

Factors influencing business intelligence adoption: An exploratory analysis of organizational and human dimensions in Morocco



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Abstract Recently, advances in computing and telecommunications technologies have had a profound influence on the decision-making process. As a result, research into technological innovations that support decision-making has increased significantly. However, studies aimed at understanding the adoption process of these innovations in emerging countries remain limited, despite the growing interest in digital transformation and data-driven decision-making. Business intelligence (BI) is one of the tools attracting the attention of managers because of its crucial role in enhancing the decision-making process. At the same time, the analysis of the factors influencing the adoption of this technology is attracting growing interest in academic circles, particularly in the context of emerging economies. However, limited research has explored the key determinants of successful BI adoption in these settings. This exploratory study examines the specific determinants of human and organizational adoption of business intelligence in Moroccan companies. A mixed-method approach was used to conduct the study, following the guidelines of the multimethodology proposed by Mingers (2006): Appreciation, Analysis, Evaluation, and Action. To gather relevant data, an online survey was conducted, involving 82 respondents, 62 of whom met the study's requirements, which primarily focused on professionals using a BI tool operating in Morocco. The findings of this study identify several crucial determinants for Moroccan companies to adopt business intelligence systems: data management, clarity of objectives, and management support on the organizational side, alongside perceived ease of use, level of education, computer knowledge, and user satisfaction on the human side. These factors play a fundamental role in shaping the success of BI adoption in Moroccan businesses.

Keywords: decision support, decision, making, empirical investigation, Moroccan environment

1. Introduction

The development of artificial intelligence (AI) has led to a variety of functions within companies, including information management and the evolution of data processing techniques aimed at optimizing decision-making. In the late 2000s, usability analytics was identified as a crucial element of artificial intelligence (Davenport, 2006). Additionally, the concepts of 'big data' and 'big data analytics' were employed to characterize datasets and analytical methods in applications that are extensive and intricate, necessitating advanced and specialized data processing techniques (Chen et al., 2012). Business intelligence is one of the most important systems in this context because of its ability to gather and analyze vast quantities of data. BI is also defined as a set of decision-support tools that are based on advanced information technologies and techniques. This enables raw data to be converted into meaningful and useful information for decision-making. BI has sophisticated systematic capabilities for collecting, analyzing and transforming data into information or knowledge about opportunities and threats to provide intelligent solutions for business operations. The development of business intelligence (BI) has accounted for the largest share of global corporate investment in information technology (Chen & Lin, 2021; Ransbotham et al., 2017). The importance attached to BI is in meeting the needs of managers and decision-makers.

They have become a leading technology of interest to decision-makers and industry experts because of their ability to provide more informed knowledge for decision-making processes (Ahmad et al., 2020). This helps companies and organizations make informed strategic decisions (Eriksson & Ferwerda, 2021). BI systems can provide real-time information, create accurate and in-depth analyses, monitor and manage business processes via dashboards displaying key performance indicators, and display current or historical data linked to organizational or individual objectives (Hou, 2013). It also offers best practices that enhance information analysis for optimal decision-making (Chen et al., 2012; Foshay & Kuziemsy, 2014; Kasemsap, 2018). Therefore, business intelligence can also provide considerable benefits in terms of competitiveness and operational efficiency. Elbashir et al. (2008) asserted that the main objective of implementing BI is to enhance the analytical capabilities of business information stored in ERP systems to support and improve management decision-making. Despite the increasing importance of BI, the literature indicates that most business intelligence projects have not achieved the desired results (Ahmad et al., 2020;



UI-Ain et al., 2019; Boyton et al., 2015), which is driving research into the key determinants for maximizing the benefits of BIS integration (Liang & Liu, 2018).

In numerous published studies, practitioners and academics continue to discuss tactical, managerial and strategic approaches to successful BIS integration and adoption. However, studies focusing on human factors are relatively rare (Villamarín & Díaz Pinzón, 2017; Xu & Lu, 2022). It is essential to examine users and their individual computing and statistical analysis skills, especially given the complexity of business processes, tasks and objectives, making it imperative to integrate human intelligence into data analysis and visualization from the very start of the process (Amyrotos et al., 2021).

Morocco, a developing country in Africa, has recently embarked on its digital transition and currently ranks fourth in the Middle East and North Africa in terms of digital competitiveness. As a result, a parallel phase of data engineering has been launched, which involves collecting, digitizing, and facilitating access to data and then analyzing it (Moudni & Khalid, 2021). This vision calls for research into an IS specialized in information management, considering the Moroccan ecosystem. Business intelligence, as a decision-support tool linked to AI, has also recognized several adoption challenges and constraints among Moroccan companies. This has raised several questions about the root of the problem. The aim of this work is to examine the adoption of business intelligence tools and investigate the drivers of adoption, with a greater focus on organizational and human aspects. In this context, it is important to carry out in-depth research to identify the specific factors hindering the adoption of business intelligence, taking into account the particularity and identity of the Moroccan market. Hence, the following research question is proposed:

What human and organizational factors influence the adoption of business intelligence in the Moroccan context?

The analysis of the concept and the treatment of this question raised the following subobjectives:

- Examine the organizational and human factors involved in adopting BI systems in Moroccan companies.
- These factors are classified according to their importance and particularities in relation to other information technologies and information systems.
- Explore the key critical success factors for BIS adoption in Moroccan companies.

This paper is structured as follows. The first part addresses a conceptual framework for the research, followed by a presentation of business intelligence in general, as well as in the Moroccan context. This is followed by a discussion of the drivers of BI adoption in the Moroccan context.

2. Conceptual Framework

Information systems research encompasses several key areas. Decision support and science design focus on the use of technology to support managerial decision-making. Information valorization aims to create economic value through the processing and dissemination of data. Human machine system design integrates cognitive and decision-making aspects to improve the efficiency of information systems. IS organization and strategy assess the impact of information technologies on organizational performance and success, especially from the user's point of view. Finally, IS and IT Economics highlight the importance of economics in the creation of these systems, using analytical modeling and operational research to optimize their management. To this end, several studies have been carried out in the field of business intelligence considering it to be one of the most powerful information systems for data management.

Jalil and Hwang (2019) validated a model by studying technological, individual, and supply chain efficiency for multinational companies in Malaysia, whereas Ahmad et al. (2020) and their collaborators designed a business intelligence (BI) adoption model specific to the textile and apparel industry in Pakistan. Daryaei et al. (2013) conducted a study to develop theories to create a conceptual model, analyzing the factors influencing the adoption process and the intention to use BI.

Mathew (2012) proposed a model for BI adoption in Indian retail. (Antoniadis et al., 2015) examined the adoption and implementation of ERP systems by SMEs in the Western Macedonia region, focusing on critical factors and the potential of business intelligence in ERP use. (Rouhani & Mehri, 2018) undertook an in-depth analysis to understand the critical factors influencing the decision to adopt business intelligence in the banking and financial sectors, validating and testing an adoption model. Nithya and Kiruthika (2021) attempted to create a conceptual framework for measuring the impact of business intelligence adoption on bank performance. Puklavec et al. (2018) aimed to provide a better understanding of the postadoption impact of a business intelligence system (BIS) on company performance, developing and testing a conceptual model in the context of SMEs. Finally, (Daradkeh & Moh'd Al-Dwairi, 2018) presented and tested an integrated model of the antecedents of BIS tool acceptance in commercial enterprises in Jordan. Ahmad et al. (2020) conducted a statistical evaluation of the BIS adoption model for the sustainable textile and apparel industry in developing countries.

3. Business Intelligence in Morocco

The term intelligence has been used by researchers since the 1950s with artificial intelligence. After the 1990s, the term business intelligence became popular within the business and IT communities (Chen et al., 2012). In management science, BI is implemented to create a decision-support environment to better understand and manage organizational processes (Rouhani et al., 2018). In general, information technologies offer advantages, but developing countries often struggle to exploit them in

the same way as developed countries do. When these methods are used, a significant time lag usually occurs (Bagchi et al., 2015).

Recently, research attention to the benefits of adopting business intelligence (BI) systems has increased. The literature indicates that companies fail to fully exploit the benefits offered by these information management tools (Turner & Atkinson, 2021; Wieder & Ossimitz, 2015). In addition, the integration of business intelligence systems requires specific requirements, particularly in developing countries, which gives rise to several challenges at various levels, including organizational culture, infrastructure, and human resources and skills. This situation may be due to a variety of factors, such as financial constraints, a lack of awareness of the importance of BI, or challenges related to setting up appropriate organizational structures to integrate this technology effectively.

The literature in the Moroccan context includes few Moroccan studies in the field of business intelligence. Okar et al. (2012) conducted a survey-based quantitative study to explore the links between SCPMS project maturation and the use of BI tools. (Fedouaki et al., 2013) conducted a study aimed at designing a maturation model for BIS projects within small and medium-sized enterprises (SMEs) based on the concept of critical success factors (CSFs). A study by Jadi and Jie (2017) examined how business intelligence can be integrated into Morocco's e-government system. Elhissi and Haqiq (2016) worked on the development of an information system to manage information security and communication research at a Moroccan university. The aim of this system is to collect, classify, process, and disseminate data related to scientific research to organize and structure all university activities.

4. Business Intelligence Adoption

Research into the adoption of information systems has grown exponentially, and several theories have been developed to further explore this concept, most notably TOE. This theory was developed by (Tornatzky et al., 1990) to explore the adoption process of technological innovations, whereas (Rogers, 2004) proposed the diffusion of innovations theory (DOI). This theory identifies five qualities crucial for the successful diffusion of an innovation: relative advantage, compatibility, simplicity, trialability, and observability. UTAUT has also led to a significant improvement in our understanding of how IT is adopted in different organizations (Venkatesh et al., 2003). It progresses by integrating the main concepts of eight preexisting models ranging from human behavior to IT. The literature identifies eight prominent theoretical models that have guided research on technology acceptance: the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model, the Theory of Planned Behavior (TPB), a hybrid framework combining TAM and TPB, the Model of Personal Computer Utilization, the Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT) (Chang, 2012).

Despite these efforts, companies face many uncertainties when deciding to invest in technological innovation (IT) (Ahmad & Miskon, 2021; Ul-Ain et al., 2019) because the impacts of new technology adoption by companies are not yet sufficiently understood, and the adoption process is characterized by a complex interplay between environmental, technical, organizational and human factors. In addition, organizational and human factors can influence the decision to adopt new technologies, especially when they require specific skills. Understanding these factors leads to positive or negative attitudes toward technology. This helps management implement new technologies with less attrition. In particular, resistance to new information technologies (IT) can reduce an organization's overall performance (Al-Jabri & Roztock, 2015).

Today, the vast volume of data and the turbulence and complexity of the business environment have increased companies' dependence on data and information management technologies. These factors have led to a demand for research into the adoption of tools and practices for collecting, storing, analyzing and processing data to support the decision-making process.

Business intelligence is a technology that has attracted the attention of managers in performing these tasks. However, the adoption of BI tools requires a certain level of organizational maturity to successfully complete the adoption process (Maghsoudi & Nezafati, 2023; Ul-Ain et al., 2019) state that individual and organizational acceptance is one of the main challenges in the successful implementation of BIS within organizations. Owing to their complexity and human nature, BI requires careful monitoring and control.

The adoption of business intelligence (BI) can pose several challenges for companies. First, cost represents a major obstacle, as implementing BI can involve considerable expenditures in terms of money, time and human resources. Second, technical complexity is a challenge, requiring specific skills to ensure proper installation. Another crucial challenge lies in data quality, which requires it to be accurate, reliable and relevant. Data confidentiality and protection are also important issues. Finally, the adoption and use of BI by users require adequate qualifications for optimal use, as well as an accurate perception of its added value.

5. Research Methodology

A mixed-method approach was used for this study, following the guidelines of the multimethodology proposed by Mingers (2006). This approach focuses on four key stages: appreciation, analysis, evaluation, and action. For appreciation, an exhaustive literature review was conducted to understand the business intelligence adoption (BIA) determinants mentioned in

the literature. In the analysis, these factors were subsequently examined and classified according to their human and organizational natures. The assessment involved a survey of experts to evaluate and rank these factors according to their importance in the BIA process in the Moroccan context. Finally, in the action phase, the research results were discussed, and practical recommendations were formulated, aimed at improving existing practices or suggesting avenues for future research.

5.1. Literature review

The field of BI has seen significant importance among researchers in further investigating and understanding the adoption factors that can facilitate implementation and ensure the successful use of these tools. (Ain et al., 2019) presented a systematic review of the literature. This work examines employees to study the adoption, use and success of BI systems. (Ahmad & Miskon, 2021) used the TOE model to classify BI adoption factors. They applied the content analysis method with Yoshikoder text mining techniques and human coding skills to identify these factors. An exhaustive reading of the literature established by (El Malki & Touate ,2024) revealed more than 94 business intelligence adoption factors. This literature review was based on the theory of content analysis. It identified more than sixty human and organizational determinants.

Organizational factors refer to the characteristics and resources of a company, such as its size, level of training, degree of centralization, management structure, available resources and human resources. They also encompass the organization's objectives, strategies, plans and priorities. (Tseng et al., 2023) asserted that organizational innovation is a determining factor in the acceptance of innovation within a company. According to Tornatzky et al. (1990), organizational processes and structure can facilitate innovation adoption. In general, these organizational factors are predicted to contribute to the success of information systems within an organization. Lu & Wang (1997) employed management style as a measure of organizational context and illustrated that various organizational characteristics can influence the adoption of innovation. They are also an additional driving force encouraging companies to adopt technological innovations. Typically, human factors encompass characteristics such as experience, knowledge, skills, and abilities, which are attributes that can be challenging to quantify uniformly and objectively. Other measurable factors may represent them, including position in the organization, personality, behaviors, organizational characteristics, and work-related aspects. Human factors play a significant role in the technology adoption process (Cosar, 2011).

Table 1 shows the organizational and human factors of BIA as identified by El Malki & Touate (2024). This study aims to explore these factors within the Moroccan context. This approach is motivated by the crucial importance of these two aspects in the technology adoption process.

Table 1 Organizational and human factors.

Organizational factors	Human factors
Size	Perceived ease of use
Age	Educational level and computer knowledge
Management system	Social influence and motivation
Decision support	Task fit
Task complexity	Perceived Risk
Top Management support	Venturesomeness
Organization readiness	Perceived usefulness
collaboration	Quantitative skills
Project group skills	Technology familiarity
Process of surveillance	Voluntariness
Clarity of objectives	Software education
Capability of management	manager innovativeness
Managerial Influences	Manager characteristics/skills
Organizational intention	Personal involvement
Superiors' influence	Attitude
Technology readiness	Individual adoption intention
Peers' influence	Behavioral
Leadership	User 'traits
Data Management	Self-efficacy
Customer demand	Interpersonal communication
Slack	satisfaction after using
Availability organization	perceived benefits
decision making culture	technology anxiety
Relative advantage	IS Knowledge
training	Absorptive capacity

5.2. Methods

This research examines the human and organizational elements that impact the adoption of business intelligence tools in Morocco, taking into consideration the various local business and industry sectors. These factors are evaluated and analyzed within the Moroccan context. An online survey was used to determine the human and organizational factors influencing the adoption of business intelligence tools. These factors are evaluated and determined within the Moroccan ecosystem. The first phase of the surveys ran from 23/11/2023 to 06/04/2024. The respondents were first asked to specify whether they had an activity in Morocco and whether they used one of the BI tools to identify their department, the size of the organization and the number of years of experience. Activity in Morocco and the use of BI tools are conditions for participation in the second phase of the survey.

The respondents were then asked to express their level of agreement on the influence of these factors on BIS adoption. To do this, a 5-point Likert scale was used, where 1 corresponded to total disagreement on the influence of a specific determinant, whereas 5 indicated total agreement on this influence.

5.3. Sample selection

The sample was carefully selected using BI and data analyst profiles from LinkedIn and professional networks. Before presenting the study link, it is important to emphasize that the objective was to explore, in depth, the human and organizational factors influencing the adoption of Business Intelligence within the Moroccan ecosystem. This study focuses on BIS adopters, decision-makers with adequate knowledge of BIS adoption within their companies, BI professionals in the field, researchers in the field of data analysis and decision-making, executives, data analysts, practitioners, researchers, BI application developers, and BI users, such as business analysts, who integrate the latter into their analyses or strategy formulation. We mainly considered the experience of BIS adoption and use, workstations, and company size to obtain an idea of the use of business intelligence in Morocco.

This section provides an opportunity to express gratitude for any assistance or support received that goes beyond the author's direct contributions or funding sources. It is possible to acknowledge individuals or organizations that provided administrative and technical support throughout the research process. This could include valuable contributions such as guidance from mentors, assistance from laboratory staff, or support from colleagues who provided insightful discussions and feedback. Additionally, it is an opportunity to acknowledge any donations in kind, such as the provision of materials or equipment used in the experiments, which greatly facilitated the research.

6. Search Findings

The total number of respondents was 82, of whom only 60 met the needs of the study. This part is presented at two levels: a presentation of the sector of activity, the size of the organization, the department, and the years of experience of the respondents. The second section will classify the adoption factors according to their importance in the adoption process in Morocco.

6.1. Respondents' years of experience

The results reveal that most users in this study have significant experience in the field, with most of them having over 10 years of experience. Some users also have between 5 and 10 years of experience, indicating a solid familiarity with business intelligence tools and practices. On the other hand, a notable number of users have less than 5 years of experience, suggesting a growing presence of newcomers to the field of business intelligence in Morocco. Figure 1 presents the years of experience of the survey respondents. These results highlight the diversity of experiences of business intelligence users in the country, ranging from seasoned professionals to newcomers, and underline the importance of taking this diversity into account when designing and implementing training and professional development programs in this field.

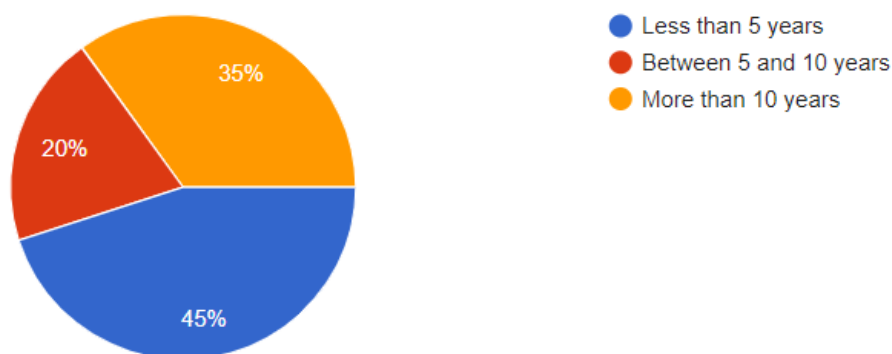


Figure 1 Years of experience of survey respondents.

6.2. Business intelligence departments

A thorough examination of the data reveals the distribution of departments utilizing business intelligence (BI) in Morocco. This distribution reveals a variety of levels of BI adoption and integration across different business sectors. The most frequently mentioned sectors are education and information technology, followed by consulting and finance.

The consulting sector also stands out, with a significant presence in the use of BI. This trend highlights the crucial role of BI in consulting activities, where data analysis is often essential to organizations. The manufacturing, automotive and construction sectors are also present but less frequently. Other sectors, such as agriculture, food, tourism, aerospace and healthcare, are mentioned less frequently on the list. This underlines the diversity of sectors that use this technology in Morocco. Figure 2 presents the distribution of business intelligence departments.

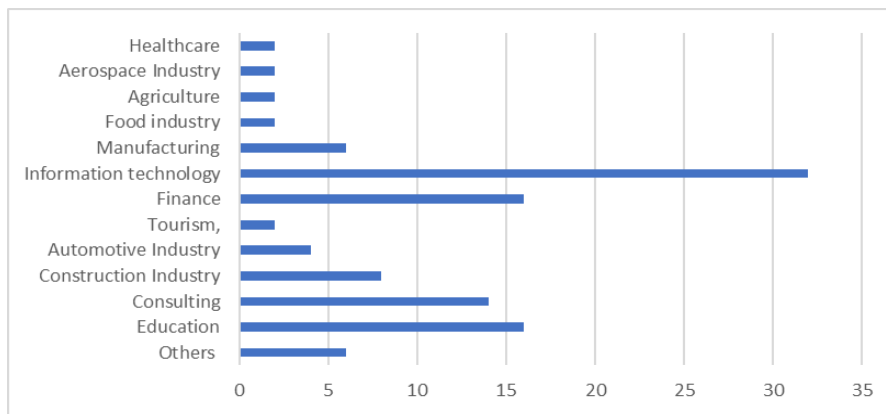


Figure 2 Distribution of business intelligence departments.

6.3. Company size

The results indicate a high prevalence of business intelligence use among large companies in Morocco, with a majority exceeding 200 employees. Medium-sized companies, with between 50 and 200 employees, also appear to be significant users of business intelligence. In contrast, smaller companies, those with fewer than 10 employees, appear to be less represented in the adoption of these technologies. Figure 3 presents the company size distribution of business intelligence users. This trend suggests that business intelligence is more widely integrated in large and medium-sized companies, perhaps due to greater resources and capabilities to implement such solutions. For smaller companies, there may be specific challenges, such as budget constraints or less pressing data analysis needs, that limit their adoption of business intelligence. In summary, these findings underline the importance of taking company size into account when planning and implementing business intelligence strategies in Morocco.

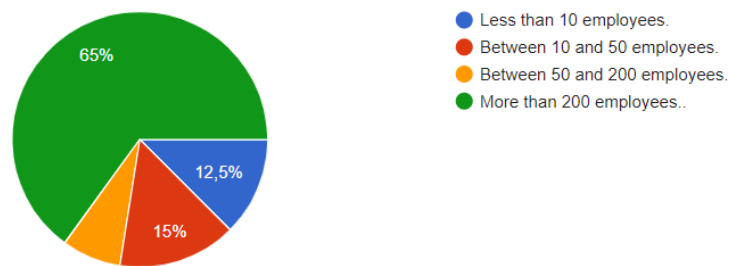


Figure 3 Company size distribution.

The opposite figure shows the areas in which business intelligence (BI) is used. Notably, information technology is the main sector in which business intelligence is used (30%), followed by education (20%) and especially scientific research, since the respondents in this field are university researchers. Together, these two sectors account for almost half of all the responses.

This could indicate a strong demand for data and analytics in these areas, perhaps to optimize internal processes or to make data-driven strategic decisions.

The consulting, finance and manufacturing sectors also show significant use of business intelligence, suggesting increased interest in optimizing operations, managing risk, and identifying growth opportunities. Sectors such as tourism, agriculture and aerospace seem less represented in the responses, which could indicate either a less pressing need for business intelligence in these areas or underrepresentation in the survey sample. In summary, the survey highlights the diversity of sectors where business intelligence is used, with trends reflecting the specific needs of each industry in terms of data analysis and management.

6.4. Selection of key determinants

6.4.1. Organizational factors

This study presents three levels of factors: those with an average of 3--3.5 and those with an average of up to 4. This classification provides an overview of how business intelligence users perceive the BI adoption process in Morocco.

In the range of 3--3.5, we observe factors such as task complexity, relative advantage, availability of additional resources (slack), organizational intent, age of organization, collaboration, organizational readiness, leadership, availability of organizational resources, customer demand, training, superior influence, and peer influence. These factors seem to be perceived as moderately important or moderately favorable in the BI adoption process. They could indicate aspects of the organization that require particular attention to foster successful BI adoption. In the range of 3.5--4, factors such as managerial influence, management capability, organization size, the management system, technology readiness, the monitoring process, data management and project group skills can be identified. Factors scoring up to 4 in the study, including data management, top management support, decision support, and clarity of objectives, were perceived as the most critical factors for successful BI adoption. These high ratings could indicate areas where the organization already excels. Conversely, they might highlight areas requiring further investment to strengthen the BI adoption process. Figure 4 presents the average for all determinants.

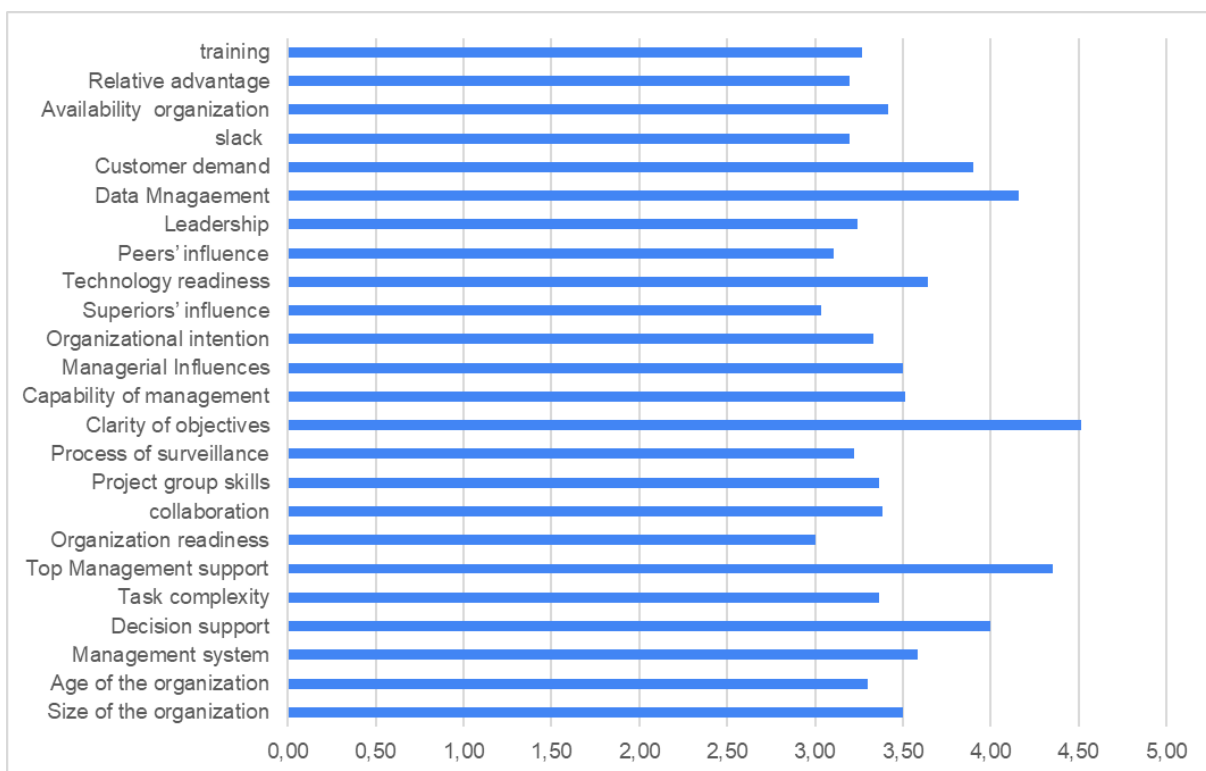


Figure 4 Average values of organizational factors influencing BI adoption.

6.4.2. Human factors

The results of this study present a classification of the importance of some business intelligence human factors in the adoption process in Morocco. Several human factors are considered in this analysis. It presents three levels of factors: those with an average below 3, averages between 3 and 3.5, and averages up to 4. In the 2.5--3 category, we observe elements such as boldness, which indicates a certain propensity to take risks, although this is slightly below the average for this category. In categories 3--3.5, crucial factors such as task fit, software education, manager skills and characteristics, manager innovation, user characteristics, self-confidence, information systems knowledge, knowledge absorption capacity, positive social influence, and perceived benefits are presented. Notably, certain factors, such as attitudes, personal involvement and interpersonal communication, are slightly below average in this category, which may require special attention in the adoption process. Finally, in categories 4--5, we find the following: perceived ease of use, use satisfaction, quantitative skills, software education, level of education and computer literacy.

Taken together, these categories reveal a range of human factors that can influence the adoption of business intelligence in Morocco, from individual motivation to the organizational and social environment. A successful adoption strategy should take these various aspects into account to maximize the chances of success. Figure 5 presents the average for all determinants.



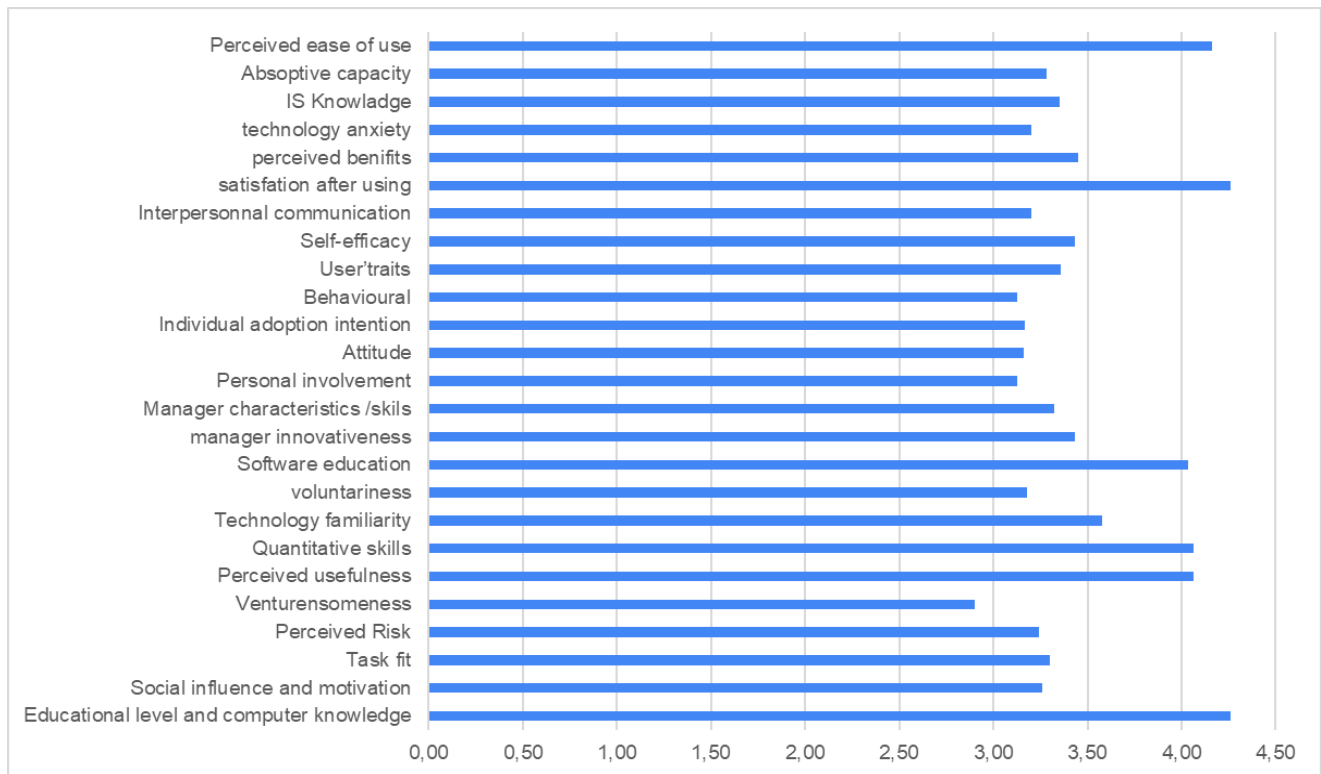


Figure 5 Average values of human factors influencing BI adoption.

7. Discussion

An analysis of the diversity of business intelligence (BI) use in Morocco, which is based on the departments mentioned above, highlights a diverse range of industries that are adopting this technology for specific needs. The significant use of BI can be seen in key sectors, such as education, IT, consulting and finance, reflecting a global trend where these fields leverage data to improve their operations and decision-making. In addition, sectors such as manufacturing, automotive, tourism, construction, agriculture and even aerospace are also adopting BI, illustrating its versatility and applicability to diverse contexts. This diversity of use suggests that BI has become a cross-cutting technology, beneficial to a multitude of sectors in Morocco, for applications ranging from operational management to strategic analysis, as well as improving efficiency and competitiveness.

This study highlights certain factors that are more important than others are based on the survey results concerning organizational and human determinants. The organizational determinants refer to the environment and conditions within which an organization operates, encompassing its structure, culture, resources, and external influences. This study identifies top management support, data management, and clarity of objectives as the most significant factors of interest.

Top Management Support (TMS): The TMS has been the subject of study in diverse research fields. Some studies approach TMS through either an attitudinal or a behavioral lens (Jarvenpaa & Ives, 1991). Attitudinal interpretations define TMS as a collection of positive attitudes that are expressed through active and enthusiastic approval, involvement, and commitment. In contrast, management support, from a behavioral perspective, includes top management's encouragement and allocation of resources specifically to influence employee behaviors. It can be defined as a set of specific managerial skills, such as offering technical assistance to help employees resolve hardware and software difficulties (Dong et al., 2009). Abu-ALSondos (2023) affirms that organizations must assume greater responsibility for the environmental impact of IT. In addition, the TMS can improve the direction, strategic vision and commitment to create a positive perspective of innovation.

Top management is a critical success factor for project success, as it provides vision, support, and commitment to foster a positive perspective for innovation. They can also offer strategic direction and clarity and can play a significant role in the success of projects (Dong et al., 2009; Teo & King, 1997). For BI tools, TMS is crucial for establishing the level of usage, demonstrating commitment to the BI project, and determining the long-term strategy for BI system implementation. In summary, the TMS is pivotal in ensuring project success and innovation by providing a strong foundation for resource allocation, strategic vision, and the removal of obstacles that may arise during project implementation.

Data Management: Data management requirements for enterprise applications have evolved significantly in recent years. The traditional distinction between transactional and analytical access patterns is no longer sufficient. From a business perspective, transactional queries often involve building sums of already delivered orders or calculating overall liabilities per

customer. Moreover, analytical queries demand immediate access to operational data to enable accurate insights and real-time decision-making.

Applications require a holistic, consistent, and detailed view of underlying business processes, leading to the need for large data volumes to be kept online for querying and analysis. Data management provides various solutions for the storage and analysis of accumulated business data (Stjepić et al., 2021). To generate large amounts of structured and unstructured data via various technologies, implementing a dependable solution for storing, analyzing, and distributing such data is essential.

This factor is identified as a significant determinant in the technology adoption process, with organizations that have better data management processes being more likely to adopt data-driven technologies. Most companies understand the benefits of using BI technologies capable of handling large volumes of data. BI helps identify, develop, and create new strategic business opportunities. It offers data integration and analytical capabilities, enabling valuable decision-making at different organizational levels. Thus, adopting a BIS requires significant investment from organizations, primarily focused on improving data management processes. We notice that effective data management prevents subjective data definitions, establishes a data dictionary, and ensures data security.

Clarity of objectives: Having clear objectives is crucial for effective decision-making. In addition, "If you don't know where you are going, any road will get you there". Therefore, with clear objectives, decision-making becomes focused and purposeful (Hollis & Hollis, 2013). Every enterprise must have a basic functional purpose and a vision of what it aspires to become. According to Carpenter and Sanders (2009) and Mulyani et al. (2016), a vision is a simple statement or understanding of what the firm will be in the future, representing the ideal future state of the entire entity. Vision clarity refers to the precision and detail of this objective (Lynn et al., 2000), which provides the foundation for developing a comprehensive mission statement (David, 2011). Thus, successful managers will be those who can establish and implement the proper vision, obtaining the best performance of people in the process (van Kemenade & Hardjono, 2018), so integral vision will allow a general audience to fully understand what all the excitement has been about (Wilber, 2000). Collins and Porras (1996) state that a vision articulates a realistic, credible, and attractive future for the organization, a condition that is better in important ways than the present. Thus, a business vision is a simple statement of the ideal state of the desired company in the future, understood by all members of the company, and drives their commitment and motivation to achieve it.

Second, we look at human factors, which are those that explain human characteristics and skills identified by (El Malki & Touate 2024). This study revealed that perceived ease of use, use satisfaction, quantitative skills, and educational level are the most important factors identified by survey respondents.

Perceived Ease of Use: The Technology Acceptance Model (TAM) posits that a user's behavioral intention to accept technology is determined by two key beliefs: perceived usefulness and perceived ease of use. Both variables are influenced by external factors such as system characteristics, the development process, and training. Studies have applied the TAM to investigate the perception of BI technology and the intention to accept or use BI technology. The impact of these two beliefs on a user's intention to adopt technology is mediated by the user's attitude toward using the technology. Perceived ease of use refers to the degree to which one perceives that adopting an innovation will be free of physical and mental effort (Moore & Benbasat, 1991; Olexova, 2014). Additionally, research by (Daryaei et al., 2013) shows that perceived usefulness fosters trust among employees and customers and has a direct effect on individuals' job performance. Several studies have examined the impact of perceived ease of use on BI adoption, focusing on how the nature of business intelligence is perceived and reported (Daryaei et al., 2013; Hatta et al., 2015). (Ain et al., 2019) discuss users' behavioral usage patterns toward BI systems.

Quantitative skills and level of education: (Bischoff et al., 2015) identified fifteen distinct areas of competency for big data, categorizing them into business competencies, such as management and domain-specific competencies, and IT competencies, including methodological, conceptual, and product-specific knowledge. Bischoff et al. also emphasized the importance of the skills of commercial software platforms for BI tools. (Chen et al., 2012) outline the competency requirements for various fields that higher education should consider in their curricula. These competencies include relational database management, data warehousing, ETL, data mining, statistical analytics, web crawling, networking theories, machine learning, process mining, cloud computing, sentiment analytics, and web visualization. The approach of business intelligence requires specific considerations. Higher education positively impacts the ease of use of concepts and increases users' confidence in their perception of ease of use.

Use satisfaction: (Doll & Torkzadeh, 1988) described user computing satisfaction as a user's positive emotional response to a particular computer application they use directly. User satisfaction can be defined as the extent to which users believe that the information system at their disposal meets their information needs (Hou, 2018). Use satisfaction is one of the most important conditions for individuals' success, happiness, and productivity (Thong & Yap, 1996). This concept has received special attention in the field of information systems (IS) because of its specific characteristics. Many researchers have identified

Bailey & Pearson (1983); DeLone & McLean (2003); Doll & Torkzadeh (1988). (Hou, 2018) argued that user satisfaction can be the best overall omnibus measure of the success of information systems. In addition, (Powers & Dickson, 1973) argue that user satisfaction is the most important criterion for evaluating the success or failure of information systems. User satisfaction after an information system is used is also defined as an affective attitude toward a specific computer application by someone who interacts with it directly (Torkzadeh & Lee, 2003). DeLone and McLean also proposed that higher levels of

individual satisfaction with using an information system led to higher levels of intention to use, which, in turn, impact the use of the system.

8. Conclusion

This study offers suggestions for enhancing a business analytical culture and environment to promote the successful use and adoption of BI systems within an organization. It focuses on two axes, organizational and human factors, in the Moroccan context. Our findings further affirm the importance of the clarity of objectives, top management support, and data management as organizational factors. Clarity of objectives and having a clear vision provide the foundation for adopting business analytics tools effectively. Top management support is crucial for establishing the level of usage, demonstrating commitment to the BI project, and determining the long-term strategy for BI system implementation. Furthermore, data management and data quality have also been shown to increase the competitive advantage of a business. This supports the effective adoption of BI systems by Moroccan companies.

Moreover, as human factors, the perceived ease of use, satisfaction after use, and level of education of users are crucial factors for successfully adopting BI systems. User satisfaction with BI systems relies on establishing sound data connectivity, which can be enhanced by maintaining data integrity and timeliness. Perceived ease of use contributes to greater intentions to use BI systems. Additionally, users with higher educational levels experience greater ease in understanding concepts and are more confident in their perception of ease of use.

Although emerging countries often have specific needs and generally experience lower levels of digitalization than developed countries do, this disparity can impact the adoption of advanced technological tools, such as BI systems. Moreover, a more focused study on the educational levels of specific subjects, such as artificial intelligence, should be considered, as this could significantly help companies in these countries adopt the right tools to support the decision-making process.

Finally, it is crucial to note the limitations of this study. First, the sample of included companies could be larger and geographically more diverse. Additionally, the number of respondents is insufficient due to the low adoption rate of BI by Moroccan companies. Another limitation is that the questionnaires were distributed only online, which excludes some companies that use BIS and does not directly target individuals involved in BI adoption. Furthermore, this study did not differentiate between the sectors of activity of the respondents, whereas it is crucial to consider specific adoption factors according to the field of work.

Acknowledgment

The authors are thankful to the referees for their valuable comments and suggestions.

Ethical Considerations

To conduct this research, the survey was ethically designed to avoid sensitive questions. All ethical guidelines and protocols were strictly followed to ensure the integrity and respect of the participants, the institution, the country, and any other community involved.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Funding

This research is fully funded by Sidi Mohammed Ben Abdellah University, Fez, Morocco.

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