

Al-Faouri, Abeer Hmoud

Article

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*Corresponding author: Abeer Hmoud Al-Faouri, Management Information Systems Department, Al-Balqa Applied University, As-Salt, Jordan
E-mail: dr.abeeral-faouri@bau.edu.jo

Reviewing editor:
Balan Sundarakani, University of Wollongong Faculty of Business, United Arab Emirates

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INFORMATION & TECHNOLOGY MANAGEMENT | RESEARCH ARTICLE

Green knowledge management and technology for organizational sustainability: The mediating role of knowledge-based leadership

Abeer Hmoud Al-Faouri^{1*}

Abstract: In today's business landscape, the integration of green knowledge management and technology has become a crucial element for organizations to meet the emerging expectations of environmentally-conscious consumers. This study aims at examining the impact of green knowledge management, including green knowledge acquisition, storage, sharing, application, creation, as well as technology in organizational sustainability across its economic, social, and environmental dimensions. The data for this research was collected from different industries of IT companies in Jordan operating in IT solutions and services such as the financial services with a sample size of 288 companies. The Structural equation modeling SEM was used to analyze the data. The results indicated a positive effect of green knowledge management on organizational sustainability with an estimate of 0.253 for this relationship. Furthermore, the findings suggest that knowledge-based leadership mediates the relationship between green knowledge management, technology, and organizational sustainability. The research provides useful insights and perspectives for a better understanding of this topic and offers suggestions and implications to cover the gaps in existing research. Overall, this study highlights the importance of implementing green knowledge management and technology in promoting organizational sustainability, which can lead to a competitive advantage, enhanced organizational performance, and increased stakeholder satisfaction.

Subjects: Management of IT; Environmental Economics; Business, Management and Accounting; Information Technology

Keywords: green knowledge management; organizational sustainability; knowledge-based leadership

1. Introduction

Modern companies consider the preservation of natural resources essential in addressing global environmental challenges (Abbas & Sağsan, 2019; Hottenrott et al., 2016). The era of globalization is characterized by increasing integration among global economies, cultures and societies, which confirms the importance of preserving natural resources as an essential part of the strategy to meet the global environmental challenges. Therefore, stakeholders should focus on resolving those environmental issues, reap the social and economic benefits, and sustain a competitive edge in the

businesses (Abbas, 2020; Sahoo et al., 2023). The digital technology, networks, monitoring, and measuring green management practices and technologies have enabled the industry's operations to inundate the main business processes, with a high technology adoption, to generate green business outcomes (Gauthier & Zhang, 2020; Martins et al., 2019). Forty percent of the survey respondents, directed by the World Economic Forum and Bain & Company, believe that digital technologies have a positive impact on their sustainability goals (Anderson & Caimi, 2022). Furthermore, Wang et al. (2023) found that digital technology has a significant role in attaining a green supply chain as well as decreasing energy and resource consumption, which can lead to enhanced operational efficiency as well as gaining social, economic, and environmental benefits. The increasing number of business activities over a variety of functional operations has shown the importance and usefulness of assessing green knowledge management with data, to make decisions and improve industrial operations (Raharjo, 2019; Wang et al., 2020).

Realizing the green-related aspects of business activities may look simple. Yet, the growing concern of the challenges across the factors, that potentially represent other forms of the challenge, leverages the knowledge and data that extract meaningful information and help in gaining a competitive advantage (Saunila et al., 2019; Zhuge et al., 2023). Modern management attempts to guide the processes of knowledge management within the organizations and the generated benefit of these practices and capabilities (Song et al., 2020) as well as enable the corporate to achieve its favorable goals of environmental performance. Organizations perceive sustainability as the capacity of having a well-informed and quality decision-making related to the organizational sustainability issues (Chopra et al., 2021; Jamison, 2001).

Environmental sustainability refers to the conscientious interaction with the natural environment to prevent the depletion or degradation of its resources, and to promote long-term environmental quality. This concept embodies the notion of meeting the present generation's needs while safeguarding the ability of future generations to meet their own as posited by Schianetz et al. (2007). Social sustainability, in contrast, pertains to the cultivation of inclusive and resilient societies, wherein individuals possess a voice and governments are responsive. Its ultimate target is to expand opportunities for all people, both now and in the future, as delineated by Moore et al. (2017). Lastly, economic sustainability entails the implementation of various strategies to optimize the utilization, maintenance, and preservation of human and material resources in a responsible, beneficial, and sustainable manner. The goal is to achieve a responsible, long-term, and sustainable balance through recovery and recycling, ensuring that the economy can sustain a given level of economic output indefinitely in a business context, as highlighted by Marcelino-Sádaba et al. (2015).

Green knowledge management processes through acquiring, disseminating and applying important knowledge about environment conservation may assist organizations in achieving the aims and objectives of the market competition and improve organizational sustainability issues (Cai et al., 2023). Previous research findings indicated that businesses have utilized advanced business analysis techniques to optimize their core operations for environmental friendliness, increasing productivity and identifying key parameters for developing sustainable organizational practices (Martins et al., 2019; Ramdhani et al., 2017). The concept of green knowledge management is novel and is mainly defined as the practices related to knowledge management concerning the green aspects and integrating them with knowledge management factors (Abbas & Khan, 2022).

The existing literature shows that green knowledge management is a five-factor framework comprising green knowledge acquisition, storage, sharing, application, and creation (Hottenrott et al., 2016). Green knowledge acquisition involves a company's concerted efforts to procure, extract, and systematize knowledge about environmental preservation (Aboelmaged & Hashem, 2019). The utilization of ecological resources and technologies can play a crucial role in enhancing the protection of natural resources (Wang et al., 2008). Companies acquire knowledge from diverse sources, both internal and external, that are pertinent to their specific interests. The acquired

knowledge can be immediately shared with relevant stakeholders and retained for future use. The extant literature also underscores that organizations acquire knowledge, create it and employ it for the betterment of the organization (Maravilhas & Martins, 2019). Hence, companies concentrate on developing effective mechanisms to organize knowledge that can be easily retrieved in the future.

The research draws a comparison between organizational sustainability and emerging knowledge management. It suggests that businesses can adapt to market changes more effectively, and improve the sustainability of their core operations, then ultimately earn the trust of consumers by acquiring and implementing environmentally- friendly knowledge, utilizing organizational capacity and data analysis (Abbas, 2020; Tajpour et al., 2022)., Despite the existing literature exploring aspects of green knowledge management such as knowledge application and creation, research implications for leadership and organizational sustainability have comparatively received less attention. Knowledge-based leadership, however, has been identified as a critical factor influencing knowledge management (Borah et al., 2023; Sanguankaew & Vathanophas Ractham, 2019), with leaders defining practices aimed at enhancing knowledge-related activities.

The concept of knowledge-based leadership comprises various components, including the leaders' skills and their ability to collaborate effectively. This collaboration relies primarily on open and transparent communication channels that enable exchanging ideas and experiences across all organization departments through regular dialogues, where everyone has a voice which is respected (Mabey et al., 2012). The level of cooperation and trust in the relationship between leaders and subordinates is crucial in fostering positive outcomes for the organization and building long-term trusted ties that would lead to desirable success (Avidov-Ungar & Shamir-Inbal, 2017).

Moreover, knowledge integration and innovation form the cornerstone of knowledge-based leadership, allowing individuals to utilize advanced integration methods and practices to achieve the organizational goals (Hallinger & Suriyankietkaew, 2018). Effective leadership behavior is also critical for knowledge management within organizations, as noted by Heizmann and Liu (2018).

In light of the above, it can be said that green knowledge management is an important concept that denotes the management of capability and knowledge associated with sustainable environmental technologies and practices. This concept intends to improve sustainability by embracing sustainable environmental practices, supporting the development of environmental solutions, and minimizing environmental risks and costs. The role of knowledge-based leadership arises as a method to support this concept by directing strategies and goals toward incorporating green knowledge throughout the organization. By allocating resources and providing support, it contributes to the move toward increasing awareness of the importance of sustainability. Despite the importance of the relationship between green knowledge management and sustainability, and the mediating role of knowledge-based leadership, empirical studies examining the link between these concepts and practices remain scarce (HOUa et al., 2020; Spangler et al., 2014). Thus, this study aims to address this gap by examining the impact of green knowledge management on organizational sustainability and analyzing the mediating role of knowledge-based leadership. The present paper is structured firstly with a review of the relevant literature, then the research method, presenting results, discussion, and concluding the work with implications and limitations.

2. Literature review & hypotheses development

2.1. Green knowledge management

The swift changes in management perceptions towards technology and knowledge management have led to an increased focus on green knowledge management as a source for competitive advantage (Abbas & Sağsan, 2019; Santoro et al., 2019). The literature on knowledge management and organizational outcomes acknowledges that knowledge-based management is essential for organizational success. Moreover, the green technology and knowledge management standards

encourage the organizations to engage in different forms of knowledge management development to improve the quality of products or services (Shehzad et al., 2023). This approach also enables organizations to provide innovative solutions that meet the customers' social and environmental needs. In the current business landscape, green knowledge management is a fundamental factor for business survival, driving great outcomes such as increasing the market competitive capabilities (Hottenrott et al., 2016).

Literature has addressed knowledge acquisition and sharing as an innovative aspect of knowledge management. Successful organizations create new business units that prioritize knowledge management operations by relying on different methods to create new markets (Ahn, 2016; Shahzad et al., 2022). This also emphasizes the organizational processes required for sustainability and considers knowledge-based processes to explore useful solutions to problems (Batouta et al., 2023). It is believed that green knowledge of social and environmental sustainability issues forms ideas that can be effectively implemented (Iazzolino & Laise, 2016). It should be acknowledged that active organizations aim to implement public policies within their operations, by coordinating different activities. When it comes to organizational sustainability, green knowledge management is among the top concerns of contemporary companies. Optimizing the knowledge process triggers companies to focus further on sharing and organizing green knowledge to replace the traditional perception of business with lower regard for sustainability aspects (Buter & Van Raan, 2013; Tajpour et al., 2022).

2.1.1. Knowledge-based leadership

The generally-stated goal of a business is profit generation, yet knowledge management in general and green knowledge management in particular, to improve organizational management practices, remains under-examined (Chopra et al., 2021; Spangler et al., 2014). Furthermore, literature on knowledge management identifies the gaps in empirical findings that could help us understand the factors influencing knowledge management such as knowledge-based leadership (Birou et al., 2019). Yet, studies have examined knowledge management related factors such as innovation, leadership, and other organizational dynamic elements, such as innovation and integration (AL-Faouri et al., 2019; Shahzad et al., 2020). Therefore, research on this topic should address its implications and expand investigations of knowledge management that lack concepts related to the association of knowledge-based leadership, knowledge management, and sustainability (Demir et al., 2023; Raharjo, 2019).

Nowadays, business enterprises depend on knowledge acquisition, storage, and information sharing between customers and employees. Thus, organizational knowledge management considers knowledge as an essential and integral part of human capital (Abubakar et al., 2019; Ali et al., 2021). Moreover, green knowledge management, with its commitment to encountering uncertain and challenging factors, maintains situations that promote competitive outcomes (DiVaio et al., 2021). Managing sustainability issues based on knowledge management can create more meaningful and important decisions and develop knowledge-based management practices (Ode & Ayavoo, 2020; Rioba et al., 2023). Furthermore, green knowledge management is still considered more central than concrete knowledge as organizations seek to transform the individuals' and organizations' knowledge into competencies (Hock-Doepgen et al., 2021). Successful management outperforms others by creating a sustainable business environment with less fear and more confidence that the management is willing to share knowledge with others (Shahzad et al., 2022).

2.1.2. Organizational sustainability

The concept of sustainability underwent a revolution in the 1970s. Many policymakers, practitioners and researchers started identifying sustainability with other concepts in the economic, social, and environmental areas of the organizations (Ali et al., 2021; Demir et al., 2023). Several issues have made sustainability a global concern, including environmental degradation, the marginalization of the local society, and the search for green knowledge which can provide further

insights into this topic (Dwivedi et al., 2023; Herrmann et al., 2014). Studies have shown that the presence of sustainability in an organization and related dimensions can lead to a greater employee commitment and represent the goal of sustainability (Andreopoulou, 2012; Ramdhani et al., 2017). This is based on the environmental modernization theory, which considers key principles such as modern sciences and technologies as the mission of ecology and economics. Any conflicts between the economic processes and the environment must be addressed by the market, using policies to achieve sustainable development. Based on the above arguments, this study formulates the following hypotheses:

H1: Green knowledge Management (Green Knowledge Acquisition, Storage, Sharing, Application, and Creation) positively influences Economic Sustainability.

H2: Green knowledge Management (Green Knowledge Acquisition, Storage, Sharing, Application, and Creation) positively influences Social Sustainability.

H3: Green knowledge Management (Green Knowledge Acquisition, Storage, Sharing, Application, and Creation) positively influences Environmental Sustainability.

2.1.3. *Green technology*

The notion of technology is an emerging problematic concern for the environment, as it can lead to pollution, but it can also be a savior. The technology is both a solution and a problem for environmental and economic sustainability. Therefore, this discussion aims to employ the power of technology in innovative ways to increase concerns about environmental issues and make technology systems greener (Cardoni et al., 2020; Saunila et al., 2019). The green technology also benefits the environment by improving energy efficiency, reducing greenhouse gases, using less harmful materials, and encouraging reuse and recycling (Guo et al., 2020). Thus, it encompasses dimensions related to environmental sustainability, such as the economic usage of energy and ownership costs. Both organizations and individuals are driven to go green by factors such as increasing awareness of the harmful impacts of gas emissions, new environmental legislation, and concerns about electronic waste disposal practices (Dao et al., 2011; Hock-Doepgen et al., 2021).

The emerging issue states that the organizations' green practices can assist them in developing a strategy for adopting green technology in their major operations (Madaleno et al., 2022; Sharif et al., 2023). As a result, many researchers have focused on the application of green technology across various industries and contexts, recognizing its urgent societal needs. The green technology requires more focus through increase awareness of environmental issues including the environmental IT infrastructure, services, and practices (Andreopoulou, 2012; Donate et al., 2022). Based on the above arguments, this study will formulate the following hypotheses:

H4: Green knowledge Management (Green Knowledge Acquisition, Storage, Sharing, Application, and Creation) positively influences Knowledge-based Leadership.

H5: Green technology positively influences Organizational Sustainability.

2.1.4. *Knowledge management, knowledge-based leadership & sustainability*

Recent work in management literature, knowledge-based theory, and knowledge management literature contribute to the development of the organizations knowledge-based theory. In addition, it also cites the major reasons for the existence of companies in creating, integrating, and utilizing knowledge (Coff, 2003; Hadi & Marpaung, 2023). The knowledge-based view is rooted in the resource-based view of the organization, which concentrates on strategic assets as a key source of sustainability (Gibbins & Jamal, 1993). Under the knowledge-based view, knowledge is a strategic resource that enables

organizations to create further value through the exploitation of products and services. Accordingly, organizations embody knowledge and manage this resource through dynamic capabilities (Eisenhardt & Santos, 2002). Nevertheless, literature points out issues and problems for those seeking to develop sustainable competitive advantages in a business. In the field of management and strategy, many efforts have been made to identify knowledge as a basis for sustainability and to explain ways in which companies can develop, sustain, and apply knowledge (Cardoni et al., 2020; Iazzolino et al., 2017).

Regarding leadership, literature suggests that organizations can boost their sustainability by bringing together divergent behaviors that depend on the demands of different situations. Successful organizations combine knowledge exploration and creation as important initiatives to attain sustainability (Cavaleri et al., 2005; Mikalauskiene & Atkočiūnienė, 2019). They are also able to lead individuals toward strategic objectives in various settings with distinct sustainability requirements (Hallinger & Suriyankietkaew, 2018).

The debates indicated skepticism towards different leadership practices in specific contexts and advocate alternative forms of leadership styles and practices to build knowledge organization. These practices should focus on leader-follower exchange to benefit and motivate followers to exhibit their best behavior (Donate et al., 2022; Rooney & McKenna, 2009). There is an emphasis on the leader's role in knowledge management and planning knowledge procedures to foster the implementation processes through reward incentive systems (AL-Faouri et al., 2011; Hadi & Marpaung, 2023). Interestingly, suggestions to manage different forms of explicit and tacit knowledge through exchange, combination, and communication for sustainable aspects indicate that organizations need a mixture of leadership practices (Eisenhardt & Santos, 2002; Karakose et al., 2021). The evidence also contemplates integrative perspectives by considering the role model of leadership, expectations, vision articulation and clarification, and leadership capabilities to recognize their subordinates' knowledge-related behaviors.

Knowledge-based leadership plays an important mediating role between green knowledge management and sustainability. Leaders who understand the value of green knowledge and how it applies to operations, can motivate their teams to make sustainable decisions and adopt practices that serve the environment and society (Chen et al., 2023; Kordab et al., 2020). Knowledge-based leaders can be the channel between action and knowledge, contributing to better sustainability. In general, this study assumes that the impact of green knowledge management on sustainability, and the mediating role of knowledge-based leadership depends on the integration of good coordination of these factors within organizations. Accordingly, the study is interested in formulating the following hypotheses:

H6: Knowledge-based leadership significantly influences organizational sustainability.

H7: Knowledge-based leadership mediates the impact of green knowledge management on organizational sustainability.

3. Method

The study employed a quantitative research methodology utilizing a cross-sectional approach, which involved the design of a survey to collect data. Column 5 in Table 2 shows the number of items that were used to measure each variable of the study. The study encompassed various management levels, including operational, managerial, and upper-level management, from 78 IT companies in the Jordanian IT industry, all of which have significant experience with various green practices of knowledge management. A total of 288 participants from these companies participated in the study and were invited to provide their agreement and perceptions with the statements presented in the questionnaire. The sampling method used in this research was a convenient approach for easy application and saving time during data collection with no exclusion criteria in order to involve a wide range of responses.

Table 1. VIF Results

Factor	Tolerance	VIF
Green Knowledge Acquisition	0.58	2.11
Green Knowledge Storage	0.56	3.42
Green Knowledge Sharing	0.62	3.74
Green Knowledge Application	0.67	2.85
Green Knowledge Creation	0.53	2.94
Green technology	0.59	2.99
Economic Sustainability	0.69	3.08
Social Sustainability	0.72	3.77
Environmental Sustainability	0.60	2.79
Knowledge-Based Leadership	0.51	3.78
Knowledge Integration and Innovation	0.63	3.80

Table 2. Descriptive and reliability results

Factor	Mean	SD	Cronbach's	No. of items	Factor loadings
Green Knowledge Acquisition	3.51	0.70	0.88	3	0.64
Green Knowledge Storage	3.44	0.59	0.76	3	0.61
Green Knowledge Sharing	3.87	0.61	0.79	3	0.67
Green Knowledge Application	3.29	0.83	0.80	3	0.71
Green Knowledge Creation	3.34	0.75	0.81	3	0.80
Green technology	3.44	0.68	0.71	4	0.68
Economic Sustainability	3.40	0.56	0.71	3	0.74
Social Sustainability	3.82	0.67	0.72	3	0.78
Environmental Sustainability	3.11	0.45	0.83	3	0.72
Knowledge-Based Leadership	3.19	0.41	0.81	4	0.69
Knowledge Integration and Innovation	3.49	0.59	0.76	4	0.70

The research instrument was developed based on relevant literature, such as the green knowledge management measure by Gauthier and Zhang (2020) and Sahoo et al. (2023), sustainability measures by Raharjo (2019) and Martins et al. (2019), and knowledge-based leadership by Hallinger and Suriyankietkaew (2018) and Cavaleri et al. (2005). The instrument underwent validation by a panel of professionals in the study scope and field, and necessary amendments were made to ensure clarity and

comprehensibility of the measures. The survey was translated into Arabic by translation experts with experience in this field to eliminate any ambiguities and ensure the participants were aware of the research objectives.

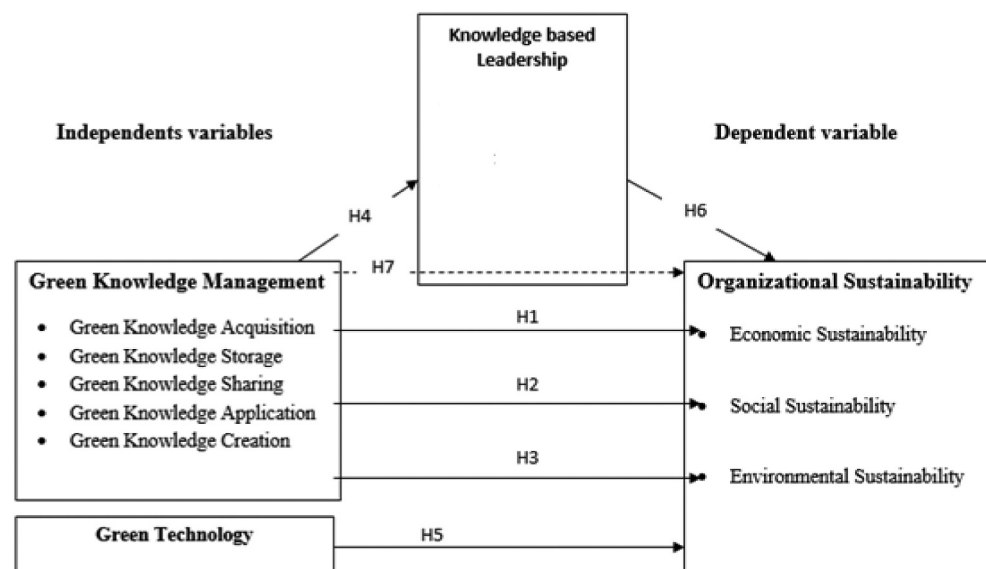
The method of Structural Equation Modeling (SEM) analysis considered in this study requires a sample size of over 200 observations, as suggested by the maximum likelihood estimation approach. Additionally, the research aims to analyze the data using Analysis of Moment Structures (AMOS), which helps in statistical processes. The procedure of the data analysis in this technique generally presents a latent construct that is arrowed into its items to show the relationship between the respective constructs (Ullman & Bentler, 2012). On the other hand, the SEM approach analysis is interested in analyzing the association between the latent constructs and their measurement errors. The study variables are connected with the indicators that measure and rank the responses through a response scale ranging from 1=strongly disagree to 5 =strongly agree.

The researcher formulated a causal model (Figure 1) based on the existing theoretical considerations to fill the research gap in this area and to provide new implications that could help green management practitioners. Figure 1 shows the independent variable -Green Knowledge Management with its sub-variables, the dependent variable- Organizational Sustainability with its sub-variables-, and the mediating variable- Knowledge-based Leadership-. The relationships between the studied variables are depicted by the supposed hypotheses in the figure. This model is suitable to test the study hypotheses and draw the direction of the association. Additionally, the study is interested in analyzing the model through descriptive statistics that are conducted using the Statistical Package for Social Sciences (SPSS), which includes mean, standard deviation, and reliability measures.

4. Results

As the current work aims to examine the effect of green knowledge management on organizational sustainability, the research followed the structural equation modeling (SEM) approach. This approach has the strength of enabling building a hierarchy of latent constructs and reducing the bias that may be caused by measurement error. Analyzing the collected data requires the researcher to apply basic statistics through SPSS and AMOS. Conducting multi-variate analysis through SEM, the study suggests ensuring an adequate sample size with no existence of multicollinearity or common method bias (CMB). As per Hoelter's (1983) recommendation of a sample size of at least 200 for SEM, the present research has a sample of 288 participants, which meets Hoelter's criteria related to the minimum sample size. The

Figure 1. Research conceptual framework.



multicollinearity issue in this research was evaluated using the variance inflation factor (VIF), and the results indicated values less than 5.0 (Table 1), which represents no existence of multicollinearity (Franke, 2010).

According to Podsakoff et al. (2012), the presence of common method bias (CMB) can influence the study results, especially when a single factor accounts for a significant proportion of the total variance (50% or more). To address this issue, the study conducted a factor test of Harman's to analyze the presence of CMB. The findings indicated that the contribution of CMB was only 42.5%, which is below the 50% cut-off and suggests the non-existence of CMB in the data.

To further ensure the validity and reliability of the measurements, the study utilized confirmatory factor analysis (CFA) to test for model unidimensionality and important validity. Additionally, the measurement reliability was assessed using Cronbach's alpha, which yielded good values exceeding 0.70. These results are consistent with the suggested values given by Peterson (1994) and confirm that the measures are reliable.

Furthermore, the study also tested for convergent and discriminant validity. Convergent validity was assessed by examining the factor loadings, which needed to be greater than 0.6 according to Awang (2012).

4.1. Research validity

According to Molina et al. (2007), the Average Variance Extracted (AVE) is an important element of measurement model validity and should meet a minimum value of 0.5 for all model constructs to judge the good validity of the measurement model. The findings on convergent validity indicate factor loadings higher than 0.6 and AVE values greater than 0.5. The loading of the items, along with AVE and composite reliability results, are illustrated in Table 3.

The study has used Fornell's and Larcker's approach to assess the discriminant validity, which suggests that a variable's variance should be greater than its correlations with other variables. The square root of AVE values presents a high correlation between pairs of indicators, which reflects discriminant validity. Joseph et al. (2010) state that this correlation should be less than 0.9. The findings presented in Table 5 are fully consistent with the criteria suggested by Fornell and Larcker (1981) and Hair (2011) for discriminant validity. Shaheen et al. (2017) have highly recommend using fitness indices for the measurement model, such as chi-square, goodness-of-fit indexes, and comparative fit indexes, as indicators of model fit.

Table 3. AVE & composite reliability

Factor	AVE	Composite Reliability
Green Knowledge Acquisition	0.55	.74
Green Knowledge Storage	0.51	.81
Green Knowledge Sharing	0.57	.77
Green Knowledge Application	0.60	.71
Green Knowledge Creation	0.61	.87
Green technology	0.58	.80
Economic Sustainability	0.58	.75
Social Sustainability	0.62	.79
Environmental Sustainability	0.53	.78
Knowledge-Based Leadership	0.64	.89
Knowledge Integration and Innovation	0.66	.84

Table 4. Goodness of fit

Factor	Mean	SD	χ^2/df	GFI	CFI	RMSEA
Green Knowledge Management	3.67	0.60	2.083	0.91	0.93	0.077
Green Technology	3.52	0.62				
Organizational Sustainability	3.73	0.57				
Knowledge-based Leadership	3.66	0.68				

Table 5. Results of hypotheses

Hypotheses	Estimate	Critical ratio	p-value	Decision
H1	0.253	2.212	.016	Accepted
H2	0.261	2.240	.008	Accepted
H3	0.327	2.922	.002	Accepted
H4	0.355	3.675	.000	Accepted
H5	0.267	2.006	.007	Accepted
H6	0.304	2.117	.000	Accepted

Table 6. Mediation Analysis

Hypotheses	Estimate	Critical ratio	p-value	Decision
H7	0.363	3.212	.000	Accepted

4.2. Structural model

The study findings have revealed that the structural model met the value of χ^2/df 2.083, which meets the required threshold of being lower than 3.00. The RMSEA value is 0.077, which is also consistent with the upper limit value of 0.08. Lastly, the results connected to GFI and CFI have values greater than 0.9, as stated by Bagozzi and Yi (1988). By considering these findings, it can be confidently noted that the study model generally fulfils the goodness-of-fit criteria (Table 4).

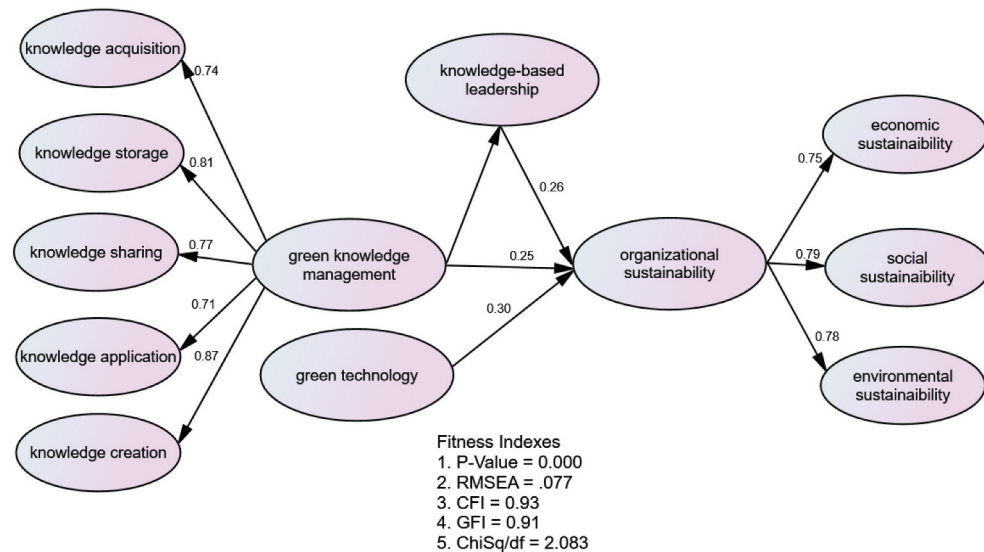
4.3. Hypotheses testing

The present study has employed Structural Equation Modeling (SEM) to examine the proposed research paths. The statistical significance results are illustrated by using the structural parameters to confirm the validity of the research path hypotheses. The findings have specifically revealed that green knowledge management has a significant and positive impact on organizational sustainability with a significance level of this key finding. Additionally, the dimensions of green knowledge management (i.e., acquisition, storage, sharing, application, and creation) demonstrate a significant and positive effect on organizational sustainability knowledge, with a significance level of this key finding. Furthermore, the study has found that green technology also exerts a significant and positive influence on organizational sustainability. Hence, the study supports and accepts research hypotheses H1, H2, H3, H4, H5, and H6. It is noteworthy that the study's results confirmed the respective path coefficients, which explained the statistically significant findings as presented in Table 5 and Figure 2.

4.4. Mediation analysis

This study has sought to explore the mediating effect of knowledge-based leadership on the relationship between green knowledge management and organizational sustainability. The

Figure 2. SEM model.



findings demonstrate that knowledge-based leadership significantly mediates this relationship in a positive manner ($p < 0.05$). Specifically, the results highlight the crucial role of knowledge-based leadership in mediating the relationship between green knowledge management and organizational sustainability, which is consistent across all model paths. These findings (Table 6) lend support to hypothesis H7, which posits that knowledge-based leadership plays a pivotal role in promoting organizational sustainability through green knowledge management.

5. Discussion

The purpose of this research is to investigate the multidimensional effect of green knowledge management on organizational sustainability, particularly through the acquisition, storage, sharing, application, and creation of green technology. The study also aimed at examining the mediating role of knowledge-based leadership in this relationship. The empirical results revealed a significant positive impact of green knowledge management on organizational sustainability, which is consistent with the prior findings. The results indicated that the researched companies in the IT industry in Jordan efficiently utilize green knowledge management to achieve sustainable objectives and utilize green technology to trigger environmental and social activities. The significance of these key findings underpins the research trends in this topic and aligns with the insights about green knowledge management.

Green knowledge management provides numerous opportunities for collaboration and knowledge sharing. Firms' management can access required data and information to develop environmentally friendly technologies through the acquisition and storing of green knowledge. Furthermore, green technology has a positive impact on organizational sustainability and acts as a catalyst for IT companies to invent new technology and processes to become more environmentally-friendly and meet social and economic sustainability aspects.

The study also revealed that sampled IT companies capitalize on green knowledge management practices to meet the overall sustainability. The dimensions levels analyses demonstrate a significant effect of green knowledge management on various forms of sustainability, which is consistent with the prior findings. Knowledge-based leadership contributes to green knowledge management processes and facilitates them, leading to higher sustainable results for the business, meeting green consumers' requirements, and supporting services/products quality with low cost through lower consumption of natural key resources.

The study has offered implications through focusing on the significant relations between green knowledge management and organizational sustainability as well as proving how knowledge-based leadership can facilitate organizational sustainability to achieve the sustainable goal. The study proposed effective implementations of green knowledge management processes to achieve this goal and focused on the essential role of knowledge-based leadership in facilitating the researched companies to achieve the sustainability features of the businesses.

On the other hand, the results implication of this study has enriched the existing relevant literature on the relations between green knowledge management, organizational sustainability, and knowledge-based leadership, by explaining how green knowledge processes support the sustainable activities of IT companies. The study further focused on the growing essential role of knowledge leadership in this association and has shed light on the significance of concerning numerous aspects or dimensions of green knowledge management to enhance the green practices of the companies and capabilities to meet their sustainable objectives.

6. Conclusion

This research has utilized the theoretical framework of knowledge management and the principles of sustainability to examine the multidimensional relationships among green knowledge management, technology, organizational sustainability, and knowledge-based leadership. By incorporating five green knowledge management activities, namely knowledge acquisition, storage, sharing, application, and creation, and three aspects of organizational sustainability, i.e., environmental, social, and economic sustainability, this study investigated the impact of green knowledge management on organizational sustainability. The findings indicate that green knowledge management significantly influences organizational sustainability, and knowledge-based leadership plays a mediating role in the relationship between green knowledge management and organizational sustainability. Furthermore, all paths of green knowledge management and technology show significant impacts on different aspects of sustainability, and knowledge-based leadership mediates the impact of green knowledge management on all aspects of organizational sustainability of IT companies in Jordan.

However, this study has certain limitations. The data collection process only included the opinions of different management levels in the studied IT companies in Jordan, while operational and marketing departments were excluded. In future research, it is recommended to include these excluded departments for a more comprehensive exploration of this subject. Moreover, the data collection process was conducted through an invitation to participants with a convenient sampling approach to provide their perceptions, which may have caused some bias in the data. Considering the studied context with further analytical methods of the model, also need to be considered. Although the study has addressed validity and reliability issues, the potential influence of bias can't be eliminated. Besides management perceptions, it is recommended to use organizations'

financial reports and documents for data collection purposes. Finally, the study only focused on IT companies located in Amman, the capital of Jordan, and did not include other cities in the Kingdom. Therefore, future research should expand the study context and include more regions and sectors to increase the generalizability of the findings.

Author details

Abeer Hmoud Al-Faouri¹

E-mail: dr.abeeral-faouri@bau.edu.jo

ORCID ID: <http://orcid.org/0000-0002-8378-5290>

¹ Management Information Systems Department, Al-Balqa Applied University, As-Salt, Jordan.

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