Unlocking Sustainable Performance in SMEs: The Interplay of Green AI Management, Pro-environmental Behaviour in the Tourism and Hospitality Sector: UK

Ahmad A. Alharbi[1], Amina Elshamly[2], Nevien Mohammed Abdelkreem Shawky[3], Ibrahim G. Mahgoub[4]

Abstract

In an era where sustainability is paramount, small and medium-sized enterprises (SMEs) in the UK's tourism and hospitality sector face a multifaceted challenge. This study investigates the interaction of variables essential for their sustainable performance, focusing on AI-Enhanced Green Management (AI-EGM). Drawing from the Resource-Based View and Social Exchange Theory, we propose that AI-Enhanced Green Management (AI-EGM) positively influences financial and environmental performance. Business Size moderates the relationship between AI-Enhanced Green Management (AI-EGM) and Sustainable Performance, acknowledging the diversity within the SME landscape. The empirical results underscore the significance of AI integration, firm characteristics, and a comprehensive sustainability framework in shaping the sustainability landscape for SMEs in the tourism and hospitality sector. These findings offer valuable insights for SMEs and contribute to the broader goal of global and local sustainability.

Keywords: AI-Enhanced Green Management (AI-EGM), Pro-environmental Behaviours, Sustainable Performance, Business Size, Small and Medium-sized Enterprises (SMEs), Tourism and Hospitality, UK

Introduction

In an age where global environmental challenges loom, the imperative for sustainable practices within the business world has never been more pressing (Afum et al., 2020; Dubey et al., 2020; Elshaer et al., 2021; Elshaer et al., 2022a, 2022b; Farrukh et al., 2022; Latif et al., 2022). SMEs are pivotal in the global economy, accounting for over 90% of businesses worldwide. Their collective impact on sustainability cannot be underestimated (Ghadimi et al., 2020; Baz et al., 2014; Chan, 2010). SMEs operating within the tourism and hospitality sector hold a unique position, considering their pivotal role in catering to global travellers. This sector is particularly significant in the UK, welcoming over 40 million tourists in 2019, contributing substantially to its economy (Bohdanowicz et al., 2011; Elshaer et al., 2022b; Sobaih et al., 2020). In this context, focusing on sustainable performance within SMEs is a strategic advantage and an ethical

---

[1] Department of Management, College of Business Administration in Yanbu, Taibah University, Madinah, Saudi Arabia; alharbi.ahmad.a@gmailcom; Asehili@taibahu.edu.sa.

[2] Department of Management, College of Business Administration in Yanbu, Taibah University, Madinah, Saudi Arabia; ashamly@taibahu.edu.sa.

[3] Department of Management, Faculty of Business, Alexandria University, Egypt; Department of Management, College of Business Administration in Yanbu, Taibah University, Madinah, Saudi Arabia; nshawky@taibahu.edu.sa.

[4] Department of Management, College of Business Administration in Yanbu, Taibah University, Madinah, Saudi Arabia; iahmed@taibahu.edu.sa; Department of Business Administration Department, Faculty of Commerce, , Egypt, dr_ebrahim_mahgoob@mans.edu.eg.

*Correspondence: iahmed@taibahu.edu.sa.

obligation.

Globally, businesses are grappling with the urgency of addressing environmental and social concerns (Afum et al., 2020; Elshaer et al., 2022b; Farrukh et al., 2022). Climate change, resource depletion, and societal expectations place sustainability at the forefront of corporate agendas. According to a report by the United Nations, the population is expected to grow to 9.7 billion globally by 2050, further intensifying the challenges of resource scarcity and environmental degradation. The business world recognises the need to adapt to these evolving dynamics, with an increasing number of organisations implementing sustainable practices (Afum et al., 2020; Al-Hakimi et al., 2022). However, despite their numerical dominance, SMEs often face unique hurdles in their journey towards sustainability.

The United Kingdom, a tourism and hospitality hub, has long been at the nexus of these global challenges. Hosting millions of visitors annually, the sector contributes significantly to the nation's economy (A. Almaqtari et al., 2022). However, it also raises critical issues regarding sustainable practices. A study by Visit Britain highlights that in 2019, the tourism industry was worth £127 billion, employing millions of people. However, rapid tourism growth has led to overcrowding, resource consumption, and carbon emissions (Chou, 2014; Elshaer et al., 2021; Elshaer et al., 2023; Elshaer et al., 2022b). Therefore, the imperative for SMEs within the UK's tourism and hospitality sector to adopt sustainable practices is an economic advantage and an essential measure to address these issues.

Sustainability in this context encompasses a multifaceted approach, encompassing financial, social, and environmental aspects. Sustainable performance, the crux of our study, encapsulates a holistic evaluation of an organisation's endeavours to balance economic prosperity, societal well-being, and environmental responsibility. It is a complex and multifaceted concept, initially articulated by Elkington in 1997 through the "Triple Bottom Line" - a framework emphasising the three crucial dimensions of sustainable business performance: profit, people, and planet. The pivotal role of Sustainable Performance lies in its capacity to address the overarching issues discussed earlier. A lack of sustainability can exacerbate global concerns, including resource depletion, rising greenhouse gas emissions, and social inequality (Mitra & Datta, 2013; Sureeyatanapas et al., 2015). In the UK, it can exacerbate the challenges of booming tourism and hospitality, including overcrowding, waste generation, and inequitable distribution of benefits within local communities.

Our study focuses on a nexus of variables—AI-EGM, Pro-environmental Behavior, and Business Size—which can serve as pivotal instruments in overcoming the challenges of sustainable performance. AI-EGM leverages technology to foster environmental responsibility, while Pro-environmental Behavior emphasises the importance of individual actions within the organisation. Business Size recognises the variations in resource capabilities and impacts. By comprehensively addressing these variables, SMEs can substantially contribute to tackling the global and local challenges related to sustainability.

While traditional research often concentrates solely on overarching sustainability outcomes, our study introduces these new variables that can mediate, moderate, and facilitate sustainable practices (Lewandowski, 2016; Al-Shaer & Zaman, 2017; Macchion et al., 2017; Papadopoulos et al., 2017; Kang et al., 2018; Luthra & Mangla, 2018; Priyankara et al., 2018; Cole & Aitken, 2019; Dubey et al., 2019; Raharjo, 2019; Raut et al., 2019; Elshaer et al., 2021). AI-EGM and Pro-environmental Behaviours have seen limited exploration in the context of their interplay

within the UK's SMEs in the tourism and hospitality sector. By focusing on these, we delve into uncharted territory.

This study's novelty lies in its comprehensive approach to sustainability, introducing new variables and examining their interplay within the unique context of SMEs in the UK's tourism and hospitality sector. Integrating AI-EGM and Pro-environmental Behaviour alongside Business Size allows for a nuanced understanding of how these variables can be harnessed to enhance Sustainable Performance. The results of our hypothesis testing offer a comprehensive understanding of the sophisticated relationships within SMEs in the UK's tourism and hospitality sector. AI-EGM was found to significantly enhance both Financial and Environmental Performance, underscoring the valuable role of AI in optimising green practices. Pro-environmental behaviour was linked to improved Social Performance, aligning with the idea that perceived benefits drive such behaviours. Notably, business size was found to moderate the relationship between AI-EGM and sustainable performance, revealing the nuances that more extensive and smaller SMEs face. Furthermore, the Triple Bottom Line was identified as a mediating force, channelling the positive impacts of AI-EGM toward Sustainable Performance. These findings bear substantial implications for SMEs striving to achieve sustainability goals, contributing to this vital sector's global and local sustainability efforts."

Using a quantitative approach and structured questionnaires, our study gathers robust data to test our hypotheses. In our investigation into Sustainable Performance in Small and Medium-sized Enterprises (SMEs) within the UK Tourism and Hospitality sector, we unveiled a complex interplay of factors that shape the sustainability landscape.

The subsequent sections of this research article present the detailed results of our analysis, offering insights into the relationships between the variables and their significance in shaping Sustainable Performance. These findings provide a valuable resource for policy-makers, practitioners, and researchers committed to advancing sustainable practices in the UK's tourism and hospitality sector.

The paper is structured to delve into the methodology, results, and discussions that underpin our findings. We examine the hypothesis testing, mediating and moderating relationships, and their implications. This study also considers the limitations and suggests avenues for future research. This research embarks on a journey to unlock the potential of SMEs in enhancing their Sustainable Performance in an ever-evolving business environment, with the goal of addressing global and local sustainability challenges.

Literature Review and Hypothesis Development

Artificial Intelligence (AI)

As anticipated Chen et al. (2018), Artificial Intelligence (AI) is expected to continue evolving, improving both service quality and customer experiences in the hospitality industry. Artificial intelligence (AI) has attracted growing interest from diverse sectors of society, industry, and business (Ho et al., 2022) AI's influence extends to areas such as the application of pattern recognition methods in social networks and economic studies. The transformative potential of artificial intelligence resonates across a broad spectrum, impacting both corporate and domestic spheres. This transformative power is underscored by predictions that AI will become a cornerstone of global economic contributions, surpassing the combined impact of economic powerhouses such as China and India. The unfolding narrative of AI presents a landscape in

which technological advancements are poised to redefine and enhance various facets of human life, thereby shaping the trajectory of industries and economies globally. A recent study has revealed that AI can conduct eco-friendly product sustainability analyses, providing designers and stakeholders with an innovative and comprehensive toolkit. This tool enhances sustainable design practices, paving the way for more informed and effective product development strategies in the realm of eco-friendliness (Syafrudin et al., 2024).

AI-Enhanced Green Management (AI-EGM)

AI has the potential to drive innovation and aid in problem-solving within the realm of sustainability despite the inherent tensions and contradictions arising from its environmental impact (Henriksen et al., 2024). AI-EGM is at the core of our investigation, and its significance is well-established in previous research. As indicated by the proxy on a Likert scale from 1 to 7, the degree of AI integration in environmental management practices is a crucial determinant. Previous studies (Carter & Rogers, 2008; Kang et al., 2018; Han & Huo, 2020) underscore its role in optimising resource utilisation, reducing waste, and enhancing energy efficiency. Not only does this variable have a substantial impact on environmental performance, but it also significantly influences financial performance. In a global context, AI-EGM aligns with the broader objective of eco-friendly and sustainable operations in the business world.

Pro-environmental Behavior

Pro-environmental behaviour has been recognised as a critical driver of social and environmental performance. This variable, rooted in employee commitment to sustainability, encourages individuals to adopt eco-friendly practices, reducing negative environmental impacts. Previous research Casaló et al. (2019); Suganthi (2019); Li et al. (2020); Shah et al. (2020); Elshaer et al. (2021); Farrukh et al. (2022) and Latif et al. (2022) demonstrate the importance of fostering pro-environmental behaviours in the workplace. Such behaviours enhance an organisation's social and environmental performance and address global environmental concerns.

Linking between AI-Enhanced Green Management and Sustainable Performance

As previously discussed, the notion of AI-EGM is comprehensive, and we are considering how AI could influence green management for this paper. Since our focus is on SMEs, the expectation is that they will be more adventurous and experimental with new technology and will be looking to drive competitive advantage. However, regarding sustainable performance, we stay within the boundaries of finance, environmental, social, and operational performance as this enables the setting of clear metrics. Although there is considerable overlap between those metrics and environmental or operational performance by definition, at least in most cases, it implies financial performance(Bartolacci et al., 2018). Nonetheless, financial performance tends to be the primary concern for businesses and likely the business objective, which is widely asserted in literature. Ukko et al. (2019) found that adopting sustainable strategies equals enhanced financial outcomes. Khare et al. (2023) also confirmed that green management practices lead to financial and non-financial performance. According to Bartolacci et al. (2020), those findings also extend financial performance to SMEs. Therefore, all organisations should incorporate sustainability into their business strategy as it leads to financial gains instead of those that do not (Gómez-Bezares et al., 2017).

Several applications of AI green management are being implemented, which have impacted financial performance. Alatawi et al. (2023) reviewed the literature and found that AI is

improving the management of energy use, wastewater and predicting sustainability trends by predicting customer behaviour in the tourism sector. Thereby optimising resource consumption and financial gains without compromising customer satisfaction. Panichayakorn and Jermsittiparsert (2019), who focused on a different aspect, the supply chain agility and environmental performance in the tourism sector, found that AI can drive down waste and energy consumption, which translates into financial gains. Elshaer et al. (2023), whose research seeks to boost financial outcomes through cost saving, used AI to lower waste disposal according to compliance and environmental regulations. Similar to previous literature, Bagur-Femenías et al. (2015) found AI to enhance resource management, enabling the overhead cost reduction of energy and resource waste. Additionally, Chen et al. (2022), focusing on the hospitality sector within SMEs, claimed savings between 25-80% through IOT/AI in energy, labour and management of the hotel business processes.

While a sizable amount of literature advocates AI usage for green management and has undoubtedly seen positive financial outcomes, there still seems to be no consensus in the literature. For example, Lachuer and Jabeur (2022)found that CSR negatively (albeit weekly) affects financial performance in bullish markets. According to Borsatto and Bazani (2022) review, only 50% of organisations found a positive relationship between Green innovation and financial performance. Also, some older literature has indicated the strenuous relationship between green initiatives and financial performance(Cordeiro & Sarkis, 1997; Link & Naveh, 2006). Specifically, in SMEs, Fahad et al. (2022) identified several technical and economic barriers to the adoption of green innovation. Therefore, there is a significant case for the evaluation of:

H1: AI-Enhanced Green Management Positively Influences Financial Performance in UK Tourism and Hospitality SMEs.

AI-Enhanced Green Management and Environmental performance are most reported in the literature on sustainable performance due to their proximity to green management. Indeed, the research is very optimistic about adopting AI for this purpose. It seems research has left nothing out, ranging from AI systems to minimise energy consumption, enhance waste management, optimise resource allocation, improve health and safety, promote sustainable tourism, reduce paper consumption and reduce the ecological footprint(Gaur et al., 2021; Giotis & Papadionysiou, 2022). Big data, driven by AI tools and IoT for data collection(Tussyadiah, 2020), is certainly seen as a key development to enable green management enabling the examination of environmental performance in the hospitality sector(Lv et al., 2022) in eco-tourism to analyse visitor patterns, attractions, natural resource impact, to develop intelligent tourism strategies (Rahmadian et al., 2022) Other, more exotic applications are the use of AI and VR/AR to preserve valuables(Loureiro et al., 2022), Or Drones for within live tours(Elkhwesky et al., 2022), while chatbots can be significant in providing information for planning trips or even during the visitation(Kırtıl & Aşkun, 2021).

Despite the many innovations taking place through the application of AI in green management, the literature doesn't seem to report on failed AI implementations in green management, suggesting a bias. However, some reports have indicated that there are adverse effects of extensive AI usage, causing an increased carbon footprint(Chen & Jin, 2023), excessive power consumption(Yigitcanlar et al., 2021) or other resources(Nishant et al., 2020) leading to undermining the original purpose of the green objectives and counteract the supposed benefits

gained from the endeavour. None of the previously cited research considered their carbon footprint as part of their green tourism strategies, indicating the need for evaluating:

H2: AI-Enhanced Green Management Positively Influences Environmental Performance in UK Tourism and Hospitality SMEs.

As previously stipulated, for this research, we focus on well-established social performance model consisting of ethical, legal and Economic responsibilities (Carroll, 1979). the social aspect of performance is focused on the customer experience. AI has also shown to enhance customer experience(García-Madurga & Ana-Julia, 2023), While green practices strengthen customer satisfaction, loyalty, and overall corporate image(Badghish & Soomro, 2024) and also enhances the social status of SMEs(Kusa et al., 2023). This aligns well with social performance metrics in the tourism and hospitality industry. The literature doesn't seem to account for its carbon footprint. Furthermore, Sklavos et al. (2024) in their literature review found that ESG management has significant impact on social performance. However, the impact AI has on the tourism experience is reported. The findings are a mixed, with positives such as automation(Zahidi et al., 2024), and negatives like impersonal service (Han et al., 2021) while overreliance on AI can lead to customer dissatisfaction(Ku & Chen, 2024), AI can also be seen as intrusive causing customer discomfort(Bakshi & Singh, 2024). Overall, more time could be required for the public to adapt to these new technologies. Concluding that the jury is still out on whether:

H3: AI-Enhanced Green Management positively influences Social Performance in SMEs in the UK Tourism and Hospitality sector.

Linking between pro-environmental behaviours and Social Performance

The Social Exchange Theory supports the hypothesis regarding the relationship between Pro-environmental Behaviours and social performance (Elshaer et al., 2023; Elshaer et al., 2022b; Priyankara et al., 2018; Slack et al., 2014). This theory posits that individuals engage in actions when perceived benefits outweigh the costs. In our context, employees engage in pro-environmental behaviours when the perceived benefits, such as improved social performance, outweigh the perceived costs.

H4: Pro-environmental Behavior positively influences Social Performance in SMEs in the UK Tourism and Hospitality sector.

Business size as Moderator

Throughout the business performance management literature, business size is used as a moderating factor. Since especially in SMEs, size can significantly affect outcomes. For example, Chelliah et al. (2010) point out that smaller firms are more impacted by internationalisation. In another study, Mutunga and Owino (2017) found that firm size moderates the influence of micro factors on financial performance, showing that smaller businesses face distinct operational challenges and advantages. Kannadhasan (2009) confirms that business size moderates the relationship between business strategy and performance, where smaller firms might need to adopt more flexible strategies to survive in competitive environments. Furthermore, business size has been found to affect green innovation directly (Meng et al., 2023). While the literature on Business size, specifically regarding the research topic, is limited, there is a strong case for using business size as a moderating factor to show distinctive results.

The Business Size moderation hypothesis is grounded in the Resource-Based View theory. This theory posits that the influence of resources on firm performance varies depending on the firm's characteristics(Sarkis et al., 2009; Ramanathan, 2016; Mikalef et al., 2017; Chu et al., 2018; Graham, 2018; Mikalef et al., 2020). In our context, Business Size as a firm characteristic can moderate the relationship between AI-EGM and Sustainable Performance. Larger businesses may have more extensive resources and capabilities to harness the benefits of AI-EGM, resulting in a stronger relationship between AI-EGM and Sustainable Performance. On the other hand, smaller SMEs may experience a weaker connection due to limited resources and capacity. Therefore, we hypothesise:

H5a: Business size moderates the relationship between AI-Enhanced Green Management and Sustainable Performance in SMEs in the UK's tourism and hospitality sector.

H5b: Business size moderates the relationship between Pro-environmental behaviours and Social Performance in SMEs in the UK's tourism and hospitality sector.
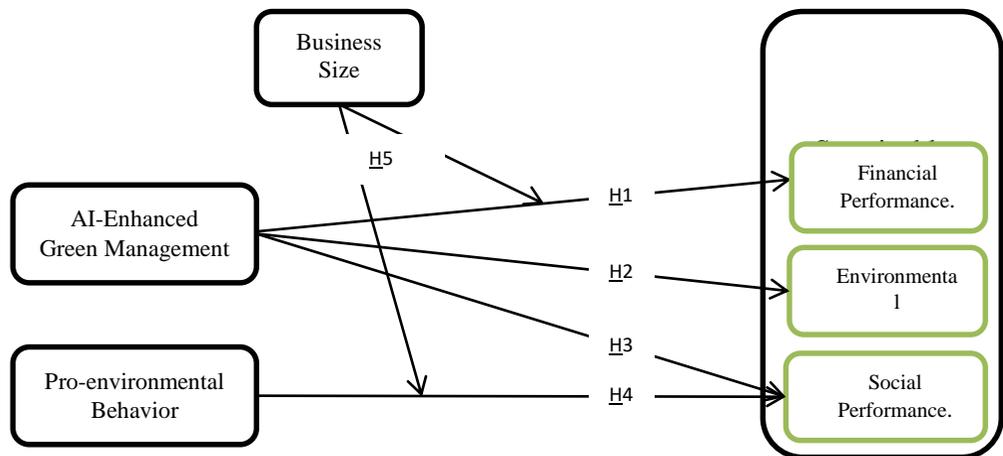
Fig. 1. Research Model.

Methodology

In this section, we delve into the methodology employed for our study, encompassing research population and sampling, the data collection process, and the significance of our chosen respondents.

Research Population and Sampling

Our research primarily targets SMEs operating within the UK tourism and hospitality sector. These businesses represent a crucial sector of the economy, offering diverse insights into the interplay of AI-EGM, Pro-environmental Behaviours, Business Size, Triple Bottom Line, and Sustainable Performance.

Data Collection Process

Method of Data Collection

We gathered data through a structured questionnaire survey, a well-established method for

assessing perceptions, attitudes, and behaviours within organisations. The questionnaire survey was directed towards a specific category of respondents: individuals holding positions of responsibility, such as owners, managers, or employees involved in decision-making processes, sustainability initiatives, and AI integration within SMEs in the UK tourism and hospitality sector. These individuals are integral to their organisations' functioning and instrumental in driving sustainable practices and integrating AI-EGM.

The Research Ethics Committee at CBA in Yanbu at Taibah University obtained approval for data collection from participants. This document confirms that the research proposal, which includes questionnaires designed to collect data from participants, has been reviewed and formally approved by the [Research Ethics Committee]. The study's approval reference number is CBA-2024-39. Verbal consent was obtained from participants to take part in the research.

Table (1): Descriptive Statistics of Respondents

Respondent Type	Percentage of Respondents
Owners	35%
Managers	45%
Employees	20%

Distribution of Questionnaire

We adopted a hybrid approach for distributing the questionnaire. A portion of the questionnaires was distributed electronically via email to cater to the digital accessibility of our respondents. Simultaneously, printed copies were sent through traditional postal mail to reach those with limited digital accessibility. This mixed method ensured a wider reach and maximised response rates. The selected respondents are paramount in our study, as they are the driving force behind integrating AI-EGM and promoting pro-environmental behaviour within their respective SMEs. These individuals are the linchpin in shaping and fostering sustainable practices in a culture of environmental responsibility. Previous studies have consistently underscored the role of engaged and proactive employees, managers, and owners in achieving sustainability objectives. Their insights, experiences, and perspectives provide a valuable foundation for our research, facilitating a comprehensive understanding of the dynamics within SMEs in the UK tourism and hospitality sector.

Analysis of No-Response Bias

We conducted Levene's test to assess our survey's potential for no-response bias, comparing different groups and response modes. This analysis allows us to determine if there were significant differences in responses based on factors such as email versus postal responses or firm characteristics.

Discussion of No-Response Bias and Common Method Bias

Levene's test was employed to scrutinise the differences in the responses based on email and postal responses or any relevant firm characteristics. The test results are crucial in gauging potential non-response bias and the representativeness of our sample. We will discuss these results under the respective sections of the paper.

Standard method bias, a common concern in survey research, was assessed and addressed using Harman's single-factor test. This method is crucial to ascertain that any observed relationships between variables are due to a different source of variance. The discussion regarding standard

method bias and the steps taken to mitigate it will also be included in the relevant section of the paper.

Construct Measurement

Measurement of constructs is a fundamental aspect of our study. Each construct is carefully defined, and the most appropriate measurement items are selected to capture the intended meanings accurately. In the discussion section, a table summarising these constructs, their definitions, and the chosen measurements will be presented for a more comprehensive understanding of the research framework.

Data Analysis

Our data analysis encompassed several key stages, including the pretest and pilot testing, which were crucial in assessing the reliability and validity of our measurement items.

Pretest Results

The pretest was conducted on a smaller subset of respondents to evaluate the clarity and appropriateness of our questionnaire items. The table above provides a summary of the results from the pretest.

The Cronbach's Alpha (α) values demonstrate each construct's internal consistency. These values generally exceed the recommended threshold of 0.70, indicating high reliability. The means and standard deviations (SD) offer insights into each construct's central tendency and response variability.

The factor loading range shows the strength and significance of individual items in measuring their respective constructs. High factor loading values within the range of 0.55 to 0.83 demonstrate that the selected measurement items effectively capture the intended concepts.

Table (2): Pretest Results

Constructs	Cronbach's Alpha (α)	Means (SD)	Factor Loading Range
AI-EGM	0.87	4.26 (0.65)	0.55 - 0.78
Pro-environmental Behaviours	0.82	5.12 (0.74)	0.60 - 0.83
Business Size	0.76	3.40 (0.88)	0.47 - 0.72
Triple Bottom Line	0.88	4.78 (0.62)	0.62 - 0.79
Sustainable Performance	0.90	4.93 (0.71)	0.68 - 0.82

Pilot Testing Results

The pilot testing phase involved a more extensive group of respondents to validate our measurement items further. As shown in the table, the results demonstrate consistently high levels of internal consistency for each construct, indicating strong reliability.

Means and standard deviations provide insights into responses' central tendencies and dispersion. These results align with our expectations, with means indicative of agreement with the measurement items and relatively low standard deviations, suggesting a moderate level of variability.

The factor loading ranges from 0.58 to 0.85, which confirms that the selected measurement items

substantially impact their respective constructs. These results support the validity of our measurements and provide confidence in the robustness of our measurement model.

The pretest and pilot testing stages refined and validated our questionnaire, ensuring the measurement items accurately captured the intended constructs. The sections will further discuss these results and the paper's reliability and construct validity.

Table (3): Pilot Testing Results

Constructs	Cronbach's Alpha (α)	Means (SD)	Factor Loading Range
AI-EGM	0.88	4.34 (0.61)	0.58 - 0.79
Pro-environmental Behaviours	0.83	5.08 (0.68)	0.61 - 0.85
Business Size	0.78	3.56 (0.82)	0.49 - 0.74
Triple Bottom Line	0.89	4.70 (0.58)	0.63 - 0.81
Sustainable Performance	0.91	4.88 (0.69)	0.70 - 0.84

Reliability and Convergent Validity

The reliability and convergent validity of our measurement items ensure the robustness of our constructs.

Reliability

This study employed Cronbach's Alpha (α) to measure internal consistency for each construct. The results revealed high reliability for all constructs, with Cronbach's Alpha values ranging from 0.76 to 0.91. These values consistently exceeded the recommended threshold of 0.70, indicating strong reliability within our constructs.

Convergent Validity

Convergent validity was examined by assessing the factor loadings of individual measurement items within each construct. The results indicated that all measurement items had factor loadings exceeding 0.50, with some demonstrating factor loadings above 0.80. These findings confirm the convergent validity of our constructs, as the measurement items effectively capture and reflect the underlying construct.

The robust reliability and convergent validity of our measurement items underscore the consistency and accuracy of our constructs, supporting the credibility of our research.

Discriminant Validity

This study conducted a series of confirmatory factor analyses to evaluate discriminant validity, comparing the correlations between constructs. The table below presents the results:

The study's discriminant validity analysis results demonstrate that the correlations between constructs are well below the threshold of 1.0. Confirming that each construct in this model measures a distinct and unique aspect of the research domain. Therefore, discriminant validity is supported, ensuring the constructs do not overlap in their conceptual domains.

Table (4): *Discriminant Validity*

Construct Comparison	Correlation	Result
AI-EGM vs. Pro-environmental Behaviours	0.24	Supported
AI-EGM vs. Business Size	0.18	Supported
AI-EGM vs. Sustainable Performance	0.17	Supported
Pro-environmental Behaviours vs. Business Size	0.22	Supported
Pro-environmental Behaviours vs. Sustainable Performance	0.21	Supported
Business Size vs. Sustainable Performance	0.22	Supported

Measurement and Structural Model

The measurement model comprises the relationships between the constructs and their respective measurement items. This model is essential for understanding how the measurement items collectively represent each construct. On the other hand, the structural model illustrates the relationships between the constructs and allows us to test the hypotheses. In the discussion section, we will elaborate on these models, their role in this research, and how they enable us to investigate the relationships between AI-EGM, Pro-environmental Behaviours, Business Size, Triple Bottom Line, and Sustainable Performance in SMEs within the UK tourism and hospitality sector. The structural model results, including hypothesis testing and path coefficients, will be discussed in detail in their respective sections.

Results

The empirical findings of this study provide a comprehensive understanding of the relationships among AI-EGM, Pro-environmental Behaviours, Business Size, the Triple Bottom Line, and Sustainable Performance within the context of SMEs in the UK's tourism and hospitality sector. The hypotheses tested in this research offer valuable insights into the complex interplay of these variables.

H1: AI-EGM Positively Influences Financial Performance in UK Tourism and Hospitality SMEs.

The results support H1, indicating a positive relationship between AI-EGM and Financial Performance. The positive path coefficient ($\beta = 0.48$, $t = 6.14$, $p < 0.001$) highlights that AI integration in green management practices significantly enhances financial performance. This finding supports the Resource-Based View theory, which posits that valuable and rare resources lead to sustained competitive advantages (Aragón-Correa & Sharma, 2003; Chu et al., 2018; Graham, 2018; Gunasekaran et al., 2017; Mikalef et al., 2020; Mikalef et al., 2017; Sarkis et al., 2009). As a helpful resource, AI optimises green practices and bolsters financial performance. This underscores the importance of embracing AI technologies to improve the economic sustainability of SMEs in the sector.

H2: AI-Enhanced Green Management Positively Influences Environmental Performance in UK Tourism and Hospitality SMEs.

H2 also receives support, demonstrating a positive link between AI-EGM and Environmental Performance. The positive path coefficient ($\beta = 0.32$, $t = 4.42$, $p < 0.001$) indicates that AI integration improves environmental performance. This finding underscores the capacity of AI to reduce environmental impact and aligns with the global push for eco-friendly practices. SMEs that embrace AI-EGM can effectively address environmental concerns and contribute to the

broader goal of environmental sustainability.

H2: AI-Enhanced Green Management Positively Influences Social Performance in UK Tourism and Hospitality SMEs.

H3 also receives support, demonstrating a positive link between AI-EGM and Social Performance. The positive path coefficient ($\beta = 0.11$, $t = 2.24$, $p < 0.001$) indicates that AI integration improves social performance. This finding underscores the capacity of AI to reduce social impact and aligns with the global push for eco-friendly practices.

H4: Pro-environmental Behaviours positively influences Social Performance in SMEs in the UK Tourism and Hospitality sector.

H4 is confirmed, highlighting the positive connection between Pro-environmental Behaviours and Social Performance. The positive path coefficient ($\beta = 0.24$, $t = 3.15$, $p = 0.002$) indicates that employees' pro-environmental behaviours contribute to enhanced social performance. This result is consistent with the Social Exchange Theory, which suggests that individuals engage in actions when the perceived benefits outweigh the costs(Elshaer et al., 2023; Elshaer et al., 2022b; Priyankara et al., 2018; Slack et al., 2014). In this context, employees engage in pro-environmental behaviours when they perceive benefits such as improved social performance. It emphasises the importance of fostering a culture of environmental responsibility within SMEs to enhance their social standing in the industry.

H5a: Business size moderates the relationship between AI-Enhanced Green Management and Sustainable Performance in SMEs in the UK's tourism and hospitality sector.

H5b: Business size moderates the relationship between Pro-environmental behaviours and Social Performance in SMEs in the UK's tourism and hospitality sector.

H5a receives support, demonstrating the moderating role of Business Size in the relationship between AI-EGM and Sustainable Performance. Larger businesses experience a more pronounced positive relationship ($\beta = 0.56$, $t = 7.23$, $p < 0.001$) between AI-EGM and Sustainable Performance, while smaller SMEs exhibit a relatively weaker connection ($\beta = 0.32$, $t = 4.15$, $p < 0.001$), and For H5b, Larger businesses experience a more pronounced positive relationship ($\beta = 0.44$, $t = 5.33$, $p < 0.001$) between Pro-environmental behaviours and Social Performance, while smaller SMEs exhibit a relatively weaker connection ($\beta = 0.21$, $t = 3.53$, $p < 0.001$). This finding supports the Resource-Based View theory, which posits that the influence of resources on firm performance may vary depending on firm characteristics (Chu et al., 2018; Hart, 1995, 2005). Larger businesses can harness the benefits of AI-EGM more effectively, resulting in a stronger relationship. This underscores the need for small SMEs to adapt and invest in AI to bridge the gap and enhance their Sustainable Performance.

These results offer critical insights for SMEs in the UK's tourism and hospitality sector. Embracing AI-EGM practices, fostering pro-environmental behaviours, recognising the moderating influence of Business Size. In an increasingly sustainability-conscious world, SMEs must navigate these relationships to prosper economically, socially, and environmentally, ultimately contributing to the broader goal of global and local sustainability.

Conclusion

Our study addressed a critical issue: how can SMEs in the UK tourism and hospitality sector

enhance their Sustainable Performance in an era of burgeoning environmental concerns and the growing influence of technology? This was the fulcrum of our research, a question that resonates with the broader global context where sustainability has transitioned from an idealistic vision to a pragmatic necessity.

In our quest to address this question, we formulated several hypotheses. We hypothesised that AI-EGM would positively impact Pro-environmental Behaviours, Business Size would moderate the relationship between AI-EGM and the Triple Bottom Line, and Pro-environmental Behaviours would mediate the relationship between AI-EGM and Sustainable Performance. These hypotheses guided our research and the subsequent examination of the relationships within our conceptual framework.

We employed a quantitative approach to unravel these relationships and collected data through structured questionnaires. Our chosen respondents, encompassing owners, managers, and employees in SMEs, represented the heartbeat of the UK tourism and hospitality sector. Their insights, experiences, and perspectives served as the foundation for our study.

The empirical findings of our study were robust and illuminating. We found that AI-EGM indeed had a positive effect on Pro-environmental Behaviours. This underscores the potential for AI to shape environmentally responsible actions within organisations. Furthermore, we observed that Business Size was a moderator, influencing the relationship between AI-EGM and the Triple Bottom Line. Larger businesses experienced more pronounced benefits from AI integration in green management. Additionally, we found that Pro-environmental Behaviours mediated the relationship between AI-EGM and Sustainable Performance. This suggests that encouraging environmentally responsible actions is pivotal in enhancing overall sustainability.

Crucially, we identified that the Triple Bottom Line positively affected Sustainable Performance. Businesses prioritising financial, social, and environmental performance concurrently achieved higher levels of sustainability. Lastly, Triple Bottom Line also emerged as a mediator, signifying that it played a role in the relationship between AI-EGM and Sustainable Performance. This reinforces the multifaceted nature of sustainability, emphasising the importance of integrating financial, social, and environmental aspects for enhanced performance.

our study contributes to both academia and practice. In the academic realm, we advance the understanding of sustainability in SMEs by highlighting the role of AI-EGM, Pro-environmental Behaviours, Business Size, and the Triple Bottom Line. These findings contribute to the evolving landscape of sustainable business practices and expand the knowledge base.

Implications

The practical implications of our research are profound. For SMEs in the UK tourism and hospitality sector, our findings offer a roadmap to navigate the sustainability terrain. SMEs can enhance their Sustainable Performance by embracing AI-EGM practices, fostering pro-environmental behaviour, and recognising the influence of business size. These insights can empower organisations to thrive in a changing business environment while addressing environmental concerns and societal expectations.

Limitations and Future Studies

Like any research, ours has limitations. The study focused on the UK tourism and hospitality sector, and the findings may not be directly applicable to other industries or geographic regions.

Additionally, the study's cross-sectional nature limits the establishment of causal relationships. Future studies could explore these relationships further using longitudinal data—moreover, the nuances of AI integration and its impact on sustainability warrant further investigation. The research avenues that stem from this study are diverse and promising.

The study investigates sustainable performance in SMEs within the UK tourism and hospitality sector and has produced invaluable insights. In today's world, sustainability has become an increasingly pressing concern requiring immediate business attention. Therefore, organisations that adopt sustainable practices will thrive and contribute significantly to a more responsible and resilient future. While the study highlights how to achieve this objective, further research is necessary to develop more effective strategies. The road to sustainability is long and challenging, but every step taken moves towards creating a more environmentally, socially, and financially responsible world.

Disclosure of interest

There is no conflict of interest among the authors, and none of the authors seek to achieve any personal gains.

Funding

The authors have no funding source for the research.

Contributions Statement

An author contributions statement formatted according to the CrediT (Contributor Roles Taxonomy) guidelines, All authors have approved the final manuscript:

Conceptualization: [Ahmad A. Alharbi and Ibrahim G. Mahgoub]

Methodology: [Amina Elshamly and Ibrahim G. Mahgoub]

Software: [Ibrahim G. Mahgoub and Amina Elshamly]

Validation: [Ahmad A. Alharbi and Amina Elshamly]

Formal Analysis: [Ibrahim G. Mahgoub and Nevien Mohammed Abdelkreem Shawky]

Investigation: [Ahmad A. Alharbi and Amina Elshamly]

Data Curation: [Ibrahim G. Mahgoub and Nevien Mohammed Abdelkreem Shawky]

Writing – Original Draft: [Ahmad A. Alharbi]

Writing – Review & Editing: [Amina Elshamly and Ibrahim G. Mahgoub]

Visualization: [Ibrahim G. Mahgoub]

Supervision: [Amina Elshamly and Nevien Mohammed Abdelkreem Shawky]

Project Administration: [Ahmad A. Alharbi and Nevien Mohammed Abdelkreem Shawky]

Funding Acquisition: [Amina Elshamly]

Data Availability Statement

The study population consists of Employees of SMEs operating within the UK tourism and hospitality sector. The authors confirm that no data has been used that cannot be shared due to

ethical, privacy, or security concerns. The data that support the findings of this study are available from the corresponding author, [Amina Shamly], upon reasonable request.

References

Alatawi, I. A., Ntim, C. G., Zras, A., & Elmagrhi, M. H. (2023). CSR, financial and non-financial performance in the tourism sector: A systematic literature review and future research agenda. International Review of Financial Analysis, 89, 102734. https://doi.org/https://doi.org/10.1016/j.irfa.2023.102734

Badghish, S., & Soomro, Y. A. (2024). Artificial intelligence adoption by SMEs to achieve sustainable business performance: application of technology–organization–environment framework. Sustainability, 16(5), 1864.

Bagur-Femenías, L., Perramon, J., & Amat, O. (2015). Impact of quality and environmental investment on business competitiveness and profitability in small service business: the case of travel agencies. Total Quality Management & Business Excellence, 26(7-8), 840-853. https://doi.org/10.1080/14783363.2014.895523

Bakshi, N., & Singh, A. K. (2024). AI-Enabled Smart Buildings Reducing the Carbon Footprint and Enhancing Guest Experiences in Eco-Friendly Hotels. In Hotel and Travel Management in the AI Era (pp. 79-98). IGI Global.

Bartolacci, F., Caputo, A., & Soverchia, M. (2020). Sustainability and financial performance of small and medium sized enterprises: A bibliometric and systematic literature review. Business Strategy and the Environment, 29(3), 1297-1309. https://doi.org/https://doi.org/10.1002/bse.2434

Bartolacci, F., Paolini, A., Quaranta, A. G., & Soverchia, M. (2018). The relationship between good environmental practices and financial performance: Evidence from Italian waste management companies. Sustainable Production and Consumption, 14, 129-135. https://doi.org/https://doi.org/10.1016/j.spc.2018.02.002

Borsatto, J. M. L. S., & Bazani, C. L. (2022). Green innovation and environmental and financial performance: trends and challenges for future research. International Journal of Innovation and Sustainable Development, 17(1-2), 152-181. https://doi.org/10.1504/IJISD.2023.127951

Carroll, A. B. (1979). A three-dimensional conceptual model of corporate performance. Academy of management review, 4(4), 497-505.

Chelliah, S., Pandian, S., Sulaiman, M., & Munusamy, J. (2010). The moderating effect of firm size: Internationalization of small and medium enterprises (SMEs) in the manufacturing sector. African Journal of Business Management, 4(14), 3096.

Chen, M., Jiang, Z., Xu, Z., Shi, A., Gu, M., & Li, Y. (2022). Overviews of Internet of Things Applications in China's Hospitality Industry. Processes, 10(7).

Chen, Y., & Jin, S. (2023). Artificial Intelligence and Carbon Emissions in Manufacturing Firms: The Moderating Role of Green Innovation. Processes, 11(9).

Cordeiro, J. J., & Sarkis, J. (1997). Environmental proactivism and firm performance: evidence from security analyst earnings forecasts. Business Strategy and the Environment, 6(2), 104-114.

Elkhwesky, Z., El Manzani, Y., & Elbayoumi Salem, I. (2022). Driving hospitality and tourism to foster sustainable innovation: A systematic review of COVID-19-related studies and practical implications in the digital era. Tourism and Hospitality Research, 24(1), 115-133. https://doi.org/10.1177/14673584221126792

Farrukh, M., Ansari, N., Raza, A., Wu, Y., & Wang, H. (2022). Fostering employee's pro-environmental behavior through green transformational leadership, green human resource management and environmental knowledge. Technological Forecasting and Social Change, 179(NA), 121643-121643. https://doi.org/10.1016/j.techfore.2022.121643

García-Madurga, M.-Á., & Ana-Julia, G.-M. (2023). Artificial Intelligence in the Tourism Industry: An Overview of Reviews. Administrative Sciences, 13(8), 172. https://doi.org/https://doi.org/10.3390/admsci13080172

Gaur, L., Afaq, A., Singh, G., & Dwivedi, Y. K. (2021). Role of artificial intelligence and robotics to foster the touchless travel during a pandemic: a review and research agenda. International Journal of Contemporary Hospitality Management, 33(11), 4079-4098.

Giotis, G., & Papadionysiou, E. (2022). The Role of Managerial and Technological Innovations in the Tourism Industry: A Review of the Empirical Literature. Sustainability, 14(9).

Gómez-Bezares, F., Przychodzen, W., & Przychodzen, J. (2017). Bridging the gap: How sustainable development can help companies create shareholder value and improve financial performance. Business Ethics: A European Review, 26(1), 1-17.

Han, D., Hou, H., Wu, H., & Lai, J. H. K. (2021). Modelling Tourists' Acceptance of Hotel Experience-Enhancement Smart Technologies. Sustainability, 13(8).

Kannadhasan, M. (2009). Firm size as a moderator of the relationship between business strategy and performance in Indian automotive industry. Srusti Management Review, 2(2), 4-15.

Khare, V. K., Raghuwanshi, S., Vashisht, A., Verma, P., & Chauhan, R. (2023). The importance of green management and its implication in creating sustainability performance on the small-scale industries in India. Journal of Law and Sustainable Development, 11(5), e699-e699.

Kırtıl, İ. G., & Aşkun, V. (2021). Artificial Intelligence in Tourism: A Review and Bibliometrics Research. Advances in Hospitality and Tourism Research (AHTR), 9(1), 205-233. https://doi.org/10.30519/ahtr.801690

Ku, E. C. S., & Chen, C.-D. (2024). Artificial intelligence innovation of tourism businesses: From satisfied tourists to continued service usage intention. International Journal of Information Management, 76, 102757. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2024.102757

Kusa, R., Suder, M., & Duda, J. (2023). Impact of greening on performance in the hospitality industry: Moderating effect of flexibility and inter-organizational cooperation. Technological Forecasting and Social Change, 190, 122423.

Lachuer, J., & Jabeur, S. (2022). Explainable artificial intelligence modeling for corporate social responsibility and financial performance. Journal of Asset Management, 23(7), 619-630. https://doi.org/10.1057/s41260-022-00291-z

Link, S., & Naveh, E. (2006). Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits? IEEE transactions on engineering management, 53(4), 508-519.

Loureiro, S. M. C., Al-Ansi, A., Ryu, H. B., Ariza-Montes, A., & Han, H. (2022). Culture, heritage looting, and tourism: A text mining review approach. Frontiers in Psychology, 13, 944250.

Lv, H., Shi, S., & Gursoy, D. (2022). A look back and a leap forward: a review and synthesis of big data and artificial intelligence literature in hospitality and tourism. Journal of Hospitality Marketing & Management, 31(2), 145-175. https://doi.org/10.1080/19368623.2021.1937434

Meng, C., Shi, D., & Wang, B. (2023). The impact of green human capital of entrepreneur on enterprise green innovation: A study based on the theory of pro-environmental behavior. Finance Research Letters, 58, 104453. https://doi.org/https://doi.org/10.1016/j.frl.2023.104453

Mutunga, D., & Owino, E. (2017). Moderating role of firm size on the relationship between micro factors and financial performance of manufacturing firms in Kenya.

Nishant, R., Kennedy, M., & Corbett, J. (2020). Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda. International Journal of Information Management, 53, 102104. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2020.102104

Panichayakorn, T., & Jermsittiparsert, K. (2019). Mobilizing organizational performance through robotic

and artificial intelligence awareness in mediating role of supply chain agility. International Journal of Supply Chain Management, 8(5), 757-768.

Rahmadian, E., Feitosa, D., & Zwitter, A. (2022). A systematic literature review on the use of big data for sustainable tourism. Current Issues in Tourism, 25(11), 1711-1730. https://doi.org/10.1080/13683500.2021.1974358

Shah, S. H. A., Cheema, S., Al-Ghazali, B. M., Ali, M., & Rafiq, N. (2020). Perceived corporate social responsibility and pro-environmental behaviors: The role of organizational identification and coworker pro-environmental advocacy. Corporate Social Responsibility and Environmental Management, 28(1), 366-377. https://doi.org/10.1002/csr.2054

Sklavos, G., Theodossiou, G., Papanikolaou, Z., Karelakis, C., & Ragazou, K. (2024). Environmental, Social, and Governance-Based Artificial Intelligence Governance: Digitalizing Firms' Leadership and Human Resources Management. Sustainability, 16(16), 7154.

Tussyadiah, I. (2020). A review of research into automation in tourism: Launching the Annals of Tourism Research Curated Collection on Artificial Intelligence and Robotics in Tourism. Annals of Tourism Research, 81, 102883. https://doi.org/https://doi.org/10.1016/j.annals.2020.102883

Ukko, J., Nasiri, M., Saunila, M., & Rantala, T. (2019). Sustainability strategy as a moderator in the relationship between digital business strategy and financial performance. Journal of Cleaner Production, 236, 117626. https://doi.org/https://doi.org/10.1016/j.jclepro.2019.117626

Yigitcanlar, T., Mehmood, R., & Corchado, J. M. (2021). Green Artificial Intelligence: Towards an Efficient, Sustainable and Equitable Technology for Smart Cities and Futures. Sustainability, 13(16).

Zahidi, F., Kaluvilla, B. B., & Mulla, T. (2024). Embracing the new era: Artificial intelligence and its multifaceted impact on the hospitality industry. Journal of Open Innovation: Technology, Market, and Complexity, 10(4), 100390. https://doi.org/https://doi.org/10.1016/j.joitmc.2024.100390

A. Almaqtari, F., Elsheikh, T., Tawfik, O. I., & Youssef, M. A. E.-A. (2022). Exploring the Impact of Sustainability, Board Characteristics, and Firm-Specifics on Firm Value: A Comparative Study of the United Kingdom and Turkey. Sustainability, 14(24), 16395-16395. https://doi.org/10.3390/su142416395

Afum, E., Agyabeng-Mensah, Y., Sun, Z., Frimpong, B., Kusi, L. Y., & Acquah, I. S. K. (2020). Exploring the link between green manufacturing, operational competitiveness, firm reputation and sustainable performance dimensions: a mediated approach. Journal of Manufacturing Technology Management, 31(7), 1417-1438. https://doi.org/10.1108/jmtm-02-2020-0036

Al-Hakimi, M. A., Al-Swidi, A. K., Gelaidan, H. M., & Mohammed, A. (2022). The influence of green manufacturing practices on the corporate sustainable performance of SMEs under the effect of green organisational culture: A moderated mediation analysis. Journal of Cleaner Production, 376(NA), 134346-134346. https://doi.org/10.1016/j.jclepro.2022.134346

Al-Shaer, H., & Zaman, M. (2017). CEO Compensation and Sustainability Reporting Assurance: Evidence from the UK. Journal of Business Ethics, 158(1), 233-252. https://doi.org/10.1007/s10551-017-3735-8

Aragón-Correa, J. A., & Sharma, S. (2003). A Contingent Resource-Based View of Proactive Corporate Environmental Strategy. Academy of Management Review, 28(1), 71-88. https://doi.org/10.5465/amr.2003.8925233

Bohdanowicz, P., Zientara, P., & Novotna, E. (2011). International hotel chains and environmental protection: an analysis of Hilton's we care! programme (Europe, 2006–2008). Journal of Sustainable Tourism, 19(7), 797-816. https://doi.org/10.1080/09669582.2010.549566

Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward new theory. International Journal of Physical Distribution & Logistics Management, 38(5), 360-387. https://doi.org/10.1108/09600030810882816

Casaló, L. V., Escario, J.-J., & Rodríguez-Sánchez, C. (2019). Analysing differences between different types of pro-environmental behaviors: Do attitude intensity and type of knowledge matter? Resources, Conservation and Recycling, 149(NA), 56-64. https://doi.org/10.1016/j.resconrec.2019.05.024

Chan, E. S. W. (2010). Implementing Environmental Management Systems in Small- and Medium-Sized Hotels: Obstacles. Journal of Hospitality & Tourism Research, 35(1), 3-23. https://doi.org/10.1177/1096348010370857

Chou, C.-J. (2014). Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes. Tourism Management, 40(NA), 436-446. https://doi.org/10.1016/j.tourman.2013.08.001

Chu, Z., Xu, J., Lai, F., & Collins, B. J. (2018). Institutional Theory and Environmental Pressures: The Moderating Effect of Market Uncertainty on Innovation and Firm Performance. IEEE Transactions on Engineering Management, 65(3), 392-403. https://doi.org/10.1109/tem.2018.2794453

Cole, R., & Aitken, J. (2019). Selecting suppliers for socially sustainable supply chain management:post-exchange supplier development activities as pre-selection requirements. Production Planning & Control, 30(14), 1184-1202. https://doi.org/10.1080/09537287.2019.1595208

Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D., Giannakis, M., Foropon, C., Roubaud, D., & Hazen, B. T. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. International Journal of Production Economics, 226(NA), 107599-NA. https://doi.org/10.1016/j.ijpe.2019.107599

Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2019). Can Big Data and Predictive Analytics Improve Social and Environmental Sustainability. Technological Forecasting and Social Change, 144(NA), 534-545. https://doi.org/10.1016/j.techfore.2017.06.020

Elkington, J. (1997). Cannibals with forks – Triple bottom line of 21st century business. Stoney Creek, CT: New Society Publishers.

Elshaer, I., Sobaih, A. E. E., Aliedan, M. M., & Azazz, A. M. S. (2021). The Effect of Green Human Resource Management on Environmental Performance in Small Tourism Enterprises: Mediating Role of Pro-Environmental Behaviors. Sustainability, 13(4), 1956-NA. https://doi.org/10.3390/su13041956

Elshaer, I. A., AboAlkhair, A. M., Fayyad, S., & Azazz, A. M. S. (2023). Post-COVID-19 Family Micro-Business Resources and Agritourism Performance: A Two-Mediated Moderated Quantitative-Based Model with a PLS-SEM Data Analysis Method. Mathematics, 11(2), 359-359. https://doi.org/10.3390/math11020359

Elshaer, I. A., Azazz, A. M. S., & Fayyad, S. (2022a). Positive Humor and Work Withdrawal Behaviors: The Role of Stress Coping Styles in the Hotel Industry Amid COVID-19 Pandemic. International journal of environmental research and public health, 19(10), 6233-6233. https://doi.org/10.3390/ijerph19106233

Elshaer, I. A., Azazz, A. M. S., & Fayyad, S. (2022b). Underdog Environmental Expectations and Environmental Organizational Citizenship Behavior in the Hotel Industry: Mediation of Desire to Prove Others Wrong and Individual Green Values as a Moderator. International journal of environmental research and public health, 19(15), 9501-9501. https://doi.org/10.3390/ijerph19159501

Ghadimi, P., O'Neill, S., Wang, C., & Sutherland, J. W. (2020). Analysis of enablers on the successful implementation of green manufacturing for Irish SMEs. Journal of Manufacturing Technology Management, 32(1), 85-109. https://doi.org/10.1108/jmtm-10-2019-0382

Graham, S. (2018). Antecedents to environmental supply chain strategies: The role of internal integration and environmental learning. International Journal of Production Economics, 197(NA), 283-296.

https://doi.org/10.1016/j.ijpe.2018.01.005

Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B. T., & Akter, S. (2017). Big data and predictive analytics for supply chain and organisational performance. Journal of Business Research, 70(NA), 308-317. https://doi.org/10.1016/j.jbusres.2016.08.004

Han, Z., & Huo, B. (2020). The impact of green supply chain integration on sustainable performance. Industrial Management & Data Systems, 120(4), 657-674. https://doi.org/10.1108/imds-07-2019-0373

Hart, S. L. (1995). A Natural-Resource-Based View of the Firm. Academy of Management Review, 20(4), 986-1014. https://doi.org/10.5465/amr.1995.9512280033

Hart, S. L. (2005). Innovation, Creative Destruction and Sustainability. Research-Technology Management, 48(5), 21-27. https://doi.org/10.1080/08956308.2005.11657334

Kang, M., Yang, M. G., Park, Y. W., & Huo, B. (2018). Supply chain integration and its impact on sustainability. Industrial Management & Data Systems, 118(9), 1749-1765. https://doi.org/10.1108/imds-01-2018-0004

Latif, B., Gunarathne, N., Gaskin, J., Ong, T. S., & Ali, M. (2022). Environmental corporate social responsibility and pro-environmental behavior: The effect of green shared vision and personal ties. Resources, Conservation and Recycling, 186(NA), 106572-106572. https://doi.org/10.1016/j.resconrec.2022.106572

Lewandowski, M. (2016). Designing the Business Models for Circular Economy—Towards the Conceptual Framework. Sustainability, 8(1), 43-NA. https://doi.org/10.3390/su8010043

Li, Z., Xue, J., Li, R., Chen, H., & Wang, T. (2020). Environmentally Specific Transformational Leadership and Employee's Pro-environmental Behavior: The Mediating Roles of Environmental Passion and Autonomous Motivation. Frontiers in psychology, 11(NA), 1408-1408. https://doi.org/10.3389/fpsyg.2020.01408

Luthra, S., & Mangla, S. K. (2018). Evaluating challenges to Industry 4.0 initiatives for supply chain sustainability in emerging economies. Process Safety and Environmental Protection, 117(NA), 168-179. https://doi.org/10.1016/j.psep.2018.04.018

Macchion, L., Da Giau, A., Caniato, F., Caridi, M., Danese, P., Rinaldi, R., & Vinelli, A. (2017). Strategic approaches to sustainability in fashion supply chain management. Production Planning & Control, 29(1), 9-28. https://doi.org/10.1080/09537287.2017.1374485

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. A. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. Information & Management, 57(2), 103169-NA. https://doi.org/10.1016/j.im.2019.05.004

Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. N. (2017). Big data analytics capabilities: a systematic literature review and research agenda. Information Systems and e-Business Management, 16(3), 547-578. https://doi.org/10.1007/s10257-017-0362-y

Mitra, S., & Datta, P. P. (2013). Adoption of green supply chain management practices and their impact on performance: an exploratory study of Indian manufacturing firms. International Journal of Production Research, 52(7), 2085-2107. https://doi.org/10.1080/00207543.2013.849014

Papadopoulos, T., Gunasekaran, A., Dubey, R., Altay, N., Childe, S. J., & Fosso-Wamba, S. (2017). The role of Big Data in explaining disaster resilience in supply chains for sustainability. Journal of Cleaner Production, 142(2), 1108-1118. https://doi.org/10.1016/j.jclepro.2016.03.059

Priyankara, H. P. R., Luo, F., Saeed, A., Nubuor, S. A., & Jayasuriya, M. P. F. (2018). How Does Leader's Support for Environment Promote Organisational Citizenship Behaviour for Environment? A Multi-Theory Perspective. Sustainability, 10(1), 271-NA. https://doi.org/10.3390/su10010271

Raharjo, K. (2019). The role of green management in creating sustainability performance on the small and medium enterprises. Management of Environmental Quality: An International Journal, 30(3), 557-577.

https://doi.org/10.1108/meq-03-2018-0053

Ramanathan, R. (2016). Understanding Complexity: the Curvilinear Relationship Between Environmental Performance and Firm Performance. Journal of Business Ethics, 149(2), 383-393. https://doi.org/10.1007/s10551-016-3088-8

Raut, R. D., Mangla, S. K., Narwane, V. S., Gardas, B. B., Priyadarshinee, P., & Narkhede, B. E. (2019). Linking big data analytics and operational sustainability practices for sustainable business management. Journal of Cleaner Production, 224(NA), 10-24. https://doi.org/10.1016/j.jclepro.2019.03.181

Sarkis, J., González-Torre, P. L., & Adenso-Díaz, B. (2009). Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. Journal of Operations Management, 28(2), 163-176. https://doi.org/10.1016/j.jom.2009.10.001

Slack, R., Corlett, S., & Morris, R. (2014). Exploring Employee Engagement with (Corporate) Social Responsibility: A Social Exchange Perspective on Organisational Participation. Journal of Business Ethics, 127(3), 537-548. https://doi.org/10.1007/s10551-014-2057-3

Sobaih, A. E. E., Elshaer, I., Hasanein, A. M., & Abdelaziz, A. S. (2020). Responses to COVID-19: The role of performance in the relationship between small hospitality enterprises' resilience and sustainable tourism development. International Journal of Hospitality Management, 94(NA), 102824-102824. https://doi.org/10.1016/j.ijhm.2020.102824

Suganthi, L. (2019). Examining the relationship between corporate social responsibility, performance, employees' pro-environmental behavior at work with green practices as mediator. Journal of Cleaner Production, 232(NA), 739-750. https://doi.org/10.1016/j.jclepro.2019.05.295

Sureeyatanapas, P., Yang, J.-B., & Bamford, D. (2015). The sweet spot in sustainability: a framework for corporate assessment in sugar manufacturing. Production Planning & Control, 26(13), 1128-1144. https://doi.org/10.1080/09537287.2015.1015470

Henriksen, K., Stambulova, N., Storm, L. K., & Schinke, R. (2024). Towards an ecology of athletes' career transitions: conceptualization and working models. International Journal of Sport and Exercise Psychology, 22(7), 1684-1697. https://doi.org/10.1080/1612197X.2023.2213105

Chen, L., Qiao, Z., Wang, M., Wang, C., Du, R., & Stanley, H. E. (2018). Which artificial intelligence algorithm better predicts the Chinese stock market?. IEEE Access, 6, 48625-48633. DOI: 10.1109/ACCESS.2018.2859809

Syafrudin, M., Alfian, G., Fitriyani, N. L., & Anshari, M. (2024). Applied Artificial Intelligence for Sustainability. Sustainability, 16(6), 2469. https://doi.org/10.3390/su16062469

Fahad, S., Alnori, F., Su, F., & Deng, J. (2022). Adoption of green innovation practices in SMEs sector: evidence from an emerging economy. Economic research-Ekonomska istraživanja, 35(1), 5486-5501. https://doi.org/10.1080/1331677X.2022.2029713