INTERNATIONAL JOURNAL OF
SCIENCE ARTS AND COMMERCE

MODERATING ROLE OF HOTEL CHARACTERISTICS IN DIGITAL TRANSFORMATION: EVIDENCE FROM STAR-RATED HOTELS IN ELDORET AND KISUMU CITIES, KENYA

Bernard Gichana Ombati[1], Rita Nthiga[2] and Geoffrey Koome[3]

[123]School of Tourism, Hospitality and Events Management, Moi University, P.O. Box 3900–30100, Eldoret, Kenya.

Abstract

As digital transformation becomes a strategic approach, it is emerging as a route by which hotels can enhance their efficiency, service and sustainability. The advantages of digital transformation, however, are not equal among hotels as the resources, management support, organizational culture, staff expertise and operational structures vary from organization to organization. The study investigated the moderating effect of the hotel characteristics on the relationship between four dimensions of digital technology adoption and hotel sustainability for the star rated hotels in Eldoret and Kisumu cities in Kenya. Guest-Facing Technology Adoption (GFTA), Operations Technology Adoption (OTA), Data Analytics Solutions Adoption (DASA), and Integrated Digital Platform Adoption (IDPA) were the dimensions. The concepts that guided the study were the Technology–Organization–Environment (TOE) framework, the Technology Acceptance Model (TAM), the Triple Bottom Line (TBL) framework and the Organizational Resilience Theory. A positivist philosophy and cross sectional quantitative survey approach were used. A total of 27 star rated hotels were identified, out of which five middle level managers were identified from; Front Office, Reservations, Guest Relations, ICT and Finance in each hotel, that amounted to 135 respondents. Of this, 119 usable questionnaires were returned, for an 88.1% return. Descriptive statistics, Pearson correlation, Hayes PROCESS Model 1 Multiple Regression were used to analyse data. The moderation results showed statistically significant interaction effects for GFTA × hotel characteristics ($\beta = -0.0360$, $\Delta R^2 = .0419$, $p < .001$), OTA × hotel characteristics ($\beta = -0.0427$, $\Delta R^2 = .0803$, $p < .001$), DASA × hotel characteristics ($\beta = -0.0291$, $\Delta R^2 = .0372$, $p = .0001$), and IDPA × hotel characteristics ($\beta = -0.0151$, $\Delta R^2 = .0121$, $p = .0225$). The operations technology showed the highest moderation effect and integrated digital platforms showed the lowest. Conditional-effects analysis also revealed that, the greater the improvement in hotel characteristics, the more influential GFTA and OTA became, with the same direction of effect for DASA and IDPA, but not at conventional significance levels at all levels of moderation. The research findings suggest that digital

transformation is not simply a technology purchasing project, but a business capability that should be considered in the context where it's being implemented. Hotel technology investments should therefore be accompanied by management commitment, financial and technological resources, digital competence, innovation-oriented culture and supportive operational structures. The findings add empirical evidence from emerging urban tourism destinations in Kenya while building on technology-sustainability scholarship as they illustrate the significance of the hotel characteristics as boundary conditions of the outcomes of digital transformation.

Keywords: digital transformation, hotel characteristics, hotel sustainability, digital technology adoption, moderation, star-rated hotels, Kenya

1. Introduction

Hospitality is going through a significant digital transformation as hotels have to deal with the expectations of guests, the pressure of sustainability, competitive expectations and the need for resilience at the operational level. In addition to guest-facing applications and digital payment systems, digital technologies are now being used in the field of automated operational systems, data analytics, Internet of Things applications and integrated digital ecosystems. These technologies can decrease paper-based processes, optimize resource utilization, help manage energy and water, personalize services, enable evidence-based decision making and boost organizational coordination in the hospitality industry. Digital transformation is now widely seen as a strategic and organizational process, not just the installation of single information technologies (Verhoef et al., 2021; Sigala, 2023).

Sustainability is now as important as competitiveness and long term viability of hotels. Hotels are "resource intensive" facilities that consume a considerable amount of energy and water, generate food and solid waste, employ many staff and have a high dependence on neighbourhoods and supply chains. Sustainable hotel management therefore calls for the simultaneous care of the environment, economic sustainability and the creation of social value. It is important to recognize the performance of this multidimensional aspect by keeping in mind the three dimensions of the Triple Bottom Line (TBL), which seek to incorporate environmental, economic and social outcomes (Elkington, 1998; Jones et al., 2021). All of these dimensions can be aided by digital technologies, but the impact of digital technologies will vary depending on which technologies are chosen, how they are implemented, integrated and used inside organisations.

One of the major themes in the digital transformation literature is thus not only 'will hotels adopt technology' but 'when will technology create desired outcomes?'. According to the Technology – Organization – Environment (TOE) model (Tornatzky & Fleischer, 1990), the characteristics of the technology, organizational readiness, and the external environment influence the adoption and outcomes of the technology. Likewise, the RBV focuses on the fact that technologies can be strategically valuable only when they are accompanied by complementary organizational resources and capabilities. In the field of hospitality, such capabilities can encompass managerial engagement, financial resources, employee digital skills, organizational practices, and technological systems and procedures. A strong hotel with capabilities could be more likely to adapt technology into everyday processes while a weak hotel with not much resources could end up buying the technology and not getting the full benefit of it.

This is a relevant question in the Kenyan hospitality setting. Digitalization has been on the rise in Kenya and there's an increasing demand for urban tourism, business travel, conferences, sports tourism and regional trade. Concurrently, digital transformation varies by property and property type. Experience in markets in Kenya and elsewhere in Africa indicates that infrastructure limitations, financing constraints, shortage of skills, and organizational readiness and management capability can impact adoption rates and results (Kimbu et al., 2021; Kobia & Oliech, 2021; Manyara & Ndegwa, 2023). There are, however, many publications in the field of hospitality technology that have focused mostly on the major metropolitan and mature tourism locations. New urban locations like Eldoret and Kisumu offer a crucial context for exploring how the value created by digital technologies is shaped by the properties of the hotels in which they operate.

This research aims to tackle this concern by investigating the effect of digital transformation on hotel sustainability with special attention to hotel characteristics as a moderator. The study identifies four dimensions of digital technology: Guest-Facing Technology Adoption (GFTA), Operations Technology Adoption (OTA), Data Analytics Solutions Adoption (DASA), and Integrated Digital Platform Adoption (IDPA). The hotel characteristics are considered as an organizational composite construct that includes management support, financial and technological resources, employee digital competence, organizational culture and organizational structures. Hotel sustainability is taken into consideration from environmental, economic and social perspectives.

The study aimed at finding the extent to which the different dimensions of digital technology adoption relate to the hotel sustainability for star rated hotels in Eldoret and Kisumu cities in Kenya, moderated by the hotel characteristics. The article has three main contributions. First, it goes beyond a technology-focused perspective on digital transformation, considering organizational conditions as a boundary condition. Secondly, it examines and contrasts the moderating effect of hotel characteristics by four digital technology domains. Third, it offers empirical evidence in the context of emerging urban tourism destinations in a developing-country setting where the differences in resources and capabilities can be relevant.

2. Theoretical and Conceptual Framework

2.1 Technology–Organization–Environment Framework

This study is guided by the main theoretical perspective of the Technology – Organization – Environment (TOE) framework. The technological conditions, organizational characteristics and external environment are fundamental factors of technological innovation, according to the framework. The organizational component is specifically relevant to this present study because it includes the internal resources, structures and processes that influence an organization's readiness, and their ability to adopt and benefit from technologies. Therefore, understanding the characteristics of the hotel is an organizational-level boundary condition that digital technologies can create a stronger or weaker sustainability outcome.

This is supported by the results of the thesis. The characteristics of the hotel were management support, organizational culture, financial capabilities, digital competence of staff and organizational structures. They include whether technology is part of the strategic planning process, whether employees are skilled in its use, whether there are financial resources available to implement and maintain it and

whether organizational routines make it easier to integrate technology. The TOE framework therefore helps to explain why the same technology could be used to achieve different outcomes in different hotels.

2.2 Technology Acceptance Model

The Technology Acceptance Model offers an alternative understanding of user acceptance and adoption of digital technology. The technology acceptance and actual use depends on the perceived usefulness and ease of use (Davis, 1989). In hotels, technologies, well designed or not, can fail to deliver expected results when staff members and guests are not able to use them properly. Perceived usefulness might depend on the hotel characteristics that affect the conditions for organizational use. Management support, training, culture and infrastructure can help to support employee acceptance whereas lack of support can undermine utilization.

2.3 Triple Bottom Line Framework

Elkington (1998) introduced the “Triple Bottom Line” (TBL) framework, which visualizes sustainability in three different aspects; environmental, economic and social. Digital technologies can help save energy, water, and limit waste and paper in the hotel industry, as well as help to monitor the environment. They can be used to lower transaction and operational costs, increase productivity and enhance profitability. Social outcomes can be increased guest satisfaction, employee productivity, enhanced service quality and stakeholder engagement. The framework is beneficial because it doesn't allow digital transformation to be judged by its operational efficiency or financial results.

2.4 Organizational Resilience Theory

The ORT sees resilience as a capacity of an organisation to anticipate, manage and adjust to a disruptive event whilst functioning and capitalizing on opportunities (Duchek, 2020). Digital technologies can help to build resilience in terms of increased access to information, visibility of operations, communication and reaction. But if resilient outcomes are to be achieved, organizational capacities need to be developed that can absorb and translate technology into action. The hotel characteristics are therefore conceptually linked with the concept of Resilience as they enable the organisation to take advantage of digital systems under varying circumstances.

2.5 Conceptual Model

The conceptual model specifies four technology adoption dimensions as predictors of hotel sustainability, with hotel characteristics moderating each relationship:

GFTA → Hotel Sustainability, moderated by Hotel Characteristics

OTA → Hotel Sustainability, moderated by Hotel Characteristics

DASA → Hotel Sustainability, moderated by Hotel Characteristics

IDPA → Hotel Sustainability, moderated by Hotel Characteristics

The moderation model is expressed as:

$$Y = b0 + b1X + b2W + b3XW + e$$

The following is a breakdown of the equation for the model of "Hotel Sustainability" (Y) as a function of one of the dimensions of the digital technology adoption (X), hotel characteristics (W), and

the interaction between the two (XW), with the error term represented as e. If the interaction coefficient is statistically significant, it can be concluded that the impact of the digital technology dimension on sustainability is different depending on the hotel characteristics.

3. Literature Review and Research Gap

Digital transformation is a key tool to foster more sustainable hospitality. Smart hotel technologies can enable energy management, automatically control rooms, supply and deliver digital services, monitor resources and optimize their operation. The above-mentioned research shows that digitalization can contribute to environmental sustainability and organizational performance if technologies are embedded in organizational strategies (Gajić et al., 2024; Abdou et al., 2025; Sigala et al., 2023).

Technologies that are used for guests include online reservation systems, mobile apps, digital concierge, contactless technologies, smart rooms and digital feedback systems. These technologies can help to save paper, simplify payments, and enhance the guest experience. Studies by Wei et al. (2022) and Leong et al. (2021) showed that guest-facing technologies can impact sustainability performance and the adoption of mobile technologies was shown to be correlated with hotel performance outcomes, respectively. The value of guest facing systems for sustainability, however, could be subject to staff readiness, managerial support and guest technology integration with the hotel's processes.

The types of operations technologies are digital housekeeping systems, procurement platforms, staff scheduling systems, maintenance monitoring and the technologies which control energy and water consumption. These technologies can enhance coordination and use of resources during operations. Karanja and Onyango (2021) noted that digital procurement systems have the potential to enhance operational linkages in Kenyan hotels, and Rashidian and Hassanpour (2022) linked operational technologies to productivity and sustainability outcomes. However, cross-departmental co-ordination and organizational discipline is often needed in operational systems. Weak structures can, therefore, restrict their effectiveness.

Predictive analytics, revenue management solutions, customer relationship analytics, forecasting systems and sustainability monitoring dashboards are all examples of data analytics solutions. Analytics can be used to eliminate inefficiencies, predict demand, learn about customer behaviour, and make better use of resources for the hotel. Mariani and Baggio (2021); Li et al. (2022) emphasize the importance of analytics in the decision-making process in the hospitality industry. However, analytics need people that can analyze, managers that can act on it, and systems that can make decisions based on information. Njoroge et al. (2022) also found organizational and capability issues that hinder analytics adoption in secondary city hotels in Kenya.

Integrated digital platforms bring together functions like property management, financing, customer relations management, operations and management information systems. By integrating, duplication of effort can be minimized and information can be shared, enabling coordinated decision making. According to Buhalis and Leung (2023), smart hospitality is more about ecosystems of digital solutions than about single solutions. The cost and organizational requirements of integration, however, can be significant. It necessitates standardisation of processes, management commitment, staff competence, provision of appropriate infrastructure and financial resources.

While literature has found a relationship between digital technologies and sustainability, little focus has been devoted to hotel characteristics as an explicit moderator. Organizational attributes are often studied as the determinants of technology adoption instead of as conditions that influence the strength of the relationship between technology and sustainability. This is significant to note. The antecedent is a question about whether or not a hotel will adopt technology, and a moderator is a question about whether a technology will have better or worse results. The present study aims to fill this moderation gap by testing four interaction models with the same organizational moderator and the same sustainability outcome.

The study also responds to a contextual gap. Previous research in Kenya has found that there are also geographical differences in technology adoption and sustainability practices, where there are significant disparities between tourism destination maturities (Kobia & Oliech, 2021; Manyara & Ndegwa, 2023). Both Eldoret and Kisumu are also economically important secondary urban centers (SUCs) with developing hospitalities sectors that have received less empirical research and investigation compared to Nairobi and Mombasa. The findings of the present analysis thus provide context-specific evidence of the organizational conditions conducive to digital transformation for supporting sustainable outcomes in emerging hotel markets in cities.

4. Methodology

4.1 Research Design and Study Area

The study was positivist in philosophy and of a quantitative cross sectional survey design. Time of data collection: April-May 2026. The cities of Eldoret and Kisumu were chosen because they are significant commercial and urban tourism centres with emerging hospitality sector. The towns of Eldoret and Kisumu are strategic commercial, agricultural, sports and educational centres in Uasin Gishu County and Lake Region, respectively, with business, conference and leisure tourism activity.

4.2 Population, Sampling and Respondents

All 27 star rated hotels, as listed by the Tourism Regulatory Authority, in the two cities were the target population. The hotels comprised two 1-star, seven 2-star, thirteen 3-star, four 4-star and one 5-star hotel. In total, 135 middle-level managers, within five functional areas targeted (Front Office, Reservations, Guest Relations, ICT and Finance) in each hotel, were targeted. The respondents were selected through purposive sampling technique, which was used because they had first-hand experience of technology implementation, hotel operations, customer service, finance and sustainability. The study involved all the identified hotels and a total of 119 questionnaires were received, 88.1% of which were usable.

57.1% of those who responded were from 3-star hotels, 21.0% were 4-star hotels, 13.4% were 2-star hotels, 5.9% were 1-star hotels, and 2.5% were 5-star hotels. In terms of hotel size, 50.4% of hotels were of 50-99 rooms, 26.9% of hotels were of less than 50 rooms, 16.8% of the hotels were of 100-199 rooms and 5.9% of the hotels were of 200 rooms and above. The independently owned hotels accounted for 75.6% of the respondents, while chain-affiliated and franchises accounted for 20.2% and 4.2% respectively. 73.1% of the hotels reported having a sustainability champion.

4.3 Data Collection Instrument and Measurement

Primary data collected by using a structured questionnaire. It included sections on GFTA, OTA, DASA, IDPA, hotel characteristics and hotel sustainability, as well as other hotel profile information. The constructs were assessed by a 5-point scale. The hotel characteristics construct included management support, financial and technological resources, employee digital and sustainability skills, organizational culture and policies and operational structures to support sustainability and digital integration.

It was pre-tested in 15 respondents at star rated hotels in Nakuru City. Content and construct validity procedures were carried out and internal consistency assessed by Cronbach's Alpha. Constructs with α values of 0.70 or higher were deemed reliable (Irinjee et al., 2017). The study also received an institutional approval and a NACOSTI research permit. Confidentiality, anonymity and voluntary participation explained to respondents.

4.4 Data Analysis

SPSS was used for the coding and analysis of the data. The hotel characteristics and variables of the studies were summarized using descriptive statistics. Associations between variables were measured using Pearson Product Moment Correlation. Combined effect of digital technology adoption and hotel characteristics were investigated in multiple regression. The moderating effect of the hotel characteristics was tested by using Hayes PROCESS Macro Version 5.0, Model 1. Variables were mean centred before moderation to make interpretation easier and to prevent possible multicollinearity.

The moderation model for each technology dimension was:

Hotel Sustainability = b0 + b1(Digital Technology) + b2(Hotel Characteristics) + b3(Digital Technology × Hotel Characteristics) + e.

To decide if there was moderation, the interaction coefficient (b3) and the change in explained variance (ΔR2) were assessed. A $p < .05$ was considered statistically significant. The conditions for regression were considered acceptable based on the diagnostic tests. The tolerance values were above .10 and the values of VIF were below 10 as for OTA, tolerance was 3.673 and VIF was 7.208 for DASA. Residual scatter plots indicated that the data were homoscedastic, and Q-Q plots indicated approximate normality.

5. Results

5.1 Descriptive Profile of Hotel Characteristics

The overall ratings for hotel characteristics were moderately high. The statement with the highest mean score was "Clear policies/operational structures exists to support sustainability/digital integration" (M = 3.79; SD = .973). The financial and technological resources were good (M = 3.58, SD = 1.225) followed by the adequacy of financial and technological resources. Also, the mean value of Organizational culture for innovation, collaboration and introducing new technologies was 3.45 (SD = 1.073) and the mean value of Management support for digital technology adoption was 3.42 (SD = 1.211). The lowest mean (M = 3.12, SD = 1.310) was for the digital and sustainability related skills of employees. The pattern shows that formal structures/resources were relatively stronger than employee's capability, implying that skills development is an important part of organizational readiness.

Table 1. Descriptive Statistics for Hotel Characteristics

Hotel Characteristic Indicator	Mean	SD
Management strongly supports digital technology adoption	3.421	1.211
Adequate financial and technological resources	3.585	1.225
Employees possess adequate digital and sustainability skills	3.120	1.310
Culture encourages innovation and technology adoption	3.453	1.073
Clear policies and operational structures support integration	3.793	0.973
Overall Mean	**3.47**	—

Source: Author (2026)

5.2 Correlation Results

The relationships between all of the major study variables were significant and positive. GFTA correlated with hotel sustainability at r = .773 (p < .001), OTA at r = .697 (p < .001), DASA at r = .828 (p < .001), and IDPA at r = .807 (p < .001). Hotel characteristics were strongly correlated with sustainability (r = .849, p < .001) and also correlated with GFTA (r = .792), OTA (r = .797), DASA (r = .876) and IDPA (r = .838), all p < .001. The results show that hotels with a more positive attitudes towards adoption of technology and organizational attributes tended to report a higher sustainability performance. The correlations between the predictors were relatively high so the study was appropriate to test for multicollinearity before regression. There was no harmful multicollinearity that was revealed by the VIF results.

Table 2. Pearson Correlation Matrix

Variable	GFTA	OTA	DASA	IDPA	EESO	MVHC
GFTA	1.000	.804**	.852**	.733**	.773**	.792**
OTA	.804**	1.000	.829**	.754**	.697**	.797**
DASA	.852**	.829**	1.000	.864**	.828**	.876**
IDPA	.733**	.754**	.864**	1.000	.807**	.838**

Variable	GFTA	OTA	DASA	IDPA	EESO	MVHC
EESO	.773**	.697**	.828**	.807**	1.000	.849**
MVHC	.792**	.797**	.876**	.838**	.849**	1.000

Note: GFTA = Guest-Facing Technology Adoption; OTA = Operations Technology Adoption; DASA = Data Analytics Solutions Adoption; IDPA = Integrated Digital Platform Adoption; EESO = Enhanced Hotel Sustainability Outcomes; MVHC = Hotel Characteristics. **N = 119. Correlation is significant at the 0.01 level (2-tailed).

Note: ** Correlation is significant at the 0.01 level (2-tailed); N = 119. EESO = Hotel Sustainability; MVHC = Hotel Characteristics. Source:

Author (2026).

5.3 Overall Contribution of Hotel Characteristics

The multiple regression model with GFTA, OTA and DASA and IDPA accounted for 74.0% of the variance in the hotel sustainability ($R^2 = .740$). The explanatory power was enhanced by the inclusion of hotel characteristics to $R^2 = .779$ or an additional 3.9% of explained variance. The combined model was statistically significant, $F(5,113) = 79.560$, $p < .001$. The characteristics of the hotel had the highest standardized effect in the combined model ($\beta = .452$, $p < .001$). This finding offers preliminary support for the addition of organizational characteristics to the explanation for the success of technology use beyond adoption alone.

Table 3. Combined Regression Model

Table: Multiple Regression Results for Digital Technology Adoption and Hotel Sustainability

Predictor	Standardized β	p-value
Guest-Facing Technology Adoption	.234	.011
Operations Technology Adoption	−.172	.049
Data Analytics Solutions Adoption	.164	.192
Integrated Digital Platform Adoption	.245	.010
Hotel Characteristics	.452	<.001
R^2	**.779**	—
Adjusted R^2	**.769**	—
F (5, 113)	**79.560**	**<.001**

Source: Author (2026).

Note: β = Standardized regression coefficient; R^2 = coefficient of determination; F = F-statistic. **N = 119.** Statistical significance was assessed at **p < .05**.

Interpretation

The regression model was statistically significant, F (5, 113) = 79.560, p < .001 and accounted for 77.9% of the variance in the hotel sustainability outcomes (R^2 = .779; Adjusted R^2 = .769).

Hotel Characteristics contributed the most positively to sustainability (β = .452, p < .001). Guest-Facing Technology Adoption (β = .234, p = .011), and Integrated Digital Platform Adoption (β = .245, p = .010) were also statistically significant positive effects. The standardized coefficient (β) for Operations Technology Adoption was found to be statistically significant with negative sign (β = −.172, p = .049) and Data Analytics Solutions Adoption was not statistically significant (β = .164, p = .192).

This table must be presented separately from the moderation tables as it is not the interaction between each digital transformation dimension and the hotel characteristics, but the overall multiple regression model.

5.4 Moderating Role of Hotel Characteristics

5.4.1 Guest-Facing Technology Adoption

The GFTA moderation model was statistically significant, F (3,115) = 110.977, p < .001, with R = .8621 and R^2 = .7433. The coefficient for the GFTA was statistically significant (β = −.3669, p = .0081) and that of hotel characteristics statistically significant and positive (β = .1739, p < .001). The interaction of GFTA and hotel characteristics was most significantly statistically significant (β = −.0360, p < .001). The interaction increased explained variance by 4.19% (ΔR^2 = .0419; F change = 18.7483, p < .001).

The results for the GFTA effect were not significant at low hotel characteristics, (β = −.1230, p = .3044). It was significant at moderate characteristics (β = −.4077, p = .0046) and stronger and significant at the high characteristics (β = −.5375, p = .0010). The pattern suggests that for guest-facing technology to benefit the organization, it is essential that the context of the organization is part of the equation.

Table 4: Moderating Effect of Hotel Characteristics on the Relationship between Guest-Facing Technology Adoption and Hotel Sustainability

Statistic	Result
R	.8621
R^2	.7433
F(3, 115)	110.977, *p* < .001
GFTA coefficient	−.3669, *p* = .0081

Statistic	Result
MVHC coefficient	.1739, $p < .001$
GFTA × MVHC	−.0360, $p < .001$
ΔR^2	.0419
F change	18.7483, $p < .001$

Source: Author (2026).

Note: GFTA = Guest-Facing Technology Adoption; MVHC = Hotel Characteristics; R^2 = coefficient of determination; ΔR^2 = change in explained variance. N = 119**.** Statistical significance was assessed at $p < .05$.

Interpretation

The moderation model was statistically significant: $F(3, 115) = 110.977$, $p < .001$, $R^2 = .7433$, meaning that about 74.33% of the variance in hotel sustainability was explained by the three variables (Guest-Facing Technology Adoption, Hotel Characteristics and the interaction between them).

The interaction between GFTA and MVHC was statistically significant ($\beta = -.0360$, $p < .001$), which confirms that the interactions of hotel characteristics and the relationship between GFTA and hotel sustainability was statistically significant. The explained variance was increased by 4.19% ($\Delta R^2 = .0419$) and the change in F-statistic was significant (F change = 18.7483, $p < .001$) after the addition of the interaction term.

The negative interaction coefficient suggests that the relationship between GFTA and sustainability changed with the change in levels of hotel characteristics. Therefore, the impact of guest-facing technologies on the hotel's sustainability was dependent on the existing organizational features of the hotel. This is reflective of the thesis that hotel characteristics play an important role in the digital technology-sustainability relationship.

Conditional effects: Low MVHC $\beta = -.1230$, $p = .3044$; Moderate MVHC $\beta = -.4077$, $p = .0046$; High MVHC $\beta = -.5375$, $p = .0010$.

5.4.2 Operations Technology Adoption

The OTA moderation model was statistically significant, $F(3,115) = 91.2278$, $p < .001$, with $R = .8391$ and $R^2 = .7041$. The coefficient for OTA was highly significant ($\beta = -.6924$, $p < .001$), the coefficient for hotel characteristics was highly significant ($\beta = .2282$, $p < .001$) and the interaction of OTA × Hotel characteristics was highly significant ($\beta = -.0427$, $p < .001$). The interaction had the largest effect of explaining variance ($\Delta R^2 = .0803$; $\Delta F = 31.1928$, $p < .001$) and thus was the best moderation among the four models.

Conditioned effects were significant at all three levels of hotel characteristics. The OTA effect was $\beta = -.3465$ at low characteristics ($p = .0212$), $\beta = -.7043$ at moderate characteristics ($p < .001$), and $\beta = -.9747$ at high characteristics ($p < .001$). As a result, the level of connection rose significantly with the better the organizational conditions.

Table 5. Moderation of Operation Technology Adoption by Hotel Characteristics

Statistic	Result
R	.8391
R^2	.7041
F(3, 115)	91.2278, p < .001
OTA coefficient	−.6924, p < .001
MVHC coefficient	.2282, p < .001
OTA × MVHC	−.0427, p < .001
ΔR^2	.0803
F change	31.1928, p < .001

Source: Author (2026).

Note: OTA = Operations Technology Adoption; MVHC = Hotel Characteristics; R^2 = coefficient of determination; ΔR^2 = change in explained variance. **N = 119.** Statistical significance was assessed at p < .05.

Interpretation

The moderation model was statistically significant, F(3, 115) = 91.2278, p < .001, accounting for 70.41% of the variation in hotel sustainability with respect to the model.

The relationship between OTA and MVHC was statistically significant (β = −.0427, p < .001), and the hotel characteristics moderated the relationship between OTA and hotel sustainability to a degree that was statistically significant. This interaction accounted for an 8.03% increase in explained variance (ΔR^2 = .0803) and was the greatest among the four dimensions of digital technologies that were studied.

Negative interaction coefficient means that the relationship between operations technology adoption and the hotel sustainability was systematic as the level of hotel characteristics changed. The thesis also notes that the conditional effect grew larger from β = −.3465 when the levels of hotel characteristics was low, to β = −.7043 at moderate levels, and β = −.9747 at high levels of hotel characteristics.

The results therefore show that the organizational environment in hotels plays a significant role in achieving the sustainability results of adopting operation technology. Operational technology implementation and usage can be affected by favorable management support, financial ability, organizational culture, employee competence and operation structures.

Conditional effects: Low MVHC β = −.3465, p = .0212; Moderate MVHC β = −.7043, p < .001; High MVHC β = −.9747, p < .001.

5.4.3 Data Analytics Solutions Adoption

The DASA moderation model was statistically significant, F (3,115) = 114.1918, p < .001, with R = .8653 and R^2 = .7487. In this moderation model, the direct coefficient of DASA was not statistically significant (β = −.1606, p = .3481), but the direct coefficient of hotel characteristics was (β = .1395, p < .001). The DASA × MVHC interaction was statistically significant (β = −.0291, p = .0001), increasing explained variance by 3.72% (ΔR^2 = .0372; F change = 17.0368, p = .0001).

Conditional effects were not significant at low characteristics (β = .0724, p = .6303), moderate characteristics (β = −.1790, p = .3022), or high characteristics (β = −.3528, p = .0775). The coefficients in this table were not significant at the .05 level, but the direction of the coefficients is becoming somewhat stronger as the hotel characteristics become better. The statistically significant interaction verifies that the relationship between the adoption of analytics and sustainability is different in organizational contexts.

Table 6: Moderating Effect of Hotel Characteristics on the Relationship between Data Analytics Solutions Adoption and Hotel Sustainability

Statistic	Result
R	.8653
R^2	.7487
F(3, 115)	114.1918, $p < .001$
DASA coefficient	−.1606, $p = .3481$
MVHC coefficient	.1395, $p < .001$
DASA × MVHC	−.0291, $p = .0001$
ΔR^2	.0372
F change	17.0368, $p = .0001$

Conditional effects of DASA at different levels of MVHC

Level of Hotel Characteristics (MVHC)	Conditional Effect (β)	p-value
Low MVHC	.0724	.6303

Level of Hotel Characteristics (MVHC)	Conditional Effect (β)	p-value
Moderate MVHC	−.1790	.3022
High MVHC	−.3528	.0775

Source: Author (2026).

Note: DASA = Data Analytics Solutions Adoption; MVHC = Hotel Characteristics; R^2 = coefficient of determination; ΔR^2 = change in explained variance; β = regression coefficient. **N = 119.** Statistical significance was assessed at $p < .05$.

Interpretation

The moderation model was statistically significant, F(3, 115) = 114.1918, p < .001, and explained about 74.87% of the variation in hotel sustainability, $R^2 = .7487$.

The direct effect of DASA on hotel sustainability was not statistically significant (β = −.1606, p = .3481). The relationship between DASA and MVHC, however, was statistically significant (β = −.0291, p = .0001). The interaction term added an additional 3.72% of explained variance ($\Delta R^2 = .0372$), and was a significant change to the model (F change = 17.0368, p = .0001).

The conditional effects give further insights. The effect of DASA was positive but not statistically significant at low levels of hotel characteristics (β = .0724, p = .6303). However, at intermediate concentrations, the effect turned negative, although it was not significant (β = −.1790, p = .3022). The negative effect increased in strength at high levels of hotel characteristics (β = −.3528), although it was not statistically significant at the 5% level (p = .0775).

Thus, based on the results, there is a significant interaction between the data analytics solutions adoption and hotel sustainability with the presence of significant hotel characteristics, which suggests that statistical relationships vary with the hotel characteristics. None of the effects of MVHC at low, moderate or high concentration were significant on their own, however. This distinction is significant when reporting findings and is necessary to avoid misrepresenting the finding of a significant simple effect from DASA at any one level of hotel characteristics.

5.4.4 Integrated Digital Platform Adoption

The IDPA moderation model was statistically significant, F(3,115) = 109.2732, p < .001, with R = .8604 and $R^2 = .7403$. The direct IDPA coefficient was not statistically significant (β = −.2467, p = .1004), but the hotel characteristics were shown to be positively and statistically significant with sustainability (β = .1584, p < .001). The interaction term IDPA × MVHC was significant (β = −.0151, p = .0225). The interaction explains the smallest variance ($\Delta R^2 = .0121$; F change = 5.3508; p = .0225) of the four models but was still statistically significant.

There were no conditional effects for low characteristics (β = −.1282, p = .3273) or moderate characteristics (β = −.2501, p = .0975). The effect was larger in magnitude (β = −.3465) but just slightly

above the conventional level (p = .0502) at high characteristics. Overall, the results suggest that there is a significant interaction, but weak conditional evidence at the chosen values of the moderator.

Table 7: Moderating Effect of Hotel Characteristics on the Relationship between Integrated Digital Platform Adoption and Hotel Sustainability

Statistic	**Result**
R	.8604
R^2	.7403
F(3, 115)	109.2732, $p < .001$
IDPA coefficient	−.2467, $p = .1004$
MVHC coefficient	.1584, $p < .001$
IDPA × MVHC	−.0151, $p = .0225$
ΔR^2	.0121
F change	5.3508, $p = .0225$

Conditional effects of IDPA at different levels of MVHC

Level of Hotel Characteristics (MVHC)	**Conditional Effect (β)**	**p-value**
Low MVHC	−.1282	.3273
Moderate MVHC	−.2501	.0975
High MVHC	−.3465	.0502

Source: Author (2026).

Note: IDPA = Integrated Digital Platform Adoption; MVHC = Hotel Characteristics; R^2 = coefficient of determination; ΔR^2 = change in explained variance; β = regression coefficient. **N = 119.** Statistical significance was assessed at $p < .05$.

Interpretation

The moderation model was statistically significant, $F(3, 115) = 109.2732$, $p < .001$, and accounted for 74.03% of the variance in hotel sustainability. The overall model exhibited a very good correlation between the predictors and hotel sustainability, according to the thesis.

The effect of IDPA on hotel sustainability was not statistically significant, direct ($\beta = -.2467$, $p = .1004$). But the relationship between IDPA and MVHC was statistically significant ($\beta = -.0151$, $p = .0225$). The interaction term increased the explained variance by 1.21%, ($\Delta R^2 = .0121$) and the change in the model was statistically significant (F change = 5.3508, $p = .0225$).

However, the conditional effects indicate that IDPA had a negative, although non-significant, effect at low levels of the hotel characteristics ($\beta = -.1282$, $p = .3273$). When moderate, the negative effects increased but was not statistically significant ($\beta = -.2501$, $p = .0975$). The impact was greatest ($\beta = -.3465$) and just short of the conventional 5% significance level ($p = .0502$) for high levels of hotel characteristics.

The results showed that the relationship between hotel characteristics and integrated digital platform adoption on hotel sustainability was significant and was moderated by the characteristics of the hotel. The moderating effects of the hotel characteristics were not significant at the 5% level. The four dimensions of digital technology were also ranked by their contribution to the explained variance with the moderation effect being the least, explained variance was 1.21%. The results align with the thesis conclusion, that organizational conditions play a role in shaping the sustainability effects from digital transformation and that the role of the moderating effect varies across technology dimensions.

5.5 Comparative Moderation Results

The four models of interaction are sufficiently different from each other to create a clear hierarchy of the strength of the interaction. OTA recorded the largest incremental contribution of the interaction term ($\Delta R^2 = .0803$), followed by GFTA ($\Delta R^2 = .0419$), DASA ($\Delta R^2 = .0372$) and IDPA ($\Delta R^2 = .0121$). Each interaction term was found to be significant.

Table 8: Comparative Summary of Moderation Effects

Technology Dimension	Interaction β	Δ R²	F Change	p-value	Relative Moderation
Guest-Facing Technology Adoption (GFTA)	−.0360	.0419	18.7483	< .001	Strong
Operations Technology Adoption (OTA)	−.0427	.0803	31.1928	< .001	**Strongest**
Data Analytics Solutions Adoption (DASA)	−.0291	.0372	17.0368	.0001	Moderate
Integrated Digital Platform Adoption (IDPA)	−.0151	.0121	5.3508	.0225	**Weakest**

Source: Author (2026).

Note: β = interaction coefficient; ΔR^2 = change in explained variance attributable to the interaction term; F change = change in the F-statistic associated with the interaction effect. Statistical significance was assessed at $p < .05$.

Interpretation

The comparative results showed that the four relationships between digital technology adoption and hotel sustainability were all moderated by the hotel characteristics. However, the size of the moderating effects differed significantly among the four technology dimensions.

The interaction coefficient ($\beta = -.0427$) and the change in R^2 ($\Delta R^2 = .0803$) were highest for Operations Technology Adoption (OTA) which also had the highest F change (F change = 31.1928; $p < .001$). When considering the interaction between the OTA and MVHC, the characteristics of the hotel explained an extra 8.03% of the variation in hotel sustainability. The thesis thus reveals that OTA is the most heavily influenced technology dimension by hotel characteristics.

Guest-Facing Technology Adoption (GFTA) had the second largest moderation effect with a β of −.0360 and a ΔR^2 of .0419 ($p < .001$). Therefore, the relationship between the GFTA and sustainability further explained another 4.19% of the variance due to hotel characteristics.

The comparative result is crucial since it shows that the organization context does not have the same moderating effect on all technologies. The most incremental explanatory power was provided by the operation technologies. This may be due to the organizational structure of operational technologies, which are heavily reliant on operational routines, the coordination of different departments, skills of different employees, maintenance activities, procurement and management of operational technologies. Guest-facing technologies also experienced significant dampening due to the capacity of the hotel to support the service delivery of digital technology and integrate guest-facing systems with internal operations. While conditional effects were not significant, analytics revealed meaningful moderation indicating that organizational capability influences the transformation of data to sustainability action. The smallest interaction was from integrated platforms, but even so it was statistically significant.

6. Discussion

The study shows that the hotel properties are a significant boundary condition in the digital transformation-sustainability nexus. By comparing the overall regression results, it was found that the addition of the hotel characteristics increased the explanatory power from 74.0% to 77.9%. Of greater importance, all four interaction terms between technology and interaction were statistically significant. The evidence thus indicates that digital transformation has a certain sustainability value, which is partly determined by the organizational context of the technology deployment.

The results corroborate the TOE approach. Adopting technology is not an organizational void. Hotels vary on their management commitment, financial resources, staff ability, culture, formal and infrastructure. The differences have an impact on implementation quality and technology-to-outcome conversion. In all four models, the interaction effects were significantly greater, giving empirical support to the notion that organizational characteristics not only predict the adoption of technology but also moderate the outcomes of technology application.

The results also validate the Resource Based View (RBV) perspective presented in the thesis. While they can be resources of value, digital technologies are not necessarily organizational capabilities themselves. Their worth lies in the complementing resources that facilitate deployment, integration, learning and continuous improvement. This is demonstrated in the strongest moderation effect for OTA. Operational technologies are used in the day-to-day processes. With good management systems, trained staff, proper resources and supportive systems, operational technology can be incorporated into housekeeping, procurement, scheduling, maintenance, energy and water systems management. Where these capabilities are less developed, the technology could be underutilized or not used at all or used only superficially.

The results of the GFTA corroborate the conclusion that digital guest technologies are a source of sustainability value for hotels that can enable the service processes. The conditional effects were shifted from non-significant at low level of hotel characteristics to significant at moderate and high level of hotel characteristics. This implies that, as hotels adopt more customer-facing digital systems, the organizational context becomes more crucial. The discovery supports the findings of Wei et al. (2022), who associated guest-facing technologies and sustainability outcomes, and Wangari et al. (2021), who argued that the organizational support and the digital competence of employees are important in Kenyan hotels.

The findings from the OTA were the most supportive of organizational contingency. The interaction explained an additional 8.03 % of the variance and the interaction effect was statistically significant at low, moderate, and high levels of hotel characteristics. The conditional coefficient became more positive as the relationship between operations technology and sustainability became stronger, indicating that improved conditions in the organization are linked to higher positive association between operations technology and sustainability. This is in line with Karanja and Onyango (2021), Rashidian and Hassanpour (2022) whose work highlights operational technologies as a source of efficiency and productivity. It also advances the results by showing how the magnitude of the technology-sustainability relationship changes because of the organizational environment.

Theoretically the findings of the DASA are important because the interaction was significant and the direct effect was not. This means that with just analytics, sustainability outcomes cannot be achieved. Data analytics demands qualified people, data governance and management decision processes that are able to translate information into action, and commitment from management. This outcome is consistent with the findings of Mariani and Baggio (2021), Karimi and Dogru (2022), and Njoroge and others (2022) who highlight organisational and human capability to add value to analytics. Non-significant conditional effects at low, moderate and high levels should be interpreted with caution, however. The statistically significant interaction results in the moderation of the model, but simple slopes at the chosen levels do not provide statistically significant effects on their own. The result therefore offers greater support for differential relations than for a simple effect of analytics across all levels of hotel characteristics that may be universally significant.

The moderation of the IDPA results is the weakest of the three, but still statistically significant. Platforms can bridge departments and eliminate information silos, but may need to be implemented, standardized processes and aligned with organizations for sustainability. The significant interaction

provides evidence that platform effectiveness is related to hotel characteristics, and the conditional effects provide evidence that the relationship is stronger at the higher levels of organizational support but is weak at the conventional level of significance. This is in line with the findings of Buhalis and Leung (2023) and Vial (2021), who have pointed out that digital transformation goes beyond technology to the organization itself.

The descriptive results support this interpretation. The mean for formal policies and operational structures was highest (M = 3.79) and the mean for employee digital and sustainability competence was lowest (M = 3.12) in the hotel characteristics. This is relevant due to the relative lack of employee competence, as the success of digital transformation is ultimately a matter of employees who configure, use, interpret and maintain digital systems. Return on technology investment may then be lower if there are no technology investments in parallel training and capability development.

The results of this study also have implications for the Triple Bottom Line framework. Digital transformation can help achieve environmental sustainability by monitoring energy and water consumption, reducing waste and going paperless; economic sustainability by controlling costs, improving productivity and resource allocation; and social sustainability by enhancing service quality, employee productivity and guest engagement. But the moderation results suggest that these benefits may be contingent upon organizational capability. The sustainability result of digital investment is therefore affected not just by the technology, but also the skills and expertise to make it work.

7. Implications for Hotel Management and Policy

The main takeaway for hotel managers is that a digital transformation must be considered an organizational change programme. To implement technology acquisition, there ought to be clear management commitment, training of staff, budgeting, and process changes and monitoring. Before decisions on investments are made, managers should assess the capabilities of their organizations for each technology.

This is particularly true of the operations technology which had the strongest moderation effect. Hotels must harmonize their investments in digital procurement, housekeeping systems, staff scheduling, maintenance monitoring and the systems that control the use of resources with clear operational processes and accountability structures. It should be the goal to incorporate technology in everyday management and not use individual digital tools.

In addition, the digital competence of employees should be reinforced in the hotel sector. The least descriptive mean of the hotel characteristic indicators was employee digital and sustainability skills. Such continuous training has to include technical operation of digital systems as well as strategic use of digital systems. Staff should become familiar with the connection between digital data and sustainability indicators, the quality of services and operational performance.

Organizational culture should be enhanced by promoting experimentation, learning, collaboration and innovation by management. Utilization can be limited even if infrastructure and financing are in place due to resistance to technology. A culture that makes digital transformation a joint organizational effort is more likely to enable effective digital transformation adoption.

Policymakers and tourism regulators should realize that technology supports or infrastructure needs may not be enough. Digital skills development, management training, technology advisory services and sustainability measurement should also be a part of support programmes. This is particularly the case for independent hotels, representing 75.6% of respondents, who might be experiencing a range of resource challenges that are different from those of chain-affiliated properties.

Technology providers must be able to provide scalable solutions, implementation support and staff training and not only the software and hardware sales. For vendors who support smaller, independent hotels, modular platforms, low-cost subscription offerings and technical support that can scale with the growth of the organization may be a worthwhile consideration.

8. Conclusion

This study aimed at investigating the moderating effects of hotel characteristics on the relationship between digital transformation and the hotel sustainability in the cities of Eldoret and Kisumu in Kenya. The results show a uniform picture of the importance of organizational context. Hotel characteristics significantly moderated the relationships between GFTA, OTA, DASA and IDPA and hotel sustainability.

The most effective moderation was seen in operations technology, guest-facing technology, and data analytics and integrated digital platforms. The pattern suggests that the ability of the organization is crucial in the case of technologies used in the daily work of the hotel. The results also confirm that the use of technology cannot be considered an investment in isolation. The capability base, in which technology generates sustainability outcomes, consists of management support, financial and technological resources, employee competence, organisational culture and organisational support structures.

The study provides a theoretical contribution to hospitality technology studies because it views the hotel characteristics as moderator and not only an antecedent of technology adoption. The results further support the organizational aspect of the TOE framework and align with TAM, TBL, and Organizational Resilience Theory in that the acceptance of technology, sustainability outcomes, and technology resilience are dependent on organizational capacity. The new urban tourism sites in Kenya also contribute to the context that is not covered in the digital literature of the hospitality industry.

The cross-sectional design and restricted focus to star-rated hotels in two cities of Kenya restricts causal inference and generalization. Future research is recommended to use longitudinal designs, add non-rated hotels and other areas of the country, use mixed methods and incorporate objective sustainability measures (e.g. energy use, water use, waste etc, financial measures). Technological readiness, leadership style, organizational learning and stakeholder engagement are other factors that could be explored as moderators and/or mediators to be studied in the future.

9. Recommendations

Hotels need to incorporate digital investment plans in their organizational capability-development plans. Key issues of management should include leadership commitment, training of staff, innovation-oriented culture, sufficient funding, reliable digital infrastructure and clear operational procedures. Hotels should consider creating key performance indicators around sustainability and digital

transformation to gauge the actual environmental, economic and social impacts of technology investments.

It is recommended that industry associations and policy makers should encourage digital readiness programmes and provide incentives for the use of technologies in addition to skills training. Technology vendors need to be flexible and scalable to the various financial and tech capacities of the hotel. The moderation model should be applied in other cities in Kenya, East Africa and in another type of hotels, with longitudinal and multi-source data.

References

Abdou, A. H., Hassan, T. H., Salem, A. E., & Albakhit, A. I. (2025). Digital transformation and sustainability performance in hospitality organizations. Sustainability, 17(2), 845. https://doi.org/10.3390/su17020845

Buhalis, D., & Leung, D. (2023). Smart hospitality and digital ecosystems in tourism. Tourism Review, 78(2), 342–357. https://doi.org/10.1108/TR-09-2022-0458

Casais, B., & Ferreira, J. J. (2023). Digital transformation, sustainability, and performance in hospitality and tourism: A systematic literature review. Tourism Management Perspectives, 46, 101061. https://doi.org/10.1016/j.tmp.2023.101061

Chen, C. C., & Law, R. (2024). A systematic review of hospitality technology research: Themes, methodologies, and future directions. International Journal of Hospitality Management, 116, 103615.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Creswell, J. W., & Creswell, J. D. (2024). Research design: Qualitative, quantitative, and mixed methods approaches (7th ed.). SAGE.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Duchek, S. (2020). Organizational resilience: A capability-based conceptualization. Business Research, 13(1), 215–246.

Elkington, J. (1998). Cannibals with forks: The triple bottom line of 21st century business. New Society Publishers.

Field, A. (2024). Discovering statistics using IBM SPSS Statistics (6th ed.). SAGE.

Gajić, T., Petrović, M. D., Blešić, I., & Vukolić, D. (2024). Digital transformation and sustainable hotel management. Sustainability, 16(3), 1227. https://doi.org/10.3390/su16031227

Hayes, A. F. (2022). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (3rd ed.). Guilford Press.

Ivanov, S., & Webster, C. (2023). Adoption of smart technologies in hospitality and tourism. Tourism Management Perspectives, 45, 101037. https://doi.org/10.1016/j.tmp.2022.101037

Jones, P., Hillier, D., & Comfort, D. (2021). Sustainability in the hospitality industry. International Journal of Contemporary Hospitality Management, 33(4), 1459–1477.

Jones, P., Klanten, A., & Ratten, V. (2021). Hotel characteristics and technology-enabled sustainability performance: A European investigation. International Journal of Contemporary Hospitality Management, 33(9), 3127–3149. https://doi.org/10.1108/IJCHM-01-2021-0098

Karanja, N., & Onyango, G. (2021). Digital procurement systems and local economic linkages: Evidence from Kenyan hotels. Information Technology & Tourism, 23(2), 283–306. https://doi.org/10.1007/s40558-021-00198-0

Karimi, S., & Dogru, T. (2022). Predictive analytics and sustainability performance in the hospitality industry. International Journal of Hospitality Management, 103, 103202. https://doi.org/10.1016/j.ijhm.2022.103202

Kimbu, A. N., de Jong, A., & Adam, I. (2021). Digital transformation and sustainability in African hospitality and tourism businesses. Sustainability, 13(23), 13212. https://doi.org/10.3390/su132313212

Kobia, C., & Oliech, J. (2021). Digital divide and ICT adoption in Kenya's hospitality sector. African Journal of Hospitality, Tourism and Leisure, 10(3), 1154–1169.

Leong, C. M., Hew, T. S., Ooi, K. B., & Lin, B. (2021). Mobile technology adoption and hotel performance outcomes. International Journal of Hospitality Management, 94, 102860. https://doi.org/10.1016/j.ijhm.2020.102860

Li, J., Bonn, M. A., & Ye, B. H. (2022). Revenue management analytics and hotel sustainability performance. Tourism Management Perspectives, 44, 101022. https://doi.org/10.1016/j.tmp.2022.101022

Manyara, G., & Ndegwa, M. (2023). Digital technology adoption and hotel sustainability in Kenya. African Journal of Hospitality, Tourism and Leisure, 12(4), 1450–1468.

Mariani, M., & Baggio, R. (2021). Big data and analytics in hospitality and tourism management. International Journal of Contemporary Hospitality Management, 33(3), 1058–1080. https://doi.org/10.1108/IJCHM-07-2020-0749

Melissen, F., Kallmuenzer, A., Peters, M., & Buhalis, D. (2022). Digitalization and sustainability in hospitality operations. International Journal of Hospitality Management, 102, 103171. https://doi.org/10.1016/j.ijhm.2022.103171

Njoroge, J. M., Ateljevic, J., & Atongo, S. A. (2022). Data analytics adoption challenges in secondary city hotels: Evidence from Kenya. Tourism Management Perspectives, 43, 100997.

Rashidian, H., & Hassanpour, M. (2022). Operational technology and productivity enhancement in hospitality organizations. Journal of Hospitality and Tourism Technology, 13(4), 589–607. https://doi.org/10.1108/JHTT-06-2021-0178

Sigala, M. (2023). Digital transformation and sustainability in hospitality and tourism. Journal of Hospitality and Tourism Management, 56, 368–377. https://doi.org/10.1016/j.jhtm.2023.07.009

Sigala, M., Gretzel, U., & Pesonen, J. (2023). The impact of digital technologies on sustainability in tourism and hospitality: A strategic perspective. Journal of Sustainable Tourism, 31(4), 905–923. https://doi.org/10.1080/09669582.2022.2038913

Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington Books.

Tussyadiah, I., Wang, D., & Li, X. (2023). Gamification for sustainability: How hotel apps motivate guest participation in green initiatives. International Journal of Hospitality Management, 109, 103310.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Vial, G. (2021). Understanding digital transformation: A review and a research agenda. In Managing Digital Transformation (pp. 13–66). Routledge. https://doi.org/10.4324/9781003008638-2

Wangari, E. W., Mutua, J., & Otieno, R. (2021). Sustainability practices and digital innovation in Kenyan hotels. African Journal of Hospitality, Tourism and Leisure, 10(5), 1450–1465.

Wei, W., Torres, E. N., & Hua, N. (2022). Guest-facing technologies and sustainability performance in hotels. International Journal of Hospitality Management, 102, 103168. https://doi.org/10.1016/j.ijhm.2021.103168

Zhang, Y., & Cao, X. (2021). Hotel characteristics and sustainability technology performance: Evidence from global hospitality firms. Journal of Sustainable Tourism, 29(11–12), 1883–1904. https://doi.org/10.1080/09669582.2020.1864387

Zhang, Y., Buhalis, D., & Law, R. (2023). Smart hospitality and sustainable performance. Tourism Management, 92, 104563.