence (BI). Hence, the following hypothesis is postulated:

H1. The functions of Business Intelligence (BI) are positively correlated with enhanced knowledge processing in Decision Support (DS).

As suggested by [54], the ability to process knowledge swiftly is linked to the fast pace of decision-making. Analysis tools, as discussed by [38], are engineered to equip leaders with critical data, assisting them in making informed decisions promptly, recognizing the value of time. Moreover, [26] proposed that BI analytical mechanisms are capable of effectively compiling essential data for management accountants and decision-makers. These tools strive to elevate the promptness and caliber of inputs directed towards the decision-making process.

Moreover, considering the complex nature of addressing problems with multifaceted dimensions, the decision-making procedure necessitates substantial investment of time to clarify problems and relationships, and identify both qualitative and quantitative variables. Consequently, in a Decision Support (DS) scenario, the implementation of Multi-Criteria Decision-Making (MCDM) and fuzzy logic may be essential for the reduction of time spent [48,55,56].

Furthermore, intelligent optimization utilizing evolving prototyping is contemplated, and recommendations to decision-makers are proffered based on these prototypes. It was recognized in [57] that this competence has the potential to decrease the duration needed for tasks and decision-making through the utilization of dashboards, which can synthesize a substantial quantity of data in a short time span.

Furthermore, optimization and simulation can condense decision alternatives, subsequently curtailing decision time by portraying the potential ramifications of the scenario [37,58]. Regarding dashboards, [41] contended that organizations could offer status data on pivotal performance indicators to provide indispensable and timely data for immediate action. Additionally, it can proffer crucial data via timely and pertinent information, which can assist in diminishing decision time [5].

Given the necessity of procuring environmental data and general information to adapt to current contexts [32], DS should facilitate users by offering relevant data [59]. Hence, in order to comprehend the complete business landscape, leaders necessitate a potent capability to provide a comprehensive range of indispensable data [46]. Hence, [18] presented the provision of TMND capability as one of the five integral constituents of BI. In this scenario, decision-makers receive assistance by importing explicit information and historical tests from business settings and supplying them with groupware to choose from, based on collective intelligence. Collective intelligence originates from the coordination, collaborative efforts, and rivalry among several individuals, and is manifested in consensus decision-making. Considering the association between TMND and decreased decision time, [51] pointed out that offering environmental data through importing information and exchanging reports can aid decision-makers in shortening the time for decision-making. This proficiency can influence the time taken for decision-making can be reduced by utilizing problem clustering [60]. Similarly, managers who have adequate access to environmental information and engage in group decision-making can also contribute to this process. can make decisions more rapidly [56,61,62]. To some extent, it is logical to anticipate that the provision of TMND capability of BI aids in reducing decision time.

Thus, it is rational to presume that BI fosters the DS advantages derived from reduced decision time. This leads us to the following hypothesis:

H2. The functions of Business Intelligence (BI) are positively correlated with reduced decision time in Decision Support (DS).

Different researchers have proposed various scales to gauge the effectiveness of decision- making. For instance, [42] argued that impactful decisions could be evaluated using indicators such as reduced time and costs involved in making decisions.

Furthermore, the effectiveness of a decision- making endeavor hinges greatly on the application of pertinent knowledge and its effective processing [35]. Research by [36] indicated that successful decision-making is fuelled by enhancing the abilities of decision- makers. Successful decision-making necessitates individuals to construct suitable mental representations, wherein the cognitive mechanisms that decision-makers engage in establish the link between the narrative and the task at hand [57]. As some data or information is inherently more valuable than others, [63] posited that successful business decisions rely on the acquisition, processing, and application of vital information. It can be deduced from this that enhanced information processing and decreased decision duration can result in more effective decisions, contributing to organizational benefits. Therefore, the ensuing hypothesis is proposed:

H3. Enhanced knowledge processing and shortened decision time contribute positively to organizational performance in practical decisions.

This study views DS as an intermediary layer linking BI functions to organizational performance. Consequently, we will not consider the H3 hypothesis and will instead concentrate on H1 and H2.

then evaluated, and the emerging themes were discussed, as detailed in the subsequent sections.

METHOD

A qualitative descriptive approach was utilized in this study, involving semi-structured interviews as the primary data collection method among the leadership of a Moroccan firm to gather insights about issues related to BI. Emerging themes

from these interviews are subsequently analyzed. The research subject was a Moroccan banking institution that had implemented and utilized an advanced BI system for over a year.

The investigation started with the recruitment of 15 research participants, divided into managers and subordinates. The participants were selected from five distinct business units within the corporation, all of which were already utilizing BI tools. Additionally, an individual from the division managing BI solutions was interviewed—this person was chosen as a key informant due to their knowledge about the core BI tools deployed within the company. From each unit, one manager and two subordinates were selected, leading to a total of five managers and ten subordinates. A semi-structured interview, consisting of questions about various aspects of BI, was provided to each participant (see Appendices). All participants completed the survey. The findings from the interviews were then evaluated, and the emerging themes were discussed, as detailed in the subsequent sections.

RESEARCH RESULTS

This study presents the findings of interviews focused on the influence of business practices on organizational performance. Specifically, we examine the impact of BI on Decision Support, which serves as a mediating concept. We investigated the effect of BI on two key components: Enhanced knowledge processing and minimized decision time. Table 1 and 2, along with Figures 2 and 3, provide a summary of employees' feedback on various facets of BI systems and their perceived value within the organization.

Figure 2: Number of responses of Managers on various aspects of BI systems

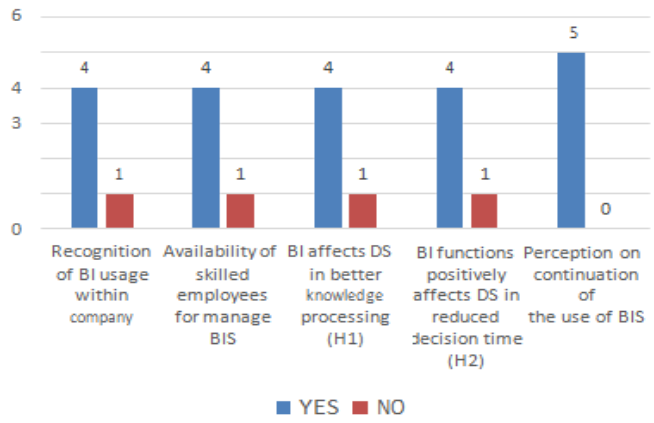


Table 1: Summary table presenting the responses of managers regarding different aspects of Business Intelligence

BI Systems Aspects Tested Through Managers Interviews (5 managers)	YES	NO
Recognition of BI usage within the company	4	1
Availability of skilled employees to manage BI outputs	2	3
BI has a good impact on DS in terms of knowledge processing (H1)	4	1
BI has a good impact on DS in reduced decision time (H2)	4	1
Perception of the continuation of the use of BI systems	5	0

Figure 3: Number of responses of subordonate on various aspects of BI systems

Figure 3: Number of responses of subordonate on various aspects of BI systems

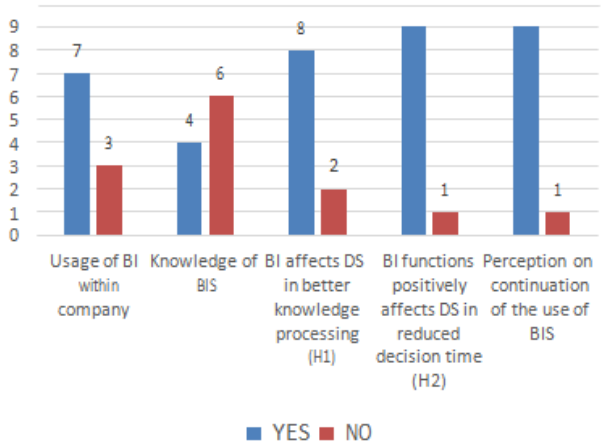


Table 2: Summary table displaying the responses of subordinate employees regarding different aspects of Business Intelligence

BI systems Aspects Tested Through subordinates (10 employees)	YES	NO
Usage of BI within the company	7	3
Knowledge of managing BI outputs	2	8
BI has a good impact on DS in terms of knowledge processing (H1)	8	2
BI has a good impact on DS in reduced decision time (H2)	9	1
Perception of the continuation of the use of BI systems	9	1

ANALYSIS

Acknowledgement of BI Implementation

A significant insight obtained from the study is the acknowledgment of BI application and utilization within the company. The data gathered from managers and their staff indicates that the majority recognize and use BI tools in their respective departments. All the departments selected for the study are utilizing BI tools, as confirmed by our interviewee from the BI management entity. Interestingly, one manager and three subordinates did not identify their use of BI tools. These tools, grounded on BI data drawn from the central data warehouse, constitute a transparent layer for the workforce. For these employees, we clarified the function of BI and enlightened them that the data (reports and dashboards) are generated from a BI system. Additionally, we observed that two subordinate employees were unfamiliar with BI systems.

innovation - a theory that attempts to explicate the propagation rate of new ideas and technology [64]. Hence, we affirm that nearly all employees are aware of this innovation.

Presence of Proficient BI Maintenance Staff

The study uncovers that many organizations face challenges in having the necessary personnel to oversee these innovative systems. Based on the results, just two managers acknowledged having skilled staff within their departments who can effectively handle BI systems and their outcomes. The results from manager interviews align with those obtained from subordinate interviews. The survey conducted among subordinates indicated that only two of them knew how to handle BI outputs.

One of the complexities of BI systems is that they integrate critical mathematical functions necessary for predicting specific phenomena within a company and providing suitable solutions. IT proficiency is crucial when working with BI systems [65]. As depicted in the interviews, a significant number of employees lack BI knowledge, which could be attributed to a deficiency in IT skills.

Influence of BI on Decision Support

The third aspect that emerged from this research pertains to the impact of BI on Decision Support (DS). As per the interview responses, 4 out of 5 managers and 8 out of 10 subordinates concur that BI has a beneficial effect on decision-making processes within their respective departments.

Influence of BI on DS Through Enhanced Knowledge Processing

According to [66], BI systems contribute to the enhancement of information value. The data generated is of superior quality, being error-free and profoundly analyzed, leaving the business leaders with the primary task of interpreting the results. The business analysis capability of a BI system is also crucial as It enables an organization to recognize evolving patterns and potential risks, thereby facilitating appropriate decision making. Almost all participants confirmed that BI positively impacts DS through enhanced knowledge processing (refer to Figures 2 & 3). One interviewee stated, "In our company, we depend on business intelligence. It enables us to consolidate information and understand aspects that we can't discern when using standard tools like sheets". This statement demonstrates that BI tools foster a more comprehensive understanding of data. Interview results indicate that BI tools decrease the overall effort required in examining output data, leading to improved information processing. This aligns with [56]'s findings, suggesting that "Recognition and visualization of patterns within generated data play a crucial role in the progression of insight-gathering and enhance decision-making". According to [53], real-time business intelligence visualizations reduce cognitive load, enabling end-users to achieve significantly improved decision-making performance when time is essential, and data is fast-moving.

Influence of BI on DS Through Reduced Decision Time

From the interviews, it is apparent that BI tools contribute to reducing decision time (refer to Figures 2 & 3). One of the business managers stated, "Our organization has implemented business intelligence systems which provide real-time data. This data is vital as it allows us to make swift decisions". This feedback demonstrates that BI tools provide essential technological resources that empower companies to make well-informed decisions using dependable data and prompt timeframes. As market trends remain highly unpredictable and competitive, the provision of essential data in a timely manner is crucial. BI is advantageous for businesses as it provides fundamental data, this feedback indicates that the utilization of data in decision-making streamlines the decision- making process, resulting in reduced decision time.The study shows that these tools are positioned to make substantial reductions in operating costs and improved uptime. Therefore, it is evident that BI is essential in assisting business managers in reducing decision time. Consequently, BI supports contemporary employees and organizational executives in making well-founded decisions by combining historical and real-time data accessible whenever necessary. This approach allows business leaders to swiftly and confidently make decisions due to the credibility of the data. This aligns with [56], who concluded that BI's reduced error performance increases the performance ratio with minimum time delay in the system's presence. Therefore, BI provides a business with comprehensive data that is essential for decision-making in reduced time [56].

CONCLUSION, LIMITATION, AND FUTURE RESEARCH

The primary objective of this review is to investigate the influence of business intelligence on organizational performance, with a specific focus on the concept of decision support. Primarily, we directed our attention to two variables representing the advantages of decision support: Enhanced knowledge processing and diminished decision time.

This study substantiates that BI has a positive impact on organizations, especially in the realm of decision support. Firstly, Business Intelligence (BI) streamlines the decision-making process for managers by delivering valuable, timely, and precise information. The data generated through BI provides valuable perspectives on historical, current, and future events, empowering end-users to make well- informed decisions. As highlighted above, BI tools augment data understanding and the capacity for knowledge processing. Additionally, BI tools play a role in decreasing decision time as they empower business leaders to make quick and confident decisions based on the reliability of the data they provide. These findings align with the results of prior research [19,53,56,67].

Like all studies, this one has its limitations. Firstly, we focused on a predefined number of benefits of decision support. While these benefits are widely acknowledged as the most frequently mentioned ones, additional merits like improved reliability, and enhanced communication and coordination may also be taken into account [19]. Secondly, even though our research model and hypotheses are constructed based on logical reasoning regarding BI tools and their correlation with DS benefits, our study lacks a robust theoretical foundation when establishing the connections between BI tools and DS benefits. Thirdly, detailing BI Tools instead of considering them as a whole may impact results, especially if the focus is on the influence of each component within BI Tools. Further testing of the proposed model might be beneficial in a different context.

Considering the limitations mentioned above and reflecting on the results obtained in this study, we encourage future research. Firstly, it would be beneficial to verify the validity of

these findings in a different context. A quantitative analysis based on a questionnaire may be conducted. Secondly, adopting a detailed approach to the BI concept rather than treating it as a single entity might offer more valuable insights into studying the impact of each BI tool on organizations. Lastly, there is the possibility of testing and adding other variables to the proposed model.

References:

[1] F. Fourati-Jamoussi and C. N. Niamba, "An evaluation of business intelligence tools: a cluster analysis of users' perceptions," J. Intell.

Stud. Bus., vol. 6, no. 1, pp. 48–58, 2016

[2] P. Jenster and K. S. Søilen, "The Relationship between Strategic Planning and Company Performance – A Chinese perspective," J.

Intell. Stud. Bus., vol. 3, no. 1, pp. 15–30, 2013

[3] A. Popovič, R. Hackney, P. S. Coelho, and J. Jaklič, "Towards business intelligence systems success: Effects of maturity and culture on analytical decision making," Decis. Support Syst., vol. 54, no. 1, pp. 729–739, 2012

[4] M. K. Chen and S. C. Wang, "The use of a hybrid fuzzy-Delphi- AHP approach to develop global business intelligence for information service firms," Expert Syst. Appl., vol. 37, no. 11, pp. 7394–7407, Nov. 2010

[5] W. W. Eckerson, "Performance dashboards : measuring, monitoring, and managing your business," p. 318, 2011.

[6] F. S. C. Tseng and A. Y. H. Chou, "The concept of document warehousing for multi-dimensional modeling of textual-based business intelligence," Decis. Support Syst., vol. 42, no. 2, pp. 727– 744, Nov. 2006

[7] E. Turban, R. Sharda, J. E. Aronson, and D. King, "Business intelligence: a managerial approach | Ricardo Muñoz - Academia.edu," 2008.

[8] C. Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making," 2009.

[9] B. Evelson, "Trends 2011 and Beyond: Business Intelligence,"

Forrester Res. Cambridge, MA, p. 31., 2011.

[10] P. Rikhardsson and O. Yigitbasioglu, "Business intelligence & analytics in management accounting research: Status and future focus," Int. J. Account. Inf. Syst., vol. 29, no. June 2016, pp. 37–58, 2018

[11] M. Z. Elbashir, S. G. Sutton, H. Mahama, and V. Arnold, "Unravelling the integrated information systems and management control paradox: enhancing dynamic capability through business intelligence," Account. Financ., vol. 61, no. S1, pp. 1775–1814, 2021

[12] M. T. Lee and S. K. Widener, "The Performance Effects of Using Business Intelligence Systems for Exploitation and Exploration Learning," J. Inf. Syst., vol. 30, no. 3, pp. 1–31, Sep. 2016

[13] M. Gardner et al., "AllenNLP: A Deep Semantic Natural Language Processing Platform," pp. 1–6, 2019

[14] J. Reinking, V. Arnold, and S. G. Sutton, "Synthesizing enterprise data through digital dashboards to strategically align performance: Why do op'erational managers use dashboards?," Int. J. Account.

Inf. Syst., vol. 37, Jun. 2020

[15] J. Reinking, V. Arnold, and S. G. Sutton, "Synthesizing enterprise data to strategically align performance: The intentionality of strategy surrogation," Int. J. Account. Inf. Syst., vol. 36, Mar. 2020

[16] N. U. Ain, G. Vaia, W. H. DeLone, and M. Waheed, "Two decades of research on business intelligence system adoption, utilization and success – A systematic literature review," Decis. Support Syst., vol. 125, no. April, p. 113113, 2019

[17] M. Petrini and M. Pozzebon, "Managing sustainability with the support of business intelligence: Integrating socio-environmental indicators and organisational context," J. Strateg. Inf. Syst., vol. 18, no. 4, pp. 178–191, 2009

[18] M. Ghazanfari, M. Jafari, and S. Rouhani, "A tool to evaluate the business intelligence of enterprise systems," Sci. Iran., vol. 18, no. 6, pp. 1579–1590, Dec. 2011

[19] S. Rouhani, A. Ashrafi, A. Zare Ravasan, and S. Afshari, "The impact model of business intelligence on decision support and organizational benefits," J. Enterp. Inf. Manag., vol. 29, no. 1, pp. 19–50, 2016

[20] Ö. Işik, M. C. Jones, and A. Sidorova, "Business intelligence success: The roles of BI capabilities and decision environments,"

Inf. Manag., vol. 50, no. 1, pp. 13–23, 2013

[21] C. F. Cheung and F. L. Li, "A quantitative correlation coefficient mining method for business intelligence in small and medium enterprises of trading business," Expert Syst. Appl., vol. 39, no. 7, pp. 6279–6291, Jun. 2012

[22] D. Delen and H. Demirkan, "Data, information and analytics as services," Decis. Support Syst., vol. 55, no. 1, pp. 359–363, 2013

[23] G. Kou, Y. Shi, and S. Wang, "Multiple criteria decision making and decision support systems - Guest editor's introduction," Decis.

Support Syst., vol. 51, no. 2, pp. 247–249, 2011

[24] S. Gao and D. Xu, "Conceptual modeling and development of an intelligent agent-assisted decision support system for anti-money laundering," Expert Syst. Appl., vol. 36, no. 2 PART 1, pp. 1493–

1504, 2009

[25] M. Z. Elbashir, P. A. Collier, and M. J. Davern, "Measuring the effects of business intelligence systems: The relationship between business process and organizational performance," Int. J. Account.

Inf. Syst., vol. 9, no. 3, pp. 135–153, Sep. 2008

[26] S. Negash, "Business Intelligence," Commun. Assoc. Inf. Syst., vol.

13, pp. 177–195, 2004

[27] S. Rouhani, S. Asgari, and S. Vahid Mirhosseini, "Review Study: Business Intelligence Concepts and Approaches," Am. J. Sci. Res.

ISSN, vol. 1450, no. 50, pp. 62–75, 2012

[28] S. Rouhani, M. Ghazanfari, and M. Jafari, "Evaluation model of business intelligence for enterprise systems using fuzzy TOPSIS,"

Expert Syst. Appl., vol. 39, no. 3, pp. 3764–3771, Feb. 2012

[29] C. W. Holsapple and M. P. Sena, "ERP plans and decision-support benefits," Decis. Support Syst., vol. 38, no. 4, pp. 575–590, 2005

[30] G. J. Udo and T. Guimaraes, "Empirically assessing factors related to DSS benefits," Eur. J. Inf. Syst., vol. 3, no. 3, pp. 218–227, Jul. 1994

[31] Y. Yousfi, Ö. Belgin, G. Tuncay, B. S. Sahay, and J. Ranjan, "Real time business intelligence in supply chain analytics," 2008

[32] S. T. March and A. R. Hevner, "Integrated decision support systems: A data warehousing perspective," Decis. Support Syst., vol. 43, no. 3, pp. 1031–1043, Apr. 2007

[33] M. H. Zack, "The role of decision support systems in an indeterminate world," Decis. Support Syst., vol. 43, no. 4, pp. 1664–1674, Aug. 2007

[34] E. Turban, J. Aronson, and T.-P. Liang, "Decision Support Systems and Intelligent Systems, 7th ed.," Pearson Prentice Hall, 2005.

[35] N. Bolloju, M. Khalifa, and E. Turban, "Integrating knowledge management into enterprise environments for the next generation decision support," Decis. Support Syst., vol. 33, no. 2, pp. 163–176,Jun. 2002

[36] G. D. Bhatt and J. Zaveri, "The enabling role of decision support systems in organizational learning," Decis. Support Syst., vol. 32, no. 3, pp. 297–309, Jan. 2002

[37] J. Shang, P. R. Tadikamalla, L. J. Kirsch, and L. Brown, "A decision support system for managing inventory at GlaxoSmithKline," Decis. Support Syst., vol. 46, no. 1, pp. 1–13,Dec. 2008

[38] D. Delen and D. B. Pratt, "An integrated and intelligent DSS for manufacturing systems," Expert Syst. Appl., vol. 30, no. 2, pp. 325– 336, Feb. 2006

[39] Y. H. Lin, K. M. Tsai, W. J. Shiang, T. C. Kuo, and C. H. Tsai, "Research on using ANP to establish a performance assessment model for business intelligence systems," Expert Syst. Appl., vol. 36, no. 2 PART 2, pp. 4135–4146, 2009

[40] W. Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions Wayne Eckerson - PDF Free Download," 2003

[41] S. Williams and N. Williams, "The Profit Impact of Business Intelligence," Morgan Kaufmann, San Fr. CA., 2010.

[42] K. N. Papamichail and S. French, "Design and evaluation of an intelligent decision support system for nuclear emergencies,"

Decis. Support Syst., vol. 41, no. 1, pp. 84–111, Nov. 2005

[43] C. K. M. Lee, H. C. W. Lau, G. T. S. Ho, and W. Ho, "Design and development of agent-based procurement system to enhance business intelligence," Expert Syst. Appl., vol. 36, no. 1, pp. 877– 884, Jan. 2009

[44] S. Y. Hung, Y. C. Ku, T. P. Liang, and C. J. Lee, "Regret avoidance as a measure of DSS success: An exploratory study," Decis.

Support Syst., vol. 42, no. 4, pp. 2093–2106, Jan. 2007

[45] L. Yu, S. Wang, and K. K. Lai, "An intelligent-agent-based fuzzy group decision making model for financial multicriteria decision support: The case of credit scoring," Eur. J. Oper. Res., vol. 195, no. 3, pp. 942–959, Jun. 2009

[46] Y. Duan, V. K. Ong, M. Xu, and B. Mathews, "Supporting decision making process with 'ideal' software agents - What do business executives want?," Expert Syst. Appl., vol. 39, no. 5, pp. 5534– 5547, Apr. 2012

[47] K. Metaxiotis, J. Psarras, and E. Samouilidis, "Integrating fuzzy logic into decision suppport systems: Current research and future prospects," Inf. Manag. Comput. Secur., vol. 11, no. 2–3, pp. 53– 59, 2003

[48] D. Liu and T. J. Stewart, "Integrated object-oriented framework for MCDM and DSS modelling," Decis. Support Syst., vol. 38, no. 3, pp. 421–434, Dec. 2004

[49] S. Jarupathirun and F. M. Zahedi, "Dialectic decision support systems: System design and empirical evaluation," Decis. Support Syst., vol. 43, no. 4, pp. 1553–1570, Aug. 2007

[50] J. Zeleznikow and J. R. Nolan, "Using soft computing to build real world intelligent decision support systems in uncertain domains,"

Decis. Support Syst., vol. 31, no. 2, pp. 263–285, Jun. 2001

[51] M. Özbayrak and R. Bell, "A knowledge-based decision support system for the management of parts and tools in FMS," Decis.

Support Syst., vol. 35, no. 4, pp. 487–515, Jul. 2003

[52] P. Gottschalk, "Expert systems at stage IV of the knowledge management technology stage model: The case of police investigations," Expert Syst. Appl., vol. 31, no. 3, pp. 617–628, Oct. 2006[53]

E. Davcheva and A. Benlian, "Visual decision-making in real-time business intelligence: A social media marketing example," Proc. Annu. Hawaii Int. Conf. Syst. Sci., vol. 2018-Janua, pp. 1319–1328, 2018

[54] K. Pal and O. Palmer, "Decision-support system for business acquisitions," Decis. Support Syst., vol. 27, no. 4, pp. 411–429, 2000

[55] S. Wadhwa, J. Madaan, and F. T. S. Chan, "Flexible decision modeling of reverse logistics system: A value adding MCDM approach for alternative selection," Robot. Comput. Integr. Manuf., vol. 25, no. 2, pp. 460–469, Apr. 2009

[56] L. Zhang, B. Vinodhini, and T. Maragatham, "Interactive IoT Data Visualization for Decision Making in Business Intelligence," Arab.

J. Sci. Eng., no. 0123456789, 2021

[57] O. M. Yigitbasioglu and O. Velcu, "A review of dashboards in performance management: Implications for design and research,"

Int. J. Account. Inf. Syst., vol. 13, no. 1, pp. 41–59, Mar. 2012
[58] D. J. Power and R. Sharda, "Model-driven decision support

systems: Concepts and research directions," Decis. Support Syst., vol. 43, no. 3, pp. 1044–1061, Apr. 2007

[59] R. Vahidov and G. E. Kersten, "Decision station: Situating decision support systems," Decis. Support Syst., vol. 38, no. 2, pp. 283–303,Nov. 2004

[60] Y. Reich and A. Kapeliuk, "A framework for organizing the space of decision problems with application to solving subjective, context-dependent problems," Decis. Support Syst., vol. 41, no. 1, pp. 1–19, Nov. 2005

[61] M. Evers, "An analysis of the requirements for DSS on integrated river basin management," Manag. Environ. Qual. An Int. J., vol. 19, no. 1, pp. 37–53, 2008

[62] G. E. Phillips-Wren, E. D. Hahn, and G. A. Forgionne, "A multiple- criteria framework for evaluation of decision support systems,"

Omega, vol. 32, no. 4, pp. 323–332, Aug. 2004

[63] J. Hill and T. Scott, "A consideration of the roles of business intelligence and e-business in management and marketing decision making in knowledge-based and high-tech start-ups," Qual. Mark.

Res. An Int. J., vol. 7, no. 1, pp. 48–57, Mar. 2004

[64] J. Fèvres, "Everett M. Rogers, Diffusion of innovations," Essais, no. 1, pp. 135–137, May 2012

[65] W. Boonsiritomachai, "Enablers affecting the adoption of business intelligence : a study of Thai small and medium-sized enterprises," VU Research Repository | Victoria University | Melbourne Australia, 2014

[66] B. Wieder and M. L. Ossimitz, "The Impact of Business Intelligence on the Quality of Decision Making - A Mediation Model," Procedia Comput. Sci., vol. 64, pp. 1163–1171, 2015

[67] J. Calof, "An examination of the impact of business intelligence systems on organizational decision making and performance: The case of France," J. Intell. Stud. Bus., vol. 6, no. 1, pp. 48–58, 2017