

Impact of green market orientation, information and communication technology use, and knowledge sharing on green innovation and green brand equity

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Received Jan. 9, 2026

Revised Mar. 1, 2026

Accepted Mar. 6, 2026

Online Mar. 11, 2026

Abstract

This study focuses on testing whether green market orientation (GMO), information and communication technology (ICT) use, and knowledge sharing have any effect on green innovation and green brand equity. The required data was gathered based on a structured survey being administered to the managers and owners of various small and medium enterprises (SMEs) in the United Arab Emirates (UAE). During the data gathering process, a convenience sampling technique was used to ensure that the required sample size was reached. In total, 206 usable questionnaires were received from the respondents. Furthermore, the SmartPLS software was utilized for data analysis and drawing conclusions. The findings verified that knowledge sharing and ICT use positively affect green innovation and green brand equity. The analysis also confirmed that green market orientation positively influences both green innovation and green brand equity. These outcomes contribute to the empirical literature on green brand equity and provide valuable implication for policy makers in SMEs to thrive in today's business markets.

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Published by ARDA.

Keywords: Green brand equity, Green innovation, Green market orientation, ICT use, Knowledge sharing

1. Introduction

As customers nowadays have greater awareness about environmental issues and regularly seek environmentally friendly offerings, firms are increasingly obliged to make necessary adjustments in the management of their business operations to benefit from green brand equity [1]. Therefore, green brand equity is a contemporary trend that received large attention from several business practitioners and scholars worldwide. Green brand equity can be described as a set of corporate assets and responsibilities pertaining to green initiatives and environmental issues linked to a brand which can either mitigate or enhance the worth of a product or service [2]. Earlier literature has identified different consequences of green brand equity, such as favorable word of

mouth [2, 3], better brand image [4], high profit margins [5], and repeated purchases. Furthermore, green innovation has emerged as a key strategic approach that is widely adopted by several enterprises for responding to the growing ecological issues [6]. Green innovation exists through the ability to create new products or services that are not harmful to the environment, are recyclable, and characterized by less consumption of energy [7]. However, despite the significance of green business innovation in shaping a company's competitive advantages, only few studies intended to explore its impact on green brand equity [8].

In the UAE context, green innovation has been viewed as one of the key agendas of the government to reinforce the competitiveness of SMEs, achieve sustainability objectives, and comply with environmental regulations [9]. SMEs in the country contribute significantly to the economy and represent around 94% of overall businesses [10]. Besides that, the adoption of green and sustainable practices in SMEs is well aligned with the aspirations of the government to attain the Net Zero Strategy by 2050. The government has also established certain laws to govern the operations of SMEs by urging them to follow green business practices to safeguard the environment and protect society. By adopting green and sustainable practices, SMEs can benefit from government support through incentives and access to renewal energy resources, while also managing operational costs more effectively. For instance, BloomSpoon is one of the SMEs in the UAE that offers innovative plantable cutlery along with a wide range of eco-friendly products for a more sustainable lifestyle. The website of the company operates as a net-zero platform, where it can track and its digital footprint based on the number of visitors.

The importance of adopting green innovation and building green brand equity have been acknowledged in numerous previous studies which focused on testing their determinants. For instance, Lin and Chen [11] and Zhou et al. [12] reported that a green innovation capability can be fostered through knowledge sharing. Another research done by Tiwari and Pal [13] proved that knowledge sharing positively influences green brand equity. Santos et al. [14] added that companies are facing increasing pressure from environmentally conscious stakeholders to adopt green practices, such as information exchange, to enhance sustainable performance. The dissemination of environmental knowledge is essential for a firm's sustainable performance. Many firms recognize that information is a critical resource for improving green innovations across all industries [15]. For several organizations, achieving a competitive advantage depends on their ability to generate and apply intellectual expertise [16, 17]. Moreover, a firm's knowledge-sharing network enables it to seize new business opportunities and strengthen its allegiance towards ecologically friendly attempts [15]. Therefore, firms that invest in the preservation of the surrounding environment can get first-mover advantages, unique positioning strategies, enhanced green brand image, and competitive benefits.

In recent years, there has been a remarkable growth in information and communications technology (ICT), benefiting both individuals and organizations which provide these services [18]. Enterprises can gain multiple advantages from using the ICT resources to enhance production efficiency and reduce raw materials use [19]. According to Usman, Khan, and Omri [20], ICT plays a significant role in contributing to the growth of economy, development of innovative products and services, and minimizing the detrimental effects of business activities on the environment. Moreover, ICT influences the consumption and production patterns in a more sustainable manner [19]. Additionally, earlier literature has highlighted several benefits of ICT use in companies, including minimal efforts for performing tasks, enhanced communication among business stakeholders and shareholders, greater efficiency in internal operations, maximized profits, and lower costs [21, 22]. The utilization of ICT resources also reduces efforts in different types of tasks, enhancing employee satisfaction and motivation [23]. However, few studies have examined the impact of ICT use on both green innovation and green brand equity in SMEs' setting, particularly in developing and emerging economies [24].

Furthermore, as environmental issues have become increasingly noticeable worldwide, enterprises are now expected to prioritize the protection of the natural environment and adopt green management practices [25]. Wang [26] reported that companies should broaden their market orientation by addressing the requirements of environmental concerns. GMO denotes an organization's efforts to cultivate and enhance environmental competencies, services, or products to achieve superior sustainable business performance [27]. Organizations

that follow a GMO approach recognize the importance of environmental management, track the activities of their rivals, and project an image regarding environmental responsibility to consumers [28]. Accordingly, such businesses are likely to set environmental goals for their internal operations or production, strive to achieve them, and invest additional resources in promoting green innovation and green brand equity. Nevertheless, while prior research has emphasized the importance of relationship between GMO and green brand equity, few studies have investigated whether green innovation serves as an intervening factor [26]. Qayyum et al. [1] also stated that there are limited studies which focused on examining the actual effect of green market orientation on a firm's green brand equity.

In accordance with the gaps stated above, this research aims to explore the impact of knowledge sharing, ICT use, and green market orientation on green innovation and green brand equity with novel findings from SMEs in the UAE. The aforementioned factors were examined separately in earlier research, and it is not easy to find an empirical research paper that collectively examined their impact on both green brand equity and green innovation, particularly in the Middle East region.

2. Literature review

2.1. Green innovation

Green innovation has emerged as a strategic approach for business growth, prosperity, and long-term survival in the current century [29]. It was defined by Chen et al. [30] as the ability to introduce new or modified products, services and processes that emphasize energy saving, reduction of environmental pollution, recyclability, and eco-friendly design of products and packaging. Successful enterprises dedicate their resources to investing in green innovations as it provides them with extensive opportunities to expand into additional markets and obtain long-term competitive advantage by positioning their brands as eco-friendly [31, 32]. Green innovation improves customers' perceptions regarding the ethical practices of enterprises which prioritize the environment in their daily operations [33, 34]. It also allows such enterprises to gain first-mover advantages by expanding into new markets or charging premium prices from customers [35]. Enterprises can strengthen their green brand equity by stressing on the economic, social, and environmental benefits demonstrated via green production processes and products in their advertisements [36]. Previous research on the role of green innovation in affecting brand performance has mainly emphasized traditional measures of monetary performance, such as market share, growth of sales and profit margins [37]. However, green innovation may also impact a firm's non-monetary performance, such as brand attitude, buyer satisfaction, and corporate image [38]. Steffl et al. [39] outlined that green innovation improves the distinctiveness, preference, and strength of brand equity. Earlier literature also verified the positive impact of green innovation on green brand equity [8, 31, 40]. In relation to the above discussion, the following research hypothesis is formulated:

H_1 : Green innovation positively affects green brand equity.

2.2. Knowledge sharing

Knowledge sharing was conceptualized in the past literature as the dissemination of important knowledge with all stakeholders of the firm [41]. The word "knowledge sharing" also refers to a firm's approaches and tactics for communicating and transmitting knowledge to its staff to enable them to utilize it to generate new ideas [42]. In line with the Knowledge-Based View (KBV), the acquisition and utilization of knowledge represent an important resource for an enterprise's success [43]. The proponents of the theory suggest that the capabilities and bases of heterogeneous knowledge are the key drivers of sustainable competitive advantage and brand performance. Knowledge sharing has a critical role in strengthening the competitiveness of enterprises, as it facilitates the generation of new ideas, goods, or services [44]. The exchange of knowledge among organizational staff facilitates the dissemination of ideas, information, thoughts, and experiences, hence serving as a catalyst for creativity and innovation to ensure long-term prosperity [44]. Given the regular changes in business environment, it is widely acknowledged that organizations which are proficient in managing the

knowledge rooted in their daily operations will excel over their rivals [45]. Furthermore, knowledge has transformed the traditional perception of competitiveness, especially in industrialized nations. There is a pressing need for businesses to find ways to obtain necessary knowledge and seek the relevant ideas that will lead to ecologically sustainable outcomes and provide competitive advantages over rivals [46, 47, 48]. Past studies confirmed that knowledge sharing positively affects organizational innovation [49, 50] and green brand positioning [31]. Also, Shahzad et al. [51] and Ma et al. [15] reported that knowledge sharing reinforces the capabilities of an enterprise's green innovation and leads to better brand performance. Accordingly, the following research hypotheses are advocated:

H_2 : Knowledge sharing positively affects green innovation.

H_3 : Knowledge sharing positively affects green brand equity.

2.3. Information and communication technology (ICT) use

ICT resources in organizations encompass a range of technological capabilities, systems, and appropriate infrastructures that can be utilized for managing, storing, processing, disseminating, and exchanging information among business stakeholders [52, 53]. Such resources are necessary for modernizing business operations, smoothing interactions, driving innovation, supporting decision-making, and ensuring greater efficiency in daily operations [54]. Based on the theory of dynamic capabilities, prior research has highlighted that ICT resources represent a key asset which enhances the ability of an enterprise to access necessary data, improve communication, streamline operations, and be proactive in introducing innovative products and services [55, 56]. Besides that, the utilization of ICT can improve environmental growth and yield favorable sustainability results by creating real-time decision support systems that integrate government and an enterprise's ICT innovations, thereby empowering managers and decision makers to take appropriate approaches that align with environmental sustainability objectives [57]. Innovation capabilities and ICT breakthroughs play a significant role in advancing organizations and nations towards more ecologically sustainable results [58]. Accordingly, the utilization of ICT enables organizations to substantially lower expenses and augment productivity, hence improving their brand equity [59, 60]. Earlier research has confirmed that ICT use positively affects green innovation [61, 62, 63] and brand equity [64, 65]. Corresponding to the aforementioned arguments, the following research hypotheses are proposed:

H_4 : ICT use positively affects green innovation.

H_5 : ICT use positively affects green brand equity.

2.4. Green market orientation

GMO represents an extension of the market orientation concept, which is centered on an enterprise's philosophical approach in detecting and fulfilling customers' needs and aspiration via the introduction of new offerings on regular basis [66]. The shift towards the adoption of GMO is primarily driven by growing customers' expectations, government policies, and competitors' actions towards environmental management and sustainability [67]. Apparently, GMO necessitates enterprises to adopt environmentally friendly practices in manufacturing and marketing communications. It also encourages them to be innovative and proactive in responding to various stakeholders' expectations. According to the Natural Resource-Based View (NRBV), enterprises should demonstrate continuous engagement in activities that promote environmental sustainability via recycling and innovative packaging to attain superior brand equity [68, 69]. From a marketing perspective, NRBV is closely aligned with GMO, which emphasizes the integration of green practices into all aspects of marketing programs [70]. For instance, government policies in certain nations expect businesses to be committed to environmental sustainability in packaging and overall operations. A company that follows the GMO approach while running its business possesses a comprehensive awareness of consumers' needs and environmental requirements, thus enabling it to pursue ecological innovation and acquire further knowledge [71]. Furthermore, green market-oriented enterprises tend to acquire diverse knowledge from different sources

to identify opportunities and respond to stakeholders' expectations ahead of competitors [26]. Thus, enterprises that follow the GMO approach tend to implement strategies that promote the creation of sustainable products for meeting stakeholders' needs [72]. In general, previous studies have indicated that GMO positively affects green innovation [31, 73, 74] and green brand equity [1, 75, 76]. Hence, the subsequent hypotheses are advocated:

H_6 : GMO has a positive impact on green innovation.

H_7 : GMO positively affects green brand equity.

With reference to the above-mentioned literature review and underpinning theories which support the hypotheses of this research, the conceptual framework is presented in Figure 1.

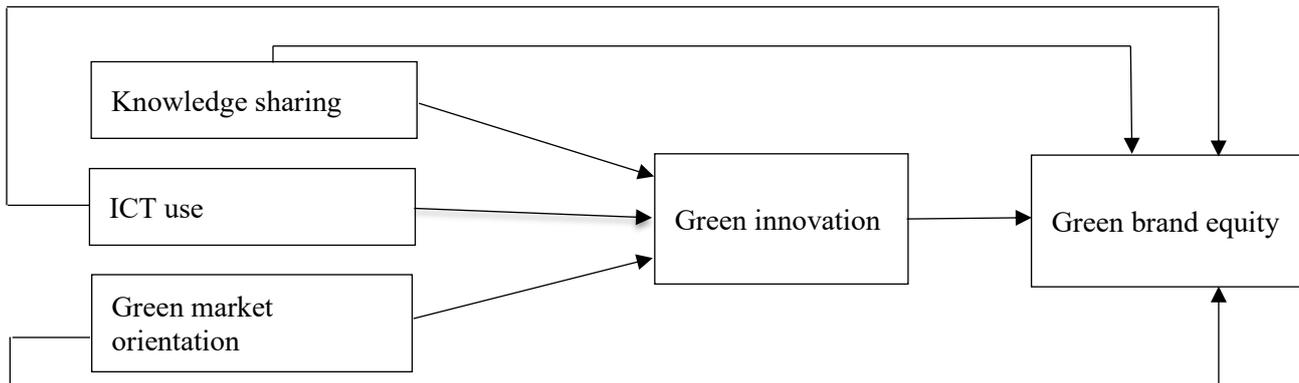


Figure 1. Conceptual framework

3. Research method

The principal objective of this research was to examine the impact of knowledge sharing, ICT use, and GMO on both green innovation and green brand equity in SMEs' setting. In relation to that, the data was gathered from managers and owners of several SMEs that are currently operating in the UAE. These respondents are considered as the most suitable individuals who can provide accurate data to fulfil the aims of this research and then test the proposed hypotheses. Due to certain challenges in collecting the desired number of responses from SMEs' owners and managers, the convenience sampling method was used during the entire data collection process. In addition to that, both an online and a self-administered survey were employed to warrant that the required sample size can be obtained from them. Convenience sampling methodology was used due to the unavailability of the sampling frame for respondents and time constraints. Similar past studies have also relied on this sampling technique for data collections from managers and owners of SMEs in different regions [77, 78, 79]. During the phase of data collection, ethical standards were followed to avoid any pressure on the respondents. They were initially informed about the purpose of this research, requested to participate voluntarily in filling out the questionnaire, and assured that all their responses will remain confidential. In total, 630 questionnaires were distributed to the respondents, but only 214 were returned, accounting for a 34% response rate. Out of the questionnaires received, 8 were discarded due to incomplete answers. Hence, the usable sample for data analysis included 206 respondents. Most of the participants were males that worked in service sector (57.8%) and had more than 10 years of experience.

The questionnaire used in this research comprised of two parts: respondents' profile and measurement items. The measurement items of all the constructs used in this paper were adapted from similar previous studies. Particularly, the construct of knowledge sharing was measured via six items taken from Oliveira et al. [80]. To measure the constructs of ICT use, five items were adapted from the study of León-Gómez et al. [81]. Furthermore, GMO was measured using six measurement items being taken from Nigatu et al. [82]. Green innovation was also measured based on four items being adapted from the study of Guo et al. [83]. Finally, green brand equity was measured based on four items being taken from Mehdikhani and Valmohammadi [2].

All construct items were answered by the respondents based on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

4. Results

In this research, PLS-EM approach was utilized for data analysis and verifying the postulated hypotheses. According to Hair et al. [84], PLS-SEM is best suited for the analysis of complex models which have multiple constructs. It does not require the data to be either normally distributed or large sample size, unlike covariance-based methods. This software has been extensively used in previous studies for modelling formative as well as reflective variables, and this further provides evidence of its methodological strength in comparison to other techniques [85]. Additionally, PLS-SEM is appropriate for the analysis of survey data in applied research, and it does not follow strict criteria for attainment of model fit. Therefore, it is well-aligned with the key objectives of the current study [86].

To ensure the absence of multicollinearity issues across the obtained data, PLS-algorithm was used for calculating the Variable Inflation Factor (VIF). Earlier literature regarded VIF as a reliable indicator for detecting multicollinearity and measuring correlations among multiple items in the research framework. Based on the suggestions of Vu et al. [87], if the VIF value for each item in the measurement model is registered at less than 5, then it can be said that the data is free from any multicollinearity issue. The table below (Table 1) illustrates that all values of VIF are in the tolerable range (< 5), and this provides a clear indication that the gathered responses are appropriate for further analysis [88].

Table 1. Test of multicollinearity

| Construct | Item | VIF | Construct | Item | VIF |
|--------------------------|-------|-------|--------------------|------|-------|
| Knowledge sharing | KS1 | 2.333 | Green brand equity | GBE1 | 1.535 |
| | KS2 | 3.094 | | GBE2 | 1.826 |
| | KS3 | 3.319 | | GBE3 | 2.022 |
| | KS4 | 1.106 | | GBE4 | 1.692 |
| ICT use | ICTU1 | 1.649 | | | |
| | ICTU2 | 1.979 | | | |
| | ICTU3 | 2.175 | | | |
| | ICTU4 | 1.413 | | | |
| Green market orientation | GMO1 | 1.515 | | | |
| | GMO2 | 3.320 | | | |
| | GMO3 | 2.339 | | | |
| | GMO4 | 4.123 | | | |
| Green innovation | GI1 | 2.442 | | | |
| | GI2 | 1.675 | | | |
| | GI3 | 1.745 | | | |
| | GI4 | 2.203 | | | |

To deal with the potential problem of common method bias (CMB), Harman's one-factor test was utilized, as recommended by Podsakoff et al. [88]. This mechanism is based on the premise that, in the presence of CMB, either a single component explains most of the covariance among the measurements, or only one variable is extracted. The findings from Harman's one-factor analysis [89] demonstrated the absence of CMB, since the primary factor explained 32.7% of the extracted variance. Additionally, a partial correlation analysis was conducted to determine whether any significant differences exist in the correlation values after controlling for market factors. In general, the findings did not indicate the existence of the CMB that could compromise the reliability of the data.

As suggested by Hair et al. [84], prior to testing the research hypotheses, it is vital to calculate both the validity and reliability of measurement items to ensure they are in the acceptable range. Hence, the confirmatory factor analysis (CFA) was executed via the SmartPLS software. The results presented in Table 2 reveal that the composite reliability and Cronbach’s alpha values for all the variables exceeded the threshold of 0.7, indicating that the reliability assumptions were met [90]. Besides that, the factor loadings for items were calculated (see Figure 2), and the ones with minimum factor weight of 0.5 were maintained [90]. An AVE test was also performed using the residual factor loadings of measurement items. When the AVE value falls between 0.5 and 1, convergence validity and uni-dimensionality are considered adequate [84]. The research verified the existence of convergent validity across all the variables, since AVE values are above 0.5.

Table 2. Results of CFA

| Constructs | Items | Factor loadings | Cronbach’s alpha | CR | AVE |
|--------------------------|-------|-----------------|------------------|-------|-------|
| Knowledge sharing | KS1 | 0.683 | 0.784 | 0.843 | 0.575 |
| | KS2 | 0.815 | | | |
| | KS3 | 0.816 | | | |
| | KS4 | 0.710 | | | |
| ICT use | ICTU1 | 0.789 | 0.814 | 0.878 | 0.643 |
| | ICTU2 | 0.817 | | | |
| | ICTU3 | 0.859 | | | |
| | ICTU4 | 0.736 | | | |
| Green market orientation | GMO1 | 0.681 | 0.867 | 0.909 | 0.717 |
| | GMO2 | 0.888 | | | |
| | GMO3 | 0.873 | | | |
| | GMO4 | 0.922 | | | |
| Green innovation | GI1 | 0.875 | 0.842 | 0.894 | 0.679 |
| | GI2 | 0.781 | | | |
| | GI3 | 0.781 | | | |
| | GI4 | 0.854 | | | |
| Green brand equity | GBE1 | 0.760 | 0.819 | 0.881 | 0.649 |
| | GBE2 | 0.828 | | | |
| | GBE3 | 0.847 | | | |
| | GBE4 | 0.785 | | | |

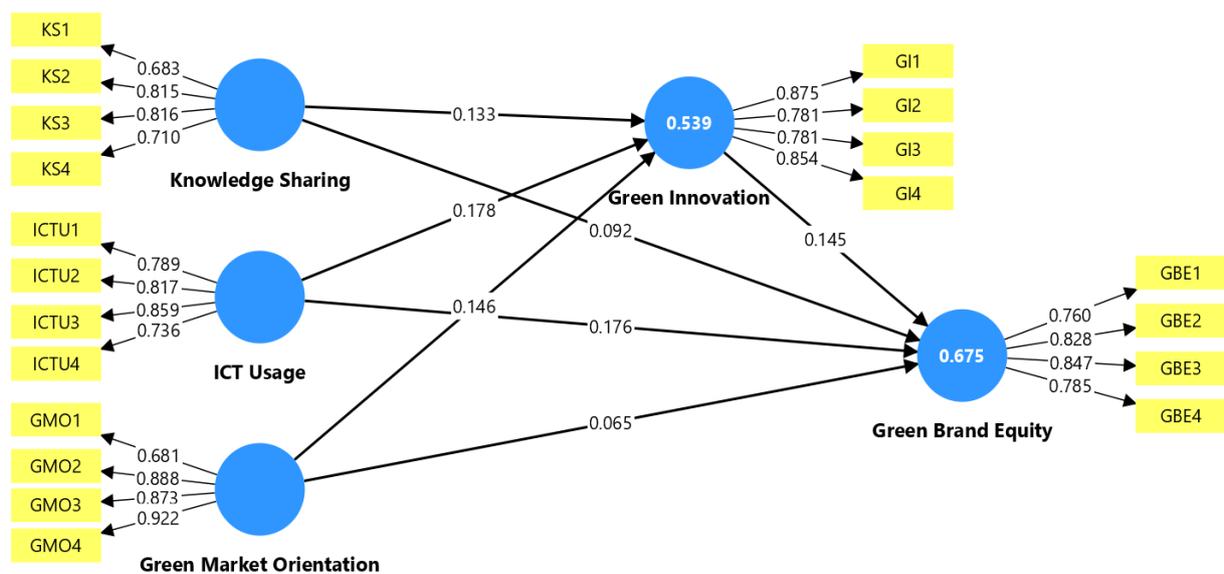


Figure 2. Measurement model

This study also relied on Fornell and Larcker’s [91] formula for calculating discriminant validity. Specifically, the test was conducted by comparing the square root of the AVE with the correlations among the other variables.

To ensure the existence of discriminant validity among the constructs, the sqrt of the AVE must exceed the corresponding inter-correlation coefficients [92]. Table 3 shows that all diagonal values exceed the corresponding inter-correlation coefficients, hence indicating that the discriminant validity has been attained. The coefficient values also were all below 0.8, signifying a lack of strong association between any pair of variables [93].

Table 3. Analysis of discriminant validity

| Construct | 1 | 2 | 3 | 4 | 5 |
|-----------------------------|-------|-------|-------|-------|-------|
| 1. Green brand equity | 0.806 | | | | |
| 2. Green innovation | 0.728 | 0.824 | | | |
| 3. Green market orientation | 0.633 | 0.608 | 0.847 | | |
| 4. ICT use | 0.686 | 0.616 | 0.567 | 0.802 | |
| 5. Knowledge sharing | 0.514 | 0.481 | 0.332 | 0.310 | 0.759 |

After the estimation of the measurement model, the next step was to run the structural model to examine the proposed hypotheses. A bootstrapping technique (5,000 resamples) was used to assess the path estimates of the proposed hypotheses. As depicted in Table 4, the first hypothesis (H_1) of this research which suggested a positive impact of green innovation on green brand equity was supported ($\beta=0.319$, t-value =2.108, $p>.05$). The findings also displayed that knowledge sharing positively and significantly impacts green innovation ($\beta=0.265$, t-value =2.921, $p>.05$) and green brand equity ($\beta=0.197$, t-value =2.014, $p>.05$); hence, H_2 and H_3 are supported. Besides that, the findings verified that ICT use positively affects both green innovation ($\beta=0.352$, t-value =2.794, $p>.05$) and green brand equity ($\beta=0.319$, t-value =2.984, $p>.05$), thus supporting H_4 and H_5 . Finally, the findings displayed that GMO has a significant as well as positive impact on green innovation ($\beta=0.321$, t-value=3.119, $p>.05$) and green brand equity ($\beta=0.193$, t-value =2.150, $p>.05$); therefore, H_6 and H_7 are confirmed. Overall, knowledge sharing, ICT use, and GMO explain around 53.9% of the variance in green innovation. Collectively, these factors together with green innovation explain 67.5% of the variance in green brand equity.

Table 4. The results of research hypotheses

| Hypotheses | | Beta | Std. Dev. | t-value | P |
|--------------------------|----------------------|-------|-----------|---------|-------|
| Green innovation | → Green brand equity | 0.319 | 0.152 | 2.108 | 0.035 |
| Knowledge sharing | → Green innovation | 0.265 | 0.091 | 2.921 | 0.004 |
| Knowledge sharing | → Green brand equity | 0.197 | 0.098 | 2.014 | 0.044 |
| ICT use | → Green innovation | 0.352 | 0.126 | 2.794 | 0.005 |
| ICT use | → Green brand equity | 0.319 | 0.107 | 2.984 | 0.003 |
| Green market orientation | → Green innovation | 0.321 | 0.103 | 3.119 | 0.002 |
| Green market orientation | → Green brand equity | 0.193 | 0.090 | 2.150 | 0.032 |

5. Discussion and conclusion

The main purpose of this research was to explore the effect of selected variables (green market orientation, ICT use, and knowledge sharing) on both green brand equity and green innovation in SMEs. By reviewing the literature on green brand equity, it is difficult to find an empirical study that has collectively examined the impact of the aforementioned variables on it, particularly in the context of SMEs. The findings displayed that knowledge sharing plays a crucial role in affecting both green innovation and green brand equity. Additional support has been reported in past research which concluded that there is a positive effect of knowledge sharing on green innovation [94, 95, 96], open innovation [97], and green brand equity [98, 99]. Markovic and Bagherzadeh [100] also stated that enterprises which demonstrate effective knowledge sharing processes among organizational members and various business stakeholders tend to exhibit greater creativity and improved financial performance. The findings signify that the acquisition of relevant and valuable knowledge from both internal and external sources leads to deeper understanding of information that facilitates the development of

new goods/services, the identification of potential suppliers, and the comprehension of buyer preferences. Thus, the acquired knowledge can be utilized to address complex business challenges, contributing to the improvement of an enterprise's green brand equity and its positioning in the target markets.

The findings also verified that ICT use positively affects an enterprise's green brand equity and green innovation. Further support was documented in prior studies which showed that ICT use positively and significantly influences both green innovation [62, 101] and green brand equity [64, 65, 102]. Dash, McMurtrey, Rebman, and Kar [103] illustrated that ICT use helps firms to automate regular tasks, while enhancing sustainable performance demonstrated via effective operational practices and reducing the costs associated with inventory and transportation. Similarly, Tan et al. [104] asserted that ICT represents a cost-effective method for enabling SMEs to address the challenges related to competition with rivals and utilizing the internet as a novel approach to business operations. Integrating ICT into the daily operations of SMEs will allow them to possess enhanced resources to undertake new endeavors and improve brand performance [105]. ICT can enhance the ability of SMEs to create unique goods, processes, and services that are more appropriate to the sustainability requirements of their stakeholders [81]. Businesses can integrate their ICT innovations with environmental goals, thereby enabling them to promote environmental protection and build their green brand equity through service and cost efficiency [106].

Finally, the outcomes displayed that GMO positively impacts both green brand equity and green innovation. More support can be noticed in prior research which confirmed the existence of a positive effect of GMO on both green innovation [82, 107, 108] and green brand equity [109]. Certain researchers also proposed that GMO enables enterprises to cultivate distinctive competencies for attaining exceptional performance in relation to environmental sustainability and business profits. GMO signifies a strategic stance and market-centric methodology that primarily directs corporations to comprehend the expectation of customers towards adopting ecological practices and be proactive in developing appropriate strategies [25]. Green market orientation drives companies to improve their offerings by introducing ecologically friendly items for minimizing the detrimental effect of their daily operations on the natural environment and social wellbeing [110]. Thus, entrepreneurs and decision makers in SMEs should recognize that following the GMO approach will allow them to cultivate green innovations and strengthen their green brand equity.

6. Limitations and future research

Several limitations were identified in this paper that should be carefully considered in future research endeavors. First, this study relied on a cross-sectional survey for data collection. Future studies could utilize longitudinal or experimental approaches to more effectively ascertain the causal impact of GMO, ICT use, and knowledge sharing on green innovation and green brand equity. Second, the outcomes of this paper are derived from data collected from a single country (UAE); thus, generalizing the results to other countries or areas may be constrained due to cultural variations that may demonstrate differences in the results of hypotheses. Third, data were collected using a non-random sampling method (convenience sampling) which may limit the generalizability of the results to other contexts. Future studies are therefore encouraged to use random sampling techniques (e.g. systematic or simple random sampling). Finally, this study focused on exploring the effect of three variables only on green innovation and green brand equity. Thus, future research can test other predictors, such as strategic partnership and corporate social responsibility. Moreover, upcoming studies can test the mediating effect of green innovation or include other mediators (such as sustainable leadership) for examining the fundamental mechanisms that elucidate how the selected variables affect green brand equity in SMEs' setting.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Funding information

No funding was received from any financial organization to conduct this research.

Author contribution

The contribution to the paper is as follows: Jalal Rajeh Hanaysha: original draft, review and editing, conception and design, formal analysis; Khaled M.K. Alhyasat: conception and design, interpretation of results; Fayez Bassam Shriedeh: review and editing, validation, data curation; Said Yousef Dwikat: review and editing, software, methodology. All authors approved the final version of the manuscript.

Ethical approval statement

Ethical approval is not applicable for this research.

Informed consent

Informed consent for the publication of personal data in this article was obtained from the participants. Each respondent has given the consent to participate on a voluntary basis in this research by answering a question at the beginning of the survey without any coercion. Moreover, it was guaranteed that all obtained data will remain confidential, anonymous, and will not be revealed in any manner.

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 Appendix A: Measurement items of the constructs

| Construct | Items |
|--------------------------|---|
| Knowledge sharing | <p>When our employees learn something new, they share the subject with their colleagues.</p> <p>Our employees share the information they have with their colleagues.</p> <p>Our employees regularly share what they do with their colleagues.</p> <p>When our employees need some specific knowledge, they ask their colleagues.</p> <p>Our employees ask the colleagues to share their skills when they need to learn something.</p> <p>When one employee is good at something, the other employees ask him to teach them how to do it.</p> |
| Green market orientation | <p>Our company conducts market research to identify green needs in the marketplace.</p> <p>Our company supports the practice of e-commerce, as it is more eco-friendly.</p> <p>Our company favors digital communication methods for promoting our products, as it is eco-friendly.</p> <p>Our company practices a paperless policy in our procurement where possible.</p> <p>Our company attempts to use renewable energy sources for our products/services.</p> <p>Our company carefully monitors the level of commitment to serving customers' environmental needs.</p> |
| ICT use | <p>Our company uses its own website.</p> <p>Our company uses E-commerce platform for generating sales.</p> <p>Our company has active presence in social networks.</p> <p>Our company uses ERP applications for integrated production management.</p> |
| Green innovation | <p>We often improve an existing product to make it more environmentally friendly.</p> <p>We often improve existing processes to make them more environmentally friendly.</p> <p>We often exploit existing technologies to make processes more environmentally friendly.</p> <p>We often exploit existing technologies to make products more environmentally friendly.</p> |
| Green brand equity | <p>It is reasonable to be associated with our brand, as it shows concern for the environment.</p> <p>Even though other brands could emerge, most of our customers remain loyal to our brand as a result of its commitments to the environment.</p> <p>In case another brand emerges, many customers prefer to be associated with our brand because of its environmental commitments.</p> <p>In case another brand emerges, this option emerges smarter owing to the fact that we acknowledge the significance of environmental sustainability.</p> |
