

RESEARCH ARTICLE

Catalyzing green competitiveness in hotel and tourism businesses: Leveraging digital dynamic capability and green creativity

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ABSTRACT

The global push for green initiatives is in line with advancements in smart technology. Therefore, this study aims to investigate the impact of digital dynamic capability “organization's capacity to swiftly utilize digital technologies for innovation and adaptation” on green competitiveness in hotel and tourism businesses, considering green creativity as a mediator. Using the statistical program WarpPLS 7.0, the study employed PLS-SEM to examine 333 replies that were provided by middle-level managers of five-star hotels and category-A travel agencies in Egypt. The study revealed that digital dynamic capability positively impacts both green competitiveness and green creativity. In addition, the study found that green creativity significantly mediates the relationship between digital dynamic capability and green competitiveness. The study offers fresh insights into how emerging concepts like digital dynamic capability predict green competitiveness in the tourism and hospitality industries.

Keywords: digital dynamic capability; green creativity; green competitiveness; hotel and tourism businesses

1. Introduction

The hotel and tourism industry, a major player on the global stage, faces increasing scrutiny for its environmental impact. High carbon emissions, resource depletion, and waste generation are serious

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concerns^[1]. As society demands more sustainable practices and regulations tighten, hotels and tourism businesses are under pressure to improve their environmental performance. This pressure presents an opportunity; developing green competitiveness is no longer just a good idea, it's a strategic necessity for survival and success^[2].

Green tourism is not just an ethical approach, it's a business strategy. By integrating local communities, social, cultural, and environmental development, green tourism businesses can create a holistic approach to improving quality of life. This goes beyond just economic well-being, encompassing social, cultural, and environmental aspects^[3]. The younger generation, particularly aware of environmental and cultural issues, is willing to pay a premium for green hotels. This presents a unique opportunity for hotels to invest in green hospitality practices, which can lead to both economic success and positive environmental impact^[4].

The hotel and tourism industry are facing increasing pressure to reduce its environmental impact and enhance its sustainability credentials^[5,6]. In this context, the concept of green competitiveness has gained significant attention, as it represents a hotel's ability to gain a strategic advantage by delivering superior environmental performance and green offerings^[7,8]. Research suggests that two key organizational capabilities could play a pivotal role in catalyzing green competitiveness in the hotel and tourism sector; digital dynamic capability and green creativity^[9,10].

On one hand, digital dynamic capability refers to a hotel's ability to leverage digital technologies and data-driven insights to sense, seize, and transform its operations in a sustainable manner^[11]. This capability allows hotels to optimize resource utilization, enhance operational efficiency, and develop innovative green products and services^[5,9]. On the other hand, green creativity is the hotel's capacity to develop novel and meaningful sustainable solutions, products, and services that reduce its environmental impact^[6,8]. This creativity-driven approach to sustainability can enable hotels to differentiate themselves, improve their environmental performance, and ultimately enhance their green competitiveness^[5,7]. The literature suggests that organizations that can effectively leverage their digital capabilities to foster a culture of green creativity are better positioned to develop and implement sustainable innovations, thereby strengthening their green competitiveness in the market^[6,9,12-14].

This study aims to explore the interplay between digital dynamic capability, green creativity, and green competitiveness in the Egyptian hotel and tourism industry, providing insights and strategies for businesses seeking to enhance their sustainability performance and competitive advantage.

Lee and Choi^[15] refer to argument against digital dynamic capability is that not all organizations have the necessary resources, such as financial capital, skilled personnel, or technological infrastructure, to effectively implement and sustain digital. organizational resistance to change and inertia can impede the development of digital dynamic capabilities. Employees and leaders may be reluctant to embrace new technologies, processes, or ways of working, leading to a lack of alignment between digital initiatives and organizational goals^[16]. Teece^[17] indicates that Critics of digital dynamic capability that organizations risk focusing too much on technology and digital tools at the expense of other critical factors such as human capital, organizational culture, and customer relationships. This narrow focus on technology may overlook the importance of holistic organizational development and innovation.

Furthermore, there is a potential gap between green competitiveness, leveraging digital dynamic capability, and green creativity in hotels. This study examines the impact of digital dynamic capability on green competitiveness in hotel and tourism businesses, considering green creativity as a mediator. The current literature may lack empirical studies that provide substantial evidence on the impact of digital dynamic capability and green creativity on green competitiveness in the hospitality sector. The study discusses the importance of stakeholder engagement in driving green competitiveness.

However, there is a potential gap in exploring the perspectives of different stakeholders, such as customers, employees, and regulatory bodies, regarding the role of digital technologies and creative sustainability practices in shaping green initiatives within hotels and tourism businesses. There is a gap

related with long-term sustainability impact that while the study focuses on the immediate effects of digital dynamic capability and green creativity on green competitiveness, there may be a gap in exploring the long-term sustainability impact of these capabilities. Hence, this study aims to address this gap by many objectives: (1) Examine how digital dynamic capability influences the green competitiveness of hotels and tourism businesses.(2) Investigate the mediating effect of green creativity in the relationship between digital dynamic capability and green competitiveness.(3) Contribute to the existing literature by examining the predictive power of digital dynamic capability in shaping sustainable innovations and competitive strategies.(4) Bridge the gap in empirical research by providing substantial evidence on the direct impact of digital dynamic capability and green creativity on green competitiveness within the hospitality sector.

2. Literature review and hypotheses development

2.1. Green competitiveness in hotel and tourism businesses:

In the context of the hotel and tourism industry, green competitiveness refers to a firm's ability to enhance its competitive position by implementing environmentally sustainable practices and developing green business models^[18,19]. According to Karakitsiou and Mavrommati^[19] hotel green competitiveness involves "the hotel's capability to gain competitive advantage by implementing environmental-friendly practices and strategies" in areas such as energy efficiency, water conservation, waste management, and sustainable procurement, but there are conflicting findings regarding the magnitude of this impact.

Dangelico and Pontrandolfo^[18] noted that hotels can improve their green competitiveness through initiatives like renewable energy installation, water-saving technologies, and ecologically friendly building materials and design. This allows them to differentiate their offerings, improve operational efficiency, and appeal to environmentally conscious consumers^[20]. Dangelico and Pontrandolfo^[18] further explained that green competitiveness in the hotel industry encompasses "the impact of environmental actions and collaborations on firm performance". This includes developing sustainable business models, building green brand reputation, and engaging with stakeholders to co-create environmentally responsible tourism experiences^[21,22]. Further, green competitiveness in the hotel and tourism industry refers to a firm's strategic and operational capabilities to leverage environmental sustainability as a source of competitive advantage through innovation, business model transformation, and stakeholder management^[23,24].

Gössling et al.^[25] refer to challenges the traditional notion that green initiatives inevitably lead to increased competitiveness in the hospitality sector. The researchers argue that while sustainability measures may attract environmentally conscious consumers, the costs associated with implementing and maintaining green practices can sometimes outweigh the perceived benefits in terms of market share and profitability. This divergence of views underscores the complexity of balancing environmental stewardship with economic viability in the context of green competitiveness.

Font et al.^[26] sheds light on the potential trade-offs between digitalization efforts and sustainability goals in the hotel industry, then highlight how the rapid adoption of digital technologies, while offering operational efficiencies and guest engagement opportunities, can also lead to increased energy consumption and electronic waste generation. This juxtaposition of digital innovation and environmental impact underscores the need for a nuanced approach to leveraging digital dynamic capability for sustainable competitiveness.

2.2. Digital dynamic capability

Digital dynamic capability is a critical organizational competency that enables firms to sense, seize, and transform their business in response to rapidly changing digital technologies and market conditions^[27,28].

This capability is particularly important in the hotel and tourism industry, which has undergone significant digital disruption in recent years^[29].

The sensing dimension of digital dynamic capability involves the continuous monitoring of the external environment to identify emerging digital trends, technological innovations, and shifting customer preferences^[30,31]. This requires firms to develop robust market intelligence systems, foster open innovation, and maintain strong relationships with technology providers, startups, and other ecosystem partners^[32,33].

The seizing dimension refers to the firm's ability to make timely and informed decisions about investing in digital technologies, restructuring organizational processes, and reallocating resources to capitalize on identified opportunities^[27,34]. This may involve the adoption of agile development methodologies, the creation of cross-functional digital teams, and the implementation of digital platforms and ecosystems^[35,36].

The transforming dimension encompasses the firm's capacity to continuously adapt its digital infrastructure, capabilities, and business models to address changes in the competitive landscape^[27,37,38]. This requires hotel and tourism firms to develop the ability to rapidly experiment, learn, and scale successful digital initiatives, while also being able to quickly pivot or divest from unsuccessful ones^[36,39,40].

2.3. Green creativity

Green creativity refers to the ability of individuals, teams, or organizations to generate novel and useful ideas, solutions, or processes that are environmentally friendly and contribute to sustainable development^[41]. According to Chen et al.^[7] green creativity involves "the ability to produce ideas, solutions, or processes that are novel, appropriate, and environmentally friendly." This includes creativity that leads to the development of green products, services, business models, and production methods.

Kim and Han^[42] refer that green creativity "represents the generation of novel and useful ideas, solutions, or processes that can reduce the negative environmental impact and promote sustainable development." This requires both the cognitive ability to think creatively as well as a pro-environmental mindset and values.

Chen et al.^[41] proposed a componential theory of creativity, which suggests that green creativity depends on three key elements: domain-relevant skills, creativity-relevant processes, and intrinsic task motivation. Kim and Han^[42] further identify organizational factors that can enable green creativity, such as environmental leadership, green organizational climate, and green human resource management practices.

Green creativity is the capacity to ideate and develop innovative, environmentally sustainable solutions, products, or processes that contribute to ecological preservation and sustainable development^[41]. It is a critical capability for firms seeking to enhance their green competitiveness. However, there is a gap in elucidating the mechanisms through which green creativity mediates the relationship between digital dynamic capability and green competitiveness. Delving deeper into this mediating process could provide valuable insights into the underlying dynamics of sustainable performance in the hospitality sector^[42].

García and Garrido et al.^[43] refer to the idea that green creativity can inspire hotels and resorts to adopt energy-efficient architectural designs that optimize natural lighting, ventilation, and insulation. For instance, the use of eco-friendly building materials, such as recycled wood or energy-efficient glass, can reduce energy consumption for heating and cooling. The Parkroyal Collection Pickering in Singapore exemplifies this approach with its sustainable architecture featuring lush sky gardens that act as natural insulation, reducing the building's energy needs. Green creativity extends to waste management strategies that minimize environmental impact and promote resource conservation. Hotels can implement innovative recycling programs that repurpose food waste into compost for gardens or use discarded materials for upcycled decor.

The Hilton London Bankside exemplifies this by partnering with local artists to create eco-friendly artwork from recycled materials, showcasing a commitment to sustainability through creative reuse initiatives^[42].

2.4. Digital dynamic capability and green competitiveness

Digital dynamic capability refers to a firm's ability to leverage digital technologies to sense, seize, and transform its resources and processes in response to changing market demands^[27,44]. This includes capabilities like digital innovation, data analytics, and digital process management. Mikalef and Pateli^[45] found that digital dynamic capability enables firms to develop innovative green products and services, optimize resource efficiency, and enhance sustainability-oriented decision making. These capabilities can directly contribute to a hotel's green competitiveness.

Schoormann et al.^[46] further explained that digital technologies, when combined with environmental management practices, can help hotels better monitor, communicate, and improve their environmental performance. This can lead to cost savings, regulatory compliance, and green brand reputation. Taber et al.^[44] refer that the hotel industry and determined that digital dynamic capability allows hotels to sense emerging green consumer preferences, seize opportunities for sustainable innovation, and transform their operations and offerings to enhance green competitiveness.

Akter et al.^[47] highlighted how digital capabilities, including analytics and big data, can enhance organizational agility and performance, which is crucial for achieving green competitiveness. Digital dynamic capability refers to a hotel's ability to leverage digital technologies to sense, seize, and transform its resources and processes in response to changing environmental demands^[27,44]. This includes capabilities like digital innovation, data analytics, and digital process management. Consequently, the following hypothesis is formulated:

H1: Digital dynamic capability positively impacts green competitiveness.

2.5. Digital dynamic capability and green creativity

Mikalef and Pateli^[45] found that digital dynamic capability enables firms to develop innovative green products and services, which requires a high degree of green creativity. These digital capabilities allow hotels to better understand customer preferences, identify new sustainable opportunities, and ideate novel green solutions. Martínez-Martínez et al.^[8] studied the hotel industry and determined that digital technologies, when combined with environmental management practices, can stimulate employees' green creativity by providing them with real-time data, predictive insights, and collaborative platforms to ideate and implement sustainable innovations. Ting et al.^[6] further explained that a hotel's digital dynamic capability, such as data analytics and digital process integration, can enhance its green dynamic capability, which in turn fosters green creativity and innovations that improve environmental performance and green competitiveness.

Choudhary et al.^[9] found that hotels with higher digital dynamic capabilities, such as smart technology integration and data analytics, were better able to identify and implement green innovations and creative sustainability practices in their supply chain management. Garrido-Moreno et al.^[5] highlighted how a hotel's digital knowledge management capabilities, including knowledge sharing platforms and data-driven decision making, can foster a culture of creativity and ideation that leads to the development of green innovations. Sanchez-Guevara and Palacios-Marque^[10] refer that that a hotel's digital dynamic capability, such as its ability to leverage data analytics and digital processes, can significantly enhance the positive impact of its eco-innovations, which often require a high degree of green creativity, on its overall performance.

Lorden et al.^[11] found that hotels with stronger digital capabilities, including the use of digital platforms and real-time data, were better able to translate their sustainability initiatives, which are often the result of green creativity, into increased firm value and competitiveness. Consequently, the following hypothesis is formulated:

H2: Digital dynamic capability positively impacts green creativity.

2.6. Green creativity and green competitiveness

Green creativity refers to the ability of a hotel to develop novel and meaningful sustainable solutions, products, and services that reduce its environmental impact^[6,8]. This includes innovative green practices, technologies, and business models. Chen^[7] examined the hotel industry and determined that green creativity, manifested through eco-innovations and sustainable practices, is a key driver of a hotel's green competitiveness. Hotels that are more creative in developing green solutions are better able to differentiate themselves, reduce costs, and improve their environmental performance^[48,49].

Garrido-Moreno et al.^[5] further explained that a hotel's ability to foster a culture of green creativity, through knowledge sharing and employee engagement, enables it to develop unique green competencies that are difficult for competitors to imitate, thereby enhancing its green competitiveness. Ting et al.^[6] found that a hotel's green creativity, facilitated by its green dynamic capabilities, positively impacts its green competitiveness by allowing it to introduce innovative sustainable offerings, optimize resource utilization, and improve its overall environmental performance. In addition, hotels can leverage their green creativity to develop new green products and services, adopt efficient operational practices, and implement environmental management systems, all of which contribute to enhanced green competitiveness^[8,50]. Consequently, the following hypothesis is formulated:

H3: Green creativity positively impacts green competitiveness.

2.7. Green creativity as a mediator

Garrido-Moreno et al.^[5] demonstrated that a hotel's digital knowledge management capabilities, such as knowledge sharing platforms and data-driven decision making, can foster a culture of creativity and ideation that leads to the development of green innovations. This green creativity then enables the hotel to enhance its environmental performance and green competitiveness. Choudhary et al.^[9] found that hotels with higher digital dynamic capabilities, including smart technology integration and data analytics, were better able to identify and implement green innovations and creative sustainability practices in their supply chain management. This green creativity then contributed to improved green competitiveness.

Sanchez-Guevara and Palacios-Marques^[10] demonstrated that a hotel's digital dynamic capability, such as its ability to leverage data analytics and digital processes, can significantly enhance the positive impact of its eco-innovations, which often require a high degree of green creativity, on its overall green competitiveness. Lorden et al.^[11] further highlighted that hotels with stronger digital capabilities, including the use of digital platforms and real-time data, were better able to translate their sustainability initiatives, which are often the result of green creativity, into increased firm value and green competitiveness.

Hotel's digital dynamic capability, which enables it to leverage digital technologies and data to sense, seize, and transform its operations, can enhance its green creativity, which in turn positively impacts its green competitiveness^[5,9-11]. This highlights the mediating role of green creativity in the relationship between digital dynamic capability and green competitiveness in the hotel industry. Consequently, the following hypothesis is formulated:

H4: Green creativity positively mediates the relationship between digital dynamic capability and green competitiveness.

Figure 1 below shows the conceptual framework of the study.

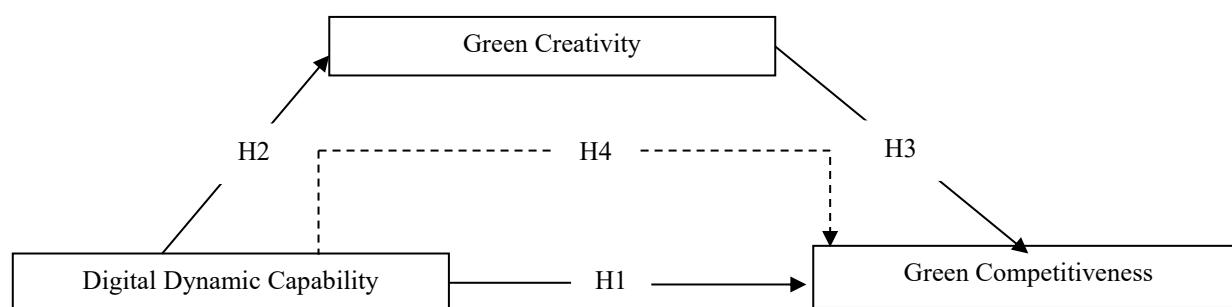


Figure 1. : The conceptual framework of the study.

3. Study methodology

3.1. Questionnaire design and study measures

A structured survey was conducted to investigate the impact of digital dynamic capability and green creativity on green competitiveness in hotel and tourism enterprises. The survey consists of two parts, discussing participants' gender, age, education, and tenure, and assessing the three researched variables using a five-point Likert scale.

The study utilized validated measurement scales from the literature to analyze the four variables under investigation. The questionnaire was translated into Arabic by a bilingual specialist and then back into English by a second bilingual professional. The consistency of the information was confirmed by examining the earlier and later English translations. The questionnaire was administered in Arabic due to a match, ensuring the comprehension of the sentences and achieving the highest possible response rate.

Digital dynamic capability was evaluated by 12-item scale adopted from Shen et al.^[51]. For instance, “We are able to analyze the signals scouted and analyze the digital scenarios of the future” and “We have the ability to generate new ecosystems”. In addition, the current study assessed green competitiveness using seven-item scale adapted from Zameer et al.^[52] and Chen^[53]. For example, “Our firm offers green products and services that are better than that of its major competitor’s” and “The distinct position of our firm cannot be easily replaced by its major competitors”. Moreover, the study assessed green creativity using Chen and Chang^[41] six-item scale, for example, “The members of the organization would rethink new green ideas” and “The members of the organization would find out creative solutions to environmental problems”. Appendix (A) contains detailed measurements scales.

3.2. Sample and data collection procedures

The research population comprises middle-level management at five-star hotels and category-A travel agencies in Egypt. Middle-level management was investigated because middle managers are essential in facilitating change, addressing team concerns, and driving positive organizational change by aiding in strategy formulation, innovative product idea development, and directing suggestions to the CEO and senior managers after being filtered from the bottom^[54,55]. In addition, five-star hotels and category-A travel agencies were chosen for investigation because they are embracing green initiatives to improve their business practices in line with the global need for sustainability.

The convenience sample approach was used to gather data from the voluntarily engaged participants of the research. The study applied a convenience sample approach due to the extensive geographical reach and dispersion of five-star hotels and travel agencies. Among 1666 category-A travel agencies and 30 five-star hotels in the Greater Cairo region^[56], 50 category-A travel agencies and 22 five-star hotels were investigated. After receiving verbal approval from businesses to visit and deliver the questionnaire at their establishments, 333 valid forms were obtained. The study included 35.74% (n=119) of participants working for travel agencies, while five-star hotels employed 64.26% (n=214).

Hair et al.^[57] recommends a sample size of 1:10, based on the number of items in the explored constructs. The study required a minimum sample size of 250 respondents for 25 items; therefore, our sample of 333 employees was sufficient for analysis purposes.

3.3. Non-response bias

Through the use of t-tests ($p > 0.05$) to compare the responses of early and late responses to the survey, the study found no significant differences between the two groups, suggesting that there were no non-response bias issues.

3.4. Common method biases

Using principal component analysis and Harman's single-factor test, the study evaluated common method variance (CMV) and discovered that no dominating factor accounted for more than 50% of the total variation. Put more simply, the test results demonstrate that the data are not overpowered by a single "bias" component. The discrepancy can be attributed to the several elements that the study is attempting to quantify, suggesting that CMV is probably not a significant worry in this investigation.

3.5. Sample' profile

The study involved 333 participants, with 250 men (75.08%) and 83 women (24.92%). The study included 128 (38.44%) respondents aged under 35, 115 (34.53%) aged 35-45, and 90 (27.03%) aged 45 or older. Over two-thirds of the participants (n=228, 68.47%) held a bachelor's degree, while 16.52% (n=55) and 15.02% (n=50) had high schools or a Master/PhD degree, respectively. The study found that 41.74% (n=139) of participants worked for their organization for two to five years, 23.12% (n=77) for six to less than ten years, and 35.14% (n=117) for ten years or longer.

3.6. Data analysis

The study used the PLS-SEM technique, a popular analytical tool in tourism research, to evaluate the proposed model using the WarpPLS software 7.0. The PLS-SEM technique is a widely-used method for confirmatory and exploratory investigations. It is a statistical method utilized for theory validation and extension and facilitating efficient data processing. In addition, this tool is ideal for strategic and management studies and is a widely used analytical tool in hospitality and tourism research. An additional method used to evaluate the significant variations in path coefficients among the variables under investigation was the PLS-SEM multi-group analysis.

4. Results

4.1. Measurement model

PLS-SEM is a statistical technique used to analyze complex relationships between variables. It involves identifying constructs, defining relationships, and developing measurement items. Data is collected, preprocessed, and standardized. Outer and inner models are assessed for construct validity, reliability, and path coefficients. Bootstrapping is used to estimate standard errors. Hypothesis testing is done to determine if

the relationships are supported by the data. The results are then interpreted, and conclusions drawn based on the supported hypotheses are discussed.

The three-factor model of digital dynamic capability, green competitiveness, and green creativity was tested using confirmatory factor analysis using WarpPLS software 7.0. The model's fit was analyzed using ten fit indices by Kock^[58,59], including, APC “P<0.05”, ARS “P<0.05”, AARS “P<0.05”, AVIF “acceptable if ≤5, ideally ≤3.3”, AFVIF “acceptable if ≤5, ideally ≤3.3”, GoF “small ≥0.1, medium ≥0.25, large ≥ 0.36”, SPR “acceptable if ≥ 0.7, ideally = 1”, RSCR “acceptable if ≥ 0.9, ideally = 1”, SSR “acceptable if ≥0.7”, and NLBCDR “acceptable if ≥0.7”. The three-factor model proposed provided well-fitted data; “APC=0.520, P<0.001; ARS=0.575, P<0.001; AARS=0.573, P<0.001; AVIF=2.640; AFVIF=2.059; GoF=0.578; SPR=1.000; RSCR=1.000; SSR=1.000; and NLBCDR=1.000”.

According to **Table 1**, the research constructs had composite reliability ratings above the minimal acceptable level (CR>0.70), with statistically significant item loadings (>0.50,p<0.05). The convergent validity was confirmed by average variance extracted values of digital dynamic capability, green competitiveness, and green creativity (AVE>0.50). The model is free of common method bias as the variance inflation factors (VIFs) for every latent variable ≤⁷3.3^[59,60].

Table 1. Item loadings, Cronbach alpha, CR, AVE, and VIFs

Factors	Item loading	Cronbach alpha	CR	AVE	VIFs	Result
Green Competitiveness (G.Comp.)	-					
G.Comp.1.	0.760**					
G.Comp.2.	0.775**					
G.Comp.3.	0.796**					
G.Comp.4.	0.794**	0.889	0.913	0.600	2.003	Supported
G.Comp.5.	0.805**					
G.Comp.6.	0.727**					
G.Comp.7.	0.761**					
Digital dynamic capability (DDC)	-					
DDC.1.	0.780**					
DDC.2.	0.784**					
DDC.3.	0.785**					
DDC.4.	0.756**					
DDC.5.	0.804**					
DDC.6.	0.765**	0.920	0.932	0.537	2.125	Supported
DDC.7.	0.753**					
DDC.8.	0.807**					
DDC.9.	0.734**					
DDC.10.	0.596**					
DDC.11.	0.630**					
DDC.12.	0.542**					
Green Creativity (G.Crtv)	-					
G.Crtv.1.	0.831**	0.868	0.901	0.605	2.050	Supported

Factors	Item loading	Cronbach alpha	CR	AVE	VIFs	Result
G.Crtv.2.	0.806**					
G.Crtv.3.	0.822**					
G.Crtv.4.	0.777**					
G.Crtv.5.	0.697**					
G.Crtv.6.	0.723**					

** P value for item loading (<0.001)

Table 1. (Continued)

According to data presented in **Table 2**, the study model's discriminant validity was confirmed. Given that each variable's AVE value is higher than the maximum common value and that there is a significantly lower correlation between two latent variables than unity. In order to examine the validity of the constructs, the HTMT was also computed and validated (refer to **Table 3** and **Table 4**).

Table 2. Discriminant validity results

	G.Comp	DDC	G.Crtv	Result
Green Competitiveness (G.Comp)	0.774	0.653	0.637	Supported
Digital dynamic capability (DDC)	0.653	0.733	0.663	Supported
Green Creativity (G.Crtv)	0.637	0.663	0.778	Supported

Table 3. HTMT for validity

HTMT ratios (good if < 0.90, best if < 0.85)	G.Comp	DDC	G.Crtv	Result
Green Competitiveness (G.Comp)				Supported
Digital dynamic capability (DDC)	0.740			Supported
Green Creativity (G.Crtv)	0.725	0.755		Supported
P values (one-tailed) for HTMT ratios (good if < 0.05)	G.Comp	DDC	G.Crtv	Result
Green Competitiveness (G.Comp)				Supported
Digital dynamic capability (DDC)	<0.001			Supported
Green Creativity (G.Crtv)	<0.001	<0.001		Supported

Table 4. HTMT confidence interval

Relationships	Bias-Corrected 95% CI	Result
Digital dynamic capability → Green Competitiveness	[0.653, 0.827]	Supported
Green Creativity → Green Competitiveness	[0.639, 0.812]	Supported
Digital dynamic capability → Green Creativity	[0.668, 0.842]	Supported

4.2. Multi-group analysis

This technique compares the same model across different groups (in this case, hotel vs. travel agency staff). It helps assess if the relationships between variables in the model hold for both groups or if there are significant differences. The test results in **Table 4** show no significant differences in path coefficients between staff members of five-star hotels and travel agencies.

Table 4. Multi-group analysis

Constructs/Hypotheses	Path coeff. (Five-Star Hotel)	Path coef. (Travel Agency)	Absolute path coeff. Diff.	p-values	Tstatistic	Result
DDC → G.Comp	0.362	0.493	0.131	0.112	1.214	No differences
G.Crtv → G.Comp	0.421	0.290	0.131	0.113	1.209	No differences
DDC → G.Crtv	0.757	0.833	0.076	0.221	0.768	No differences

4.3. Results of direct effects

Figure 2 shows that digital dynamic capability positively affects green competitiveness ($\beta=0.39$, $P<0.01$), and green creativity ($\beta=0.78$, $P<0.01$). This means that when digital dynamic capability rises, green competitiveness and green creativity increase. Thus, H1 and H2 are supported. In addition, green creativity positively affects green competitiveness ($\beta=0.39$, $P<0.01$), this means that when green creativity is high, green competitiveness tends to be high. Thus, H3 is supported.

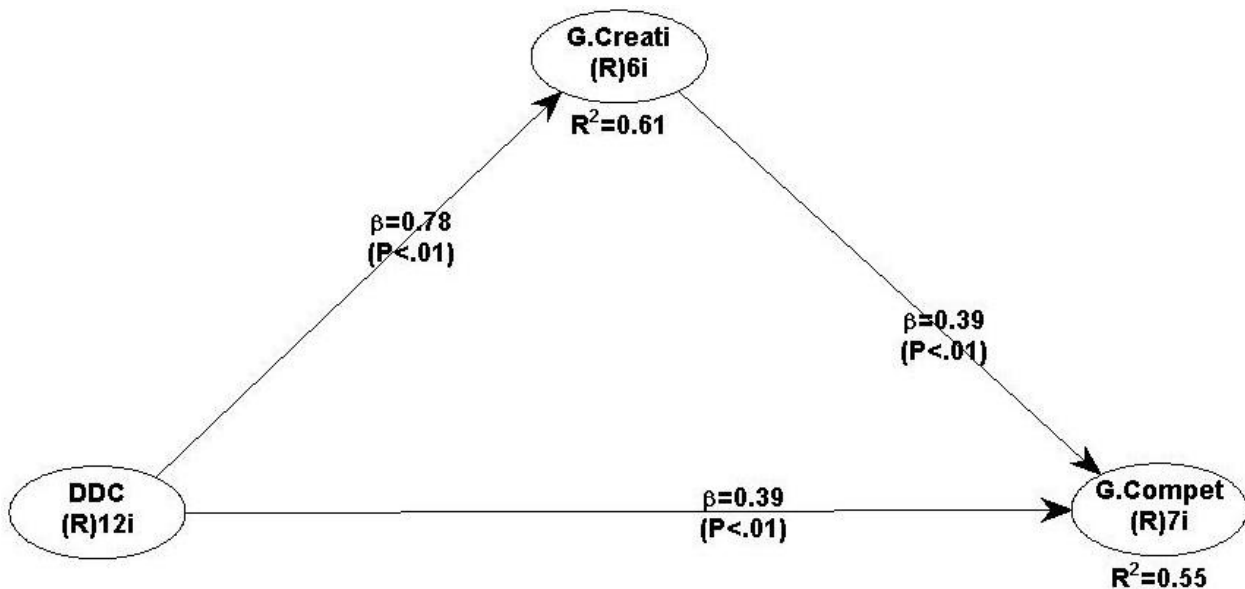


Figure 2.: final model of the study

4.4. Mediation analysis

The mediation effect of green creativity was examined using the approach developed by Preacher and Hayes^[61]. The bootstrapping analysis results presented in Table 5 reveal a significant indirect effect with a t-value of 8.222, and the 95% confidence interval does not cross a 0 in between (LL=0.232, UL=0.377). Consequently, the study supports the hypothesis (H4) that green creativity significantly mediates the relationship between digital dynamic capability and green competitiveness.

Table 5. Mediation analysis’ bootstrapped confidence interval.

	Path a	Path b	Indirect Effect	SE	t-value	Bootstrapped Confidence Interval		Decision	Result
						95% LL	95% UL		
DDC → G.Crtv → G.Comp	0.780	0.390	0.304**	0.037	8.222	0.232	0.377	Mediation	Supported

** P value for item loading (<0.001)

Table 5. (Continued)

5. Discussion

This study aims to examine the influence of digital dynamic capability (DDC) on green competitiveness in hotel and tourism businesses. It also focuses on the mediating role of green creativity. A conceptual model was formulated and tested. Findings revealed that digital dynamic capability positively affects green competitiveness (H1-supported). This result is consistent with other research by^[44,62]. DDC aids in green initiatives by enabling companies to develop eco-friendly products and processes, reducing resource usage and environmental impact through digital tools^[62,63]. DDC also helps companies optimize their operations to reduce waste and energy consumption^[64]. This can involve using data analytics to identify areas for improvement or implementing digital solutions like smart grids to manage energy use. In addition, DDC allows companies to monitor their environmental impact and communicate their sustainability efforts to stakeholders through digital platforms like supply chain tracking systems^[62,65]. Moreover, DDC enables collaboration on green initiatives, utilizing digital tools for communication, resource sharing, and joint product development for sustainability^[66,67]. In other words, DDC offers green competitiveness benefits such as reduced costs, enhanced brand image, and compliance with evolving environmental regulations, attracting environmentally conscious consumers and enabling companies to adapt quickly and efficiently^[58,68]. By effectively utilizing DDC, companies can achieve a win-win situation, gaining a competitive edge while also contributing to environmental sustainability.

Findings also revealed that digital dynamic capability positively affects green creativity (H2-supported). This result is consistent with other research^[9,62,69]. DDC enhances information flow by enabling data collection and analysis from various sources, including environmental trends, consumer preferences, and competitor innovations, fostering creative ideas for environmentally friendly products and services^[62,69]. DDC also enables companies to utilize tools like digital simulations to experiment with new eco-friendly designs and processes more quickly and efficiently. This fosters a culture of experimentation and exploration, leading to green innovations^[67]. In addition, DDC fosters collaboration across departments and external partners, promoting cross-pollination of ideas and fostering creative solutions for environmental challenges^[70]. Moreover, DDC allows companies to make data-driven decisions about their green initiatives. This can lead to a more focused approach to creativity, where resources are directed towards the most promising ideas with the highest environmental impact^[62,71]. In other words, by facilitating information flow, providing advanced tools, and fostering collaboration, DDC empowers companies to think outside the box and develop innovative solutions that address environmental concerns. This leads to a wave of green creativity, which is essential for achieving long-term sustainability goals.

Moreover, findings revealed that green creativity positively affects green competitiveness (H3-supported) and mediates the relationship between digital dynamic capability and green competitiveness (H4-supported). These results could be interpreted by the findings of Lee et al.^[72] and Makhouloufi^[73] who argued that green creativity acts as a bridge between digital dynamic capability and green competitiveness. Green creativity significantly enhances green competitiveness. Green creativity drives the creation of eco-friendly products, services, and processes, enabling companies to stand out from competitors who prioritize sustainability^[74]. Green creativity can also lead to cost savings and improved efficiency by identifying ways to reduce waste, conserve resources, and minimize a company's environmental footprint^[75]. Empowering employees to find creative solutions to environmental challenges boosts engagement and motivation^[76], fostering a positive company culture that attracts top talent. In addition, companies that exhibit green

creativity can enhance their brand image by attracting environmentally conscious customers due to their growing concern for environmental issues. Green creativity helps companies stay ahead of stricter environmental regulations, avoiding fines and legal issues, while adhering to stricter regulations^[77]. Overall, green creativity acts as a powerful driver for green competitiveness, allowing companies to thrive in a market that increasingly values environmental responsibility.

Furthermore, digital tools can stimulate green creativity by enabling exploration of innovative ideas, gathering environmental data, and fostering connections with other companies and researchers working on sustainability solutions^[65,72]. Green creativity is a powerful tool that can significantly enhance the potential of digital capabilities^[41,65]. Companies can effectively implement green ideas by leveraging their digital capabilities, such as developing eco-friendly product designs and using digital platforms for production, marketing, and distribution. Therefore, green creativity helps a company translate its digital capabilities into tangible results that enhance its green competitiveness^[72,73].

To sum up, the results of the study are consistently supported by the literature, but in an individual manner, not in an aggregate manner. The novel contribution of our study relied on integrating digital dynamic capability (DDC), green competitiveness, and green creativity in one model that was formulated and tested within the hotel and tourism businesses context.

The study's integration of DDC, green competitiveness, and green creativity in the hotel and tourism sector provides several novel contributions. The study bridges the gap between digitalization and sustainability in the hotel and tourism industry by linking digital technologies with green competitiveness and creativity. The study also provides insights into how DDC can be utilized in the hotel and tourism sector to tackle sustainability challenges and improve green competitiveness. In addition, incorporating green creativity in the study model underscores the significance of innovation in driving sustainable practices, especially in the evolving hotel and tourism industry. Moreover, the study offers empirical evidence to support the relationships between DDC, green competitiveness, and green creativity within the hotel and tourism context. This can strengthen the existing body of knowledge and offer practical guidance for industry professionals.

6. Theoretical implications

The study explores the role of green creativity as a mediator in enhancing the digital dynamic capabilities and green competitiveness relationship in the tourism and hospitality sector, providing significant insights into the existing literature. The study enhances research on the impact of digital technology (i.e. DDC) on business competitiveness, especially in the green business context. The study explores the role of digital dynamic capabilities in enhancing green creativity and green competitiveness in the tourism and hospitality industry, providing industry-specific insights into dynamic capabilities theories. The study explores how service-oriented businesses like tourism and hospitality utilize digital capabilities and green creativity to enhance operational efficiency, competitiveness, and long-term sustainability amidst environmental uncertainties.

7. Practical implications

Digital capabilities are widely regarded as a potent tool for enterprises to effectively compete in the digital era. The introduction and adoption of digital capabilities are crucial for hotel and tourism businesses to capitalize on growth opportunities and meet market demands. Digital dynamic capability allows tourism

and hotel businesses to thrive in a constantly evolving environment. Tourism and hotel firms should develop digital dynamic capabilities to transform creativity into competitive advantages, forming a green competitive advantage in uncertain environments.

The study emphasizes the importance of hotel and tourism enterprises directing IT investments to maximize business value and ensure high-quality green processes. Digital dynamic capability is crucial for tourism and hotel businesses to thrive in a constantly evolving environment. To develop this capability, businesses should stay ahead of the curve by sensing trends, seizing opportunities, and reconfiguring their approach. This involves market research, data analytics, innovation, and leveraging digital tools like virtual reality tours and AI. Additionally, businesses should adapt their digital strategy based on market conditions and guest feedback, train staff on digital tools, make data-driven decisions, and invest in the right digital tools. This long-term commitment ensures a competitive and exceptional customer experience in the digital age.

To enhance green creativity in the tourism and hotel industry, leaders should foster a green culture, educate staff on environmental issues, organize brainstorming sessions, and recognize and reward innovative green ideas. Guests should enjoy eco-friendly experiences, amenities, and eco-friendly transportation options. Educate guests about the environmental impact of tourism and the hotel's green practices through signage, digital displays, and incentives. General strategies include reducing resource consumption, waste management, sustainable procurement, and using energy-efficient materials. Transparency and communication about green initiatives are essential. Additional ideas include carbon offsetting programs, community involvement, and partnerships with eco-tourism organizations. Green creativity is an ongoing process, and businesses should continually evaluate their effectiveness and explore new ways to improve their environmental footprint.

8. Limitations and further research avenues

The study explores the link between digital dynamic capability, green creativity, and green competitiveness in hospitality and tourism sectors, but acknowledges limitations and suggests areas for further research. The study's findings may be context-specific and not universally applicable due to its focus on the Greater Cairo region of Egypt and the industry segment of travel agencies and five-star hotels. Future research should explore the role of digital dynamic capabilities in various contexts like airlines and restaurants to assess their robustness and applicability. The study also suggests green creativity mediates the digital dynamic capability-green competitiveness nexus; however, further research is needed to understand the mechanisms driving this mediation, including green organizational learning, green knowledge sharing, and green technological self-efficacy.

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Conflict of interest

The authors declare no conflict of interest.

References

1. UNWTO. (2019). *Tourism and the Sustainable Development Goals – Journey to 2030*. World Tourism Organization.

2. Davari, A., & Strutton, D. (2014). Marketing mix strategies for closing the gap between green consumers' pro-environmental beliefs and behaviors. *Journal of Strategic Marketing*, 22(7), 563-586.
3. Mihalič et.al. (2012). A hotel sustainability business model: Evidence from Slovenia. *Journal of Sustainable Tourism* 20(5):1701-719).
4. Dodds, R., & Holmes, M. (2016). Is there a Benefit from being Green. Assessing Benefits from Marketing Sustainability by North American Hotels. *J. Hotel Bus. Manag*, 5, 145).
5. Garrido-Moreno, A., Lockett, N., & García-Morales, V. (2014). The role of knowledge management for enhancing organisational creativity and innovation in the hotel industry. *Tourism and Hospitality Research*, 14(4), 186-201.
6. Ting, D. H., Ling, L. C. F., & Cheah, J. H. (2021). Investigating the role of green innovation, environmental collaboration, and green dynamic capability on sustainable tourism performance. *Sustainable Production and Consumption*, 28, 379-391.
7. Chen, Y.-S., Chang, C.-H., & Lin, Y.-H. (2015). The determinants of green radical and incremental innovation performance: Green dynamic capability, green transformational leadership, and green organizational culture. *Sustainability*, 7(11), 15169-15184.
8. Martínez-Martínez, A., Cegarra-Navarro, J. G., García-Pérez, A., & Wensley, A. (2019). Knowledge agents as drivers of environmental sustainability and business performance in the hospitality sector. *Tourism Management*, 70, 381-389.
9. Choudhary, S., Nayak, R., Kejriwal, A., & Kumar, C. (2021). Integrating green practices into supply chain strategies: A feasibility study of the Indian hotel industry. *Journal of Cleaner Production*, 291, 125243.
10. Sanchez-Guevara, A., & Palacios-Marques, D. (2020). The moderating effect of digital dynamic capability on the relationship between eco-innovation and hotel performance. *International Journal of Hospitality Management*, 88, 102506.
11. Lorden, A. L., Howton, S. W., & Howton, S. D. (2020). Sustainability reporting and firm value: Evidence from the hotel industry. *Journal of Sustainable Tourism*, 28(11), 1901-1920.
12. Alsheref, F. K., Khairy, H. A., Alsetoohy, O., Elsayy, O., Fayyad, S., Salama, M., ... & Soliman, S. A. E. M. (2024). Catalyzing Green Identity and Sustainable Advantage in Tourism and Hotel Businesses. *Sustainability*, 16(12), 5267.
13. Hussein, H., Albadry, O. M., Mathew, V., Al-Romeedy, B. S., Alsetoohy, O., Abou Kamar, M., & Khairy, H. A. (2024). Digital Leadership and Sustainable Competitive Advantage: Leveraging Green Absorptive Capability and Eco-Innovation in Tourism and Hospitality Businesses. *Sustainability*, 16(13), 5371.
14. Olya, H., Ahmad, M. S., Abdulaziz, T. A., Khairy, H. A., Fayyad, S., & Lee, C. K. (2024). Catalyzing green change: The impact of tech-savvy leaders on innovative behaviors. *Corporate Social Responsibility and Environmental Management*.
15. Lee, H., & Choi, B. (2020). Overcoming Resource Constraints in Digital Transformation: The Role of Dynamic Capabilities. *Journal of Organizational Change Management*, 33(5), 1011-1029.
16. Orlikowski, W. J., & Scott, S. V. (2015). *Digital Work: Principles and Practices*. MIT Press.
17. Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives*, 28(4), 328-352.
18. Dangelico, R. M., & Pontrandolfo, P. (2015). Being 'green and competitive': the impact of environmental actions and collaborations on firm performance. *Business Strategy and the Environment*, 24(6), 413-430.
19. Karakitsiou, A., & Mavrommati, A. (2018). Hotel green competitiveness in the field of environmental sustainability: a critical review. *Competitiveness Review: An International Business Journal*, 28(4), 394-414.
20. Tsai, H., Tsang, N. K., & Cheng, S. K. (2012). Hotel employees' perceptions on corporate social responsibility: The case of Hong Kong. *International Journal of Hospitality Management*, 31(4), 1143-1154.
21. Foss, N. J., & Saebi, T. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go?. *Journal of Management*, 43(1), 200-227.
22. Hahn, T., Preuss, L., Pinkse, J., & Figge, F. (2014). Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames. *Academy of Management Review*, 39(4), 463-487.
23. Kushwaha, G. S., & Sharma, N. K. (2016). Green initiatives: a step towards sustainable development and firm's performance in the automobile industry. *Journal of Cleaner Production*, 121, 139-149.
24. Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97-118.

25. Gössling, S., Scott, D., & Hall, C. M. (2020). Challenges of tourism in a world of accelerated global environmental change: A call for a new era of tourism. *Journal of Sustainable Tourism*, 28(7), 869-884. <https://doi.org/10.1080/09669582.2020.1781513>.
26. Font, X., Walmsley, A., Cogotti, S., & McCombes, L. (2018). Sustainable hotel practices and guest satisfaction levels. *International Journal of Hospitality Management*, 71, 1-10. <https://doi.org/10.1016/j.ijhm.2017.11.006>.
27. Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319-1350.
28. Helfat, C. E., & Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, 47(8), 1391-1399.
29. Remane, G., Hanelt, A., Nickerson, R. C., & Kolbe, L. M. (2017). Discovering digital business models in traditional industries. *Journal of Business Strategy*, 38(2), 41-51.
30. Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they?. *Strategic Management Journal*, 21(10-11), 1105-1121.
31. Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems*, 15(2), 120-131.
32. Giudici, A., Reinmoeller, P., & Ravasi, D. (2018). Open-system dynamic capabilities: an investigation of innovate-as-you-evolve strategies. *Industrial and Corporate Change*, 27(5), 1103-1123.
33. Mishra, A. N., & Agarwal, R. (2010). Technological frames, organizational capabilities, and IT use: an empirical investigation of electronic procurement. *Information Systems Research*, 21(2), 249-270.
34. Khanagha, S., Volberda, H., & Oshri, I. (2014). Business model renewal and ambidexterity: structural alteration and strategy formation process during transition to a Cloud business model. *R&D Management*, 44(3), 322-340.
35. Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2017). How big old companies navigate digital transformation. *MIS Quarterly Executive*, 16(3).
36. Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118-144.
37. Karimi, J., & Walter, Z. (2015). The role of dynamic capabilities in responding to digital disruption: A factor-based study of the newspaper industry. *Journal of Management Information Systems*, 32(1), 39-81.
38. Zhang, J., Li, Y., & Wu, Y. (2021). The impact of digital dynamic capability on green innovation performance: The moderating role of organizational learning orientation. *Technological Forecasting and Social Change*, 162, 120357.
39. Keen, P., & Williams, R. (2013). Value architectures for digital business: beyond the business model. *MIS Quarterly*, 37(2), 643-647.
40. Tarafdar, M., Cooper, C. L., Stich, J.-F., & O'Connor, R. V. (2020). Transformational leadership, digital dynamic capability, and organizational agility: A multilevel investigation. *Journal of Management Information Systems*, 37(1), 44-81.
41. Chen, Y. S., & Chang, C. H. (2013). The determinants of green product development performance: Green dynamic capabilities, green transformational leadership, and green creativity. *Journal of business ethics*, 116, 107-119.
42. Kim, S. Y., & Han, H. (2020). The impact of green practices on hotel customers' word-of-mouth and revisit intention: Do green creativity and technology use matter? *International Journal of Hospitality Management*, 88, 102504.
43. García, F., & Garrido, M. J. (2019). Sustainable creativity: Environmental innovation in the hotel sector. *Journal of Sustainable Tourism*, 27(10), 1473-1492.
44. Taber, N., Agarwal, R., & Brown, J. (2022). Digital dynamic capability and green competitiveness: Insights from the hotel industry. *Information & Management*, 59(2), 103589.
45. Mikalef, P., & Pateli, A. (2017). Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA. *Journal of Business Research*, 70, 1-16.
46. Schoormann, T., Behrens, D., & Knackstedt, R. (2020). Digital sustainability: Current and future research directions. In *Sustainable Digital Communities* (pp. 312-321). Springer, Cham.
47. Akter, S., Fosso Wamba, S., & Dewan, S. (2017). Why PLS-SEM is suitable for complex modelling? An empirical illustration in big data analytics quality. *Production Planning & Control*, 28(11-12), 1011-1021.
48. Alshehri, N. Z., Baquero, A., Abd-Elhady, M. H., Salama, W. M., Khairy, H. A., & Abouelenien, R. E. I. (2024). Green HRM and green competitive advantage in hotel and tourism industry: a mediated moderation model using eco-innovation and green psychological climate.

49. Khairy, H. A., Elzek, Y., Aliane, N., & Agina, M. F. (2023). Perceived Environmental Corporate Social Responsibility Effect on Green Perceived Value and Green Attitude in Hospitality and Tourism Industry: The Mediating Role of Environmental Well-Being. *Sustainability*, 15(6), 4746.
50. Khairy, H. A., Fahmy, N. S., Awad, A. H. I., & Ashour, E. Z. (2024). Green Work Engagement and Green Competitive Advantage in Five-Star Hotels and Travel Agencies: The Role of Green Creativity. *Journal of the Faculty of Tourism and Hotels-University of Sadat City*, 8(1/1).
51. Shen, L., Zhang, X., & Liu, H. (2022). Digital technology adoption, digital dynamic capability, and digital transformation performance of textile industry: Moderating role of digital innovation orientation. *Managerial and Decision Economics*, 43(6), 2038-2054.
52. Zameer, H., Wang, Y., & Yasmeen, H. (2020). Reinforcing green competitive advantage through green production, creativity and green brand image: implications for cleaner production in China. *Journal of cleaner production*, 247, 119119.
53. Chen, Y. S. (2008). The positive effect of green intellectual capital on competitive advantages of firms. *Journal of business ethics*, 77, 271-286.
54. Jackson, D., & Humble, J. (1994). Middle managers: New purpose, new directions. *Journal of Management Development*, 13(3), 15-21.
55. O'Shannassy, T. (2014). Investigating the role of middle managers in strategy-making process: An Australian mixed method study. *Journal of Management & Organization*, 20(2), 187-205.
56. The Egyptian Ministry of Tourism and Antiquities. (2022). Hotel and tourism companies and establishments: Directory of hotel establishments and tourism companies, the Ministry of Tourism: Egypt. Retrieved from: <https://mota.gov.eg/ar/>
57. Hair, J. F., Black, W. C., Balin, B. j., & Anderson, R. E. (2010). *Multivariate data analysis: Maxwell Macmillan International Editions*.
58. Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec)*, 11(4), 1-10.
59. Kock, N. (2017). Common method bias: a full collinearity assessment method for PLS-SEM. *Partial least squares path modeling: Basic concepts, methodological issues and applications*, 245-257.
60. Kock, N. (2021). *WarpPLS User Manual: Version 7.0*. Laredo, TX: ScriptWarp Systems.
61. Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, 40(3), 879-891.
62. Cheng, W., Li, Q., Wu, Q., Ye, F., & Jiang, Y. (2024). Digital capability and green innovation: The perspective of green supply chain collaboration and top management's environmental awareness. *Heliyon*.
63. Yousaf, Z., Radulescu, M., Sinisi, C. I., Serbanescu, L., & Păunescu, L. M. (2021). Towards sustainable digital innovation of SMEs from the developing countries in the context of the digital economy and frugal environment. *Sustainability*, 13(10), 5715.
64. Chari, A., Niedenzu, D., Despeisse, M., Machado, C. G., Azevedo, J. D., Boavida-Dias, R., & Johansson, B. (2022). Dynamic capabilities for circular manufacturing supply chains—Exploring the role of Industry 4.0 and resilience. *Business Strategy and the Environment*, 31(5), 2500-2517.
65. Al-Romeedy, B. S., & Khairy, H. A. (2024). Eco-Innovation and Hospitality and Tourism Business Resilience: The Mediating Role of Green Dynamic Capabilities. In *Shifts in Knowledge Sharing and Creativity for Business Tourism* (pp. 17-36). IGI Global.
66. Kumar, G., Subramanian, N., & Arputham, R. M. (2018). Missing link between sustainability collaborative strategy and supply chain performance: Role of dynamic capability. *International Journal of Production Economics*, 203, 96-109.
67. Van de Wetering, R., & Versendaal, J. (2021). Information technology ambidexterity, digital dynamic capability, and knowledge processes as enablers of patient agility: empirical study. *JMIRx Med*, 2(4), e32336.
68. van Eechoud, T., & Ganzaroli, A. (2023). Exploring the role of dynamic capabilities in digital circular business model innovation: Results from a grounded systematic inductive analysis of 7 case studies. *Journal of Cleaner Production*, 401, 136665.
69. Jum'a, L., Zimon, D., & Madzik, P. (2024). Impact of big data technological and personal capabilities on sustainable performance on Jordanian manufacturing companies: the mediating role of innovation. *Journal of Enterprise Information Management*, 37(2), 329-354.
70. Mukherjee, A. S. (2020). *Leading in the digital world: How to foster creativity, collaboration, and inclusivity*. MIT Press.

71. Sultana, S., Akter, S., & Kyriazis, E. (2022). Theorising data-driven innovation capabilities to survive and thrive in the digital economy. *Journal of Strategic Marketing*, 1-27.
72. Lee, V. H., Dwivedi, Y. K., Tan, G. W. H., Ooi, K. B., & Wong, L. W. (2023). How does information technology capabilities affect business sustainability? The roles of ambidextrous innovation and data-driven culture. *R&D Management*.
73. Makhloufi, L. (2024). Do knowledge sharing and big data analytics capabilities matter for green absorptive capacity and green entrepreneurship orientation? Implications for green innovation. *Industrial Management & Data Systems*, 124(3), 978-1004.
74. Tran, N. K. H. (2024). Customer pressure and creating green innovation: The role of green thinking and green creativity. *Sustainable Futures*, 7, 100177.
75. Gaussin, M., Hu, G., Abolghasem, S., Basu, S., Shankar, M. R., & Bidanda, B. (2013). Assessing the environmental footprint of manufactured products: A survey of current literature. *International Journal of Production Economics*, 146(2), 515-523.
76. Stringer, L. (2010). *The green workplace: Sustainable strategies that benefit employees, the environment, and the bottom line*. St. Martin's Press.
77. Ramanathan, R., He, Q., Black, A., Ghobadian, A., & Gallea, D. (2017). Environmental regulations, innovation and firm performance: A revisit of the Porter hypothesis. *Journal of Cleaner Production*, 155, 79-92.

Appendix (A): Detailed Measurement Scales

Digital dynamic capability

- DDC.1. We are constantly searching for technological trends
- DDC.2. We are able to analyze the signals scouted and analyze the digital scenarios of the future
- DDC.3. We build a long-term digital vision and digital thinking for the company
- DDC.4. We are able to analyze the signals we detect and analyze future digital scenarios.
- DDC.5. We can use digital innovation labs for rapid prototyping
- DDC.6. We are able to scale up digital innovation business models
- DDC.7. We are able to reallocate resources quickly.
- DDC.8. We allow for repositioning and change.
- DDC.9. We interact with multiple external partners.
- DDC.10. We have the ability to generate new ecosystems.
- DDC.11. We recruit digital talent and digital technology managers from outside.
- DDC.12. We are able to leverage digital knowledge from within the organization.

Green creativity

- G.Crtv.1. The members of the organization suggest new ways to achieve environmental goals.
- G.Crtv.2. The members of the organization propose new green ideas to improve environmental performance.
- G.Crtv.3. The members of the organization promote and champion new green ideas to others.
- G.Crtv.4. The members of the organization develop adequate plans for the implementation of new green ideas.
- G.Crtv.5. The members of the organization would rethink new green ideas.
- G.Crtv.6. The members of the organization would find out creative solutions to environmental problems.

Green competitiveness

- G.Comp.1. Our firm is more capable of environmental management than its major competitors.
 - G.Comp.2. Our firm is more capable of environmental R&D and green innovation than its major competitors
 - G.Comp.3. Our firm offers green products and services that are better than that of its major competitor's
 - G.Comp.4. Our firm has a better green corporate reputation than its competitors
 - G.Comp.5. Our firm has a competitive advantage of low cost about environmental management
 - G.Comp.6. The major competitors of our firm cannot imitate its products or services easily.
 - G.Comp.7. The distinct position of our firm cannot be easily replaced by its major competitors.
-