Journal of Infrastructure, Policy and Development 2024, 8(8), 4904.
https://doi.org/10.24294/jipd.v8i8.4904

Article

The influential impact of business intelligence tools usage in establishing responsible business practices using knowledge management stages in the educational sector

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CITATION

Mbaidin HO, Alomari KM, Sbaee NQ, et al. (2024). The influential impact of business intelligence tools usage in establishing responsible business practices using knowledge management stages in the educational sector. Journal of Infrastructure, Policy and Development. 8(8): 4904. https://doi.org/10.24294/jipd.v8i8.4904

ARTICLE INFO

Received: 28 February 2024
Accepted: 23 May 2024
Available online: 9 August 2024

Abstract: Business intelligence is crucial for businesses, from start-ups to multinationals. Examining the role and efficacy of business intelligence (BI) technologies in gathering, processing, and evaluating data to assist responsible management practices and decision-making is crucial in the modern age, especially for educational institutions. This study investigates the impact of Business Intelligence (BI) tools on Knowledge Management (KM) stages and their subsequent influence on Responsible Business Practices Outcomes in the educational sector of the United Arab Emirates. Using a quantitative research design, the study collected data from 406 faculty and staff members across various UAE universities via a structured survey. It analyzed the data using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results revealed a significant positive relationship between the use of BI Tools and the implementation of KM Stages, indicating that the utilization of BI tools is instrumental in enhancing knowledge management processes. However, the direct effect of BI Tools' usage on responsible business practices' outcomes was insignificant, suggesting the need for a mediating factor. KM Stages Implementation emerged as a significant mediator, indicating that the benefits of BI tools on responsible business practices are realized through their influence on KM processes. Moderation analyses showed that Institutional Culture, Training, and Expertise significantly moderated the relationship between BI Tools Usage and KM stage implementation, while Support from Management did not have a significant moderating effect. These findings highlight the importance of fostering an enabling institutional culture and investing in training and expertise to leverage the full potential of BI tools in promoting responsible business practices in educational settings. The study contributes to the literature on technology adoption in education and provides practical implications for educational administrators and policymakers seeking to integrate BI tools into their institutional practices.

Keywords: business intelligence tools; knowledge management; responsible business practices; PLS-SEM; educational sector

1. Introduction

Technology has profoundly changed our lives, greatly impacting our way of living, working, and interacting with the world (Mbaidin et al., 2024). Business intelligence (BI) systems have garnered substantial attention from executives and decision-makers in the recent era of technical breakthroughs and hyper-competition

due to their capacity to deliver complicated and competitive information inputs for the decision process (Ain et al., 2019). In the rapidly evolving context of the educational sector, the integration of Business Intelligence tools has emerged as an influential force (Agustiono, 2019), promoting responsible business practices through the efficient and strategic application of the knowledge management stages. Demand for Business Intelligence (BI) applications continues to grow even at a time when demand for most information technology (IT) products is soft (Skyrius, 2021). BI tools can help identify industry experts, research institutions, startups, and other organizations with relevant expertise or complementary technologies (Hmoud et al., 2023). In light of this, higher education institutions (HEIs) are also facing significant pressures for change in response to intense global competition and advancements in IT (Al-Adwan et al., 2023). Furthermore, the digitalization of knowledge directly impacts industry-specific universities and colleges, which are inextricably linked to the life cycle of generating the knowledge of firms in the sector (Khabarov and Volegzhanina, 2019). This paper explores the connection between Business Intelligence and Knowledge Management and how they can be used to establish a responsible business practice within the educational sector.

The nation's effort to improve society has always included education as one of its key initiatives. One of the ways the education sector raises the standard of excellence is through technology, such as business intelligence. Business intelligence has been influenced by a variety of researchers, including those from business, organizational, and managerial research, as well as those from information systems and computer technology. Knowledge management is a valuable asset for individuals and organizations, helping them fulfil responsibilities and direct activities to achieve goals efficiently. It is also a source of excellence and the cornerstone of an organization's growth and success. In addition, Business Intelligence (BI) is crucial for businesses of all sizes, from start-ups to large multinational corporations. In this modern era, investigating the role and effectiveness of BI tools usage in collecting, processing, and analyzing data to support decision-making and responsible management practices, particularly in educational institutions, is vital. However, there is a gap in understanding how BI tools enhance responsible business practices within the educational sector, especially in the UAE. Usability is a critical issue in BI tools usage in the educational sector due to its complexity and diverse user base (Hmoud et al., 2023). Addressing this issue by considering the utilization of these tools among educators and administrators will ensure the effectiveness of BI tools and the implementation of various Knowledge Management (KM) stages in facilitating responsible business practices. Enhancing accessibility and user-friendliness in BI tools will maximize leverage, influence, and impact in the educational sector. This research focuses on addressing these gaps and challenges to optimize BI tool usage and KM stage application in the UAE's educational institutions. Using these perspectives, the research focuses on the significant influence that Business Intelligence (BI) tools usage have on establishing responsible business practices in the educational sector through Knowledge Management stages. It is regarded as a unique topic and pioneering research because there are no studies on the influential impact of Business Intelligence (BI) tools in establishing responsible business practices using Knowledge Management stages in the educational sector within the United Arab

Emirates. The significance of this research is derived from understanding how knowledge management stages and business intelligence (BI) technologies transform sustainable business processes in the educational sector is essential to maintaining a high standard of excellence. In addition, investigates the influential impact of Business Intelligence (BI) tools in establishing responsible business practices using Knowledge Management stages in the educational sector. The purpose of this research is to address the following six research questions (RQs):

RQ1: What is an overview of Business Intelligence (BI) in terms of its brief history and development, fundamental concepts, positive aspects, functionalities, applications, and tools?

RQ2: How do Business Intelligence (BI) tools influence business practices, and what specific outcomes result from their implementation?

RQ3: How does the integration of Business Intelligence tools with Knowledge Management stages enhance business knowledge practices, and what effects does this integration have on organizational performance?

RQ4: How do Business Intelligence (BI) tools contribute to the development and implementation of responsible business practices within organizations, and what factors influence the effectiveness of this contribution?

RQ5: How do Business Intelligence (BI) tools, when integrated with Knowledge Management stages, influence the establishment of responsible business practices in educational institutions?

RQ6: How do Business Intelligence (BI) tools and Knowledge Management stages collectively influence the establishment of responsible business practices in the educational sector of the UAE?

Using these research questions as a starting point, the research objectives can be defined as follows:

1) To identify how Business Intelligence tools can be adopted when using Knowledge management stages to influence responsible business practices in the educational sector.
2) To determine the extent of the impact of Business Intelligence (BI) as an independent factor and knowledge management stages in influencing responsible business practices in the educational sector.
3) To identify specific Business Intelligence tools that can be implemented to establish responsible business practices in the educational sector.
4) To study the relationship between Business Intelligence (BI) tools using knowledge management stages, and the impact on the educational sector specifically in UAE.
5) To objectively examine the impact of Business Intelligence tools combined with Knowledge management stages on the responsible practices of the educational sector in UAE.
6) To explain the study's results and recommendations.

The research has been divided into seven sections. In Section 2, the research examines the influence of Business intelligence tools on the establishment of responsible business practices in the educational sector using Knowledge management stages; in Section 3, the research model and hypotheses are developed; Section 4

explains the research methodology; Section 5 describes the analysis of data; Section 6 discusses the findings of the research, and Section 7 summarizes the conclusions.

2. Theoretical framework and literature review

2.1. Dissecting the influential impact of business intelligence tools using knowledge management stages

2.1.1. Background of business intelligence (BI)

The research's theoretical framework is arranged in accordance with **Figure 1**, which begins with a thorough explanation of the idea of business intelligence (BI) and ends with a comprehensive examination of how it influences the establishment of responsible business practices in the educational sector, which serves as the study's focus. The history of BI is examined by investigating how business intelligence (BI) has changed throughout time. This also entails analyzing earlier decision-support information systems, which have significantly impacted the evolution of business intelligence (BI) and which, from certain perspectives, BI is still a part of (Marjamäki, 2017). Contemporary business environments continually evolve, presenting new opportunities, dangers, problems, and economic benefits (Kombo-Pinda-Loubondo, 2022). Since its inception in the 1950s, business intelligence (BI) has come a long way to become a disruptive force in today's business world (Mahroof, 2019). Initially, BI was just a basic computer-based technique for organizing and processing data. Then, Decision Support Systems (DSS), which offered analytical tools for administrative decision-making, were introduced in the 1970s and 1980s (Carlsson and Walden, 2021; Phillips-Wren et al., 2021). As stated by Salgado (2023), the BI industry then experienced rapid vendor growth during the 1980s, resulting in continued database development (Carlsson and Walden, 2021). Due to competitive pressures, storage costs were lowered, resulting in improved databases and innovative strategies to manage diverse data sources. As a result, Data Warehouses (DWs) were developed, which gather extensive data from multiple sources and improve cross-referencing and analysis capabilities (Nambiar and Mundra, 2022). The 1990s were known as BI 1.0 because of IT experts' rising rivalry and skill, which resulted in broader data access for enterprises. Still, there were drawbacks, such as creating new queries being costly, and the rapid responses provided being limited and not meeting all user requirements (Salgado, 2023). In response, new BI tools offered more sophisticated and effective solutions, particularly those for Online Analytical Processing (OLAP) and ETL (Reddy and Suneetha, 2021; Salgado, 2023). These tools are vital to contemporary BI systems and significantly contribute to process optimization. In recent years, BI has progressed into the current era of BI 3.0, and businesses of all sizes and sectors have begun to use it more frequently (Salgado, 2023). This can be partially attributed to the ease with which data can be processed and analyzed and its growing availability (Salgado, 2023). With new capabilities added for increased efficiency, BI tools are becoming increasingly more seamless and simpler to use (Hani, 2020).

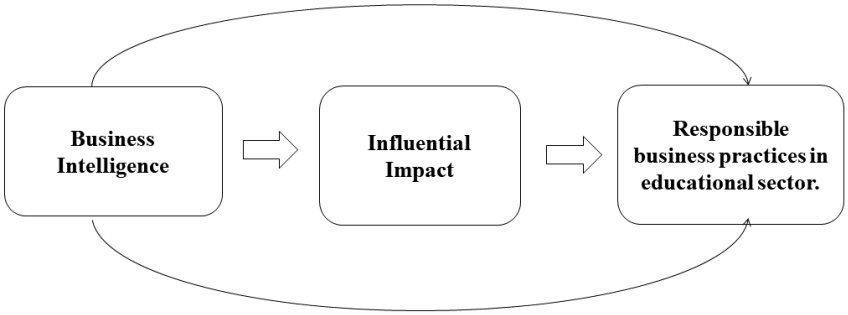

Figure 1. Theoretical research framework.

Santi and Putra (2018) explain Business Intelligence (BI) as an architecture, tool, technology, or system that gathers and stores data, uses analytical tools to analyse it, makes reporting and querying easier, and provides knowledge and information that helps organizations make better decisions. Furthermore, according to Khedr et al. (2017), Business Intelligence (BI) is a collection of tools, applications, and methods that businesses utilize to make informed decisions and take appropriate action. In the view of Igulu et al. (2024), business intelligence (BI) is an ecosystem of tools that enable the transformation of raw data into actionable information. Once the information has been collected, it can help drive corporate performance by allowing companies to formulate better strategic, tactical, and operational decisions and acquire better strategic, tactical, and operational insights. A further definition provided by Chen and Lin (2021) is that Business Intelligence (BI) is an in-depth analysis of detailed business data with the addition of databases, applications, and analysis practices. The authors expanded the definition to include knowledge management, decision support systems, enterprise resource planning, and data mining technologies.

The BI Systems are a type of decision support that collects, organizes, and evaluates data from multiple internal and external sources (Ereth and Baars, 2020; Lennerholt and van Laere, 2019). The four main objectives of BI adoption are to improve decision-making, increase competitive advantage, increase revenue, and improve operational efficiencies. As stated by Alasiri and Salameh (2020), BI systems provide new information by searching and analyzing data using multiple channels of gathering converting, and synthesizing data into actionable insights, thus enabling the tracking and monitoring of operational processes as well as identifying root causes of problems (Alasiri and Salameh, 2020; Candra and Nainggolan, 2022; Srivastava et al., 2022). Several rapidly evolving technologies influence business intelligence software tools, including data mining, predictive analytics, and big data (Hatamlah et al., 2023). With the use of BI, organizations have also accomplished additional objectives, such as those linked to risk management, improving customer service, and compliance (Alasiri and Salameh, 2020). Also, Alasiri and Salameh (2020) said that alterations in business intelligence goals that emphasize the value of BI tools and methods in facilitating prompt and efficient decision-making gives businesses a competitive edge and enable them to execute productive plans that depend on the integration of all relevant information. Using various tools, technologies, and approaches, business intelligence collects data from internal and external sources, converts it into insightful knowledge, and presents it to decision-makers intelligibly and practically (Phillips-Wren et al., 2021).

Business intelligence (BI) and other technical tools are necessary for processing information and for making informed decisions at the corporate level (Romero et al., 2021). An organization could benefit from the implementation of this technical instrument in several ways, including architecture, effective information management, and customer data management (Negro and Mesia, 2020). By using this strategy, businesses could better understand how crucial BI becomes in all kinds of settings (Romero et al., 2021). As noted by Seddigh et al. (2023) Business Intelligence (BI) is considered a powerful tool that can help corporations resolve several problems and give them a competitive advantage over their opponents. From boosting operational efficiency to encouraging strategic growth, business intelligence (BI) offers many benefits that have completely changed how businesses operate and compete in the modern world (Božič and Dimovski, 2019). Businesses can get insights from business intelligence to find hidden trends, spot areas for expansion and development, streamline operations, and ultimately make well-informed decisions that propel them to success (Bharadiya, 2023b). Consequently, corporations should plan to develop their business intelligence capabilities (Seddigh et al., 2023).

Business environments have become more intricate as the Industrial Revolution enters a new phase (Romero et al., 2021). Therefore, businesses need to innovate and use cutting-edge technologies to respond quickly in these changing marketplaces (Ahmad et al., 2020). In accordance with Shokouhyar et al. (2020), the previous few decades have seen BI become the center of attention for many corporate communities. Business intelligence has seen extensive development and application across many different fields. The tourism industry, healthcare, sales, manufacturing, and even the education sector are some of these applications (Santi and Putra, 2018). Business intelligence is an essential tool for businesses of all sizes, from start-ups to large multinational corporations. Businesses can make better use of their data by analyzing their operations in detail and making decisions based on the findings of the analyses (Igulu et al., 2024).

In the current digital age, all businesses, no matter what sector they operate in, aim to automate manual processes and go paperless. As a result, mobile, web, and other sensor-based applications are becoming increasingly popular (Ahmed et al., 2019). Almost all sectors and industries have adopted business intelligence (BI) tools or systems to help bridge the gap between massive amounts of data and meaningful information (Gurcan et al., 2023; Santi and Putra, 2018). These tools enable organizations to access only pertinent information that can positively impact their strategies and decision-making procedures (Ahmed et al., 2019). Business Intelligence has been adopted in many different industries, some of them:

Banking sector: Business Intelligence has fundamentally transformed how financial organizations operate and make decisions (Mbaidin, 2023). With the availability of vast customer data sets, banks can make better decisions in this context with the help of business intelligence and analytics (Mohammad et al., 2022). The role of Business Intelligence is even more important in the banking sector since it allows managers and experts to make better, more accurate, more timely, and relevant decisions, increasing the bank's productivity and profitability while meeting its regulatory and environmental requirements (Nithya and Kiruthika, 2021). essentially, banking domains like branch performance, sales, risk assessment, electronic banking,

customer segmentation, and retention are great places to apply different business concepts and analytics, technologies, and tools like data warehousing, data mining (DM), and decision support systems (DSS) (Mohammad et al., 2022).

Healthcare sector: Information systems and technologies have long been utilized by the healthcare industry to raise the standard, efficacy, and efficiency of healthcare services (Vaz et al., 2023). The healthcare industry appreciates the value of BI solutions since they can provide fresh chances for development, yield advantages, and assist in overcoming obstacles (Cunha et al., 2023). Patient care, marketing, operational analysis, staff development, and financial performance can all be enhanced in the healthcare sector by using business intelligence (BI). Real-time data is also essential for raising quality and lowering patient risk. BI can be used to create new or enhanced goods and services, more efficient processes, or more effective organizational intelligence (Trieu, 2017). Also, the application of business intelligence (BI) in the healthcare sector has made it possible to provide data directly to clinical staff members, who can utilize it most effectively from administrative offices. Decision-making processes in the healthcare industry can be made more efficient through the use of business intelligence (BI), which gives users rapid, reliable access to any kind of information (Kitsios and Kapetaneas, 2022; Vaz et al., 2023).

Manufacturing industry: The utilization of data-driven insights is crucial for success in the current fast-paced and competitive manufacturing environment (Almazmomi et al., 2022). In the manufacturing sector, business intelligence refers to using sophisticated analytics tools and technologies to collect, analyze, and make sense of the massive volumes of data generated during the production process (Niu et al., 2021; Zhong et al., 2017). Manufacturers may enhance their decision-making abilities, optimize resource allocations, and synchronize processes with the aid of interactive BI solutions, as a result, Business Intelligence has the potential to have a significant impact on the manufacturing industry (Yang et al., 2020).

Supply chain management: Supply chain management focuses on optimizing techniques and procedures in the production, procurement, and distribution sectors to reduce delivery times, inventories, and costs (Zhang et al., 2023). Using business intelligence in each function of a supply chain (warehouse management, transportation management, marketing and sales, financial management) has numerous positive implications that can lead to a company's success (Langlois and Chauvel, 2017). Applying BI concepts to SCM systems gives strategic information to organizational decision-makers (Olorunlana, 2023). Furthermore, real-time BI influences corporate decisions and existing business processes. All these capabilities will lead the supply chain management industry to maintain a competitive advantage and increase performance by lowering production costs, increasing customer satisfaction, and eliminating non-value-added tasks (Jafari et al., 2023).

Educational sector: Education is one of the most essential programs that has always been the country's plan for advancing society. Technology, such as business intelligence, is one of several aspects that help the education industry improve its quality (Santi and Putra, 2018). E-learning creates new learning opportunities and causes significant changes in the ways that education is taught (Wei et al., 2022). According to Mbaidin (2024), technology in the educational sector includes both the hardware and software components of the platform and the degree to which it has been

customized to support the most effective teaching methods. An academic system that is highly flexible provides an excellent opportunity for addressing the challenges that have accompanied successive developments and rapid changes in the world in terms of political, economic, social, and cultural aspects, especially technological developments. This frequently results in the formation of a flexible educational system that can meet the expanding requirements of students around the globe (Aldulaimi et al., 2021).

2.1.2. Business intelligence tools

In business intelligence, a broad range of tools, methods, and technologies are used to enable organizations to gain valuable insights from their data and use this knowledge to make informed decisions by consolidating data from diverse sources, analyzing large datasets, presenting data in an understandable manner, utilizing statistical models to analyze data, and managing data quality (Maukar and Irwansyah, 2024). Today, BI tools come in various forms (Ahmed et al., 2019). Thus, it can be difficult for managers of companies to choose tools that may be both highly productive and significantly impactful when implementing them in their organizations (Romero et al., 2021). Consequently, a comparison of a few business intelligence tools and an analysis of business intelligence done by Wangoo (2020) are presented in **Table 1** below.

Table 1. Business intelligence tools and application analysis.

S/No	BI Tools	Applications
1	Tableau	Data visualization products
2	Cognos	Performance management products
4	SAP Business Objects	Real-time Business Intelligence
5	Microsoft Power BI	Interactive visualizations with self-service business intelligence capabilities
6	Domo	SaaS
7	Pentaho	Data integration, business analytics and big data
8	Klipfolio	Building real time business dashboards
9	Dundas BI	Data visualization
10	Necto	Business Intelligence

Organizations need a set of tools, apps, and technologies to help them gather, clean, process, and analyze their data to achieve business intelligence (BI) (Reis, 2023). BI tools and systems, which provide organizations with access to pertinent data that can positively impact organizational strategies and decision-making processes (Abu-AlSondos, 2023; Maaitah, 2023), have been adopted by nearly all industries and sectors in an effort to transform the massive amounts of data into meaningful information (Indriasari et al., 2019). Though industry-specific approaches to the usage of BI tools may differ, the end goal of BI tools and systems is always the same they provide simple access to pertinent data for maintaining the best possible operations to maximize earnings and establish competitive advantage, thus affecting the performance of the organization.

2.1.3. The influential impact of business intelligence (BI) tools

A competitive and dynamic environment presents numerous problems for businesses; as a result, to respond quickly to these changing markets, businesses must innovate and use cutting-edge technologies (Ronaghi, 2023). As stated by Kazemi et al. (2024), Business Intelligence and other technology tools are useful in this situation for analyzing information and making informed decisions at the corporate level. Many benefits, including architecture, effective information flow, and data management, could result from implementing this technology solution in an organization (Bharadiya, 2023a; Romero et al., 2021). The ability to extract, organize, and analyze massive volumes of data, a task that is not viable to complete manually, is made possible by data management tools like business intelligence (BI) (Ronaghi, 2021a, 2021b). In order to extract useful information from massive data sets, organizations' managers and analysts require increasingly advanced tools. BI Systems have responded to this essential demand (Sirin and Karacan, 2017). Businesses may swiftly respond to market and customer needs shifts, seize new opportunities, and simply adapt by leveraging business intelligence and advanced tools. Also offers vital details regarding consumer preferences, rivalry, and market trends. Businesses can use this data to enhance their plans, maximize performance, and make well-informed decisions (Ronaghi, 2022; Ronaghi et al., 2019).

2.1.4. The influential impact of business intelligence (BI) tools through using knowledge management stages

Knowledge, which was once only a scientific asset, has transformed over the last ten years into a crucial component of contemporary business (Bloem and Salimi, 2023). It now positively affects a variety of company performance metrics, including market, technical, and financial performance (Abusweilem and Abualous, 2019; Choi et al., 2020). The processes and actions that help an organization create, acquire, and then discover, organize, use, and disseminate knowledge among its employees are collectively referred to as knowledge management (Moscoco-Zea et al., 2019). These activities also transform the information and experience the organization already possesses and use them in administrative tasks like working procedures, strategic planning, and decision-making (Koshelieva et al., 2023). The ways that an organization manages knowledge at multiple stages of its existence are referred to as knowledge management processes (Ayatollahi and Zeraatkar, 2020). As shown in **Figure 2**, knowledge discovery, capture, sharing, and application are the four primary knowledge management processes (Al Shraah et al., 2022; Al-Shqairat et al., 2020).

Since BI offers the tools necessary for business performance, investments in BI infrastructure, systems, and apps enhance business performance (Alshehadeh et al., 2023). Also, these stages and processes of knowledge management can affect the organization to make better insights or decisions related to the workplace, which leads to solving problems and streamlining internal operations (Al-Shqairat et al., 2020). Putting the two different approaches to sensemaking within organizations, Knowledge Management (KM) and Business Intelligence (BI) are frequently perceived as separate disciplines. Both theories are widely accepted and support methods for fostering comprehension, learning, and decision-making in businesses (Alarjani, 2019). Consequently, Establishing BI tools with knowledge management stages will have and

play a significant role in enhancing the stages of knowledge management (Abusweilem and Abualous, 2019) through efficient data handling, fostering knowledge sharing, and empowering organizations to make informed decisions based on the insights derived from data analysis.

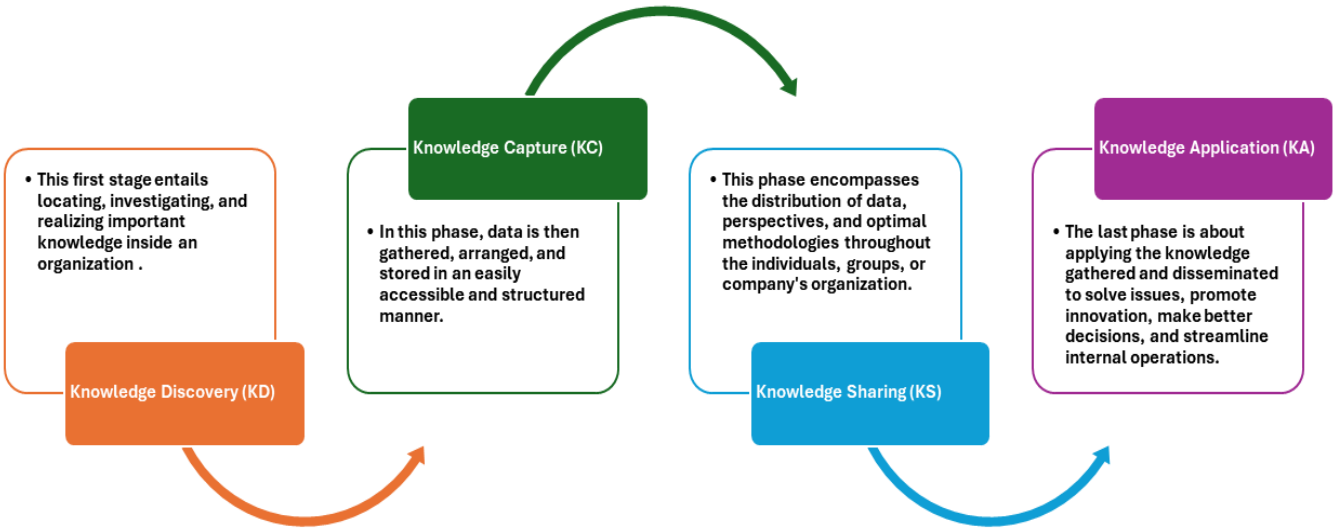

Figure 2. Stages and processes of knowledge management (Abubakar et al., 2019; Al Shraah et al., 2022; Al-Shqairat et al., 2020).

2.2. The influential impact of business intelligence (BI) tools in establishing responsible business practices

An organization's business is the act of creating something valuable to meet the needs of its customers, earn a living, and improve the world around it. Businesses must constantly evaluate their operations and progress to quickly change their strategy (Santi and Putra, 2018). Data and information are becoming increasingly important in the corporate world due to the quick advancement of technology, growing competition, and the constantly shifting demands and preferences of consumers (Alasiri and Salameh, 2020). According to Gauzelin and Bentz (2017), to assist organizations in overcoming both expected and unexpected events that could have an influence on their operations, a variety of technology solutions have been developed. One such technical instrument is business intelligence systems, which assist in gathering information about the surroundings and activities of businesses and converting it into easily understandable information. Since business intelligence systems may be used to assess an organization's performance, they are considered an essential component for them (Gauzelin and Bentz, 2017). Organizations require tools, apps, and technologies to help them gather, clean, process, and analyze their data to achieve business intelligence (BI). The value of business intelligence systems is reflected in the most widely used business intelligence analysis: First, the development of strategic business process forecasts; second, credit scoring; third, web and text mining; fourth, logistics optimizations; fifth, customer loyalty analysis; sixth, upselling and cross-selling analysis; seventh, customer segmentation and profiling; eighth, fraud detection; and ninth, survival time and parameters importance analysis (Ababseh, 2022; Ahmad et al., 2020; Alatiqi, 2022; Gadatsch, 2023; Nogués and

Valladares, 2017). High-quality business intelligence technology is characterized by BI tools that are tailored to an organization's needs and data strategy and hardware infrastructure that can process massive amounts of data rapidly. Apart from its potential influence, BI requires high-quality hardware to be a practical tool for making decisions in the face of uncertainty that meets the organization's needs and objectives (Gina and Budree, 2020; Trieu, 2017). Moreover, BI tools offer data about the outside environment that businesses can use to plan or build business strategies, which raises the organization's strategic level (Kazemi et al., 2024). In addition, forecast analysis and financial data analysis are facilitated by BI tools, which also enable more informed choices (Bharadiya, 2023a). Consequently, monitoring the market, competitors, suppliers, and the behavior of customers, and analyzing the profitability of different products are all part of business intelligence tools (Ahmad et al., 2020).

2.3. The influential impact of business intelligence (BI) tools in establishing responsible business practices using knowledge management stages

According to Areed et al. (2021), organizational progress is the use of innovative business practices in the initiative's external relations, workstation organization, or business performance to enhance knowledge utilization, workflow efficiency, and the quality of goods and services (Alomari et al., 2022). The goals of the knowledge management discipline are to preserve and maximize the present and future value of knowledge assets while also enhancing the performance of both individuals and organizations (Guambi et al., 2018). Investing in BI infrastructure, systems, and apps improves company performance as BI provides the tools required for business performance (Alshehadeh et al., 2023). Turpeinen (2022) stated that, "Knowledge management and business intelligence are closely associated, even considered genuinely similar". Linking the two approaches of Business Intelligence with different stages of knowledge management and utilizing them together contributes significantly to developing ethical business practices. The first stage, known as knowledge discovery, is concerned with BI tools that are characterized and have been excellent at collecting large amounts of data from multiple sources, enabling to identify trends, patterns, and essential information (Ahmed et al., 2019; Marjamäki, 2017). Also, BI tools in this stage helping in exploring the key indicators and metrics regarding ethical operations, social responsibility, and sustainability (Seddigh et al., 2023). For example, analyzing supply chain transparency, customer feedback associated to ethical sourcing, or energy consumption patterns. The second stage which is knowledge capture, at this stage the data is identified. The role of BI tools in this stage is assisting in organizing and capturing this information, also BI tools can enhance the storage of data by ensuring its accessibility, accuracy, and reliability (Ahmad et al., 2020). This stage the is very useful for enhancing and boosting responsible business practices with the information related to ethical guidelines, environmental impact, or compliance data. The following stage which is knowledge sharing. When the data get analyzed, BI tools display this data and distribute it in an understandable and valuable way, like dashboards, sharing reports, and visualization across different departments within organization (Phillips-Wren et al., 2021). This sharing can enhance responsible

practices in building an environment of transparency and accountability. For instance, sharing the reports regarding the performance of sustainability with members promote collective efforts in relation to reducing environmental footprints (Ramanathan et al., 2023). The final stage of knowledge management is knowledge application. This stage is likely to be the most essential stage since the results came out. BI tools allow decision makers to use and benefit from insights gained from data analysis, by assisting them to make responsible and informed decisions put in order environmental, societal, and ethical considerations (Carriço, 2022). Also, BI tools can promote responsible business practices in implementing strategic decision making with regards to enhancing processes to reduce waste, or designing products with lower environmental impact (Weber, 2023). Consequently, firms may collect and arrange data as well as extract useful insights that promote ethical decision-making by incorporating BI technologies into knowledge management phases.

2.4. The influential impact of business intelligence (BI) tools in establishing responsible business practices using knowledge management stages in the educational sector in UAE

Knowledge management, according to Areed et al. (2021), is the cornerstone of organizational strategies, providing novel perspectives on education and training within organizations, as well as new responsibilities and methods of operation for administrators. Mbaidin (2022) states that "knowledge management is one of the ways to raise the level of job performance and support the entrepreneurial orientation of companies". Via various knowledge management stages, business intelligence (BI) tools are essential to promoting ethical business practices in the UAE's educational sector. The first influential factor is data collection and integration. Utilizing Business Intelligence tools through knowledge management stages allows for educational institutions to collect and integrate data from multiple sources (Younas et al., 2022), such as systems of students' information, systems of learning management, financial database. By acquiring valuable information, institutions can have a comprehensive view of their operations (Berges et al., 2021). The second factor is facilitating knowledge sharing. The use of BI tools can provide a platform across departments and stakeholders within educational institutions for sharing insights (Hmoud et al., 2023). Also, using BI tools with knowledge management stages can encourage collaboration and knowledge sharing by embracing an environment of data-driven decision-making (Hmoud et al., 2023), allowing educators and administrators to work together lead to improve overall performance (Cardoso and Su, 2022). Third factor is data analysis and reporting. As BI tools fostering to analyze data effectively, decision-makers in educational institutions can obtain valuable insights from student performance metrics, resource utilizations, enrollment trends, and financial data (Ang et al., 2020; Mahroeian and Daniel, 2021; Webber and Zheng, 2020). Teachers and administrators can recognize areas for improvement and make informed decisions through detailed reports and visualizations that optimize student outcomes and operational efficiency (Junaedi et al., 2023). The fourth factor is regulatory compliance and ethical practices. Ensuring compliance with regulatory standards and ethical practices through using BI tools with knowledge management stages, maintaining transparent records, and

anatomizing data for compliance, educational institutions can stand by responsible business practices and ethical standards (Niño et al., 2020). The last factor that influences responsible business practices through using BI tools with knowledge management stages is resource optimization. Academic institutions can optimize resource allocation by using BI tools with knowledge management stages, like budget distribution, faculty time, or infrastructure usage; this enhancement correlated with implementing sustainability and responsible utilization of resources (Naidu et al., 2023; Nur et al., 2017; Ravikumar et al., 2023). Thus, adopting BI tools within the knowledge management stages in UAE's educational sector can lead to enhancing the quality of decision-making, optimizing accountability, and creating responsible practices, enabling educational institutions to align their strategies with their goals while adopting an environment of continuous development and advancement.

3. Model and hypotheses development

The model of the study shown in **Figure 3** demonstrates three relationships (Direct relationship, Mediated relationship, and Moderating effects on the mediation), the relationship between BI tools usage and responsible business practices, with a focus on KM stages and institutional factors as mediating and moderating variables. The following subsections cover the three relationships that are shown in the study model.

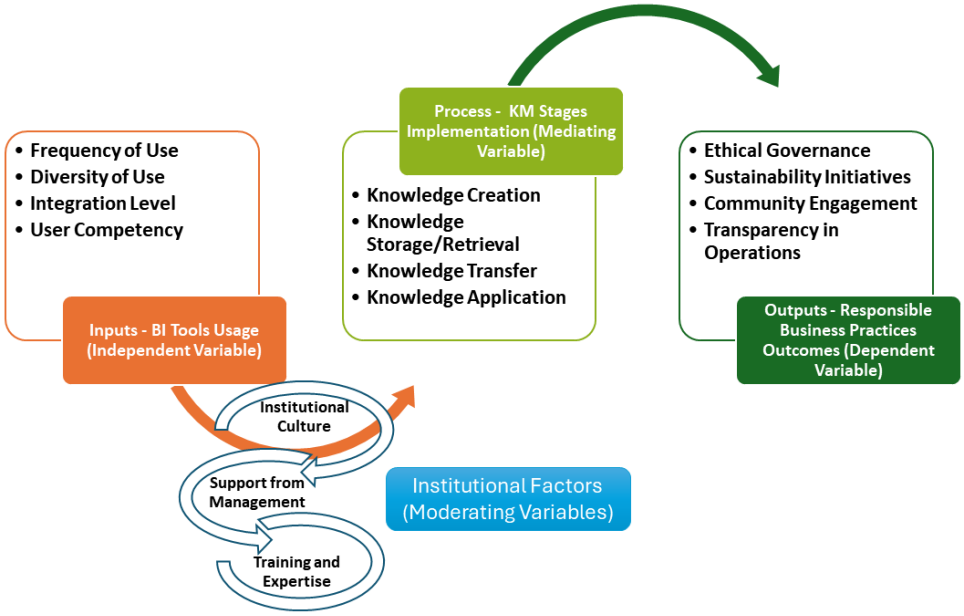

Figure 3. Study model.

3.1. Direct relationship

KM stages significantly influence the effectiveness and usability of BI tools usage since each stage of KM plays a specific crucial role in BI tools usage (Mathrani, 2021). Firstly, the Knowledge creation stage involves collecting and generating the data (Ode and Ayavoo, 2020; Rošulj et al., 2024). The role of this stage is to ensure that the data has been generated and analyzed by the usage of BI tools in a precise, relevant, complete, consistent, unique, timely, and valuable manner that aligns with

the objectives of the organization allowing them to enhance the quality of the information needed to make informed decisions. The second stage which is knowledge storage, also plays a crucial role in enhancing BI tool usage by robust the system for organizing, manipulating, storing, and retrieving knowledge from different sources, thus promoting the decision-making process to be easier, faster, informed which helps in maintaining the high quality of knowledge (Jiménez-Partearroyo and Medina-López, 2024; Shabbir and Gardezi, 2020). The third stage which is knowledge transfer encompasses managing the transacting process of knowledge across the organization, this stage can support the usage of BI tools in facilitating knowledge transfer through reports, or visualizations that proactively affect the decision-making procedure (Ode and Ayavoo, 2020). The last stage is the Knowledge application (Shabbir and Gardezi, 2020) which covers the confirmation process for ensuring the efficient and effective action usage of BI tools, therefore, BI tools usage may drive, enhance, and facilitate the combination with the other business systems, enabling them to get actionable insights that promote the quality of decision-making within the organization.

H1: BI Tools Usage (Frequency of Use, Diversity of Use, Integration Level, User Competency) are positively influenced by KM Stages Implementation (Knowledge Creation, Knowledge Storage/Retrieval, Knowledge Transfer, Knowledge Application).

Implementing the four stages of KM can have a positive influential impact on different responsible business practice outcomes (Ode and Ayavoo, 2020). First of all, the function of the knowledge creation stage is to generate actionable insights about future plans, market trends, and strategic analysis (Kokkonen, 2024), these generated data can recognize emerging issues, best practices, and chances for improving or developing new plans and approaches that address different aspects of responsible business practices including ethical governance, sustainability, community engagement, and transparency in operations. The second stage which is knowledge storage or retrieval involves storing, maintaining, and retrieving a repository of knowledge related to different aspects of responsible business practices in an effective manner which can ultimately simplify easy access to policies, standards, and guidelines associated with different aspects of responsible business practices (Aithal, 2023; Widyanti et al., 2023). Then the knowledge is shared and distributed with the knowledge transfer stage which allows for improving cross-functional collaboration in the organization, which fosters understanding of ethical governance, sustainability initiatives, community engagement, and transparency in operations. In the last stage, after the knowledge is analyzed and distributed the knowledge application stage applies the actionable insights that were taken from the decision-making process into their operations, ultimately, promoting and ensuring responsible business practice outcomes (Aithal, 2023; Widyanti et al., 2023).

H2: KM Stages Implementation (Knowledge Creation, Knowledge Storage/Retrieval, Knowledge Transfer, Knowledge Application) has a positively influence on Responsible Business Practices Outcomes (Ethical Governance, Sustainability Initiatives, Community Engagement, Transparency in Operations).

3.2. Mediated relationship

Utilizing the four different BI tools frequency of use, diversity of use, integration level, and user competency can create actionable insights that lead to making informed decisions that can build successful strategies and plans (Alasiri and Salameh, 2020; Mbaidin, 2024). Moreover, the implementation of KM stages of knowledge creation, knowledge storing, knowledge transfer, and knowledge application with BI tools usage can make robust and integrated processes that can have a profound effect on understanding and adhering to ethical governance, sustainability, community engagement, and transparency in operations.

H3: KM Stages Implementation mediates the relationship between BI Tools Usage and Responsible Business Practices Outcomes.

3.3. Moderating effects on the mediation

In today's highly competitive advantage business landscape, it is pivotal for institutions to implement recent technologies to stay in the market (Aithal, 2023). Business Intelligence and Knowledge Management are among the drivers of innovation, but the effective use of these initiatives heavily depends on the culture of the institution (Andar and Kasparova, 2024). The interactions and decisions with shared values, beliefs, norms, and behaviors are what determine an organization's culture (Ertosun and Adiguzel, 2018). To strengthen the relationship between BI tools usage and KM stages implementation an institution must control and keep the culture strong in order to implement BI tools usage with KM stages implementation effectively and efficiently.

Management support is a crucial part of any organization since it's a job to manage the whole processes and operations of the organization and make sure that is on the right path. The higher the support from the organization the more the organization becomes successful. Management support creates a culture that motivates the success of organizational transformation (Andar and Kasparova, 2024). Thus, BI tools usage and the implementation of KM stages will be more successful if management has strong support within the culture of the organization to implement these initiatives on the right path with high performance while maintaining a competitive advantage in today's dynamic competitive business environment.

Training and expertise become a very crucial part of any organization since we are experiencing a very rapidly modern age of technology where the employing of technologies has become imperative for organizations to keep pace with this era. For organizations to implement these technologies efficiently and effectively they need to have an expert employee they are aware of and know how to deal with these technologies to achieve the organization's objectives (Appelbaum et al., 2017; Fink et al., 2017; Torres et al., 2018). The role of training and expertise among employees in the organization is very critical to ensure they can adapt to these initiatives and ensure the complete and efficient integration of BI tools usage and KM stages implementation to influence decision-making processes and drive innovation capabilities to leverage data and knowledge effectively to compete with the other rivals.

H4: Institutional Factors moderate the relationship between BI Tools Usage and KM Stages Implementation.

4. Methodology

4.1. Research design

A quantitative research approach used to examine the influence of Business Intelligence (BI) tools on Knowledge Management (KM) stages and the subsequent impact on Responsible Business Practices Outcomes (RBPO) in the educational sector of the UAE. The methodology is structured to explore the direct, mediated, and moderated relationships among the constructs using the PLS-SEM Partial Least Squares -Structural Equation Modeling method. This research can be fully understood by using these analytical instruments, which make it possible to assess the correlations between various variables accurately, effectively, and efficiently.

4.2. Data collection

The survey was conducted using an online questionnaire and distributed via email and professional social media sites. In order to evaluate Business Intelligence (BI) tools' influence on Knowledge Management (KM) stages and their subsequent impact on Responsible Business Practice Outcomes (RBPOs) in UAE education, the questionnaire was developed to collect feedback on several concepts. A number of incentives were not offered to encourage participation. Respondents were guaranteed anonymity and that their responses would be handled anonymously. The data was collected through a survey distributed to faculty and staff across different universities in the UAE. A total of 406 responses were considered suitable for analysis. The study employed a convenience sample approach, with a primary focus on those working in the education sector who had some level of technological expertise and experience. The Authors used LimeSurvey to construct and distribute surveys via multiple channels to ensure a diverse representation of participants. The survey items consisted of a 5-point Likert scale designed to measure the constructs of BI Tools Usage (Independent Variable), KM Stages Implementation (Mediating Variable), Responsible Business Practices Outcomes (Dependent Variable), and Institutional Factors (moderating variables).

4.3. Sample

The 406 participants were distributed among faculties and staff positions within the UAE universities. The demographic data of the respondents is as follows:

- Gender distribution: 282 males (69.5%) and 124 females (30.5%);
- Age range: 15 below 25 years (3.7%), 168 aged 25–35 (41.4%), 165 aged 36–45 (40.6%), 45 aged 46–55 (11.1%), and 13 above 55 (3.2%);
- Position: Faculty and staff members from several different educational levels from UAE institutions completed a survey that was used to gather the data. 224 faculty members (55.2%) and 178 staff members (43.8%), with 4 categorized as 'Others' (1%).

4.4. Measures

The survey included the following measures:

- BI tools usage: Assessed by questions on the frequency of use, diversity of use,

integration level, and user competency.

- KM stages implementation: Measured through items related to knowledge creation, storage/retrieval, transfer, and application.
- Responsible business practices outcomes: Included items evaluating ethical governance, sustainability initiatives, community engagement, and transparency in operations.
- Moderating variables: Institutional factors (institutional culture, support from management, and training and expertise) were evaluated to understand their moderating effects on the relationship between BI tools usage and KM stages implementation.

4.5. Statistical analysis

The PLS-SEM analysis was conducted using SmartPLS. The construct was evaluated by path coefficients estimation and used the indirect effects approach for mediated relationships and interaction effects for moderation relationships.

4.6. Ethical considerations

Prior to participating in the survey, all individuals granted their informed consent. No inducements were provided to encourage participation, and all respondents were guaranteed complete anonymity and confidentiality of their answers. The survey questions were simple and easily understandable. It is vital to emphasize that user consent was secured for the research, including pertinent details regarding ethical considerations. Participants were given advance notice that the survey was solely for research purposes, and their data would remain confidential throughout the data gathering and analysis processes. On the first page of the survey, the participants were informed about the purpose of the study, the nature of their participation, the confidentiality of their responses, and their right to withdraw at any time.

5. Data analysis

In this section, the authors discuss measurement model assessment, structural model assessment, and path coefficient analysis.

5.1. Measurement model assessment

Table 2 shows that loadings for all items on their latent variable's observers were valuable. That indicates good individual item reliability for each construct. The outer loadings recommended threshold is above 0.5, with BI1 (0.815), BI2 (0.681), BI3 (0.793), and BI4 (0.653) indicating well loadings on the BI Tools Usage construct and also shgoodg well loadings on the KM Stages Implementation construct and Responsible Business Practices Outcomes.

Other constructs had single indicators with perfect loadings (1.000) because they were measured using single items.

Table 3 shows there are different indicators to measure reliability and validity. Cronbach's alpha values for BI Tools Usage, KM Stages Implementation, Responsible Business Practices Outcomes, and Institutional Factors are (0.720, 0.888, and 0.779), respectively, where all values are above the acceptable threshold of 0.7. Confirming

internal consistency (rho_a) and Composite reliability scores (rho_c) for all constructs are also above the acceptable threshold of 0.7, indicating good construct reliability. For validity, **Table 3** shows the Average Variance Extracted (AVE) for all construct BI Tools Usage, KM Stages Implementation, Responsible Business Practices Outcomes, and Institutional Factors Outcomes (0546, 0749, 0604), respectively, are above the acceptable threshold of 0.5, ensuring adequate convergent validity.

Table 2. Outer loadings analysis.

Latent variable	Outer loadings
BI1 ← BI Tools Usage	0.815
BI2 ← BI Tools Usage	0.681
BI3 ← BI Tools Usage	0.793
BI4 ← BI Tools Usage	0.653
KM1 ← KM Stages Implementation	0.877
KM2 ← KM Stages Implementation	0.865
KM3 ← KM Stages Implementation	0.873
KM4 ← KM Stages Implementation	0.846
RB1 ← Responsible Business Practices Outcomes	0.853
RB2 ← Responsible Business Practices Outcomes	0.631
RB3 ← Responsible Business Practices Outcomes	0.835
RB4 ← Responsible Business Practices Outcomes	0.769
Institutional Culture ← Institutional Factors	0.869
Support from Management ← Institutional Factors	0.801
Training and Expertise ← Institutional Factors	0.736
Institutional Factors × BI Tools Usage → Institutional Factors × BI Tools Usage	1

Table 3. Reliability and validity analysis.

Latent Variable	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
BI Tools Usage	0.720	0.738	0.827	0.546
KM Stages Implementation	0.888	0.889	0.923	0.749
Responsible Business Practices Outcomes	0.779	0.807	0.857	0.604
Institutional Factors	0.724	0.739	0.845	0.646

5.2. Structural model assessment

Measuring the model's explanatory power involved assessing *R*-squared values in structural model evaluation. **Table 4** shows the *R*-squared values for KM Stages Implementation and Responsible Business Practices Outcomes (0.883, 0.794) respectively. Also shows adjusted *R*-squared counterparts (0.881, 0.793), respectively, indicating that the model considered a significant part of the variance in these endogenous constructs.

Table 5 shows the Variance Inflation Factor (VIF) values for all predictors, indicating that multicollinearity wasn't a worry in the model. Where all values were below the acceptable threshold of 0.5.

Table 4. *R*-square analysis.

Construct	*R*-square	*R*-square adjusted
KM Stages Implementation	0.883	0.881
Responsible Business Practices Outcomes	0.794	0.793

Table 5. Variance inflation factor (VIF) analysis.

Predictor	VIF	Predictor	VIF
BI1	1.567	RB1	1.952
BI2	1.277	RB2	1.288
BI3	1.481	RB3	1.820
B14	1.262	RB4	1.498
KM1	2.493	Institutional Culture	1.676
KM2	2.347	Support from Management	1.526
KM3	2.422	Training and Expertise	1.291
KM4	2.208	Institutional Factors × BI Tools Usage	1

5.3. Path coefficient analysis

5.3.1. Direct relationship analysis

Figure 4 shows the PLS-SEM Bootstrapping is used to assess hypothesized by structural model. **Table 6** shows the path coefficient analysis, The path from BI Tools Usage to KM Stages Implementation was positive influence and significant ($P < 0.000$). So, that supporting H1. Where the path from BI Tools Usage to Responsible Business Practices Outcomes was not significant ($P = 0.062$). The path from BI Tools Usage to Responsible Business Practices Outcomes was positive influence and significant ($P < 0.000$). So, that supporting H2.

Table 6. Path coefficient analysis.

H	Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values
H1	BI Tools Usage → KM Stages Implementation	0.366	0.365	0.027	13.397	0.000
	BI Tools Usage → Responsible Business Practices Outcomes	−0.079	−0.078	0.042	1.868	0.062
H2	KM Stages Implementation → Responsible Business Practices Outcomes	0.958	0.958	0.037	26.133	0.000
	Institutional Factors Culture → KM Stages Implementation	0.616	0.616	0.025	24.181	0.000
H3	BI Tools Usage → KM Stages Implementation → Responsible Business Practices Outcomes	0.352	0.352	0.029	12.326	0.000
	Institutional Factors → KM Stages Implementation → Responsible Business Practices Outcomes	0.590	0.59	0.034	17.529	0.000
H4	Institutional Factors × BI Tools Usage → KM Stages Implementation	−0.017	−0.018	0.015	1.15	0.250

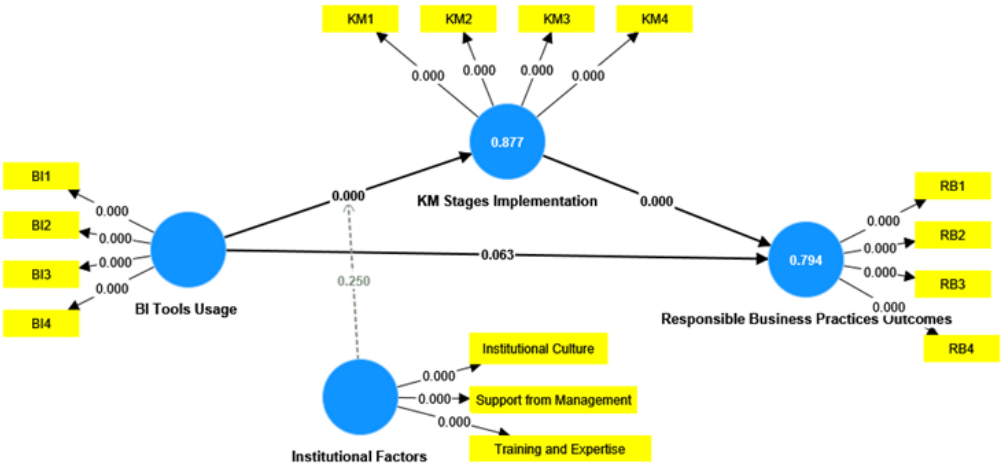

Figure 4. PLS-SEM bootstrapping.

5.3.2. Mediated relationship analysis

Mediation analysis reveals that KM Stages Implementation significantly mediates the relationship between BI Tools Usage and Responsible Business Practices Outcomes (Indirect effect $\beta = 0.350$, $p < 0.001$). So, this supports H3. There is no direct influence between BI Tools Usage and Responsible Business Practices Outcomes without the mediation of KM Stages Implementation. That confirms the mediation role. Also, KM Stages Implementation significantly mediates the relationship between Institutional Factors and Responsible Business Practices Outcomes (Indirect effect $\beta = 0.590$, $p < 0.000$).

5.3.3. Moderating effects analysis

Moderation analysis investigates the impact of Institutional Factors (Institutional Culture, Support from Management, and Training and Expertise interacting) on the relationship between BI Tools Usage and KM Stages Implementation.

H4: The interaction of Institutional Factors with BI Tools Usage negatively influenced KM Stages Implementation ($\beta = -0.017$, $p = 0.250$), suggesting these factors might not alter the influence of BI Tool Usage on KM.

These analyses provide evidence that while BI tools are pivotal in KM processes within the educational sector, their direct impact on responsible practices is fully mediated by how well KM stages are implemented. Institutional Factors, encompassing culture, support, and expertise, though important for KM, do not significantly change the primary relationship between BI Tool Usage and KM. This insight is crucial for educational institutions prioritizing responsible business practices through technology integration.

6. Discussion

The discussion of the findings from the PLS-SEM analysis provides an interpretative examination of the study's results concerning the hypotheses and the existing body of literature.

6.1. Interpretation of findings

The significant positive relationship between BI Tools Usage and KM Stages

Implementation (H1) aligns with the literature that emphasizes the importance of BI tools in enhancing knowledge management processes within organizations (Reference studies that support this finding). This finding suggests that BI tools facilitate various knowledge management stages, such as knowledge creation, storage, retrieval, transfer, and application in the educational sector.

Contrary to expectations, the direct impact of BI Tools Usage on Responsible Business Practices Outcomes was insignificant (H2), indicating that the use of BI tools alone does not directly translate to responsible practices. This could imply that while BI tools are necessary for managing knowledge, their effectiveness in influencing business practices depends on how well they are implemented within the knowledge management framework.

The strong mediating role of KM Stages Implementation (H3) confirms the process through which BI Tools Usage translates into Responsible Business Practices Outcomes. This highlights the pivotal role of effective knowledge management in ensuring that the utilization of BI tools contributes to ethical governance, sustainability initiatives, community engagement, and transparency.

The moderation analyses (H4) were hypothesized that Institutional Factors would either strengthen or weaken the relationship between BI Tools Usage and KM Stages Implementation. A lack of significant moderation could imply that BI Tools Usage independently predicts KM effectiveness, regardless of the cultural or managerial context within the institution.

6.2. Theoretical and practical implications

Theoretically, this study extends the understanding of how BI tools contribute to the development of responsible business practices in educational institutions by incorporating the stages of knowledge management as a mediating factor and examining the moderating role of institutional factors.

From a practical standpoint, the findings suggest that educational institutions should not only invest in BI tools but also focus on developing robust KM processes and fostering a culture that supports the continuous improvement and integration of these tools. Moreover, the significance of training and expertise reinforces the need for ongoing education and skill development among faculty and staff to leverage BI tools effectively.

7. Conclusion

The influential impact of Business Intelligence tools and Knowledge Management stages in the educational sector emerges as a transformative force in establishing responsible business practices. The integration of Business Intelligence tools when using Knowledge management stages promotes sustainable resource management while driving the educational sector toward responsible business practices and enhancing organizational performance. Therefore, as the educational sector evolves, embracing the influential impact of Business Intelligence and knowledge management integration seems to be proving vital, and the educational sector can create a path not just for academic success but also for a responsible business practice.

Author contributions: Conceptualization, IOA, NQS and UMC; methodology, HOM; software, KMA; validation, HOM; formal analysis, KMA; investigation, HOM and KMA; resources, HOM, KMA, NQS, IOA and UMC; data curation, KMA; writing—original draft preparation, HOM, KMA, NQS, IOA and UMC; writing—review and editing, HOM, KMA and NQS; visualization, HOM and KMA; supervision, HOM; project administration, HOM; funding acquisition, HOM and KMA. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

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