

BUSINESS INTELLIGENCE AND STRATEGIC ENTREPRENEURSHIP FOR SUSTAINABLE DEVELOPMENT GOALS (SDGS) THROUGH: (GREEN TECHNOLOGY INNOVATION AND GREEN KNOWLEDGE MANAGEMENT)

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ABSTRACT

The study aimed to investigate the effect of business intelligence on strategic entrepreneurship and the mediating role of green technology innovation and the moderate role of green knowledge management for sustainable development goals (SDGs) in the Jordanian entrepreneurial companies in King Hussein Business Park (KHBP). It was used the descriptive analytical approach, for data collection purposes the researcher uses a “random sample” consisting of (347) employees. The method of data collection was by a questionnaire distributed to the sample. The total returned questionnaires were (318) with a good response rate of approximately (79.5%). In this research, was used partial least squares structural equation modelling (PLS-SEM). The findings indicated there is: a positive and direct impact of business intelligence on (strategic entrepreneurship, and green technology innovation), a positive and impact of the green technology innovation on strategic entrepreneurship, and the green technology innovation mediate a positive effect between business intelligence, and strategic entrepreneurship and the green knowledge management moderates the impact of business intelligence on strategic entrepreneurship. The study findings emphasize the need to improve Business Intelligence to promote sustainability by incorporating environmental criteria into data analytics, allowing companies to make environmentally friendly decisions, urges companies to integrate Green Technology Innovation into their strategic plans by collaborating with technology providers and research organizations. The research also emphasizes the need for government initiatives that encourage the use of green technology innovation and green knowledge management.

Keywords: *Green Technology Innovation, Green Knowledge Management, Business Intelligence, Strategic Entrepreneurship, Sustainable Development goals (SDGs), Jordan's Entrepreneurial Sector*

1. INTRODUCTION

With the advent of the second millennium and in light of the progress of the knowledge economy, the technological explosion, and the broad transformations in the organizational environment, from work patterns and administrative methods to administrative thought, the sources of strength and progress have come to stem from knowledge and advanced technology based on knowledge in all business fields. This is because knowledge is considered a basic source of intelligence for organizations and achieving competitive advantage that depends on the quality

of decisions made as decision makers in organizations need data, information and knowledge to understand the problems they may face during work (Alomoush et al., 2021). Hence, the idea of business intelligence (BI) arose as a result of the need of organizations to improve its decisions and enhance its competitive capabilities (Cheng, 2023). BI helps analyze trends, enhance internal processes, and improve the effectiveness of strategic decision-making. Strategic leaders can help companies navigate new challenges. Leaders can identify opportunities and use resources more effectively by incorporating BI into their Strategic Entrepreneurship (SE) process. The (SE) emerged to activate the capacity of medium and small organizations and achieve competition in the market, through their ability to innovate, manage opportunities and manage resources, to keep pace with the capacity of large organizations, and enable them to form alliances with major companies (Luu, 2023), and that strategic leadership is part of the organization's strategies, and contributes to achieving competitive advantage, as methods of adding value, high performance, competitiveness and development have become strategic leadership a modern approach that organizations seek to use; to achieve strategic goals, and achieve creativity and innovation by adopting strategies and mechanisms of change; to move them from the ranks of stagnation to leading organizations, and to adapt to environmental changes. Organizations must address these issues in order to achieve the sustainable development goals (SDGs). Sustainable development is no longer an intellectual luxury, but a necessary condition for achieving justice and equity in sharing the benefits and gains of economic development and wealth between present and future generations. The term of Green Knowledge Management (GNM) describes how companies apply their understanding of the environment to enhance sustainable performance and innovation. While (Sahoo et al., 2023) found that (GNM) improves organizations' ability to achieve their environmental and strategic goals, (Wang et al., 2022) found that the use of green technology helps improve efficiency and environmental innovation. These insights will serve as the basis for this study's analysis of the relationship between (BI) and strategic leadership, focusing on the ways in which (BI) can help leaders make wiser strategic choices. In organizations, there is a robust positive correlation between (GKM) and (GTI). (GKM) establishes the groundwork for (GI) by fostering an organization-wide understanding of environmental possibilities and problems as well as the transfer and use of green knowledge (Abbas & Sağsan, 2019). The SDGs are a global call to action to achieve a better, more sustainable future for all. They seek to address the interconnected challenges of poverty, inequality, climate change, environmental degradation, green innovation, peace and justice. (Yikun et al., 2023). Although a number of researchers have studied (GKM) and SDGs from different perspectives, not enough attention has been paid to exploring the impact of (GNM) in achieving SDGs, especially with the help of Green Technology Innovation. In light of the above discussion, the present research aims to investigate: The relationship between (BI) and (SE) is examined in terms of the effects of Green Technology Innovation (GTI) as a mediating variable and (GNM) as a moderating variable. The goal is to understand how these aspects, in the context of changing environments, increase (SE) and sustainability. Previous studies have extensively examined the role of (BI) and (SE) in improving organizational performance and innovation. Previous studies have demonstrated the transformative power of (GTI) in addressing environmental concerns and achieving long-term goals. Similarly, green knowledge management has been found to help disseminate and apply environmentally relevant knowledge. However, few studies have combined these components to investigate their overall impact on achieving sustainable development goals. This research seeks to bridge this gap by examining the relationship between business intelligence and strategic entrepreneurship, as mediated by (GTI) and (GKM), and providing a comprehensive framework for sustainability-driven entrepreneurship. Based on the above explanation of the research gap, the primary research question is: How do Business Intelligence and Strategic Entrepreneurship jointly influence the achievement of Sustainable Development

Goals (SDGs) through Green Technology Innovation and Green Knowledge Management?

2. LITERATURE REVIEW

2. 1. INDEPENDENT VARIABLE (BUSINESS INTELLIGENCE (BI))

(BI) is one of the basic elements in the information technology sector and is a general term used as a synonym for decision support, data warehouses, and analysis. Currently, the term (BI) has a clearer definition and better applications (Alzghoul et al., 2024). Despite the recent studies on the concept of (BI), it has a large volume of definitions and trends, which in turn led to different points of view on accurately defining it. It includes technologies and applications that aim to ensure access to and storage of necessary data and information, and through it complex data can be analyzed. (BI) solutions also include data storage, reporting, analysis, forecasting, and data extraction processes. (BI) also refers to the comprehensive term that covers all activities and processes necessary for the process of collecting, storing and analyzing information to improve the decision-making process. Caseiro and Coelho (2019) referred to (BI) as a set of tools and processes that help in making better decisions, and the process used to collect the necessary information for organizations to survive and continue and evaluate the actions taken by competitors, suppliers, consumers, technology and the general business climate, and that it is a set of analysis methodologies and mathematical formulas that use available data to produce useful information that helps in formulating difficult decisions. Ukhalkar et al., (2021) see that (BI) is tools designed alongside business applications and strategies to integrate, collect, analyze and interpret data. (BI) is viewed as an umbrella that integrates analytical tools, databases, methodologies and applications for the purpose of transforming the data available in the organization into information and then into decisions that are implemented through specific procedures. (Keshtegar et al., 2021). Researchers have been interested in defining the dimensions of (BI). Some have defined it as (collecting, analyzing, and storing data) and other researchers depend on identify the BI dimensions on (real-time information processing, business performance management, and competitive intelligence). Some of them referred to it as (competitive intelligence, immediate analytical processing, and business performance management). Therefore, researchers' views differed on the dimensions of (BI), and the focus on some dimensions rather than others, as this discrepancy is attributed to the difference in researchers' approach to the dimensions, each according to his study, as well as the importance of each dimension and what is consistent with the nature of the sector adopted by organizations without others. After reviewing many scientific studies and research such as (Cheng, 2023; Jafari et al., 2023) it become clear that the dimensions addressed are the most frequently repeated and important, which are as) Data Warehouse, Data Mining, On-Line Analytical Processing (OLAP)).

2. 2. DEPENDENT VARIABLE (STRATEGIC ENTREPRENEURSHIP).

The concept of entrepreneurship is one of the strategies that help companies improve their competitive position in the competitive business climate, which is why many organizations are looking for good practices to survive, invest in opportunities, and search for value, which is the basic principle of the term leadership (Alshawabkeh et al., 2024). The concept of (SE) emerged to activate the capacity of medium and small organizations and achieve competition in the market, through their ability to innovate, manage opportunities and manage resources, to keep pace with the capacity of large organizations, and enable them to ally with major companies, and that strategic leadership is part of the organization's strategies, and contributes to achieving competitive advantage, as methods of adding value, high performance, competitiveness and development have differed over the ages, such as management by objectives, quality management and process engineering, and (SE) (Vedula, 2022). It has become a modern approach that orga-

nizations seek to use; In order to achieve strategic goals, and achieve creativity and innovation by adopting strategies and mechanisms of change; to move them from the ranks of stagnation to leading organizations, and to adapt to environmental changes. (SE) was one of these strategies to deal with the required change, to achieve compatibility between the strengths of small organizations and the market capabilities and huge resources of organizations (Thurik et al., 2024). Strategic leadership in general has a significant impact on organizational performance in the long term, and helps organizations adapt, survive and grow, because it seeks to develop the organization at the strategic level (Tokhirovna& Khasanovich, 2024). The research focused on the dimensions of (SE) :(managing entrepreneurial opportunities, Entrepreneurial leadership, and creativity).

2. 3. MEDIATING VARIABLE GREEN TECHNOLOGY INNOVATION (GTI)

(GTI) is an effective means of promoting the green development of the economy, and government environmental regulations are an important means of encouraging enterprises to implement GTI (Wang et al., 2022). (GTI) is one of the types of innovations that play an important role in developing the appropriate use of natural resources to improve human well-being, as green innovation includes all types of innovations that in turn contribute to the creation of products, processes or services to reduce environmental damage, as making changes in products and production processes may contribute to sustainable development GTI and its implementation aim to reduce the waste of resources and the negative environmental impacts resulting from production processes, and to prove its effectiveness in enhancing the environmental responsibility of institutions and companies. Green innovation plays an important role in enhancing the environmental responsibility of institutions and companies, through the innovation of green products, green production processes, or green administrative systems, which helps achieve a competitive advantage that enables institutions to achieve environmental sustainability (Harris et al., 2024). (Khan & al, 2024). GTI aims to move towards a green economy, as green innovation is considered a tool for protecting the environment by developing environmentally friendly products and optimal use of resources, as there is great global interest in these innovations, as many countries seek to adopt them and benefit from them as much as possible, and green innovation aims to help in the transition to a green economy (Alioune, 2024; Yanan & Qunna, 2023).

2. 4. MODERATING VARIABLE GREEN KNOWLEDGE MANAGEMENT (GKM)

Knowledge Management (KM) is now necessary for the success of an organization (Pepple et al., 2022). In order to handle a variety of environmental concerns, modern knowledge has become more and more focused on diverse environmental aspects within the framework of what is known as Green Knowledge (GK). According to Everard (2015), it also has to do with sustainable development. The modern era has witnessed a wide interest in the concept of green and green management at all levels to include many service and industrial organizations, especially those organizations that include the implementation level because they play an effective role that benefits individuals and institutions. Knowledge management is considered one of the most important concepts that have received attention; because it generates ideas and creative energies and contributes to the distinction of institutions from one another. The concept of knowledge management is considered one of the new administrative concepts that emerged in the health sectors, and it is considered an organized approach to acquiring knowledge that is striking in its renewal and modernity for organizations. The reason for this is the digital technological revolution in the current era, which is based on the use of modern renewable knowledge and the use of information in an appropriate and gifted manner (Al-Abbadi et al., 2020). (GKM) is a process

that helps companies develop products that are less harmful to the environment. This is all in achieving business development goals (Pepple et al., 2022). It has become a market element, as well as current global companies. (GKM) is a new concept in knowledge management that aims to integrate green or environmental aspects into all dimensions of (KM), giving them a competitive advantage over their competitors in addition to the technologies and practices that can aid in environmental protection, raising environmental consciousness, and creating new technical solutions, this knowledge include a grasp of ecosystems and the interactions between humans and the environment (Yu & al, 2022). In light of (Alshaketheep et al., 2024), and (Fan & al, 2023) (uses four aspects of (GKM): creation green knowledge, acquisition green knowledge, sharing green knowledge, and application green knowledge all these aspect help to achieving (SDGs) (Yu & al, 2022); (Maravilhas & Martins, 2019).

2. 5. THE RELATIONSHIP BETWEEN RESEARCH VARIABLES:

(SE) is considered a survival tool for companies today; because it enables them to search for new solutions and strategies that will help them continue to grow, innovate and create while achieving the highest levels of performance (Cristo-Andrade, 2024). While the term (BI), its theories, methodologies, processes, features and techniques are based on transforming unstructured data into information that can be used for business purposes. It also has the ability to handle massive amounts of data and help organizations identify and develop new business opportunities, seize opportunities and develop a successful strategy for organizations (Ayyaswamy, 2024). The relationship between (GTI) and (SDGs) is gaining traction, with GTI playing an important role in advancing several SDGs, particularly those related to environmental protection, sustainable economic growth, and social well-being. (GKM) aims to promote more environmentally friendly behaviors and lessen the effects of human activity on the environment by methodically developing (creating, acquiring, sharing, and applying) knowledge and information about environmental sustainability (David & Eva, 2017). In order to encourage more sustainable practices and lessen the effects of human activities on the environment, environmental sustainability is the methodical development, acquisition, sharing, and use of knowledge and information. Organizations can benefit greatly from (GKM) in achieving their (SDGs) (Hummels & Argyrou, 2021). (GKM) is an effective instrument that can assist businesses in achieving their sustainability objectives. Organizations can significantly impact the battle against climate change and other environmental issues by managing their green information well (Ma & al, 2018). To investigate the relationship between (BI) and (SE), various theories for understanding how entrepreneurs might use BI to obtain competitive advantages. Here's a summary and explanation of the applicable theories such as: (Knightian Theory of Entrepreneurship (Risk-Taking Theory), Schumpeterian Innovation Theory, McClelland's Achievement Theory, Max Weber's Theory of Entrepreneurial Growth, Hagen's Entrepreneurial Theory (Status Withdrawal), Economic Theory of Entrepreneurship, Exposure Theory of Entrepreneurship, Political System Theory of Entrepreneurial Growth) Each of these theories offers unique and distinct perspectives on how (BI) contributes to (SE). (BI) reduces risk, enhances creativity, increases efficiency, and allows managers to make strategic decisions that are consistent with the company's vision (Adama et al., 2024). Parekh & Wright (2024) assert that to enhance green knowledge management and technological innovation, it is necessary to highlight the importance of developing advanced IT infrastructures to support green knowledge management and technological innovation. Managers must align these technological investments with the company's strategic mission and vision, and ensure their seamless integration with existing management approaches. An effective IT infrastructure supports effective knowledge management and technological innovation, thus improving overall sustainability efforts.

3. RESEARCH METHOD

3.1. HYPOTHESES AND CONCEPTUAL MODEL

A review of the literature supports the correlation between BI and SE. Several studies have found a statistically significant impact. Hence, based on the above, was proposed the following hypotheses:

H01: “The BI (Data Warehouse, Data Mining, and OLAP) positively effects on SE (Managing entrepreneurial opportunities, Entrepreneurial leadership, and Creativity) in the Jordanian Entrepreneurial Sector.”

H01-1: “The BI (Data Warehouse, Data Mining, and OLAP) positively effects on Managing Entrepreneurial Opportunities in the Jordanian Entrepreneurial Sector.”

H01-2: “The BI (Data Warehouse, Data Mining, and OLAP) positively effects on Entrepreneurial leadership in the Jordanian Entrepreneurial Sector.”

H01-3: “The BI (Data Warehouse, Data Mining, and OLAP) positively effects on Creativity in the Jordanian Entrepreneurial Sector.”

H02: “The BI (Data Warehouse, Data Mining, and OLAP) positively effects on Green Technology Innovation in the Jordanian Entrepreneurial Sector.”

H03: “The GTI positively effects on Entrepreneurial leadership in the Jordanian Entrepreneurial Sector.”

H03-1: “The GTI positively effects on Managing Entrepreneurial Opportunities in the Jordanian Entrepreneurial Sector.”

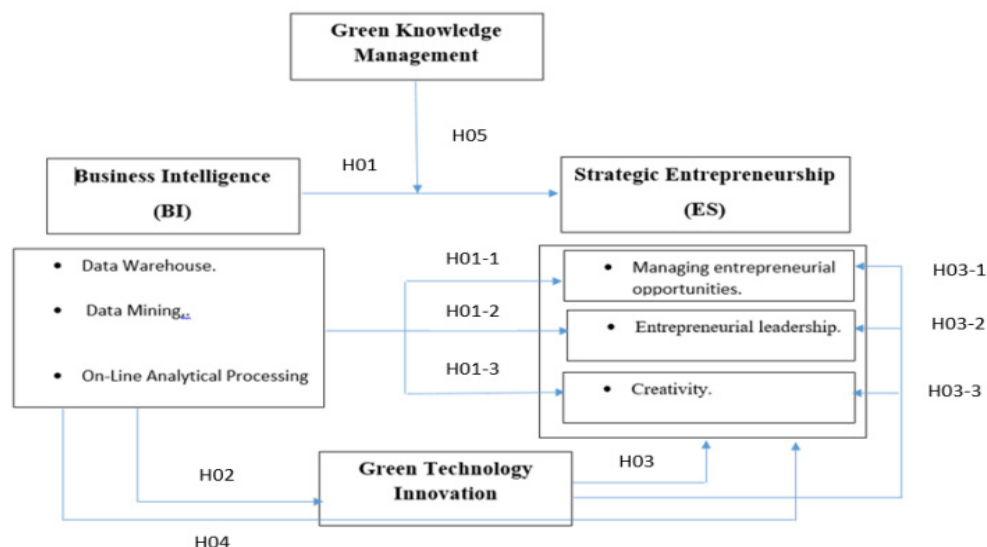
H03-2: “The GTI positively effects on Entrepreneurial leadership in the Jordanian Entrepreneurial Sector.”

H03-3: “The GTI positively effects on Creativity in the Jordanian Entrepreneurial Sector.”

H04: “GTI does not mediate the effect of BI (Data Warehouse, Data Mining, and OLAP) on Strategic Entrepreneurship (Managing entrepreneurial opportunities, Entrepreneurial leadership, and Creativity) in the Jordanian Entrepreneurial Sector.”

H05: “GKM does not modify the effect of BI (Data Warehouse, Data Mining, and OLAP) on SE (Managing entrepreneurial opportunities, Entrepreneurial leadership, and Creativity) in the Jordanian Entrepreneurial Sector.”

Figure 1. Conceptual Model



Source: Author

3. 2. RESEARCH SAMPLE, DATA COLLECTION AND INSTRUMENTS.

The study population consists of 295 start-ups, 65 local companies, 14 regional companies and 19 international companies operating in various sectors, and employs about 7,000 people located in Amman in King Hussein Business Park (KHBP). The study population consisted of all employees in (KHBPA) accordingly, the study sample was selected using a simple random sample method, based on the sample survey method. The use of Simple Random Sampling was chosen to ensure each unit in the population had an equal probability of selection, thereby minimizing selection bias and enhancing the study's validity. This approach is particularly effective for achieving a representative sample when the population is homogeneous or sufficiently well-defined. Additionally, it supports the reliability of statistical inferences drawn from the data. The sample size was (363) employees according to (Sekaran and Bougie, 2010) with a confidence level of 95% and a margin of $\pm 5\%$ of the measured value. A total number of 400 questionnaires were distributed, while the returned questionnaires were 347 and 53 questionnaires were not returned as shown in Table (1) Only 318 questionnaires were useable, indicating 79.5% response rate.

Table (1). Response Rate

Response Rate	Respondents No
Questionnaires Distributed	400
Returned	347
Not Returned	53
Returned and Unusable	29
Returned and Usable	318
Response Rate	79.5%

Source: Author

The researcher developed a questionnaire as a study tool, in a manner consistent with the variables and dimensions of the study, based on previous studies related to the research topic, where the questionnaire consisted of four parts, The study tool was formulated in the form of a questionnaire consisting of 33 paragraphs divided into 9 paragraphs measuring BI, 14 paragraphs measuring SE, 5 paragraphs measuring GTI and 5 paragraphs measuring GKM. The questionnaire utilizes a Likert scale, a widely used tool for measuring attitudes, perceptions, and opinions. Respondents rate their agreement or frequency on a five-point scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), or alternatively, from 1 (Never) to 5 (Always), this scaling method allows for quantifiable insights into subjective variables, facilitating statistical analysis and comparison.

Table 2. Research Instrument

Independent variable (BI):		
Items	Measures	Construct and derivation
Data Warehouse		(Cheng, 2023) ;(Jafari et al., 2023)
DW1	The company management has a central system for storing the big data of its business.	
DW2	The company management has special protection programs to protect its data stored in the data warehouse.	
DW3	The company management works to ensure the quality of the data before storing it in the data warehouse.	
Data Mining		
DM1	The company’s management relies on data mining technology to access valuable information in its field of work.	
DM2	The company’s management uses data mining technology to analyze the behavior of its customers.	
DM3	The company’s management relies on the results it obtained from data mining to build its strategic plans.	
OLAP		
OLAP1	The real-time analytical data processing system provides accurate results for the requested inquiries.	
OLAP2	The company’s management relies on the results provided by the real-time analytical data processing system to improve demand forecasting processes.	
OLAP3	The company relies on the results provided by the real-time analytical data processing system to improve inventory management processes.	
Dependent variable (SE)		
Managing entrepreneurial opportunities		
MEO1	The company evaluates the opportunities available in the internal and external environment in order to seize them.	(Thurik et al., 2024); (Tokhirova& Khasanovich, 2024); (Alshawabkeh et al., 2024).
MEO2	The company provides services that meet the future and potential needs of customers.	
MEO3	The company identifies the appropriate strategic alternatives in light of the available entrepreneurial opportunities.	
MEO4	The company chooses the entrepreneurial opportunities that meet the needs of the market.	
Entrepreneurial leadership		
EL1	The company management supports and encourages all employees’ personal initiatives and efforts.	(Bagheri & Harrison, 2020); (Nau-shad, 2021), (Bilal, 2021).
EL2	The company management has the ability to influence employees to achieve pioneering goals.	
EL3	The senior management has the ability to analyze potential risks facing the company in the future.	
EL4	The senior management has a future vision of what things should be like in the future, whether the company or the employees.	
EL5	The senior management has the ability to deal with the company’s problems and solve them in innovative ways.	

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Creativity		
Cr1	The company focuses on providing new services to customers.	(Murad, Ashraf & Arora, 2021); (Shaheen et al., 2023).
Cr2	The company is keen to increase the number and quality of services compared to other companies.	
Cr3	The company encourages its employees to be creative by providing new solutions to the problems they face.	
Cr4	The company is looking for new geographical areas to increase its promotion.	
Cr5	The company is interested in research and development activities to propose innovative solutions.	
Mediating variable (GTI)		
GTI1	Our company is constantly working to improve manufacturing and operating processes using cleaner methods and/or green technologies to achieve savings.	(Wang et al., 2022);
GTI2	Our company actively participates in redesigning and improving products or services.	(Khan & al, 2024); (Alioune, 2024); (Yanan & Qunna, 2023).
GTI3	Our company specializes in recycling practices to ensure that end-of-life products are recovered.	
GTI4	Our company is strictly involved in “eco-labeling” activities to make our customers aware of our sustainable management practices	
GTI5	Our company’s R&D team ensures that current technological advances are incorporated into the development of new environmental products.	
Moderate variable (GNM)		
GKM1	Our employees and partners have easy access to information about environmentally friendly best practices.	(Pepple et al., 2022); (Fan & al, 2023); (Yu & al, 2022).
GKM2	Our company has procedures in place to gain knowledge about the environmental practices of our competitors, suppliers, customers and strategic partners.	
GKM3	Our company has structured mechanisms in place to share best practices across multiple business disciplines.	
GKM4	Our company develops initiatives (such as seminars, periodic meetings and collaborative projects) that promote and support the exchange of green information across departments and/or stakeholders.	
GKM5	Our company actively participates in processes that apply knowledge to solve new challenges across organizational departments and/or beyond departmental boundaries.	

Source: Author

3. 3. DESCRIPTIVE ANALYSIS

Table 3. The mean, standard deviations, Internal Consistency Reliability- Cronbach's Alpha, factors loading, Average variance extracted, composite Reliability of variables

Variables	items	Mean	standard deviation	Rate	Cronbach Alpha	No of items	CR (0.60 ≤)	AVE (0.50 ≤)
Data Warehouse	DW1	3.92	0.926	1	0.823	3	0.895	0.739
	DW2	3.81	0.962	3				
	DW3	3.87	0.957	2				
	Total	3.8648	0.81535	high				
Data Mining	DM1	3.96	0.896	3	0.718	3	0.839	0.722
	DM2	3.96	0.894	2				
	DM3	4.33	0.683	1				
	Total	4.0828	0.57442	High				
OLAP	OAP1	4.22	0.681	3	0.813	3	0.890	0.729
	OAP2	4.24	0.732	2				
	OAP3	4.26	0.710	1				
	Total	4.2421	0.60353	High	BI (0.768)	9		
Managing entrepreneurial opportunities	MEO1	4.20	0.661	3	0.728	4	0.828	0.548
	MEO2	4.27	0.603	2				
	MEO3	4.32	0.635	1				
	MEO4	4.11	0.887	4				
	Total	4.2264	0.51614	high				
Entrepreneurial leadership	EL1	4.12	0.865	3	0.781	5	0.848	0.529
	EL2	4.24	0.779	2				
	EL3	4.34	0.681	1				
	EL4	3.88	0.898	4				
	EL5	3.79	0.974	5				
	Total	4.0736	0.61238	high	0.888	5	0.919	0.695
Creativity	Cr1	3.82	1.043	3				
	Cr2	3.84	0.909	2				
	Cr3	3.98	0.866	1				
	Cr4	3.80	0.928	4				
	Cr5	3.80	1.010	5				
	Total	3.8484	0.79385	High	SE (0.764)	14		
(GTI)	GTI1	3.80	1.034	5	0.820	5	0.882	0.655
	GTI2	3.85	0.886	4				
	GTI3	3.88	0.927	3				
	GTI4	4.09	0.966	1				
	GTI5	4.07	0.718	2				
	Total	3.9358	0.63517	High	0.879	5	0.911	0.673
(GNM)	GKM1	3.81	0.849	2				
	GKM2	3.86	0.958	1				
	GKM3	3.76	1.019	4				
	GKM4	3.81	0.950	3				
	GKM5	3.76	1.026	5				
	Total	3.8013	0.78904	High				

Author source: Smart-Pls software

3. 4. ASSESSMENT OF MEASUREMENT MODEL

In this research, partial least squares structural equation modeling (PLS-SEM) was used, which is ideal for complex models with different variables and indicators. In general, model validation is an important step in ensuring the consistency and validity of research results. It is a way to evaluate both the measurement and structural components of the model to ensure that they meet the specified requirements. This increases the credibility of the research and the reliability of the results (Hair et al., 2017).

3. 5. RELIABILITY AND VALIDITY

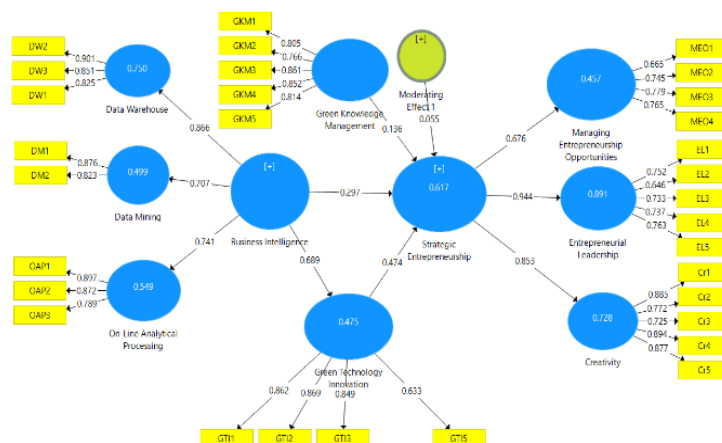
- Internal Consistency Reliability

In this research adopted both methods of Cronbach's alpha and composite coefficients. It measures the reliability of each core variable in the measurement model and composite reliability coefficient determines the internal consistency reliability of the adapted measures. Cronbach's alpha reliability coefficients between 0.6 and 0.7 generally considered acceptable, above 0.7 typically considered good or high reliability, indicating a strong internal consistency among the items in the scale (Hair et al., 2017). The consistency test was used in Cronbach's alpha, It measures the consistency of the responses of the respondents to all questions in the scale, and the alpha can be interpreted as the coefficient of internal stability between the answers, and indicates the height of its value on the degree of stability and the range between (0 and 1) and its value acceptable at (70%) and above (Sekaran and Bougie, 2010). Table (3) discussing the results of a statistical analysis, possibly related to a questionnaire and its dimensions. The information you provided indicates that the coefficients of the variables were higher than 70%, demonstrating internal consistency among the paragraphs which are considered acceptable based on (Sekaran and Bougie, 2010), which indicates that the paragraphs of the questionnaire with their dimensions have internal consistency.

- Indicator Reliability, Convergent Validity (AVE) and Composite Reliability

To avoid problems with validity, it is preferable for indicators to have values higher than 0.70, and should be given to removing indices with values between 0.30 and 0.70. This might be referring to a range of factor loadings or indicators that fall below the desired threshold. However, removal should only be considered if it leads to an increase in both composite reliability and Average Variance Extracted (AVE) above the suggested values (Leguina, 2015). The preliminary results showed that some indicators did not achieve the required level of saturation on the factors, as some of them (DM3, GTI4) showed weak consequences less than (0.40), and in such a case it is recommended to delete these items, especially with an average decrease The AVE is less than (0.50). The reason in this case may be attributed to the fact that some of these indicators may be incomprehensible or overlap with other measurement indicators for the same factor or with another factor. The initial description of the study model, which includes the study variables, the number of its indicators, and the saturation of the indicators with its factors, using (Smart PLS). The preliminary results indicated that a number of items did not achieve sufficient saturation (>0.60), which in turn may significantly affect the results of the study, so these indicators will be deleted based on (Hair et al., 2017). After testing the initial model and exploring the saturation of the indicators on the factors, it was found that a number of indicators still affect the results of the convergent validity through the composite reliability and the AVE, which remained low. The final results of the standard model of the study, which was satisfied with this amount of deletion in order to preserve the structural form of the variables as in figure (2).

Figure 2. Factors Loadings model after deleting the weak indicators



Author source: Smart-Pls software

The composite validity coefficient ranges between (0-1), and high values indicate high reliability, which all came within the acceptable limits, and this is a good indication of the validity of the factors, in addition to the saturation or loading of the items on their factors, which came greater than 0.60. As for the test of AVE, which indicates the variance in the error of the items instead of being explained by the same variable, and accordingly, the study has achieved the asymptotic validity tests for the variables. As in Table (3). The study carried out this type of analysis in order to ensure the construction of the scale, constructive validity and discriminatory validity through a set of necessary tests such as the average of AVE and the composite reliability of the questionnaire items, the study conducted the confirmatory factor analysis of the standard study model, the statements were distributed each according to its variables, and the model was tested to find out the internal validity and the number of required factors within each variable and to determine the saturation or load of the items on each variable. In order to ensure sound and strong results for the standard model, questions with a weak load (less than 0.60) were excluded. The standard model was also evaluated in order to know the correlation between these variables with their scale, through tests of validity and reliability of items and factors (Sarstedt et al., 2014).

- Fornell-Larcker Criterion

The second method for assessing discriminant validity, which is the Fornell-Larcker criterion. This criterion involves comparing the square root of the Average Variance Extracted (AVE) values with the correlations between the constructs (Fornell & Larcker, 1981). Results in Table (4) indicate that the values of all Average Variance Extracted (AVE) are greater than the squared correlations. This outcome aligns with the Fornell-Larcker criterion, suggesting that there is discriminant validity among the constructs in the research. Likewise, it determined the discriminant validity by Fornell-Larcker measurement of the AVE's square roots on the diagonals as represented by the bolded values in Table 4 – these were higher than the correlations between constructs. In essence, in comparison to other constructs of the model and according to (Hair et al., 2017), indicate that the constructs were strongly related to their respective indicators and that discriminant validity was fulfilled, the correlation threshold of less than 0.85, as referenced from (Awang, 2015).

Table 4. Discriminant Validity (Fornell-Larcker Criterion)

Variable	Creativ-ity	Data Mining	Data Warehouse	Entrepre-neurial Lead-ership	(GNM)	Green Tech-nology Inno-vation	Managing Entrepreneurship Opportunities	OLAP
Creativity	0.833							
Data Mining	0.707	0.850						
Data Warehouse	0.866	0.542	0.860					
Entrepreneurial Leadership	0.556	0.439	0.603	0.727				
(GNM)	0.566	0.394	0.594	0.503	0.820			
(GTI)	0.689	0.405	0.716	0.633	0.627	0.809		
Managing En-terpreneurship Opportunities	0.384	0.361	0.240	0.549	0.262	0.297	0.740	
OLAP	0.741	0.239	0.445	0.266	0.308	0.460	0.354	0.854

Author source: Smart-Pls software

4. RESULTS

• Direct Effect

This part deals with the hypotheses related to the path analysis test, which includes testing multiple paths such as the direct and indirect effect and the total effect in order to verify the hypotheses, reach the results and interpret the relationships (Hair et al., 2017).

H1: “The (BI) positively effects on (SE).”

The researcher employed critical path analysis to test Hypothesis 1, examining the impact of the independent variable (Business Intelligence) on the dependent variable (SE). Critical path analysis is a technique often associated with project management, but it seems to be adapted here for testing the relationship between BI (Business Intelligence) and SE.

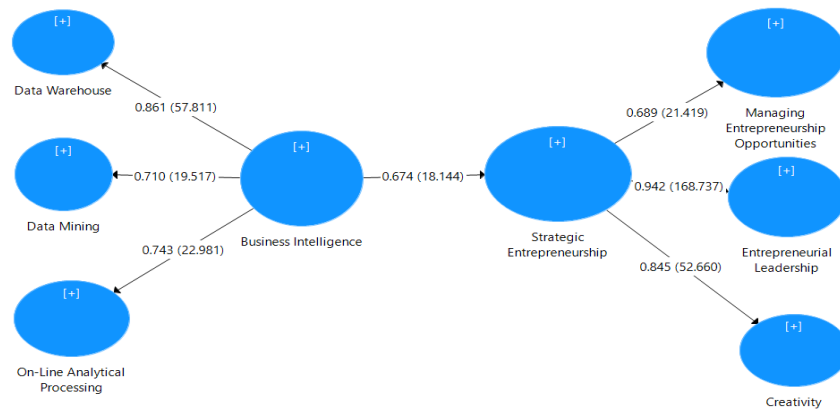
Table 5: Coefficient “(BI) on (SE)”

Element	B	Mean	S. D	T	P	Result
(BI)-> (SE)	0.743	0.740	0.032	22.981	0.000	accept
(BI)-> Managing entrepreneurial opportunities	0.453	0.457	0.049	9.316	0.000	accept
(BI)-> Entrepreneurial leadership	0.606	0.611	0.037	16.491	0.000	accept
(BI)-> Creativity	0.725	0.726	0.029	25.086	0.000	accept

Author source: Smart-Pls software

Table (5) presents the results of the hypothesis analysis of the impact of (BI) on the dependent variable ((SE)). Referred to a decision rule related to the t-statistic, indicating that the null hypothesis is rejected if the significance level (p-value) of the t-statistic is less than 0.05. In this case, it appears that for all the relationships tested, the p-values were less than 0.05. It turns out that there is a positive and direct impact of (BI) on (SE). And there is a positive and direct impact of (BI) on managing entrepreneurial opportunities. And there is a positive and direct impact of (BI) on Entrepreneurial leadership. Finally, there is a significant impact of (BI) on Creativity.

Figure 3. Path analysis test (t) for (BI) on (SE)



Author source: Smart-Pls software

H2: “The (BI) positively effects on Green Technology Innovation.”

To test this hypothesis2, the researcher used the critical path analysis, in which (BI) influences (GTI) was analyzed.

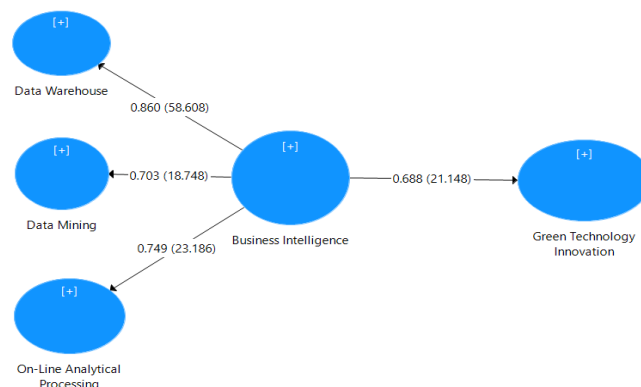
Table (6). Coefficient “(BI) on Green Technology Innovation

Element	B	Mean	S. D	T	P	Result
(BI) -> GTI	0.688	0.689	0.033	21.148	0.000	accept

Author source: Smart-Pls software

Table No. (6) Presents the results of the hypothesis analysis of the impact of (BI) on Green Technology Innovation. Referred to a decision rule related to the t-statistic, indicating that the null hypothesis is rejected if the significance level (p-value) of the t-statistic is less than 0.05. In this case, it appears that for all the relationships tested, the p-values were less than 0.05. It turns out that there is a positive and direct impact of (BI) on Green Technology Innovation.

Figure 4. Path analysis test (t) for (BI) on Green Technology Innovation



Author source: Smart-Pls software

H3: “The (GTI) positively effects on Entrepreneurial leadership.”

To test this H3, the researcher used the critical path analysis, in which (GTI) on Entrepreneurial leadership was analyzed.

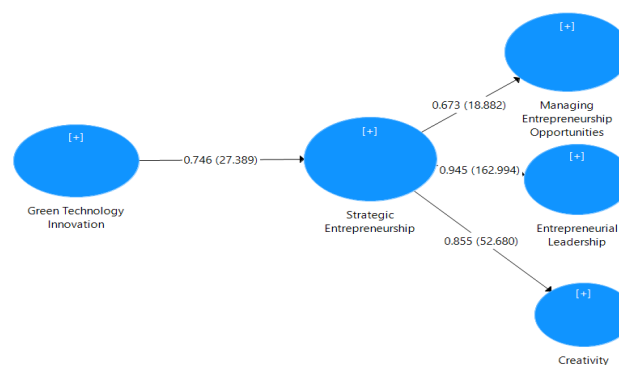
Table 7. Coefficient “(GTI) on Entrepreneurial leadership

Element	B	Mean	S. D	T	P	Result
(GTI)-> (SE)	0.746	0.748	0.027	27.389	0.000	accept
(GTI)-> Managing entrepreneurial opportunities	0.308	0.321	0.047	6.523	0.000	accept
(GTI)-> Entrepreneurial leadership	0.692	0.697	0.033	21.035	0.000	accept
(GTI)-> Creativity	0.877	0.879	0.016	55.967	0.000	accept

Author source: Smart-Pls software

Table No. (7) Presents the results of the hypothesis analysis of the impact of (GTI) on Entrepreneurial leadership. Referred to a decision rule related to the t-statistic, indicating that the null hypothesis is rejected if the significance level (p-value) of the t-statistic is less than 0.05. In this case, it appears that for all the relationships tested, the p-values were less than 0.05. It turns out that there is a positive and direct impact of (GTI) on (SE). **And** there is a positive and direct impact of (GTI) on managing entrepreneurial opportunities. **And** there is a positive and direct impact of (GTI) on Entrepreneurial leadership. **Finally**, there is a positive and direct impact of (GTI) on Creativity.

Figure (5). Path analysis test (t) for (GTI) on Entrepreneurial leadership



Author source: Smart-Pls software

H4: “(GTI) mediate the effect of (BI) on (SE).”

To test this H4, the researcher used the critical path analysis, in which (BI) effect (SE) through the mediating role of (GTI) was analyzed.

Table 8. Coefficient “(BI) on (SE) through the mediating role of Green Technology Innovation”

Element	B	Mean	S. D	T	P	Result
(BI)-> (SE)	0.319	0.316	0.059	5.423	0.000	accept
(BI)-> Green Technology Innovation	0.689	0.690	0.033	20.697	0.000	accept
(GTI)-> (SE)	0.523	0.526	0.055	9.508	0.000	accept
(BI)-> Green Technology Innovation-> (SE)	0.360	0.362	0.038	9.430	0.000	accept

Author source: Smart-Pls software

Table No. (8) Presents the results of the hypothesis analysis of the impact of (BI) on (SE) through the mediating role of (GTI). Referred to a decision rule related to the t-statistic, indi-

cating that the null hypothesis is rejected if the significance level (p-value) of the t-statistic is less than 0.05. In this case, it appears that for all the relationships tested, the p-values were less than 0.05. It turns out that (GTI) mediate a positive effect between (BI) and (SE). The table (14) shows the value of (VAF) which was greater than (20%) and less than (80%), which indicates the presence of partial mediation of knowledge management. Through the following equation (Hair et al., 2014):

$$VAF = (pa * Pb) / (pa * Pb + Pc)$$

$$VAF = (0.319 * 0.523) / (0.319 * 0.523 + 0.360)$$

$$VAF = 0.166837 / 0.526837$$

$$VAF = 31.67\%$$

Table 9. Mediation Analysis based on Preacher and Hayes (2008)"

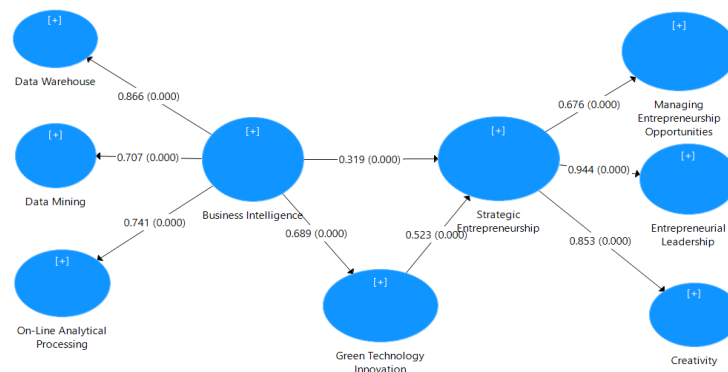
Relationship	Path a		Path b		Indirect Effect			VAF	Confidence Interval		Type of Mediation P&H	Decision
	Path coeff.	t-value	Path coeff.	t-value	Path coeff.	SE	t-value		95% LL	95% UL		
(BI)-> GTI-> (SE)	0.319	5.423	0.523	9.508	0.360	0.019	9.430	31.67%	0.296	0.435	partial	supported

Note: * = $p < 0.05$, ** = $p < 0.00$

Author source: Smart-Pls software

Next, Preacher and Hayes's (2008) approach for H4 ((BI) - (GTI) - (SE)) was [LL=0.296, UL=0.435]. In this case, the "0" did not straddle between the two values of LL and UL that indicated there was a mediation. Variance Accounted for (VAF) is a metric used to assess the accuracy or goodness-of-fit of a model by comparing the real output against the estimated output of the model. It provides insights into how well the model captures the variance in the observed data. Hair et al. (2017) have provided a guideline for interpreting Variance Accounted for (VAF) in the context of mediator analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM). If VAF is greater than 80%, it suggests that the mediator variable fully accounts for the relationship between the independent variable and the dependent variable. In other words, the mediation effect is strong, and the mediator explains a substantial portion of the variance in the dependent variable. If VAF falls between 20% and 80%, it indicates partial mediation. In this case, the mediator variable partially explains the relationship between the independent and dependent variables. While the mediator contributes significantly, there are other factors not accounted for by the mediator. If VAF is less than 20%, it suggests that the mediator variable has minimal influence, and the relationship between the independent and dependent variables is not mediated by the proposed mediator. With the calculated VAF (Variance Accounted For), this section indicates the variance between two signals. In other words, VAF is represented as learning knowledge management is the full mediator between management information systems and human resource management practices for change at (VAF=0.3167). (GTI) plays as a partial mediator effect role in the relationship between (BI) and (SE), which interpreted around 31.67% of the total effect. Interestingly, this finding proves that (GTI) partially mediate the relationship effect between (BI) and (SE).

Figure 6. Path analysis test (t) for (BI) on (SE) through mediating role Green Technology Innovation



Author source: Smart-Pls software

H5: “(GTM) modify the effect of (BI) on (SE).”

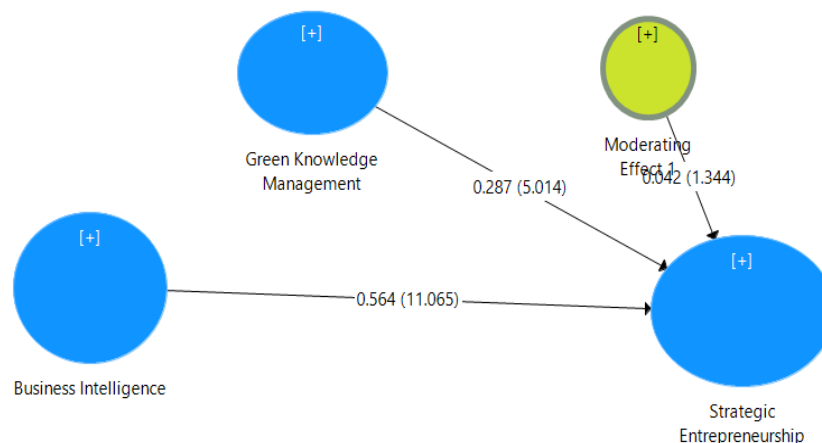
Table 10. Coefficient The moderator role of (GTM) effect (BI) on (SE)

Element	B	Mean	S. D	T	P	Result
(BI) * (GTM) <- Moderating Effect	1.513	1.502	0.102	14.900	0.000	accept

Author source: Smart-Pls software

Table No. (10) Presents the mean or coefficient (1.513) suggests the strength and direction of the moderating effect of (GTM) on the relationship between (BI) and (SE). A positive coefficient indicates that (GTM) strengthens or positively moderates this relationship. The mean (1.513) and standard deviation (1.502) provide insight into the central tendency and variability of the data, indicating a somewhat high variability given the close values. The t-value of 14.900 is quite high, suggesting that the moderating effect of (GTM) on Business Intelligence’s impact on (SE) is statistically significant. The p-value of 0.000 is below the common significance threshold of 0.05, confirming that the moderating effect is statistically significant. The decision to “accept” indicates that, based on this data, the hypothesis about (GTM)’s moderating effect (BI) (Data Warehouse, Data Mining, and OLAP) on (SE) (Managing entrepreneurial opportunities, Entrepreneurial leadership, and Creativity) in the Jordanian Entrepreneurial Sector.

Figure 7. Path analysis test (t) for (GTM)’s moderating effect (BI) on (SE)



Author source: Smart-Pls software

5. DISCUSSION

To discuss of empirical findings by addressing the four main research questions and achieving the research objectives is a logical and structured approach. This organization allows for clarity and coherence in presenting and interpreting the results. The study found that there is a positive and direct impact of (BI) on (SE). And there is a positive and direct impact of (BI) on managing entrepreneurial opportunities. And there is a positive and direct impact of (BI) on Entrepreneurial leadership. Finally, there is a significant impact of (BI) on Creativity. Referring to previous studies and literature, (BI) is considered the cornerstone of the strategic decision-making process in the entrepreneurship sector. It helps companies assess market trends, competitive strategies and potential risks, which enables business owners to design flexible strategies, improve decision-making and maintain competitiveness in dynamic markets operating in an environment characterized by uncertainty. (BI) is an opportunity for companies to identify new growth opportunities and innovation in order to maintain a strategic advantage. For example, (Cheng, 2023) found that (BI) applications enhance flexibility and responsiveness in entrepreneurial companies, which increases their ability to strategically innovate and position themselves in the market. (BI) helps identify and evaluate opportunities systematically through comprehensive data analysis. Studies reveal that (BI) enables entrepreneurs to discover emerging trends, customer preferences and unmet needs, which facilitates the capture of viable business opportunities. Jafari et al.,(2023) Found that companies that use artificial intelligence tools are better positioned to take advantage of market shifts, leading to faster and more effective market entry. Entrepreneurial leaders who use AI can also communicate strategic objectives more effectively, and align their teams toward innovation and adaptability in line with organizational goals. Entrepreneurial creativity is enhanced by BI's ability to discover unique insights and generate new ideas from data patterns. According to the study, (BI) has a positive and direct impact on green technology innovation. (BI) enables companies to systematically examine environmental data, legal requirements, and market trends, enabling strategic investment in green solutions. Organizations can use (BI) to gain insights into resource use, waste management, and emissions, which can help them implement more sustainable business processes and technologies. According to recent studies, (BI) helps generate green innovations by facilitating data-driven decisions, improving resource allocation, and reducing environmental impact. Studies found that organizations that used (BI) tools were more effective in identifying and adopting green solutions (Alioune, 2024; Khan & al., 2024).According to the study, (GTI) has a positive and direct impact on (SE). (GTI) has a beneficial and immediate impact on entrepreneurial prospect management. (GTI) has a beneficial and immediate impact on entrepreneurial leadership. Finally, (GTI) has a beneficial and direct impact on creativity. Yanan & Qunna, (2023) found that firms that invested in GTI were better able to adapt their strategies to sustainable development trends, allowing them to remain competitive while meeting environmental responsibilities. This strategic flexibility enables entrepreneurial firms to carve out unique market positions, differentiating themselves as developers of green solutions. Kumar and Verma (2022) found that GTI helps entrepreneurs find and develop sustainable products that appeal to environmentally conscious consumers. Firms that prioritize green technology can seize growing opportunities in environmentally focused industries, allowing them to differentiate their offerings and reach customer segments that value sustainable solutions. The study found that (GTI) mediate a positive effect between (BI) and (SE). (GTI) plays as a partial mediator effect role in the relationship between (BI) and (SE), which interpreted around 31.67% of the total effect. GTI thus serves as a conduit through which BI insights translate into sustainable growth and strategic renewal, aligning well with SDGs goals. The study found that (GNM) moderates the impact of (BI) (data warehousing, data mining, and online analytical processing) on (SE) (entrepreneurial opportu-

nity management, entrepreneurial leadership, and creativity) in the entrepreneurship sector in Jordan. (GNM) (GKM) provides a sustainable perspective on how organizations perceive and implement (BI) information. By integrating environmental intelligence into (BI) processes such as data warehousing, data mining, and online analytical processing (OLAP), (GNM) enables entrepreneurs to make decisions that prioritize both organizational goals and environmental concerns. This is consistent with (Soto-Acosta et al. 2018), who found that organizations that used GKM principles were more effective in using BI to identify sustainable opportunities, and in creating an entrepreneurial culture characterized by creativity and environmental responsibility. GKM mitigates the impact of BI on opportunity management by allowing entrepreneurs to recognize and act on long-term business possibilities. According to Pepple et al., (2022), companies that integrate GKM into their BI processes can better align with green market expectations, allowing them to capitalize on green potential that sets them apart from competitors.

6. CONCLUSION

The aim of the current research is to investigate the effect of business intelligence on strategic entrepreneurship and the mediating role of green technology innovation and the moderate role of green knowledge management for sustainable development goals (SDGs) in the Jordanian entrepreneurial companies in King Hussein Business Park (KHBP). The findings indicated there is: a positive and direct impact of business intelligence on (strategic entrepreneurship, and green technology innovation), a positive and impact of the green technology innovation on strategic entrepreneurship, and the green technology innovation mediate a positive effect between business intelligence, and strategic entrepreneurship and the green knowledge management moderates the impact of business intelligence on strategic entrepreneurship. The study findings emphasize the need to improve Business Intelligence to promote sustainability by incorporating environmental criteria into data analytics, allowing companies to make environmentally friendly decisions, urges companies to integrate Green Technology Innovation into their strategic plans by collaborating with technology providers and research organizations. The research also emphasizes the need for government initiatives that encourage the use of green technology innovation and green knowledge management.

7. THE IMPLICATIONS OF THE STUDY AND RECOMMENDATIONS

This structured approach ensures that the theoretical and practical implications are adequately investigated, leading to a comprehensive understanding of the overall significance of the study. The following sections address the implications of the study.

7. 1. PRACTICAL IMPLICATIONS

The finding that (GKM) moderates the impact of (BI) on (SE) implies that organizations can improve their strategic outcomes by adopting green practices. Jordanian entrepreneurs can make better-educated and more sustainable decisions that are aligned with market demands for green practices by leveraging GKM-focused (BI) techniques such as data warehouses, data mining, and online data analytics. The study found that (GNM) improves the discovery of green entrepreneurship prospects, which is particularly useful in Jordan where environmental sustainability has become more important. Investing in (GNM) techniques enables practitioners to use (BI) insights to effectively assess and capitalize on green market potential, ensuring competitiveness while contributing to environmental goals. The results also showed that GKM encourages leadership and entrepreneurial creativity by fostering a culture of innovation that focuses on green solutions and supporting leadership that attracts environmentally conscious

employees and consumers. Integrating GTI and GKM into BI not only increases consumer trust and brand loyalty, but also differentiates organizations in the market, unlocking potential in local and global green markets.

7. 2. THEORETICAL IMPLICATIONS

This work advances our theoretical knowledge on how (BI), when combined with (GKM), can promote sustainable entrepreneurship. By finding GKM as a moderating factor, the study highlights the importance of green knowledge practices in amplifying the impact of (BI) on (SE) outcomes. It also provides a new perspective on knowledge management theories, focusing on sustainability-related knowledge as a strategic asset that increases the value of (BI) tools. The findings also provide a framework for future research on the relationship between sustainable practices and BI, and recommend investigating other moderating factors or consequences of (BI) implementation in different scenarios.

7. 3. RECOMMENDATIONS

The study findings emphasize the need to improve (BI) to promote sustainability by incorporating environmental criteria into data analytics, allowing companies to make more educated and environmentally friendly decisions. It urges companies to integrate (GTI) into their strategic plans by collaborating with technology providers and research organizations. Developing (GNM) strategies is crucial to sharing green innovation experiences and best practices through platforms such as forums and intranets. The report also emphasizes the need for government initiatives that encourage the use of (GTI) and (GNM), such as tax breaks or subsidies. Finally, it suggests Jordan-specific R&D projects, as well as academic collaborations, to address environmental concerns.

7. 4. LIMITATIONS

The research rely on the relationship between business intelligence, SE, and SDGs through GIT and GKM relies primarily on secondary data sources and self-reported questionnaires. These sources may introduce biases or errors, limiting the generalizability and validity of the findings. GIT and SDGs are constantly changing. As a result, study findings may not fully reflect current trends, legislative changes, or evolving technologies, limiting their long-term applicability. The limited investigation of mediating and moderating variables, While the study investigates the mediating role of GIT and GKM, other potential mediators or moderators, such as organizational culture, policy frameworks, or stakeholder engagement, may be ignored, limiting a comprehensive understanding of the associations. The Environmental and cultural limitations, GIT and GKM techniques are often influenced by external environmental and cultural elements that cannot be fully controlled or measured. This may limit the applicability of the findings to other cultural and organizational settings.

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