Digital Leadership and Sustainable Competitive Advantage: Leveraging Green Absorptive Capability and Eco-Innovation in Tourism and Hospitality Businesses

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Abstract: This study explores the influence of digital leadership (DL) on sustainable competitive advantage (SCA) in tourism and hospitality businesses, focusing on green absorptive capability (GAC) and eco-innovation (EI) as mediators. This study focused on middle-line management in travel agencies and hotels in Saudi Arabia. A total of 323 valid responses were collected and analyzed using WarpPLS 7.0, a PLS-SEM analysis tool. DL positively affected SCA, GAC, and EI. In addition, SCA was positively impacted by GAC and EI. Furthermore, this study found that GAC and EI significantly mediated the DL→SCA relationship. This study enhances the Dynamic Capabilities Theory, offering valuable insights for tourism and hospitality managers to utilize digital strategies and environmental initiatives for eco-conscious market competitiveness.

Keywords: digital leadership; sustainable competitive advantage; green absorptive capability; eco-innovation; travel agencies; hotels; Saudi Arabia

1. Introduction

The advent of digital technologies has caused significant disruptions in the business world, impacting industries such as tourism and hospitality. These technologies have fundamentally changed how companies compete and how consumers behave, forcing organizations to adapt through digital transformation. In the digital economy, tourism and hospitality businesses use technology to improve their services and enhance customer experiences. The emergence of digital technologies has played a crucial role in driving change within the tourism and hospitality industry, transforming the way firms operate, the products and services they offer, and the overall business environment [1]. The integration of digital technology has improved the attractiveness, effectiveness, accessibility, and sustainability of the tourism and hospitality industry [2].

The tourism and hospitality sectors have been at the forefront of embracing digital innovation, particularly through the implementation of online booking systems for flights and hotels. The integration of information and communication technologies (ICTs) within the industry can be traced back to the 1970s with the introduction of computer reservation systems and later in the 1980s with the development of global distribution systems [3].
Today, tourism and hospitality businesses are increasingly utilizing advanced digital technologies to enhance customer engagement, gain insights into customer preferences, and improve operational efficiency. Various cutting-edge technologies, such as artificial intelligence, blockchain, machine learning, the Internet of Things, big data, virtual and augmented reality, smart devices, sensors, robots, drones, beacons, ubiquitous computing, and near-field communications, are driving this transformation within the industry [4].

With the advent of digital technology and its various applications, leadership has evolved to include new characteristics, giving rise to digital leadership as a potent tool for managers to inspire employees toward innovation and excellence [5]. The process of digital transformation within an organization goes beyond simply implementing digital technologies. It is intricately tied to the role of leaders who drive the digital strategy and shape the overall direction of the organization [6]. In essence, the key to thriving in the digital era lies in embracing a leadership style that fosters adaptation, creativity, and forward-thinking within an organization [7].

Digital leadership capability is crucial for managers to effectively navigate the ever-changing business environment, adapt to new challenges, and drive strategic transformations within their organizations [8]. Digital leadership entails creating a clear vision for digital processes and implementing it in organizational management. Leaders must be able to leverage digital technology to influence their behavior, as well as that of their team members, to enhance overall organizational performance. This concept encompasses three key components: integrating digital technology into management practices, evolving leadership attitudes and behaviors, and, ultimately, improving organizational effectiveness [7].

Effective digital leaders possess the vision, knowledge, and skills to leverage technology and data to achieve strategic objectives, foster innovation, and enhance organizational performance. They excel at adopting emerging technologies, fostering a digital culture, and aligning digital initiatives with business goals [9,10]. Digital leadership also emphasizes agility, adaptability, and continuous learning to stay ahead in a rapidly evolving digital environment. By championing digital initiatives, fostering collaboration, and empowering employees, digital leadership enables organizations to seize opportunities, address challenges, and gain a competitive edge in today’s digital-driven business environment [11].

Digital leadership is essential for achieving sustainable competitive advantage as it ensures that organizations are not only responsive to immediate technological changes but also innovating proactively. It plays a crucial role in integrating advanced technologies such as AI, machine learning, and data analytics into business operations. This integration optimizes processes, enhances productivity, and creates unique value propositions that competitors cannot easily replicate [12–14]. Moreover, digital leadership involves a visionary approach that anticipates future trends and prepares the organization to adapt to emerging technologies, thereby maintaining its market relevance and superiority [15]. However, this adoption of technology and digital initiatives can come with its own set of hurdles. This can include issues like employees being hesitant to embrace change, not possessing the required expertise, and struggling with the integration of new software and systems [5].

Digital leadership, marked by the proactive adoption and implementation of advanced digital technologies, is crucial in enhancing an organization’s green absorptive capability: the ability to recognize the value of green innovations and apply them effectively. Leaders proficient in digital technologies can drive the integration of sustainable practices by leveraging data analytics, IoT, and AI to monitor and reduce environmental impacts, optimize resource use, and implement sustainable processes [16,17].

By embedding sustainability into the digital transformation agenda, digital leaders enhance their firms’ green absorptive capacity, enabling them to stay ahead of regulatory requirements, meet stakeholder expectations for sustainability, and gain a competitive advantage. This strategic alignment supports compliance and efficiency while driving innovation in green technologies and practices, highlighting the symbiotic relationship between digital leadership and green absorptive capability [18]. Furthermore, digital lead-
ership is crucial in fostering a culture that values and prioritizes sustainability, integrating eco-friendly initiatives into core business strategies [19].

Additionally, green absorptive capability enables organizations to adopt and integrate green innovations, leading to significant competitive advantages [20]. Organizations with robust green absorptive capabilities can proactively respond to environmental regulations, staying ahead of competitors and avoiding potential fines or reputational damage [21].

Similarly, eco-innovation allows organizations to effectively meet regulatory compliance and differentiate themselves in competitive markets. By implementing eco-innovations, businesses can reduce costs through improved resource efficiency, such as using less energy or raw materials and minimizing waste, directly enhancing profitability [22,23]. Additionally, eco-innovation fosters internal benefits like nurturing a culture of creativity and attracting talent passionate about sustainability, further strengthening the organization. Overall, eco-innovation not only addresses immediate environmental and regulatory challenges but also serves as a cornerstone for sustainable competitive advantage, offering long-term benefits through market differentiation, cost savings, and an enhanced corporate reputation [9].

The literature on leadership and digital transformation is vast, with numerous studies exploring various aspects such as communication [24,25], technology [26], public administration [27], and small-to-medium enterprises [28]. While some research has focused on the capabilities required for working with virtual teams, there is still a lack of comprehensive analyses of how digital transformation impacts leadership capabilities overall. There is a growing recognition of the need for a shift in traditional leadership approaches to thrive in the digital age; yet, a cohesive theory linking digital leadership capabilities to sustainable competitive advantage remains elusive, highlighting the importance of further theoretical advancements in this area.

Despite growing recognition of the importance of digital leadership and sustainability, the research on digital leadership in the tourism and hospitality industry is still in its early stages and lacks a comprehensive understanding of its key features and mechanisms [29]. The process of digital transformation in the tourism and hospitality industry is fraught with risks and often fails, as highlighted by Kraus et al. [30]. Therefore, there is a pressing need for further research to identify the factors that either facilitate or hinder successful digital transformation in businesses operating in this sector [31]. This research should encompass businesses of various types and sizes. Despite significant advancements in academia regarding digital transformation in businesses, progress is impeded by ambiguously defined concepts, confusion in terminology, and a lack of a comprehensive theoretical framework [32].

Specifically, there is a lack of thorough explorations and analyses of the existing literature on digital leadership to fully grasp its conceptual meaning, fundamental attributes, and empirical insights to drive sustainable competitive advantage [33]. Previous research has often examined digital leadership or eco-innovation in isolation, without considering the interaction between digital capabilities, environmental knowledge absorption, and innovation. Moreover, the specific mechanisms through which green absorptive capability and eco-innovation mediate the relationship between digital leadership and sustainable competitive advantage remain underexplored. This gap underscores the need for a detailed examination of these mediating roles to provide deeper insights into how tourism and hospitality businesses can effectively integrate digital and green strategies. So, this study aims to examine the impact of digital leadership on sustainable competitive advantage, green absorptive capability, and eco-innovation. It also seeks to assess the effects of green absorptive capability and eco-innovation on sustainable competitive advantage and explore their mediating roles in the relationship between digital leadership and sustainable competitive advantage in tourism and hospitality businesses.

By addressing these objectives, this study intends to fill the research gap and provide a comprehensive understanding of how green absorptive capability and eco-innovation mediate the link between digital leadership and sustainable competitive advantage in
the tourism and hospitality industry. Delving into these relationships provides valuable opportunities to enrich ongoing academic discussions for three primary reasons. Firstly, in the ever-evolving tourism and hospitality industry, the impact of digital transformation on economic growth and societal progress is significant, as it fosters innovation, job creation, and the enhancement of products and services. Secondly, organizations that possess a profound understanding of leveraging digital transformation and dynamic capabilities to enhance their performance gain a competitive edge, leading to accelerated innovation, agile adaptation to market shifts, and the efficient delivery of value to customers. Lastly, scrutinizing these connections aids organizations in effectively allocating resources, enabling them to prioritize investments in digital transformation initiatives and dynamic capabilities that yield the highest performance impact.

2. Literature Review and Hypothesis Development

2.1. Dynamic Capabilities Theory

Dynamic Capabilities Theory was developed to address the limitations of the resource-based view in understanding how organizations can continuously adapt and evolve their resources and capabilities in response to rapidly changing market conditions. It serves as both an expansion of the resource-based view and a critique of its static nature when it comes to managing change and innovation [34]. Broadly, dynamic capabilities refer to an organization’s ability to recognize and capitalize on new opportunities, as well as adapt and protect their knowledge assets, skills, and resources, to maintain a competitive edge over time [35]. Microfoundations are seen as the foundational activities that support these capabilities [36]. It is emphasized that the performance of individuals, particularly managers, plays a crucial role in the development and execution of dynamic capabilities. The theory of dynamic capabilities focuses on how organizations develop and sustain capabilities that enable them to adapt and respond effectively to evolving environments. These capabilities allow organizations to detect market changes, capitalize on opportunities, and reconfigure their resources and strategies to sustain a competitive advantage [35,37].

The concept of digital transformation brings about a transformative shift in the way businesses operate, driven by the integration of digital technologies and the strategic utilization of essential skills to reshape organizational structures and processes [38,39]. This phenomenon of digital transformation is pervasive and inherently uncertain, making it essential to adopt a dynamic capability perspective when studying the role of digital leadership in navigating this evolving landscape. This perspective emphasizes the importance of adaptability and agility in responding to the challenges and opportunities presented by digital transformation [40,41].

Digital leadership exemplifies a dynamic capability as it entails leveraging digital technologies and data-driven strategies to drive innovation and gain a competitive edge. Effective digital leaders must possess the knowledge and skills to adopt emerging technologies, cultivate a digital culture, and align digital initiatives with sustainability objectives [19,42]. Green absorptive capability, on the other hand, represents an organization’s ability to acquire, assimilate, and apply knowledge related to environmental sustainability. This capability reflects the organization’s capacity to understand and respond to environmental trends, regulations, and consumer demands [20,43]. By developing green absorptive capability, organizations can seamlessly integrate digital leadership with sustainability practices, utilizing digital technologies to enhance their environment [16,44]. Eco-innovation encompasses the creation and adoption of environmentally conscious practices and solutions, showcasing organizations’ capacity to adapt and innovate in response to sustainability issues and prospects. By embracing eco-innovation, organizations can harness digital leadership to devise and deploy inventive strategies that tackle environmental issues, set themselves apart in the market, and bolster their sustainable competitive advantage [9,45].
2.2. The Effect of Digital Leadership on Sustainable Competitive Advantage

Digital leadership assumes a pivotal role in propelling organizational digital transformation forward. Leaders who grasp the capabilities of digital technologies and advocate for their integration empower organizations to boost operational efficiency, innovate products and services, and enhance customer experiences. By spearheading effective digital transformation endeavors, organizations can gain a competitive advantage by utilizing technology to streamline operations, enhance decision-making, and swiftly adapt to market dynamics [12,16]. Also, digital leadership advocates for the utilization of data analytics and insights into decision-making processes [46]. Leaders who cultivate a data-driven environment empower organizations to gather, analyze, and interpret extensive datasets to glean valuable insights into market dynamics, consumer preferences, and operational effectiveness. Through data-informed decision-making, organizations can refine their strategies, unearth novel prospects, and promptly adapt, thereby fortifying their competitive edge [15].

Digital leadership holds the potential to markedly enhance operational efficiency across organizations. Through the utilization of digital tools like automation, machine learning, and robotic process automation, leaders can rationalize workflows, diminish manual errors, and optimize resource distribution. Such efficiencies yield cost reductions, heightened productivity, and enhanced profitability, thereby fostering a sustainable competitive advantage [47]. Digital leadership holds significant sway in the attraction and retention of top-tier talent. In today’s digital environment, employees are actively drawn to organizations that espouse digitalization and cultivate a progressive atmosphere. Leaders spearheading digital endeavors cultivate an enticing workplace ethos characterized by innovation, teamwork, and ongoing development. Consequently, this environment appeals to adept professionals who can bolster sustainable competitive advantage through their digital proficiencies and competencies [48]. Hence, the following hypothesis was suggested:

**H1.** Digital leadership positively affects sustainable competitive advantage.

2.3. The Effect of Digital Leadership on Green Absorptive Capability

Digital leadership enables the automation and enhancement of environmental processes. Leaders adept in digital technologies can introduce automation tools, robotics, and artificial intelligence to refine resource management, diminish waste, and mitigate environmental footprints. Through the automation of mundane tasks and process optimization, organizations can bolster their environmental efficiency, curtail expenses, and fortify their green absorptive capability [12,49,50]. Digital leadership encourages collaboration and knowledge exchange within and outside an organization. Leaders who cultivate a collaborative culture and utilize digital platforms facilitate the sharing of green-focused knowledge, best practices, and innovations [51]. By linking employees, departments, and external collaborators via digital platforms, organizations can enrich their green absorptive capability by accessing a wider range of expertise and insights [52,53]. Digital leadership fosters sustainability-driven innovation through the utilization of digital technologies. Leaders who advocate for an innovative culture and experimentation can spearhead the creation and implementation of digital solutions that bolster environmental sustainability. For instance, leaders may promote the utilization of digital platforms for collaborative work, remote communication to mitigate travel emissions, or the deployment of intelligent systems for energy conservation. These digital innovations enhance the organization’s green absorptive capability by embedding sustainability into fundamental business operations [11,54]. Therefore, the following hypothesis was developed:

**H2.** Digital leadership positively affects green absorptive capability.
2.4. The Effect of Green Absorptive Capability on Sustainable Competitive Advantage

Green absorptive capability empowers organizations to recognize and deploy resource-efficient methods, technologies, and procedures. Through the adept acquisition and application of green knowledge, organizations streamline resource consumption, minimize waste, and boost energy efficiency. These endeavors result in cost reductions and operational streamlining, thereby augmenting an organization’s cost-effectiveness [20]. Furthermore, amidst tightening environmental regulations and standards, organizations with robust green absorptive capability are aptly poised to adhere to mandates, mitigating the likelihood of penalties or reputational harm [55]. Green absorptive capability enables organizations to distinguish themselves in the market by incorporating sustainability into their fundamental strategies, products, and processes [20]. Through the adept acquisition and integration of green knowledge and methodologies, organizations can devise innovative, eco-friendly offerings that align with the evolving preferences of environmentally conscious consumers. This sustainability-driven differentiation can establish a distinctive selling proposition, appeal to eco-minded clientele, and bolster an organization’s sustainable competitive edge [56]. Green absorptive capability cultivates an environment of innovation and flexibility within organizations. Through the continual acquisition and integration of green-centric knowledge, organizations can discern emerging trends, technologies, and methodologies that promote sustainability [57, 58]. This knowledge empowers organizations to proactively innovate and adjust their strategies, offerings, and processes to align with evolving environmental standards. The capacity to innovate and adapt to evolving sustainability needs enhances an organization’s sustainable competitive edge by outpacing competitors and meeting customer anticipations [59, 60]. Hence, the following hypothesis was assumed:


2.5. The Mediating Role of Green Absorptive Capability in the Link between Digital Leadership and Sustainable Competitive Advantage

Digital leadership encompasses harnessing digital tools and methodologies to advance environmental sustainability. Within this framework, organizations acquire and integrate green digital expertise, leveraging insights into the efficacy of digital solutions, data analytics, and automation in enhancing environmental outcomes [19, 60]. Green absorptive capability acts as an intermediary, empowering organizations to proficiently obtain and integrate this green digital knowledge into their operations, systems, and decision-making paradigms [61]. Digital leadership frequently involves cultivating and adjusting digital competencies to bolster sustainability endeavors. These competencies might comprise remote monitoring systems, data analytics platforms, and collaborative utilities that support sustainable operations [11]. Green absorptive capability empowers organizations to evaluate, choose, and tailor digital competencies explicitly for ecological sustainability. It encompasses comprehending the capabilities of digital tools and integrating them into ongoing sustainability strategies and undertakings [20, 62]. Likewise, digital leadership promotes the utilization of environmentally friendly digital methods to foster a sustainable competitive advantage. These methods might encompass employing digital technologies to streamline resource usage, minimize waste, enhance energy efficiency, and augment environmental reporting and openness [12]. Green absorptive capability empowers organizations to efficiently employ these environmentally friendly digital practices. It entails translating knowledge of environmentally friendly digital practices into practical applications, integrating digital tools and procedures, and assessing their influence on environmental performance [19, 63]. Accordingly, the following hypothesis was proposed:

H4. Green absorptive capability mediates the link between digital leadership and sustainable competitive advantage.
2.6. The Effect of Digital Leadership on Eco-Innovation

Digital leadership underscores the significance of collaboration, both internally and externally. Collaboration serves as a cornerstone for eco-innovation, facilitating the convergence of various insights, skills, and resources to tackle intricate environmental issues [64]. Leveraging digital tools like collaboration platforms and virtual communication channels, organizations enable seamless real-time collaboration and co-creation among teams and stakeholders. Digital leaders actively promote and facilitate collaboration, cultivating an environment conducive to eco-innovation through collective problem-solving and knowledge exchange [15]. Digital leadership fosters knowledge dissemination and the establishment of learning ecosystems within the realm of eco-innovation. Leaders advocate for the utilization of digital platforms, virtual communities, and collaborative mechanisms to disseminate best practices, insights gained, and accomplishments in sustainability. This sharing of knowledge fosters the exchange of ideas, spurs innovation, and expedites the uptake of eco-innovative methodologies across various domains and sectors [17,47]. Digital leadership entails harnessing digital tools to instigate organizational change and accomplish strategic objectives. Within the sphere of eco-innovation, digital technologies serve as indispensable enablers, augmenting sustainable practices. Leaders adept in digital realms recognize the transformative potential of these technologies and judiciously deploy them to propel eco-innovation endeavors [65–67]. Digital leadership contributes to the optimization of resources and efficacy in eco-innovation endeavors. By leveraging digital solutions, organizations pinpoint avenues for resource minimization, waste reduction, and energy conservation [11,66]. So, the following hypothesis was highlighted:

H5. Digital leadership positively affects eco-innovation.

2.7. The Effect of Eco-Innovation on Sustainable Competitive Advantage

Eco-innovation paves the way for accessing novel markets and business prospects. With sustainability emerging as a paramount concern among individuals, businesses, and government entities, there is a rising need for eco-conscious products, services, and technologies. Through the creation of eco-innovative solutions, organizations can tap into these burgeoning markets and leverage the escalating demand for sustainable alternatives. Furthermore, eco-innovation frequently engenders the inception of fresh business models, collaborations, and revenue channels. By actively pursuing and capitalizing on these opportunities, organizations broaden their market penetration, diversify their offerings, and secure a competitive advantage [9]. Eco-innovation frequently entails devising strategies that enhance resource efficiency, diminish waste, and mitigate environmental footprints. Through optimized resource allocation and the adoption of sustainable methodologies, businesses can realize cost reductions across various fronts, including energy consumption, raw material procurement, and waste handling [68]. These economizations bolster sustainable competitive advantage by augmenting organizational profitability and fiscal health. Additionally, eco-innovation aids organizations in forecasting and adjusting to forthcoming resource scarcities and price fluctuations, thereby mitigating risks linked to resource dependency [69]. Eco-innovation empowers organizations to distinguish their offerings and brands through the integration of environmentally sustainable elements and strategies. By pioneering inventive solutions that tackle ecological issues, organizations can resonate with eco-conscious consumers who prioritize sustainable choices [70,71]. Eco-innovation enables organizations to differentiate themselves from rivals, cultivate a devoted customer following, and establish themselves as pioneers in sustainability. This distinctiveness fortifies the organization’s competitive edge by furnishing a distinctive selling proposition and fortifying its market standing [72,73]. Therefore, the following hypothesis was developed:

H6. Eco-innovation positively affects sustainable competitive advantage.
2.8. The Mediating Role of Eco-Innovation in the Link between Digital Leadership and Sustainable Competitive Advantage

Digital leadership fosters collaboration, both internally and externally, by harnessing digital platforms. Organizations can cultivate collaborative ecosystems that unite various expertise and viewpoints to nurture eco-innovation. These ecosystems facilitate the exchange of knowledge, brainstorming, and the joint creation of sustainable solutions. Digital leaders play a proactive role in promoting and facilitating such collaboration, empowering organizations to leverage collective wisdom and propel eco-innovation endeavors forward [17,50].

Digital leadership cultivates a culture of ongoing enhancement and learning, vital for enduring eco-innovation and competitive edge [17]. Encouraging organizations to glean insights from both triumphs and setbacks, digital leaders advocate for iterative strategies and the perpetual exploration of eco-innovation prospects. This ethos of continual improvement enables organizations to remain proactive, adjust to evolving sustainability demands, and sustain a competitive advantage over the long haul [11,51,74]. Digital leadership presents avenues for the scalability and duplication of eco-innovation endeavors. Leveraging digital tools empowers organizations to expand sustainable solutions and reproduce them across various sites or divisions. For instance, a digital energy management platform implemented in one facility can be replicated across others, fostering standardized sustainable practices organization-wide [12,47]. This scalability and reproducibility bolster sustainable competitive advantage by enabling organizations to achieve cost efficiencies, optimize resource employment, and amplify their environmental impact on a broader scale [9,15]. Consequently, the following hypothesis was formulated:

H7. Eco-innovation mediates the link between digital leadership and sustainable competitive advantage.

The hypothesized research framework is presented in Figure 1 below.

Figure 1. The hypothesized research framework.

3. Methodology

3.1. Sample and Data Collection Procedures

This research examined middle-level management in Saudi Arabia’s five-star hotels and travel agencies. These two sectors were selected due to their significant presence in Saudi Arabia’s hospitality and tourism industry, as well as their commonality in catering to international visitors while also focusing on implementing environmentally friendly practices and green initiatives for sustainability. In addition, researchers have long been fascinated by the study of leadership behaviors and their effects on employees’ task perfor-
mance and organizational success [75]. Initially, the focus was solely on leaders and their behaviors, as well as the qualities that make them effective [76]. However, as the research progressed, the perspectives of followers were also taken into account to understand how leaders emerge, behave, and influence others. Scholars have identified three main areas in which followers’ behavior with their leaders is examined: their personal beliefs, values, and characteristics; their unique job-related experiences; and how they perceive their leaders [77]. Hence, middle-level management was chosen as the focal point of this research due to its pivotal role in shaping organizational strategy, fostering innovation in product development, and serving as a conduit for transferring ideas from lower-level employees to top-level executives [78,79]. A questionnaire was delivered to businesses after obtaining their verbal permission for its distribution. From 65 travel agencies and 30 five-star hotels, a total of 323 valid surveys were gathered. In total, 37.8% (n = 122) of survey respondents were employed by travel agencies, while 62.2% (n = 201) worked for five-star hotels.

Of the 323 participants in this study, 209 (64.7%) were men and 114 (35.3%) were women. Those aged 25–<35 years old made up 81 (25.1%) of the respondents, followed by those aged 35–<45 years old (n = 138, 42.7%) and ≥45 years old (n = 104, 32.2%). Furthermore, among the participants, 201 (62.3%) possessed a Bachelor’s degree, 44 (13.6%) had completed high school, and 78 (24.1%) held a Master’s or PhD degree. Additionally, each participant had been employed by their hotel or travel agency for at least two years.

3.2. Measures
Digital leadership was assessed using a 7-item scale adapted from Claassen et al. [80], with statements such as “I am involved in decisions that affect my work and my digital work environment” and “My digital literacy is encouraged by my manager”. In addition, a 4-item scale taken from Lin and Chen [81] was used to measure green competitive advantage, with statements such as “The firm has a low-cost competitive advantage regarding green management in comparison with major competitors” and “The firm offers better quality green products in comparison with major competitors”. Moreover, the green absorptive capability was assessed by a 4-item scale adapted from Özgül and Zehir [82], with statements such as “Our firm can quickly absorb, master, and use green equipment and production processes obtained from outside” and “Our firm is good at acquiring and using external green technology and knowledge”. Furthermore, a 7-item scale adapted from Cheng and Shiu [83] and Bocken et al. [84] was used to assess eco-innovation, with statements such as “In the last 2 years, your firm has designed products that reduce the use of materials” and “In the last 2 years, your firm has designed products with components for reuse or recycling.

3.3. Data Analysis
This study utilized PLS-SEM, a statistical method for theory validation and extension, for confirmatory and exploratory investigations in hospitality and tourism research [5,85–87]. It is best suited for strategic and management studies [88]. This study used WarpPLS statistical software 7.0 for data processing and conducted a multi-group analysis to identify significant differences in path coefficients between hotels and travel agencies.

4. Results
4.1. Measurement Model
The proposed four-factor model which included digital leadership, sustainable competitive advantage, green absorptive capability, and eco-innovation was evaluated by conducting a confirmatory factor analysis. Kock’s [89] ten classic indices for model fit were examined: 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 proposed four-factor model generated well-fitting data: “APC = 0.433, p < 0.001; ARS = 0.481,
Table 1 shows that the research constructs had composite reliability ratings that exceeded the acceptable threshold (CR > 0.70) and significant item loadings (>0.60, \( p < 0.05 \)). Convergent validity was confirmed by the AVE values > 0.50 for digital leadership, sustainable competitive advantage, green absorptive capability, and eco-innovation. Since the VIF of each latent variable was \( \leq 3.3 \), the model was also thought to be free of common method bias.

The constructs’ discriminant validity was confirmed by calculating the HTMT and confirming that the square root of the AVE for each construct was greater than the off-diagonal correlations (see Tables 2 and 3).

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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EI.6</td>
<td>0.796</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EI.7</td>
<td>0.841</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CR: composite reliability; CA: Cronbach’s alpha; AVE: average variance extracted; VIF: variance inflation factors.

Table 2. Discriminant validity results: Fornell–Larcker criterion.

<table>
<thead>
<tr>
<th></th>
<th>GAC</th>
<th>DL</th>
<th>SCA</th>
<th>EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Absorptive Capability (GAC)</td>
<td>0.865</td>
<td>0.512</td>
<td>0.515</td>
<td>0.713</td>
</tr>
<tr>
<td>Digital Leadership (DL)</td>
<td>0.512</td>
<td>0.760</td>
<td>0.738</td>
<td>0.602</td>
</tr>
<tr>
<td>Sustainable Competitive Advantage (SCA)</td>
<td>0.515</td>
<td>0.738</td>
<td>0.836</td>
<td>0.554</td>
</tr>
<tr>
<td>Eco-innovation (EI)</td>
<td>0.713</td>
<td>0.602</td>
<td>0.554</td>
<td>0.798</td>
</tr>
</tbody>
</table>

Off-diagonal elements are correlations and diagonal elements are square roots of AVE.
Table 3. Discriminant validity results: HTMT ratio.

<table>
<thead>
<tr>
<th>HTMT ratios (good if &lt;0.90, best if &lt;0.85)</th>
<th>GAC</th>
<th>DL</th>
<th>SCA</th>
<th>EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Absorptive Capability (GAC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Leadership (DL)</td>
<td>0.589</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable Competitive Advantage (SCA)</td>
<td>0.605</td>
<td>0.864</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eco-innovation (EI)</td>
<td>0.816</td>
<td>0.680</td>
<td>0.631</td>
<td></td>
</tr>
</tbody>
</table>

p values (one-tailed) for HTMT ratios (good if <0.05)

<table>
<thead>
<tr>
<th>GAC</th>
<th>DL</th>
<th>SCA</th>
<th>EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Leadership (DL)</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable Competitive Advantage (SCA)</td>
<td>&lt;0.001</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Eco-innovation (EI)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

4.2. Results of the Multi-Group Analysis (MGA)

Multi-group analysis (MGA) results indicated that the observed differences in path coefficients between hotels and travel agencies were not statistically significant ($p > 0.05$). In simpler terms, the relationships between variables in the model seemed to be similar for both hotels and travel agencies, see Table 4.

Table 4. Multigroup analysis for differences by organization.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Path Coeff. (Five-Star Hotel)</th>
<th>Path Coef. (Travel Agency)</th>
<th>Absolute Path Coeff. Diff.</th>
<th>p Values</th>
<th>Supported/Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL→GAC</td>
<td>0.552</td>
<td>0.692</td>
<td>0.140</td>
<td>0.090</td>
<td>Not Supported</td>
</tr>
<tr>
<td>GAC→SCA</td>
<td>0.256</td>
<td>0.134</td>
<td>0.121</td>
<td>0.142</td>
<td>Not Supported</td>
</tr>
<tr>
<td>DL→SCA</td>
<td>0.532</td>
<td>0.650</td>
<td>0.118</td>
<td>0.109</td>
<td>Not Supported</td>
</tr>
<tr>
<td>EI→SCA</td>
<td>0.219</td>
<td>0.148</td>
<td>0.071</td>
<td>0.266</td>
<td>Not Supported</td>
</tr>
<tr>
<td>DL→EI</td>
<td>0.661</td>
<td>0.777</td>
<td>0.116</td>
<td>0.128</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

4.3. Testing of Hypotheses Results

Figure 2 and Table 5 show that digital leadership (DL) positively affected sustainable competitive advantage (SCA) ($\beta = 0.51, p < 0.01$), green absorptive capability (GAC) ($\beta = 0.60, p < 0.01$), and eco-innovation (EI) ($\beta = 0.69, p < 0.01$). This study indicates that DL increases SCA, GAC, and EI, thereby supporting the hypotheses H1, H2, and H5. In addition, SCA was positively impacted by GAC ($\beta = 0.21, p < 0.01$) and EI ($\beta = 0.15, p < 0.01$). This study indicates that GAC and EI increase SCA, thereby supporting hypotheses H3 and H6.

Table 5. Direct effects.

<table>
<thead>
<tr>
<th>Hs</th>
<th>Relationship</th>
<th>Direct Effect ($\beta$)</th>
<th>Sig.</th>
<th>T Value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>DL→SCA</td>
<td>0.51</td>
<td>$p &lt; 0.01$</td>
<td>9.829</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>DL→GAC</td>
<td>0.60</td>
<td>$p &lt; 0.01$</td>
<td>11.788</td>
<td>Supported</td>
</tr>
<tr>
<td>H3</td>
<td>GAC→SCA</td>
<td>0.21</td>
<td>$p &lt; 0.01$</td>
<td>3.960</td>
<td>Supported</td>
</tr>
<tr>
<td>H5</td>
<td>DL→EI</td>
<td>0.69</td>
<td>$p &lt; 0.01$</td>
<td>13.858</td>
<td>Supported</td>
</tr>
<tr>
<td>H6</td>
<td>EI→SCA</td>
<td>0.15</td>
<td>$p &lt; 0.01$</td>
<td>2.751</td>
<td>Supported</td>
</tr>
</tbody>
</table>
Figure 2. Final model of the study.

Additionally, Hayes and Preacher’s [90] technique was used to assess the mediation effects of GAC and EI in the DL→SCA relationship. This study found that GAC and EI significantly mediated the DL→SCA relationship, as evidenced by the significant indirect effect and a 95% bootstrapped confidence interval (LL, UL) that did not cross a zero in-between, supporting H4 and H7, see Table 6.

Table 6. Mediation analysis bootstrapped confidence interval.

<table>
<thead>
<tr>
<th>Hypo.</th>
<th>Mediation</th>
<th>Path a</th>
<th>Path b</th>
<th>Indirect Effect</th>
<th>SE</th>
<th>t-Value</th>
<th>Bootstrapped Confidence Interval</th>
<th>Mediation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>DL→GAC→SCA</td>
<td>0.690</td>
<td>0.210</td>
<td>0.145</td>
<td>0.038</td>
<td>3.813</td>
<td>(0.070, 0.219)</td>
<td>Yes</td>
</tr>
<tr>
<td>H7</td>
<td>DL→EI→SCA</td>
<td>0.69</td>
<td>0.15</td>
<td>0.104</td>
<td>0.038</td>
<td>2.724</td>
<td>(0.029, 0.178)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

5. Discussion

This study aimed to investigate the impact of digital leadership on sustainable competitive advantage in tourism and hospitality businesses, focusing on green absorptive capability and eco-innovation as mediators. The findings reveal that digital leadership has a positive impact on sustainable competitive advantage. This finding aligns with previous research by Alder and Dinnen [48] and Ismail et al. [91]. Digital leadership fosters organizational agility and adaptability amidst digital disruptions and evolving market dynamics. Leaders who champion digitalization and promote employee empowerment cultivate a culture of agility and perpetual learning [92]. This ethos enables organizations to swiftly react to emerging trends, harness digital prospects, and preempt potential challenges. By embracing agility and adaptability, organizations can capitalize on new prospects and sustain their competitive edge in fluid and uncertain contexts such as the hospitality and tourism sector [93,94].

The findings also reveal that digital leadership has a positive impact on green absorptive capability. This finding aligns with previous research by Borah et al. [54] and Ratna et al. [52]. Digital leadership advocates for educational programs and training sessions centered around environmental sustainability [16,95]. Leaders utilize digital tools to deliver online training modules, webinars, and virtual workshops on green initiatives, regulations, and upcoming trends. Through the provision of accessible and interactive learning avenues, organizations can augment employees’ understanding and expertise in environmental sustainability, thereby fortifying their green absorptive capability [96].
In addition, the findings reveal that green absorptive capability has a positive impact on sustainable competitive advantage and positively mediates the relationship between digital leadership and sustainable competitive advantage. These findings are in line with previous research conducted by Sahoo et al. [60], Alabdali et al. [19], and Makhloufi [63]. Green absorptive capability secures the enduring relevance of organizations amidst dynamic business environments. With sustainability gaining prominence among consumers, investors, and regulatory bodies, organizations proficient in acquiring, integrating, and implementing green knowledge and methodologies are poised for sustained prosperity [54,57]. By harmonizing their approaches, offerings, and operations with ecological sustainability, organizations fortify their market standing, uphold customer appeal, encourage investment, and navigate evolving sustainability norms, thereby amplifying their sustainable competitive edge [55]. Likewise, digital leadership and green absorptive capability also play a vital role in fostering continuous improvement and adaptation, which are essential for maintaining sustainable competitive advantage. Continuous improvement entails consistently evaluating and refining digital strategies and environmentally friendly practices to align with evolving sustainability objectives and market dynamics [97,98]. Green absorptive capability empowers organizations to keep pace with emerging digital innovations and adjust their practices accordingly. This dynamic process of continuous improvement and adaptation ensures that organizations can sustain their competitive advantage over time [99,100].

Moreover, the findings reveal that digital leadership has a positive impact on eco-innovation. This finding is in line with previous research conducted by Filiou et al. [67] and Yordanova [66]. Digital leadership advocates for the cultivation of an innovative culture within organizations, characterized by the promotion of creativity, the embrace of novel concepts, and the endorsement of experimentation. Such a culture fosters an ideal milieu for the flourishing of eco-innovation initiatives. Digital leaders motivate and equip employees to creatively address sustainability issues and recognize prospects for eco-innovation. By nurturing an atmosphere of innovation, digital leadership stimulates the conception and execution of environmentally sustainable concepts and resolutions [17,101].

Lastly, the findings reveal that eco-innovation has a positive impact on sustainable competitive advantage and positively mediates the relationship between digital leadership and sustainable competitive advantage. These findings are in line with previous research conducted by Kuo et al. [102], Ismail et al. [15], and Al-Romeedy and Khairy [103]. Eco-innovation has the potential to bolster the resilience of supply chains by instilling sustainable practices among suppliers and collaborators. Organizations actively involved in promoting eco-innovation initiatives within their supply chain can mitigate environmental hazards, bolster transparency, and ensure adherence to sustainability criteria [104,105]. A resilient and sustainable supply chain diminishes the organization’s susceptibility to disruptions like resource shortages, regulatory shifts, or reputational hazards. Supply chain resilience contributes to sustainable competitive advantage by fostering a dependable and ethical value chain, elevating customer satisfaction, and mitigating operational risks [35,106]. Additionally, digital leadership ensures that eco-innovation aligns with the organization’s strategic objectives and priorities. Leaders in the digital realm emphasize the significance of sustainability and eco-innovation within the organization’s overarching vision and strategy, nurturing a culture that esteems sustainability and fosters innovation [17,66,107]. They also dedicate resources, such as finances, talent, and infrastructure, to bolster eco-innovation endeavors. This strategic synchronization and resource allotment empower organizations to prioritize and efficiently execute eco-innovation initiatives, culminating in a sustainable competitive advantage [108,109].

5.1. Theoretical Implications

The outcomes of this study augment Dynamic Capabilities Theory in three significant aspects. Initially, they furnish empirical validation for the theoretical tenets and hypotheses of Dynamic Capabilities Theory. Through scrutinizing the correlations among digital lead-
ership, green absorptive capability, eco-innovation, and sustainable competitive advantage, this study substantiates the theoretical underpinnings of Dynamic Capabilities Theory within the specialized domain of tourism and hospitality enterprises. This affirmation bolsters the legitimacy and relevance of the theory in elucidating organizational mechanisms and competitive supremacy. Additionally, this study illuminates the precise mechanisms and procedures by which digital leadership, green absorptive capability, and eco-innovation converge to bolster sustainable competitive advantage. It delineates the essential tasks, methodologies, and approaches that organizations must undertake to cultivate and utilize these competencies efficiently. This insight aids in refining the comprehension of dynamic capabilities by clarifying the distinct elements and endeavors that propel organizational adjustment and competitiveness. Furthermore, this study’s discoveries offer perspectives on the manifestation and functionality of dynamic capabilities within the distinctive realm of the tourism and hospitality sector. This industry-specific comprehension introduces intricacy to the overarching theoretical construct of Dynamic Capabilities Theory, acknowledging that capabilities’ essence and dynamics could differ among various industries and sectors. This study’s outcomes enrich the comprehension of how dynamic capabilities evolve and are utilized within the tourism and hospitality domain, fostering a more holistic understanding of their implications and applications.

5.2. Practical Implications

Expanding upon our findings, the necessity for tourism and hospitality organizations to undergo a digital transformation or digital business transformation is now more crucial than ever. This requires a comprehensive reevaluation of their operations, with a focus on achieving significant improvements in efficiency, enhancing customer experiences, increasing scalability, optimizing flexibility, and reducing strategic risks [3,39,110]. Successfully meeting the demands of this digital transformation mandate necessitates the development or enhancement of organizational capabilities such as digital innovation and digital customer engagement, encompassing the acquisition, assimilation, and application of environmental sustainability knowledge.

As tourism and hospitality managers are essential in leading and managing changes to develop and maintain these capabilities, they must acquire new or improved competencies. When we mention competencies, we are referring to the expertise, skills, capabilities, and other qualities that managers need to effectively carry out their managerial responsibilities [111]. To successfully navigate the ever-evolving tourism and hospitality industry, it is imperative for managers to continuously enhance their knowledge and skills to meet the demands of their roles and drive positive change within their organizations. This includes staying current on industry trends, developing effective communication and leadership skills, and adapting to new technologies and strategies. By investing in their professional development and acquiring the necessary competencies, tourism and hospitality managers can effectively lead their teams, drive innovation, and achieve sustainable success in the dynamic and competitive tourism and hospitality sectors. Organizations may consider investing in educational initiatives and training endeavors to bolster employees’ comprehension of sustainability aspects, regulatory frameworks, and evolving consumer inclinations. Such efforts empower organizations to seamlessly fuse digital leadership with sustainability endeavors, ensuring proactive alignment with environmental shifts.

Effective leaders must create a work environment that promotes innovation and flexibility, encouraging teams to incorporate new technologies into their processes. Implementing new technologies often requires thorough training for employees to develop the necessary skills to utilize these tools effectively. Training programs not only enhance the capabilities of the workforce but also play a vital role in ensuring the successful integration of technology and maximizing its benefits. Overcoming resistance to change is a common obstacle when adopting innovative technologies, as employees may feel uneasy about the potential impact on their roles. Open communication and highlighting the advantages of new technologies, such as increased efficiency and productivity, are crucial in
addressing these concerns. Alongside the implementation of new technologies, companies must also consider ethical implications. Maintaining ethical standards and transparency in technology usage is essential for building trust with stakeholders and the public.

This study also underscores eco-innovation’s pivotal role in fostering sustainable competitive advantage. Establishing a culture of innovation within organizations encourages staff to devise and execute environmentally conscious practices and remedies. This may entail instituting innovation hubs, forming interdisciplinary squads, and offering backing and incentives for eco-innovation endeavors. Through the lens of digital leadership, organizations can harness emerging technologies to craft inventive resolutions that tackle sustainability hurdles and set themselves apart in the marketplace.

As well, this study underscores the need to harmonize digital leadership strategies with sustainability objectives. Organizations should ascertain that digital endeavors and technologies are scrutinized for their ecological ramifications and contribute to sustainable protocols. This entails embedding sustainability factors into the deliberation processes for adopting and rolling out digital technologies like cloud computing, data analytics, and automation. By synchronizing digital leadership with sustainability, organizations can bolster their competitive edge while mitigating their environmental impact. In addition, digital leadership hinges on data-informed decision-making. Organizations ought to allocate resources toward enhancing their capacities for data collection, analysis, and interpretation to glean insights into environmental sustainability trends, customer inclinations, and market fluctuations. Through leveraging data, organizations can pinpoint avenues for eco-innovation, evaluate the efficacy of green absorptive capability, and assess the ramifications of sustainability endeavors on competitive advantage.

Importantly, organizations have the opportunity to engage in collaborative ventures with suppliers, customers, industry associations, and governmental entities to exchange insights, adopt best practices, and pool resources concerning environmental sustainability. These collaborative endeavors may encompass joint research endeavors, co-creation of eco-conscious products or services, and unified endeavors aimed at tackling sustainability hurdles. Through partnerships with stakeholders, organizations can bolster their capacities, tap into novel concepts, and foster a collective vision for sustainable competitive advantage. Moreover, organizations ought to cultivate an environment that prioritizes ongoing learning and adaptability. This entails consistently refreshing competencies and insights concerning digital technologies, sustainability methodologies, and market dynamics. Encouraging staff to partake in professional growth endeavors, such as workshops, conferences, and industry forums, is vital. Embracing a culture of continuous learning enables organizations to remain nimble, swiftly address emerging prospects and hurdles, and uphold their competitive edge amid the ever-changing environment of the tourism and hospitality sector.

Further, these organizations need to broaden their sustainability initiatives to encompass their supply chains. This entails partnering with suppliers to uphold eco-friendly sourcing practices, advocating for sustainable production methods, and implementing criteria for supplier selection that prioritize sustainability performance. By infusing sustainability throughout the supply chain, organizations can elevate their overall environmental performance and distinguish themselves as conscientious collaborators within the industry. Organizations can also institute comprehensive performance evaluation frameworks to monitor and appraise their sustainability endeavors. Key performance indicators (KPIs) can be devised to gauge the environmental footprint, resource effectiveness, and ethical practices of an organization’s activities. Consistent reporting on sustainability performance, both internally and externally, bolsters accountability and transparency. Moreover, it enables organizations to gauge their performance against benchmarks, pinpoint areas ripe for enhancement, and highlight accomplishments to stakeholders, including investors, collaborators, and clientele.

By strategically and responsibly incorporating technology, companies in the tourism and hospitality industry can position themselves for success in a constantly changing environment while providing top-notch experiences for their customers. These companies
need to understand that innovative technologies are not just tools but essential elements of their overall strategies. They need to invest in these technologies thoughtfully to improve customer experiences, streamline operations, and maintain their competitive edge. With the industry constantly evolving and technology advancing rapidly, companies must stay abreast of emerging trends. They should regularly monitor the technological landscape to identify opportunities for innovation and improvement, allowing them to anticipate changing customer preferences and new technologies. To ensure the successful implementation of new technologies, companies should allocate resources for employee training and have strategies in place to address any resistance to adoption. Additionally, embracing innovative technologies can also support sustainability efforts, as companies should explore eco-friendly technologies and practices to minimize their environmental impact and meet the growing demand for responsible tourism.

5.3. Limitations and Future Research

Although this study offers significant insights, it is essential to recognize its constraints and contemplate potential avenues for future investigation. This study’s outcomes pertain specifically to travel agencies and hotels. Various tourism and hospitality enterprises, regions, or cultural environments could display discrepancies in the scrutinized relationships. Future research endeavors could delve into these associations across diverse settings to bolster the applicability of the findings. Also, this study concentrated specifically on the mediating roles of green absorptive capability and eco-innovation in the correlation between digital leadership and sustainable competitive advantage. Nonetheless, there might be other mediating or moderating factors that were overlooked. Future research endeavors could delve into supplementary variables, such as organizational culture, leadership methodologies, or external environmental influences, to achieve a more comprehensive understanding of the relationships. Significantly, performing comparative analyses across various industries or sectors could enhance the comprehension of the distinctive dynamics within tourism and hospitality enterprises. Contrasting the results with those from other sectors might unveil parallels, disparities, and industry-specific approaches concerning digital leadership, green absorptive capability, eco-innovation, and sustainable competitive advantage.

Additionally, although this study centered on sustainable competitive advantage, future investigations could explore the enduring sustainability outcomes stemming from digital leadership, green absorptive capability, and eco-innovation in the hospitality and tourism industry. This could entail scrutinizing the environmental, social, and economic ramifications of these capabilities and their role in bolstering comprehensive sustainability performance. Finally, to delve deeper into the underlying mechanisms and processes, forthcoming research could integrate qualitative research methods into the restaurants and/or different travel agencies category. Techniques like interviews or case studies offer in-depth insights into the experiences, obstacles, and tactics utilized by organizations in cultivating and harnessing digital leadership, green absorptive capability, and eco-innovation.


Funding: This research was funded by funding of the Deanship of Graduate Studies and Scientific Research, Jazan University, Saudi Arabia, through Project Number: GSSRD-24.
Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: The authors gratefully acknowledge the funding of the Deanship of Graduate Studies and Scientific Research, Jazan University, Saudi Arabia, through project number GSSRD-24.

Conflicts of Interest: There are no conflicts of interest.

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