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# The impact of social media branding and technology adoption on green tourism: the role of tourist behavior as a mediator in developing countries post-COVID-19—context of Zimbabwe

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## Abstract

Green tourism, social media branding and technology adoption have recently become the most powerful elements in the tourism world during and post-COVID19 pandemic. This paper aims to investigate the effects of social media branding and technology adoption on green tourism with tourists' behavior as a mediator post-COVID 19 in developing countries such as Zimbabwe. The positivism philosophy was adopted in line with the quantitative nature of the study. The research embraced an explanatory survey research design, and a structured questionnaire was used to gather primary data. The survey's population was drawn from tourists who visited Zimbabwe post-COVID 19 era. This research used (PLS-SEM) on a sample of 408 as guided by the Krejcie and Morgan table for determining sample size. The findings indicate that social media branding and technology adoption have a positive impact on green tourism and that tourists' behavior partially and fully mediates the two indirect relationships. The distinctiveness of the current papers lies on fact that it can be a guideline to policymakers, green tourism supply chain and environmentalists in developing strategies that promote green tourism in Zimbabwe and other developing countries.

**Keywords** Social media, Social media branding, Technology adoption, Tourists' behavior, Green tourism supply chain, Green tourism

## Introduction

At the start of 2020, the COVID-19 pandemic swept across the globe, causing widespread disruption to global trade and business operations. Governments around the world implemented strict lockdown measures, including movement restrictions and health regulations like social

distancing, sanitizing, and vaccinations. These measures presented significant challenges for companies in developing countries, particularly in Sub-Saharan Africa, where weaker internet infrastructure and over-stretched health systems exacerbated the situation. In Zimbabwe, the tourism industry, which is the country's third-largest contributor to the economy after mining and agriculture, suffered greatly as a result of the pandemic. The industry was already struggling in the context of Zimbabwe's struggling economy, and COVID-19 worsened the situation. On March 28, 2020, the Zimbabwean government declared a nationwide lockdown, which came into effect within 48 h. All non-essential businesses were closed, and residents were instructed to stay indoors for 21 days.

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Only those in essential service groups were permitted to leave their homes to assist during the pandemic.

Zimbabwe is blessed with numerous natural tourist attractions, including Hwange National Park, Mana Pools, Gonarezhou, Victoria Falls, Matopos, Nyanga Mountains, Lake Kariba, and the Great Zimbabwe Ruins. During the COVID-19 pandemic, when restrictions were eased, a significant number of tourists came from Africa and the Middle East, while fewer came from Europe, America, Oceania, and Asia, which is the opposite of what usually occurs due to proximity, tiresome quarantine procedures and too many restrictions. The Zimbabwe Tourism Authority's statistics on tourist arrivals show that there was an 18.56% decline in 2017, a 20.89% increase in 2018, a 10.21% decline in 2019, and a sharp decline of 76.84% in 2020 due to the pandemic. In 2021, there was a further decline, but in 2022, there was a steady increase as Zimbabwe opened its borders to tourists, and the post-COVID era began (Fig. 1).

In the COVID-19 era, the tourism sector has increasingly embraced social media branding, adopted new technology equipment, and placed a huge emphasis on green tourism. These actions have had many benefits, such as raising campaign awareness, achieving worldwide reach without borders, refining client interactions, increasing e-marketing, and managing public reputation [1]. With movement restrictions in place, the COVID-19 epidemic has further strengthened the use of social media and technology as consumers search for and receive information about goods and services online [2]. Furthermore, [3] suggests that during the pandemic, technology applications and social media have been a welcome relief to the global community as they provide up-to-date health-related information. Social media has shifted the world toward a more unified and symbiotic one, assimilating historical stand-alone national markets into a single large marketplace. [4] defines social media branding as the consistent use of the right methods when engaging with a targeted audience on social media platforms, aiming to

enhance awareness and attract new end-users. According to [5, 6], social media includes countless social media platforms such as Facebook, TikTok, LinkedIn, Instagram, Twitter, WeChat, WhatsApp, and many applications that play a strategic role in influencing consumer behavior. Social media branding has become an inescapable medium of communication in people's daily lives and has a significant impact on consumer behavior, including tourists [7].

Service delivery has become increasingly important, and the focus has shifted from product development to service conveyance expansion. Therefore, tourism supply chains are adopting new technologies in service departments, and self-service technologies are increasingly being used in the service delivery process [8]. As part of the service trade, hotels are continuously investing in self-service machinery to maximize service superiority and ease overall expenses [9]. Moreover, the pandemic has shown people that they can generate innovation and expansion. Advancements in artificial intelligence (AI) and new technologies have made it increasingly viable for robotics to perform warden, housekeeping, dining, and other service tasks in the tourism sector [10]. However, some scholars have found the acceptance of social automatons to be non-comprehensive, as the tourism sector should retain high-touch facilities [11, 12]. The COVID-19 epidemic has forced the tourism supply chain to change its perspectives on drones, conveyance robots, and facility provision robots as they try to mitigate pandemic woes [13]. The tourism supply chain was forced to adopt new technology and social media branding as they complied with COVID-19 movement restrictions, and nothing has changed post-COVID-19, as people continue to consult social media and make use of ever-changing technology. The exceptional evolution of social media and the usage of technology, motivated by the sharp growth of internet use, have changed the forms of tourists searching for information and arranging excursions [14]. Travelers use social media and technological gadgets for information search when scheduling travel engagements [15]. Social media branding and technology tools frequently provide easy access to important information that can be used by consumers [16].



**Fig. 1** Tourists arrival in Zimbabwe (2017–2022)

## Research questions

1. What are the effects of social media branding on tourists' behavior and green tourism post-COVID-19?
2. Does the influence of tourists' behavior on green tourism post-COVID-19 gets stronger for tourists who make use social media branding and embrace technology, compared to those who do not?

3. Does technology adoption have impact on tourists' behavior post-COVID 19 and will this relationship get stronger for tourists who are eco-friendly?
4. What are the mediating effects of tourists' behavior on two independent variables social media branding and technology adoption and a dependent variable green tourism?

The literature review reveals several areas in the research on technology adoption, social media branding, tourists' behavior, and green tourism that require further attention [17–20]. Previous studies have predominantly focused on these factors in developed countries [21–24], neglecting the specific challenges faced by developing nations [25, 26]. These challenges include limited financial resources, inadequate healthcare infrastructure, and insufficient social welfare systems, which were particularly evident during the COVID-19 pandemic when developing countries heavily relied on external aid [27–29]. Additionally, despite the rapid advancements in robotics, artificial intelligence, and service automation as responses to the pandemic, no African developing country has adopted these advanced technologies [30, 31]. While scholars recognize the importance of technology adoption, tourists' behavior, and social media branding in promoting green tourism, there is limited research on their impact in developing countries [32]. According to Statista [33], as of January 2022, there were approximately 4.65 million internet users in Zimbabwe, accounting for 30.6 percent of the total population. Compared to the previous year, there was a notable increase in 265 thousand internet users, representing a growth rate of 6.0 percent. However, despite this growth, a significant portion of the population remained offline, as around 10.56 million people, comprising 69.4 percent of the total population, did not use the internet at the beginning of 2022, this further explains lack of technology and social media access in Zimbabwe. Therefore, the researchers aim to address these gaps by investigating how social media branding, technology adoption, and tourists' behavior influence green tourism in developing countries, with a specific emphasis on Zimbabwe in the post-COVID-19 context.

## Literature review

### Social media branding on tourists' behavior and green tourism

According to [34, 35], the increasing prevalence of social media and the emergence of wired societies, enabling instant communication, discussions, and the sharing of user-generated information. This has resulted in the remarkable popularity of various social media platforms like Facebook, Twitter, Instagram, TikTok, WhatsApp,

WeChat, and Messenger, with billions of active users within the tourism sector [36]. Social media has evolved into a prominent communication channel, extending beyond personal messaging to encompass discussions on pandemic-related information, measures to minimize the transmission among tourists, and it has gained popularity aftermath [37].

The theory of planned behavior, proposed by [38], suggests that social media significantly impacts tourists' personal opinions, behavioral beliefs, subjective norms, and perceived control. In a study conducted by [39], which focused on social media, consumer behavior, and service marketing, it was found that social media has a strong influence on consumer behavior due to its ability to facilitate faster and more direct communication between buyers and sellers. Several studies, such as those by [24, 40, 41], have documented that social media serves as a vital source of information that greatly influences travelers' decisions regarding travel plans and destination preferences. Moreover, research conducted by [42] has indicated a correlation between social media usage and the perception of travel destination image.

Numerous studies on green tourism have demonstrated the positive impact of social media on travel behaviors [43–45]. Social media has been found to influence tourists' attitudes, which is a crucial factor in predicting, explaining, and influencing their behavioral intentions, especially during and after the Covid-19 pandemic [46]. Assaker and O'Connor [47] discovered that social media platforms such as Facebook, Twitter, TikTok, Instagram, WhatsApp, WeChat, travel assessment sites, and virtual platforms play a significant role in reducing uncertainties related to visiting degraded environments, pandemic-affected regions, politically unstable areas, and regions prone to terrorist attacks. Hasan and Rahman [48] established a strong positive correlation between attitude and intentions to visit green tourist resorts post-Covid-19.

Scholars such as [49, 50] emphasized that social media branding provides an opportunity for people to interact and share experiences online, motivating others to do the same. Reyes [51] added that social media can shape public opinions and daily lives, depending on users' purposes and goals. According to [52], eco-friendly tourists can easily gather information online and make travel decisions based on that information. Muslim [53] found a positive correlation between social media usage and tourists' intentions, while Wut et al. [54] discovered that social media branding reduces tourists' risk perceptions and increases motivation to visit destinations even in crisis circumstances like natural disasters, extremist attacks, and political conflicts. Social media fosters participation, enabling like-minded consumers, such as those interested in green tourism, to share content, seek opinions,

and evaluate products and services through online discussions [55]. Numerous studies have shown that tourists now rely on social media platforms to gather information about products and services from the comfort of their homes. They compare and contrast information or experiences shared by other users, including topics related to environmental issues, prices, modes of transport, destination choices, and essentially anything that tourists seek. Social media provides readily available information for eco-conscious travelers, facilitating informed decision-making processes.

### **Tourists' behavior and green tourism**

As the tourism and hospitality industry continues to gain prominence, there is a growing recognition of our accountability for contributing to environmental degradation and climate change [56, 57]. Given that natural resources and the physical environment are crucial assets in the tourism industry, neglecting environmental protection would be counterproductive, as it directly influences tourists' decision-making processes [58]. Fernando [59] highlights that although tourism has become one of the fastest-growing industries, global criminal activities such as terrorism, warfare, epidemics, natural disasters, and economic recessions have hindered its progress. These events impact the well-being and safety of tourists' destinations, thereby affecting tourists' decision-making processes [60, 61].

Tourism is influenced by various external forces, including natural events and human-made disasters, as noted by [62, 63]. These human actions and disasters should be prevented as they can significantly impact the movement of tourists, especially those who prioritize a clean environment [64]. Braun et al. [65] suggest that different types of environmentally related behaviors have distinct causes, and interventions designed to change one behavior may not necessarily influence others. Song et al. [66] conducted research in different cities in China and found that as air pollutant concentrations increased, the number of tourist activities decreased meaning that tourists are eco-friendly sensitive. Additionally, [67] discovered that tourists in Hong Kong spent less time in polluted areas and preferred to spend more time in shopping malls. When planning their travels, tourists must consider various constraints such as the ambiance of tourist resorts, transportation options, length of stay, and financial budget [68]. Moreover, [69] highlighted that tourists' attitudinal beliefs, including their concern for the environment, influence their energy-saving behavior and green purchasing decisions, which can also impact their budgeting for trips.

Lee et al. [70] commented such as destination-related travel restrictions such as the political and security

situation, environment, climate and weather [71], or distance traveled are different factors that influence or guide tourists to stall tours or travel to alternative destinations [72]. Bavik et al. [73] added that tourists predetermined thoughts and imagination about resort area or the environment which they intend to visit also affects their decision making. The environment plays a significant part in tourist travelling frequency which are: It influences the decision-making process when choosing travel destinations [74] and coordinates post-decision behavior including participation (field experience) [75], satisfaction (during and off the resort environment) [76], and future behavioral intentions (revisiting intentions) [77].

Lewis et al. [78] similarly established that environment is a strong factor to consider when selecting a travelling destination post-COVID19. Previous studies by [79–81] also instituted a positive correlation between green tourism and tourists' decision making. Therefore, based on the evidence found in previous studies, we can conclude that tourists' behavior has a positive impact on green tourism that is tourists who are environmental sensitive are affected with the state tourist resort they visit, and it plays a significant role in that decision-making process. Given that natural resources and the physical environment are critical assets in the tourism industry, ignoring environmental protection is counterproductive, as it influences tourist decision-making [81]. From the literature, it is vibrant that as the tourism and hospitality industry continue to expand, it is increasingly clear that people cannot evade responsibility for contributing to environmental degradation and climate change. The relationship confirms a significant relationship between tourists' behavior and green tourism.

### **Technology adoption on tourists' behavior and green tourism**

According to [82], technology applications and social media platforms have played a crucial role in providing the global community with vital health-related information during and after the COVID-19 pandemic. Similarly, [83, 84] emphasize the significance of technology and social media in promoting green tourism and influencing tourists' decision-making processes. The utilization of technology is highly important in the research of green tourism, as highlighted by [85], and the success of technological implementations in tourism relies on user acceptance [86]. The COVID-19 pandemic has led to a shift from traditional marketing approaches toward technology, which has proven instrumental in facilitating decision-making among tourism stakeholders [87].

Early theories on technology acceptance, such as the Diffusion of Innovation Theory (DIT) by Rogers [88], were centered around the decision-making process

related to adopting innovations. They considered factors like relative advantage, compatibility, complexity, testability, and observability. Another theory called Flow Theory, introduced by Csikszentmihalyi [89], introduced the concept of optimal experience by incorporating elements like concentration, playfulness, and perceived control. Ajzen and Fishbein [90] proposed the Theory of Rational Action (TRA), which focused on behavioral intentions to use innovations, influenced by behavioral beliefs and subjective norms of end-users. As consumer technologies emphasizing hedonic properties became more prominent, researchers started examining factors like satisfaction to explain adoption behavior [91].

Research studies have indicated that visually appealing content and the integration of multi-sensory cues, such as combining images and sounds, play a crucial role in creating high levels of arousal and presence in virtual environments [91, 92]. Moreover, [93] argues that tech-savvy tourists are increasingly utilizing smart tourism applications for travel planning, while Kabadayi [94] highlights that smart tourists now employ sophisticated algorithms and data from various sources to enhance their travel experiences in a cost-effective manner. Furthermore, Reis et al. [95] underscore the significance of technology and internet usage in facilitating connectivity among people, enabling information sharing, and fostering relationship building.

Robotic technologies are gaining popularity in various high-traffic public areas, including tourist resorts, airports, and shopping malls, due to their ability to navigate and detect potential risks that may go unnoticed by the human [96, 97]. According to Hansi et al. [98], tourists are more inclined to adopt technology that is reliable, safe, and user-friendly. The emergence of the COVID-19 pandemic has further accelerated the integration of robotics in the tourism industry, driving innovation and benefiting all stakeholders, including tourists [99]. The widespread use of mobile devices has also led to the proliferation of mobile applications (apps), revolutionizing the operations of the travel industry and transforming the way people travel [100]. Travel apps enable individuals to access information, make purchases, and share their travel experiences anytime and anywhere, enhancing convenience and connectivity for travelers.

### Research methodology

The research study embraced a positivistic philosophy, allowing for the collection of quantitative data necessary for computing and testing hypotheses using SMART PLS3 software. The target population for the study consisted of tourists who visited various resorts in Zimbabwe after the COVID-19 pandemic, and the emails used for data collection were collected from Zimbabwe

Tourism Authority data base. Convenience sampling was employed because of its practicality this sampling method is practical in situations where the research focus is preliminary in nature, it is time efficient and cost-effective, and a sample size of 528 was selected, as recommended by Krejcie and Morgan [101] and supported by Ahmad [102] for populations exceeding 1,000,000. Primary data were collected using a structured questionnaire with a 5-point Likert scale ranging from strongly disagree (=1) to strongly agree (=5). The questionnaire was administered through Google Forms, with a link shared via email and other social media platforms. The data collection period spanned from December 2022 to April 2023, with the questionnaire eliciting demographic information such as gender, education level, and social media experience. A total of 426 questionnaires were received, representing a response rate of 77.3%, of which 18 were invalidated, leaving 408 responses for analysis. Participation in the study was entirely voluntary, and the researchers assured respondents that no confidential information would be disclosed to unauthorized third parties, with demographic data separated from the collected data.

### Results and discussion

In this section, the researchers presented a comprehensive analysis of all results obtained. The analysis began with the presentation of respondents' demographic information. This information included respondents' gender, age, social media experience, and education level. A descriptive exploration of the data was then conducted, followed by a thorough analysis of the constructs and structural models using structured equation modeling (SEM) techniques with Smart PLS3 software see additional data files 1 and 2. The statistical tests employed included component reliability, factor loading, correlation, regression, and mediation pathway breakdowns. The analysis was all-encompassing, leaving no stone unturned in the quest for accurate and reliable results.

#### Demographic details

This section represents the gender distribution among the study's respondents. Of the total sample size, 262 participants were male, representing 64.2%, while 146 were female, accounting for 35.8%. While the results indicate a higher proportion of male respondents, it is essential to acknowledge and value the contribution of female respondents. Regarding age groups, the study found that the largest age group was between 20–30 years, with 177 respondents, accounting for 43.4% of the sample. The second-largest age group was between 31–40 years, with 132 participants, constituting 32.4% of the sample. Participants between 41–50 years old were 72, representing

17.6% of the sample, while only 27 respondents were between 51–60 years, making up 6.6% of the sample size. In terms of education levels, 126 respondents had high school education, making up 30.9% of the sample size. 169 participants had undergraduate certificates, accounting for 41.4% of the sample, while 113 postgraduate degree holders constituted 27.7% of the sample size.

The questionnaire included questions about social media experience, seeking to establish how long the respondents had been active on social media. The first category, with 94 participants, had 0–5 years of experience, representing 23.0% of the sample. The most significant group was within 6–10 years of social media experience, with 201 respondents, making up 49.3% of the sample size. Participants with 11–15 years of experience were 79, constituting 19.4%, while 34 respondents had 16 years and above of experience, accounting for 8.3% of the total sample. The results demonstrate that the majority of participants were within the formative age group of 20–40 years, representing approximately 74% of the sample. However, the older age groups had a more extended period of social media experience, with many postgraduate degree holders.

**Constructs variables explanation and magnitude**

This section outlines the process of determining the dependent and independent variables. The paper has two independent variables: social media branding (SMB) and technology adoption (TA), one mediating variable: tourist behavior (TB) and one dependent variable: green tourism (GT). Each variable had five questions so that the researchers would establish the effects of technology adoption, social media branding and tourists’ behavior on green tourism. The idea of having five statements per each variable was derived from [103]. This study used discriminant validity to determine whether a construct measure is distinct from measures of other constructs as recommended with [104]. Discriminant validity is important because it is difficult to argue that a construct is unique and can be studied independently if a measure of that construct is not distinct from measures of other constructs. Furthermore, failure to establish discriminant validity can lead to construct validity issues, which is the

degree to which variables (technology adoption, social media branding, tourists’ behavior and green tourism) are accurately measured. Table 1 below shows the Fornell-Larcker criterion:

According to [105], this criterion is most conservative approach of checking discriminant validity. The correlation coefficients of the four variables under investigation: social media branding (SMB) and technology adoption (TA), tourist behavior (TB) and green tourism (GT) are explained as follows: The strongest correlation is between GT and TB, indicating a high positive relationship with a coefficient of 0.618. Similarly, the correlation between SMB and TB had higher correlation effect of 0.596. TA is also positively correlated with a coefficient of 0.922, TB has coefficient value of 0.828, SMB has a coefficient value of 0.843, and GT has coefficient value of 0.835.

Based on the Fornell-Larcker criterion, the results above suggest that there is discriminant validity among the constructs. The correlation between each pair of constructs is lower than the square root of the AVE for each construct, indicating that the constructs are distinct from each other. However, it is important to note that the Fornell-Larcker criterion is only one method to assess discriminant validity, and it should be used in conjunction with other methods to provide a more comprehensive evaluation of the construct’s distinctiveness. In order to make sure that the construct validity was accurate, the study carried out the Heterotrait–Monotrait Ratio (HTMT). This is another method for assessing discriminant validity that compares the correlation between two constructs with the correlations between their respective indicators [106]. The HTMT should be less than 0.9 to provide evidence of discriminant validity [107]. The HTMT results are shown in Table 2.

The study by [106] suggests that for conceptually distinct constructs, the HTMT ratio should be less than 0.85, and for conceptually similar constructs, it should be less than 0.90. The HTMT ratio between all constructs is below 0.85 meaning discriminant validity [108]. However, the HTMT ratios between GT and TB were the best with 0.823. The results above confirm that discriminant validity was achieved satisfactorily. Based on the HTMT results, there is evidence of discriminant validity among

**Table 1** Fornell–Larker criterion

	Green tourism	Social media branding	Technology adoption	Tourists’ behavior
Green tourism	0.835			
Social media branding	0.543	0.843		
Technology adoption	0.511	0.391	0.922	
Tourists’ behavior	0.618	0.596	0.436	0.828

**Table 2** Heterotrait–monotrait ratio (HTMT)

	Green tourism	Social media branding	Technology adoption	Tourists' behavior
Green tourism				
Social media branding	0.601			
Technology adoption	0.547	0.418		
Tourists' behavior	0.689	0.675	0.473	

the constructs since the HTMT values are all less than 0.9. This provides additional support for the results of the Fornell-Larcker criterion in suggesting that the constructs are distinct from each other. In order to understand the factor loading for each construct, the study went on to carry out factor analysis (Additional file 1).

**Factor analysis (outer loading)**

Outer loadings are a measure of the relationship between a construct and its indicators in a confirmatory factor analysis (CFA). They represent the strength of the correlation between each indicator and its underlying construct, and they are used to assess the reliability and validity of the construct. The outer loading of an indicator on a construct is the standardized coefficient from the CFA model that represents the relationship between the indicator and the construct. It reflects the proportion of variance in the indicator that is accounted for by the

construct, and it ranges from 0 to 1. In general, an outer loading of 0.5 or higher is considered acceptable, indicating that at least half of the variance in the indicator can be explained by the construct. The Table 3 provides outer loadings of a factor analysis for four variables: social media branding, technological adoption, tourist behavior, and green tourism. The correlation between each variable and the green tourism factor is represented by the values you provided.

Social Media Branding (SMB) was assessed using the observed variables SMB1, SMB2, SMB3, SMB4 and SMB5. The observed variables' high outer loadings (ranging from 0.718 to 0.919) imply that they are good indicators of the underlying concept of social media branding. In other words, they are highly correlated with the latent variable of social media branding, indicating that they capture different aspects of this construct effectively. Overall, the outer loadings indicate

**Table 3** Factor loadings, CR, Rho\_A and CA

Description	Items	Loadings	CA	AVE	CR	Rho_A
Social media branding	SMB1	0.718	0.895	0.711	0.924	0.903
	SMB2	0.718				
	SMB3	0.919				
	SMB4	0.918				
	SMB5	0.915				
Technology adoption	TA1	0.941	0.956	0.850	0.966	0.959
	TA2	0.924				
	TA3	0.873				
	TA4	0.941				
	TA5	0.928				
Tourists' behavior	TB1	0.756	0.885	0.686	0.916	0.887
	TB2	0.858				
	TB3	0.858				
	TB4	0.818				
	TB5	0.847				
Green tourism	GT1	0.803	0.891	0.697	0.920	0.897
	GT2	0.799				
	GT3	0.822				
	GT4	0.844				
	GT5	0.801				

<sup>a</sup> All item loadings > 0.7 indicates indicator reliability (Hair et al. 2019)

<sup>b</sup> All average variance extracted (AVE) > 0.5 indicates convergent reliability (Fornell and Larcker 1981; Gye-soo 2016)

<sup>c</sup> All composite reliability (CR) > 0.7 indicates internal consistency (Hair et al. 2019)

<sup>d</sup> All Cronbach's alpha > 0.7 indicates indicator reliability (Hair et al., 2019)

that the measurement model used in your study is reliable and valid for assessing the construct of social media branding in the context of green tourism in developing countries following the COVID-19 pandemic.

The highest outer loading of "Social Media Branding SMB" is 0.919, indicating that it is highly correlated with the observed variable(s) that comprise this factor. SMB4 and SMB5 have high outer loadings as well, indicating that they are strongly associated with their respective latent factors (Additional file 2).

The outer loadings of a factor analysis for the tourist behavior construct, based on five variables (TB1, TB2, TB3, TB4 and TB5). According to your table, tourist behavior is highly correlated with TB2 and TB3, with loadings of 0.858 and 0.858, respectively. This suggests that these variables are strong indicators of the tourist behavior construct. All other variables are strongly related; TB1 value is 0.756, TB4 value is 0.818, and TB5 value is 0.857.

Green Tourism is highly correlated with all variables, but especially GT4 which loadings of 0.844. This implies that these variables are powerful predictors of the green tourism construct. Furthermore, GT1, GT2, GT3 and GT5 have high loadings of 0.803, 0.799, 0.822 and 0.801, respectively, indicating that they are strong indicators of Green Tourism. This result is important since it assists in understanding the relationships between these variables and green tourism and to potentially develop strategies for promoting and measuring Green Tourism practices in the tourism industry.

Technology adoption had five variables (TA1, TA2, TA3, TA4 and TA5), respectively, as shown in table. The construct had highly rated variables with TA1 and TA4 both having 0.941 values meaning the variables were powerful predictors of the technology adoption construct, while TA2, TA3 and TA5 have 0.924, 0.873 and 0.928, respectively. This result is significant since it assists in accepting the relationships between these variables and technology adoption and to possibly develop policies for promoting and measuring technology adoption in the green tourism industry. The study went on to calculate the direct relationships.

**Direct relationships**

In this study, the PLS-SEM technique is utilized to predict relationships and construct statistical models that explain causal correlations, as suggested by Hair et al. (2019). This approach involves generating numerous subsamples (e.g., 5000) from the original sample with replacement to derive bootstrap standard errors, which in turn yield T-values for testing the significance of structural paths. The use of bootstrapping helps approximate data normality by estimating the distribution's spread, shape, and bias within the sampled population, following the insights of Chin (1998). The results of this analysis are summarized in Table 4 and depicted in Fig. 2 below and the present direct relationships:

Direct relationship refers to the direct effect between two variables in a model, the magnitude and significance of the direct relationship can be interpreted using path coefficients or path weights obtained from the analysis and the research has five direct relationships: **H<sub>1</sub>** social media branding (SMB) to green tourism (GT), **H<sub>2</sub>** social media branding (SMB) to tourists' behavior (TB), **H<sub>3</sub>** technology adoption (TA) to green tourism (GT), **H<sub>4</sub>** technology adoption (TA) to tourists' behavior (TB), **H<sub>5</sub>** tourists' behavior (TB) to green tourism.

The results from **H<sub>1</sub>** hypothesis show T-statistics value of 6.756 exceeding the threshold of 1.96, indicating a significant positive relationship. This finding supports the **H<sub>1</sub>** hypothesis, suggesting a significant positive relationship between SMB and GT. On the other hand, for the **H<sub>2</sub>** hypothesis, the T-statistics value of 8.466 suggests a strongest significant positive relationship SMB and TB. Hence, the **H<sub>2</sub>** hypothesis is supported, indicating there is a direct relationship between the variables. Moreover, for the **H<sub>3</sub>** hypothesis, the T-statistics value of 5.253 indicates a significant positive relationship, supporting the **H<sub>3</sub>** hypothesis. This implies that TA has a direct effect on GT. **H<sub>4</sub>** and **H<sub>5</sub>** have T-statistics values of 4.085 and 4.889, respectively, indicating both positive direct relationship between TA and TB as well as TB and GT. All the T-value statistics for 5 hypotheses were above the 1.96 threshold indicating a direct significant relationship between the constructs. The research went testing the mediation relationship of tourists' behavior.

**Table 4** Direct relationships and hypothesis testing

Hypothesis	Relationship	Std Beta	Std Value	(t-value) <sup>^</sup>	Decision	(2.5%) CI UL	(97.5%) CI LL
H <sub>1</sub>	SMB ⇒ GT	0.405	0.060	6.756	Supported	0.280	0.517
H <sub>2</sub>	SMB ⇒ TB	0.502	0.059	8.466	Supported	0.367	0.606
H <sub>3</sub>	TA ⇒ GT	0.353	0.067	5.253	Supported	0.200	0.471
H <sub>4</sub>	TA ⇒ TB	0.239	0.059	4.085	Supported	0.116	0.346
H <sub>5</sub>	TB ⇒ GT	0.374	0.077	4.889	Supported	0.214	0.523



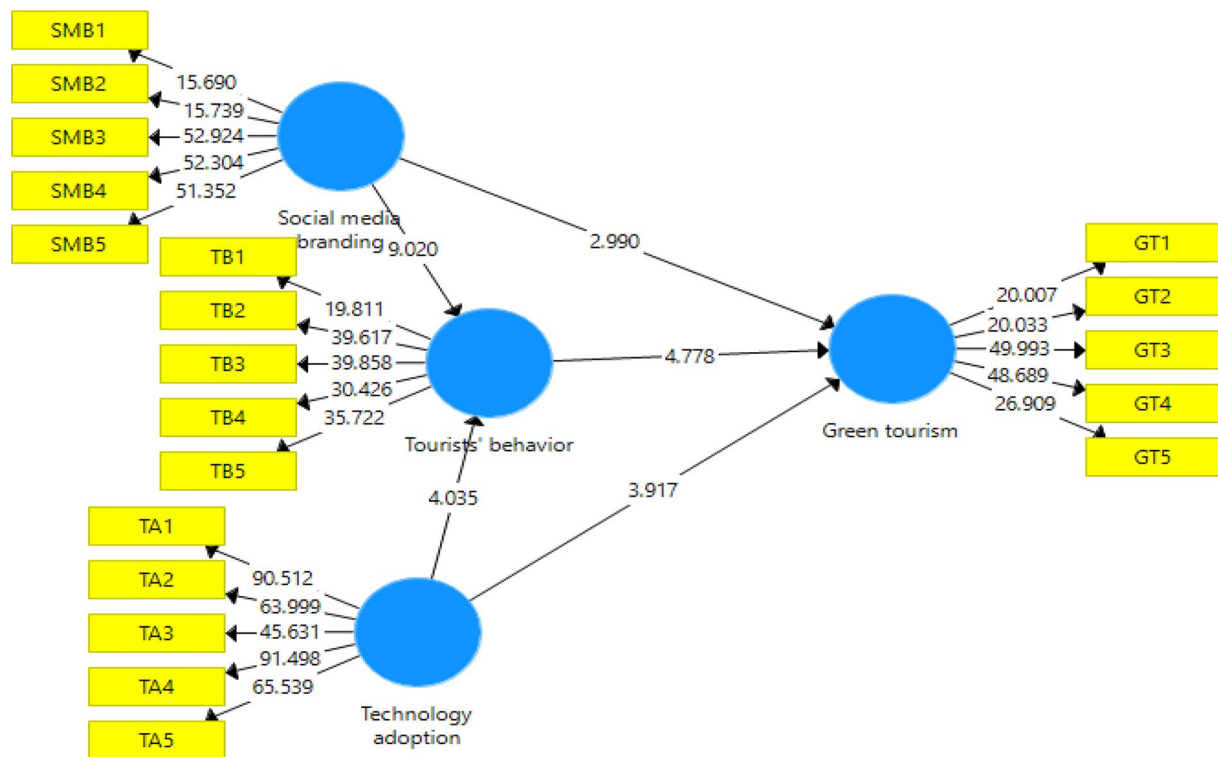


Fig. 2 PLS-SEM-bootstrapping results

**Specific indirect effects**

Specific indirect effects show the effects of a mediator on independent variables and dependent variables which is also called a mediation relationship. A mediation relationship refers to a relationship between three variables: the independent variable (IV), the mediator variable (MV), and the dependent variable (DV). It represents a process in which the IV influences the DV indirectly through the MV. The MV acts as an intermediate variable that mediates the relationship between the IV and the DV. In this study, we had two mediation relationships:  $H_6$  SMB (IV), TB (MV) and GT (DV),  $H_7$  TA(IV), TB (MV) and GT (DV) as shown in Table 5.

The results of the variance accounted for (VAR) analysis indicate that tourists' behavior partially and fully mediates the relationships between the variables.  $H_6$  tourists' behavior has a significant indirect effect on the

relationship between SMB and GT, accounting for 53.5% of the variance, meaning TB partially mediates the relationship. Similarly,  $H_7$  tourists' behavior has a strong indirect effect on the relationship between TA and GT, accounting for 75% of the variance, meaning TB fully mediates the relationship.

**Discussion of findings**

The discussion of the findings will be based on the conceptual model (Fig. 3). Firstly, hypothesis  $H_1$  the results supported that social media branding has a direct correlation with green tourism, and social media branding plays a vital role in promoting sustainable tourism practices. The use of social media platforms such as We Chat, Facebook, Instagram, Twitter, and YouTube can efficiently increase awareness of green tourism and encouraging tourists to engage in sustainable tourism activities.

Table 5 Mediation relationships and hypothesis testing

Total effects		Direct effects		Indirect effects						
$\beta$	p value	$\beta$	p value	Hypothesis	$\beta$	SD	T-value	p value	Decision	
0.405	0	0.044	0	$H_6$ SMB $\Rightarrow$ TB $\Rightarrow$ GT	0.217	0.042	4.427	0.000	Supported	
0.353	0	0.019	0	$H_7$ TA $\Rightarrow$ TB $\Rightarrow$ GT	0.263	0.028	3.218	0.000	Supported	

\*\*  $p < 0.01$ ; \*  $p < 0.05$

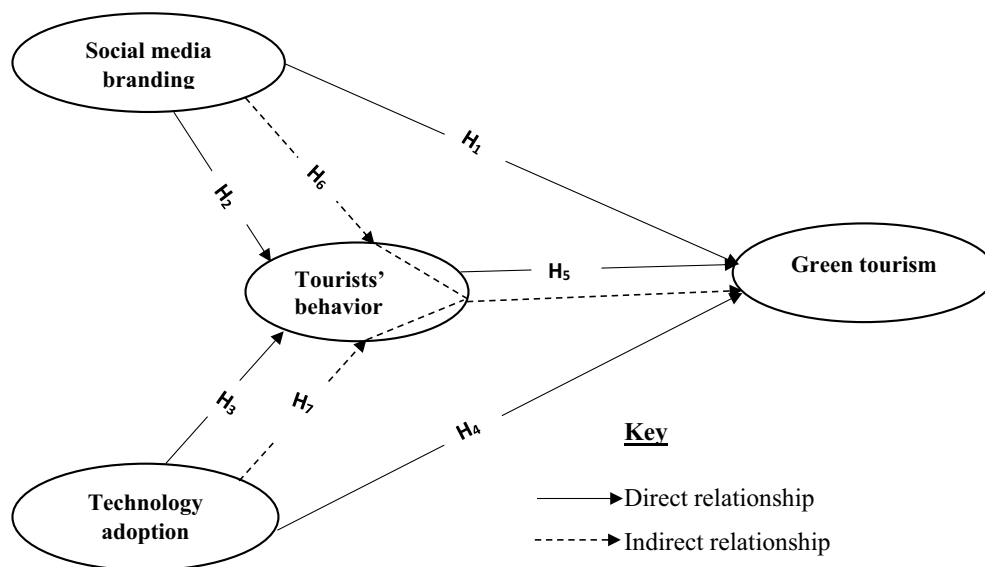


Fig. 3 Conceptual model

This is in line with some literature for example: [20, 40, 50] found that social media platforms, such as Facebook, Twitter, Tik Tok, Instagram, WhatsApp, We Chat, travel assessment sites, and virtual scenes are predominantly supportive in eradicating uncertainties of visiting degraded environments, pandemic infested regions, political unrest and terrorist attacks areas. Social media branding can be of importance in creating a positive image of green tourism in the minds of potential tourists. The research findings can aid green tourism supply chain in Zimbabwe and other developing countries to implement operational social media branding approaches that promote green tourism.

Secondly, hypothesis H<sub>2</sub> was supported and showed that social media branding has a direct relationship with tourist behavior, and meaning social media branding can affect the tourists' behavior toward green tourism. Social media branding can create awareness of sustainable tourism practices and provide information on how tourists can engage in green tourism. Tourists share their involvements and experiences on green tourism, and this can influence the behavior of other tourists. The results support H<sub>2</sub> hypothesis is significant because social media branding plays an essential role in promoting green tourism by influencing tourist behavior, and it is agreement with [6, 53] who established a high impact positive correlation between social media, attitude and intentions to visit green tourist resorts post-COVID 19. Generally, the results support hypothesis H<sub>2</sub> and stresses how important social media branding influences the tourist behavior toward green tourism, and it highlights the need for green tourism supply chain to develop an effective social

media branding tactics targeting tourists who are interested in sustainable tourism practices.

Third hypothesis H<sub>3</sub>, signified that technology adoption has a direct relationship with tourist behavior and the results supported the notion. Making technology can impact the tourists' behavior toward green tourism. Technology adoption aids access to information and resources that help in engaging green tourism practices for instance mobile applications help tourists to find environmentally friendly accommodation, access to information on green tourism and provide feedbacks on their experiences. The results agree with previous scholars [3, 39, 75] emphasize that technology and internet usage facilitate people to connect with each other, share information, and build relationships. Inclusively, the results support hypothesis H<sub>3</sub> and the significance of technology adoption as a tool for influencing tourist behavior toward green tourism, and it emphasizes the need for green tourism supply chain to develop an effective technology adoption plans that target tourists who are pro eco-friendly tourism.

Fourth hypothesis H<sub>4</sub> pointed out that technology adoption has a direct relationship with green tourism and the results supported the notion meaning technology adoption positively influences green tourism. If green tourism supply chain embrace technology, it facilitates the growth and promotion of green tourism as they share information and resources related to green tourism. The literature from [3, 12, 98] highlights the important role that technology and social media have played in promoting green tourism and influencing tourists' decision-making which is in line with researchers' results. Lastly, the results that support

hypothesis  $H_4$  highlighted how important technology adoption is as a weapon for promoting green tourism and reducing negative impacts on the tourist environment.

Fifth hypothesis  $H_5$  proved that tourism behavior has a direct relationship with green tourism as supported by the results meaning tourist behavior's influence in promoting green tourism is significant. Tourist behavior can be affected with many factors such as availability of green accommodation choices, transport options, infrastructure, access to information and resources available to them through technology adoption and social media branding. Previous studies by [56, 67, 77] also instituted a positive correlation between green tourism, tourists' behavior and decision making. The findings supporting hypothesis  $H_5$  are significant because they suggest that tourist behavior can play a critical role in promoting green tourism practices. Green tourism supply chain can use the information and resources available through technology adoption and social media branding to influence tourist behavior and promote green tourism.

Sixth hypothesis  $H_6$ , social media branding has a direct correlation with green tourism, and this relationship is partially mediated by tourist behavior, and the results supported the equation. The direct association in between social media branding and green tourism tells that social media can be used to promote green tourism. The partial mediating effect of tourist behavior expresses that tourist behavior has a positive significant relationship between social media branding and green tourism. The results agree with researches from [31, 37, 52] who found that social media branding reduces tourist risk perceptions and increases tourist motivation to visit in crisis circumstances such as natural tragedies, extremists' attacks and political conflicts. Conclusively, results support that social media branding and tourist behavior are important variables in green tourism and reducing the negative eco-friendly impacts.

Seventh hypothesis  $H_7$ , technology adoption has a direct association with green tourism, and this relationship is partially mediated by tourist behavior, and the results supported the model. The direct relationship between technology adoption and green tourism suggests that the use of technology can promote green tourism. Scholars like [15, 43] argue that tech-savvy tourists are turning to smart tourism applications for travel planning this conform to authors' results. The partially mediating effect of tourist behavior suggests that tourist behavior is an important factor in the relationship between technology adoption and green tourism. The use of technology can influence tourist behavior by providing information and resources related to green tourism.

### Limitations of the study

**Sample size and representativeness:** The sample size may not accurately represent the entire population of tourists in Zimbabwe. This could limit the generalizability of the findings. Additionally, the study focused on tourists within Zimbabwe Tourism Authority data base, which could further limit the generalizability of the results.

**Geographic limitations:** Zimbabwe has its own distinct characteristics, including its natural resources, wildlife, tourism infrastructure, and socio-political environment. These unique features can influence the effectiveness of social media branding and technology adoption on green tourism in the country. Therefore, caution should be exercised when extrapolating the findings to other destinations with different attributes.

**Response bias:** The study's findings could be influenced by response bias from the participants, especially when tourists provide socially desirable responses or exaggerate their engagement with green tourism practices due to perceived expectations or social norms.

### Conclusion

The positive significant effects of social media branding and technology adoption on green tourism in developing countries like Zimbabwe can be enhanced by considering the partial mediating effect of tourist behavior. The COVID-19 pandemic has brought about a shift in tourist behavior toward a greater focus on health and safety measures and outdoor activities, which presents an opportunity to promote green tourism.

The findings of this research imply that social media branding and technology adoption are effective tools for promoting green tourism, especially when considering the tourist behavior. The study reveals that the use of social media branding and technology adoption in promoting green tourism can improve the efficiency and effectiveness of green tourism initiatives. The study also identifies some of the challenges and barriers to adopting sustainable tourism practices in Zimbabwe. These challenges include limited resources, lack of awareness and education, and inadequate infrastructure. Social media branding and technology adoption can help overcome these challenges by increasing awareness, providing education and training, and improving infrastructure.

The implications of this research to green tourism supply chain in Zimbabwe and other developing countries are noteworthy. They can use the answers to develop effective social media branding and technology adoption approaches targeting tourist behavior, improve green tourism, and promote the economic development of their countries. More so, the partial mediating effect of tourist behavior on the positive significant effects of social media branding and technology

adoption on green tourism suggests that green tourism supply chain should consider changing tourist behavior as a key factor in promoting green tourism. The research delivered valuable insights into how social media branding and technology adoption can be leveraged to promote green tourism in developing countries like Zimbabwe.

The study has a number of limitations. First, the study was conducted in Zimbabwe, and the findings may not be generalizable to other countries. Second, the study used a quantitative research methodology, while using a mixed methodology would yield a different result. Third, the study used a convenience sample, which means that the participants were not randomly selected.

### Recommendations and areas of future research

Green tourism supply chain in Zimbabwe and other developing countries should develop and implement effective social media branding and technology adoption strategies that target changing tourist behavior toward green tourism. The government and non-governmental organizations should provide education and training programs to increase awareness of green tourism among tourists and green tourism supply chain. The green tourism supply chain should collaborate to improve infrastructure to support green tourism. Green tourism supply chain should promote outdoor activities to encourage more ecologically tourism practice.

A study can be conducted to investigate the effectiveness of different social media branding and technology adoption strategies in promoting green tourism in Southern Africa. On another note, a study can be conducted to examine the role of government policies and regulations in promoting green tourism in Zimbabwe.

### Abbreviations

SMB	Social media branding
TA	Technology adoption
TB	Tourists' behavior
GT	Green tourism
GTSCM	Green tourism supply chain management

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43093-023-00249-6>.

**Additional file 1.** SMART PLS~structural equation modelling (SEM): (Algorithm calculations).

**Additional file 2.** SMART PLS~structural equation modelling (SEM): (Bootstrapping calculations).

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### Author contributions

Mr OTC wrote the manuscript and Dr RM did data analysis and proof reading.

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Each of the authors confirms that this manuscript has not been previously published and is not currently under consideration by any other journal.

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