

# Blockchain-Based Traceability for Green Digital Marketing: Opportunities and Challenges for Businesses in Central Vietnam

Nguyen Thi Khanh Ha

Vietnam - Korea University of Information and Communication Technology, University of Da Nang, Danang City, Vietnam.

\*Corresponding Author: Nguyen Thi Khanh Ha

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Article History	Abstract
<b>Original Research Article</b>	<p><i>This study examines how blockchain technology can enhance transparency in green digital marketing, with a particular focus on businesses in Central Vietnam. While green digital marketing helps firms build sustainable brand images and attract environmentally conscious consumers, misleading environmental claims and greenwashing remain major challenges. Blockchain-based systems can support product traceability, verify sustainability claims, and improve consumer trust through tamper-resistant and auditable records. This paper reviews relevant literature and international case studies to identify potential applications in organic agriculture, eco-tourism, and sustainable fashion. The findings suggest that blockchain can help businesses substantiate green claims and strengthen brand credibility. However, adoption in Central Vietnam is constrained by high implementation costs, limited technical expertise, and an evolving regulatory framework. The paper proposes recommendations related to financial and technical support for SMEs, regulatory guidance for blockchain-based green claims, and collaboration among enterprises, universities, and technology start-ups.</i></p> <p><b>Keywords:</b> Blockchain, traceability, green digital marketing, greenwashing, sustainability claims, Central Vietnam.</p>
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## I. INTRODUCTION

### 1.1. Research background

Green digital marketing has become an important approach for businesses seeking to promote sustainable brand images and attract environmentally conscious consumers (Kumar & Ghodeswar, 2015; Szabo & Webster, 2021). However, a major problem in this field is the lack of transparency, which may lead firms to make misleading environmental claims or engage in greenwashing (Delmas & Burbano, 2011; de Freitas Netto et al., 2020). Consumers increasingly expect credible evidence behind firms' environmental and sustainability claims, particularly because perceived greenwashing can undermine consumer trust (Gürel & Tat, 2017; Parguel et al., 2011; Szabo & Webster, 2021).

Blockchain technology has been widely discussed as a tool for improving transparency, traceability, and trust in supply chains and digital transactions (Casino et al., 2019; Kshetri, 2018; Saberi et al., 2019). Applying blockchain to green digital marketing can help create tamper-resistant and auditable records through which consumers and

stakeholders can verify product provenance and sustainability-related information (Francisco & Swanson, 2018; Casino et al., 2019; Saberi et al., 2019).

### 1.2. Research objectives

This paper aims to achieve the following objectives:

- Analyze the role of blockchain in green digital marketing – Identify how blockchain technology can improve transparency, mitigate greenwashing risks, and enhance brand reputation in green marketing strategies.
- Evaluate the potential of blockchain application in businesses in the Central Vietnam region – Examine the benefits that blockchain can bring to businesses in the field of green digital marketing, while analyzing the opportunities and challenges in the process of deployment.
- Propose policy and managerial recommendations – Suggest measures to promote blockchain adoption

through SME support, regulatory guidance, and enterprise–university–start-up collaboration.

### 1.3. Research gap

Previous studies have extensively examined blockchain applications in supply-chain management, food traceability, and sustainable supply-chain management (Casino et al., 2019; Kamilaris et al., 2019; Kshetri, 2018; Saberi et al., 2019), whereas its specific application to green digital marketing and green-claim verification remains relatively underexplored. In particular, there is not much in-depth research on how blockchain can support businesses in the Central Vietnam region to enhance transparency and prevent greenwashing in marketing activities.

This paper aims to fill the research gap by analyzing the role of blockchain in green digital marketing in the Central region, while proposing practical solutions to help businesses leverage this technology effectively.

## II. THEORETICAL BASIS

### 2.1. Green digital marketing: Concept and role in the sustainable economy

Green digital marketing is the use of digital marketing tools and strategies to promote environmentally friendly products and services. This concept goes beyond environmental protection and involves building a sustainable relationship between businesses and consumers through commitments to nature conservation, use of renewable resources, pollution reduction, and optimization of production processes.

Green digital marketing plays an important role in promoting responsible consumption and strengthening brand credibility, especially when firms provide credible and verifiable environmental information (Kumar & Ghodeswar, 2015; Parguel et al., 2011; Szabo & Webster, 2021).

### 2.2. Blockchain in marketing: analysis of blockchain application models to enhance transparency

Blockchain, originally developed for decentralized digital transactions, has increasingly been explored in supply-chain management, sustainability reporting, and marketing transparency. Blockchain operates as a distributed ledger in which transactions are recorded in a tamper-resistant and verifiable manner across a network of participants (Nakamoto, 2008; Casino et al., 2019; Tapscott & Tapscott, 2016).

In marketing, blockchain can help verify information about product origins, production processes, and how businesses implement environmental commitments. This not only helps businesses mitigate greenwashing but also enhances consumer trust in the brand. Blockchain-based traceability

has been applied in food and agricultural supply chains to improve transparency, product provenance, and supply-chain visibility (Kamilaris et al., 2019; Francisco & Swanson, 2018; Treiblmaier, 2018).

### 2.3. Blockchain Adoption in Vietnam's Digital Marketing Context

Although blockchain has been explored and adopted in several fields in Vietnam, especially finance, supply chain, and data management, its application in digital marketing remains relatively limited. Vietnamese businesses, especially in regions outside Hanoi and Ho Chi Minh City, have conducted limited research and implementation of blockchain applications to increase transparency in green marketing.

Although some large companies and start-ups in Vietnam have experimented with blockchain, adoption in green digital marketing remains at an early stage. The main barriers include limited technical understanding, high implementation costs, interoperability issues, and the lack of a mature blockchain ecosystem (Lacity, 2018; World Economic Forum, 2020). Especially in the Central region, where there are many small and medium-sized enterprises, the lack of technological knowledge and government support policies makes the application of blockchain to digital marketing even more difficult.

## III. RESEARCH METHODOLOGY

### 3.1. Secondary research method

The secondary research method is applied in this paper to synthesize data from research, industry reports, and international and domestic case studies related to blockchain in green digital marketing. This data helps clarify the current situation, trends, and successful blockchain application models in other countries, thereby drawing lessons for the Central Vietnam region. Previous studies on blockchain-based supply-chain transparency, sustainable supply-chain management, greenwashing, and green consumer behavior provide the theoretical foundation for this study (Casino et al., 2019; Saberi et al., 2019; Delmas & Burbano, 2011; Kumar & Ghodeswar, 2015).

### 3.2. Case study analysis

This paper also uses the case study analysis method to evaluate businesses in Vietnam and internationally that have implemented blockchain in green digital marketing. The selected cases are analyzed based on their relevance to blockchain-based traceability, transparency mechanisms, and potential lessons for green digital marketing in Central Vietnam (World Economic Forum, 2020; Saberi et al., 2019). Some typical models are analyzed to better understand how blockchain can help businesses make product information, production processes, and marketing

campaigns transparent, thereby proposing appropriate solutions for businesses in the Central region.

### 3.3. Comparison and synthesis

Finally, the comparison and synthesis method is applied to compare international models with the current conditions of Central Vietnam.

The case studies were selected based on three criteria: relevance to blockchain-based traceability, availability of public information, and applicability to green digital marketing contexts. Each case was analyzed according to four dimensions: sector, blockchain application, transparency mechanism, and lessons for businesses in Central Vietnam.

Table 3.1. International Blockchain-Based Transparency Models and Lessons for Central Vietnam

Case	Sector	Blockchain application	Transparency mechanism	Lesson for Central Vietnam
Walmart	Food supply chain	Food traceability	Product origin tracking	Relevant to OCOP products, organic agriculture, and food traceability in Central Vietnam
Provenance	Consumer goods	Product journey verification	Public sustainability claims	Useful for SMEs seeking to substantiate sustainability claims with limited resources
VeChain	Fashion/product authenticity	Material provenance	Digital product passport	Applicable to sustainable fashion, local textiles, and product authenticity verification
Everledger	Jewelry	Origin verification	Immutable asset records	Relevant to products requiring certification, provenance verification, or anti-fraud mechanisms

These cases were selected because they represent different blockchain-based transparency mechanisms, including food traceability, product journey verification, digital product passports, and immutable provenance records (Walmart, n.d.; Provenance, n.d.; VeChain, n.d.; Everledger, n.d.; Francisco & Swanson, 2018; Saberi et al., 2019).

## IV. ANALYSIS AND DISCUSSION

### 4.1. How Blockchain Enhances Transparency in Green Digital Marketing

Blockchain, with its tamper-resistant and decentralized ledger structure, has demonstrated strong potential in supporting transparency, traceability, and trust in sustainability-related information systems (Casino et al., 2019; Kshetri, 2018; Saberi et al., 2019). This technology can directly impact three main aspects of green digital marketing: verifying product provenance, mitigating greenwashing, and improving customer data accountability.

#### 4.1.1. Verifying product provenance: transparent and immutable data

One of the biggest challenges for green digital marketing is verifying information about products and sustainable production processes. Consumers increasingly demand transparent and reliable information about product origins, especially in the context of concerns about greenwashing campaigns. Blockchain can help address this problem by creating tamper-resistant records of product-related information, including production processes, quality control, and sustainability standards (Casino et al., 2019; Kamilaris et al., 2019; Francisco & Swanson, 2018).

Each supply-chain event can be recorded as a transaction on a blockchain ledger, enabling product traceability across multiple stakeholders, in which the data cannot be changed or deleted without authorization or consensus within the network. This helps create a transparent supply chain where consumers can easily check and verify the origin of products through blockchain applications. Studies on blockchain-based traceability show that blockchain can improve product provenance, supply-chain visibility, and

stakeholder trust, particularly in food and agricultural supply chains (Kamilaris et al., 2019; Francisco & Swanson, 2018; Casino et al., 2019).

#### ***4.1.2. Mitigating greenwashing: increasing customer trust in brands***

Greenwashing, which refers to misleading or exaggerated environmental claims, is a serious problem in green marketing because it can undermine consumer trust and weaken genuine sustainability efforts (Delmas & Burbano, 2011; de Freitas Netto et al., 2020; Szabo & Webster, 2021). Greenwashing strategies not only erode consumer trust but also reduce the effectiveness of genuine sustainable marketing campaigns. Blockchain can help mitigate this issue by making sustainability-related claims more verifiable and auditable, although its effectiveness depends on reliable data input, independent verification, and appropriate governance mechanisms (Delmas & Burbano, 2011; de Freitas Netto et al., 2020; Saberi et al., 2019).

When using blockchain, sustainability-related information can be recorded in a tamper-resistant manner. However, the accuracy of environmental claims still depends on reliable data input, independent verification, and appropriate governance mechanisms. This can create a stronger monitoring mechanism and reduce the risk of misleading green claims. Blockchain-enabled transparency can help businesses build long-term trust with customers, while strengthening brand reputation.

By enabling verifiable sustainability-related records, blockchain-based systems may help firms strengthen the credibility of green claims and reduce perceived greenwashing (Parguel et al., 2011; Saberi et al., 2019; Szabo & Webster, 2021). For example, food companies may use blockchain-based traceability systems to disclose selected production and supply-chain information to consumers.

Nevertheless, blockchain should not be considered a standalone solution for transparency. Its effectiveness depends on the quality of input data, trusted data providers, third-party audits, and appropriate governance arrangements. Without reliable off-chain verification, inaccurate or misleading data can still be recorded on-chain.

#### ***4.1.3. Improving transparency and accountability in customer data management***

Security and privacy of consumers have always been hot major in digital marketing, especially in the current online environment where personal data can be exploited and misused. Blockchain can support more transparent

and accountable data management by recording consent, access rights, or verification logs. However, sensitive personal data should be stored off-chain or protected through privacy-preserving mechanisms such as permissioned access and secure data governance. This can help improve customer privacy protection and increase transparency in advertising campaigns, where information about how consumer data is used can be recorded and made accessible to authorized stakeholders. This approach can contribute to a more transparent digital advertising ecosystem, where consumers have greater visibility into how their information is used.

In digital marketing contexts, blockchain should not be treated as a complete privacy solution by itself; instead, it should be combined with suitable governance mechanisms and privacy-preserving system design (Lacity, 2018; World Economic Forum, 2020). This is particularly important in green marketing, where customers are not only interested in the product but also want to know about how businesses collect and use their personal data in advertising campaigns.

In summary, blockchain is not only a technology that helps protect data but also plays an important role in making green digital marketing activities transparent. By verifying product provenance, mitigating greenwashing, and improving customer data accountability, blockchain can help businesses build a more sustainable and trustworthy marketing strategy, thereby building trust with customers and developing their brand in today's competitive environment.

## **4.2. Business models in central Vietnam that can apply blockchain in green digital marketing**

With its abundant natural resources and diverse cultural heritage, Central Vietnam has significant potential for developing sustainable business models in agriculture, tourism, fashion, and local crafts. However, to affirm environmental commitments and increase transparency, the application of blockchain technology to green digital marketing is a promising solution. Below are three typical business sectors in the Central region that can leverage blockchain to enhance credibility in green marketing campaigns.

To contextualize the discussion, Table 4.1 summarizes three potential sectors in Central Vietnam where blockchain-based transparency mechanisms can be applied to support green digital marketing.

Table 4.1. Potential Blockchain Applications in Green Digital Marketing Sectors in Central Vietnam

Sector in Central Vietnam	Possible products/services	Transparency problem	Blockchain application
Sustainable agriculture	OCOP products, organic vegetables, seafood	Unverified origin and production standards	Product traceability
Ecotourism	Green tours, eco-lodges, nature-based tourism	Unverified environmental commitments	Auditable sustainability records
Sustainable fashion/crafts	Local textiles, recycled materials, handicrafts	Unclear material provenance	Digital product passport

These sectors are discussed in detail below to illustrate how blockchain can support product traceability, sustainability-claim verification, and consumer trust in the regional context.

#### **4.2.1. Sustainable agriculture: enhancing traceability in organic production processes**

The sustainable agriculture sector in the Central region has been growing, with organic products increasingly favored by consumers. However, one of the biggest challenges for businesses in this field is how to prove that their products truly meet organic standards, without chemical or impurity contamination. This is precisely where blockchain can play a role in building trust between producers and consumers.

Blockchain technology can record the entire organic agricultural production process, from the stage of seed selection, cultivation, harvesting to processing and distribution. Each production event can be recorded as a tamper-resistant transaction on a blockchain ledger, making it easy for consumers to accurately trace the origin of the product. This not only affirms product quality but also helps businesses demonstrate their environmental commitments, while mitigating greenwashing risks associated with misleading environmental claims.

Research on blockchain in agriculture and food supply chains shows that this technology can improve traceability, data sharing, and consumer confidence in product provenance (Kamilaris et al., 2019; Casino et al., 2019). As a result, customers can make purchasing decisions based on reliable data, rather than just relying on advertising labels.

#### **4.2.2. Ecotourism: authenticating environmental protection information**

With its rich ecosystems and many famous natural tourist attractions, Central Vietnam is becoming an ideal destination for domestic and international tourists. However, ecotourism businesses need to demonstrate their environmental commitments to meet the increasing expectations of customers regarding sustainable tourism.

Blockchain can help businesses in the industry authenticate and publicize information about environmental protection

activities, such as reducing carbon emissions, conserving wildlife, or limiting plastic waste. Each of these activities can be recorded on the blockchain, making it easy for customers to check and verify the company's commitments before choosing a service.

Sustainable tourism research emphasizes the need for credible environmental information and responsible tourism practices; blockchain may support this goal by providing auditable records of sustainability-related activities (Gössling et al., 2021; World Economic Forum, 2020). As a result, tourists' trust in ecotourism services can be strengthened, while also enhancing the competitive advantage for businesses in the industry.

#### **4.2.3. Sustainable fashion: ensuring the origin of green materials**

The sustainable fashion industry is developing strongly in Vietnam, especially in major cities like Da Nang. Today's consumers are not only interested in style and quality but also pay attention to the origin of materials and the level of environmental friendliness of the product.

Blockchain can help verify that the materials used in fashion products have sustainable origins and legal certification. For example, for products made from organic cotton fibers or recycled fabrics, blockchain will store information about the origin of the materials and the production process, helping to ensure transparency and prevent fraud. Consumers can check this information through blockchain applications, thereby making more responsible purchasing decisions.

In sustainable fashion, blockchain-based traceability can help verify material provenance and supply-chain information, thereby supporting more credible sustainability communication to consumers (Francisco & Swanson, 2018; Saberi et al., 2019; Treiblmaier, 2018). When consumers can easily verify the origin of materials, they are more likely to trust the brand, thereby increasing engagement and boosting sales.

#### **4.2.4. Typical international models of blockchain application in green digital marketing**

The application of blockchain in green digital marketing is not limited to Central Vietnam or Vietnam but has been successfully implemented worldwide. The following cases illustrate typical blockchain-based transparency models:

- Walmart (USA) – Blockchain in Food Supply Chain Management. Walmart has used blockchain-based food traceability solutions to improve the speed and reliability of tracking food products across its supply chain (Walmart, n.d.; Kamilaris et al., 2019). This example suggests that similar traceability mechanisms may be relevant to OCOP products, organic agriculture, and food supply chains in Central Vietnam.
- VeChain (China) – Blockchain in the Sustainable Fashion Industry. VeChain has partnered with many major fashion brands to verify the origin of raw materials and production processes of sustainable fashion products (VeChain, n.d.). Through blockchain, consumers can check details about the materials, production process, and environmental product certifications, helping to mitigate greenwashing risks in the industry.
- Provenance (UK) – Blockchain in Sustainable Consumer Products. Provenance provides digital tools that help businesses substantiate sustainability claims and communicate product-level transparency to consumers (Provenance, n.d.). This technology helps businesses build trust with customers and ensure product sustainability.
- Everledger (USA) – Blockchain in the Diamond and Jewelry Industry. Everledger uses blockchain to verify the legality and origin of diamonds, helping to prevent the trade of illegally sourced diamonds (Everledger, n.d.). This system not only protects consumer rights and data privacy but also helps minimize negative impacts on the environment.

These international cases suggest that blockchain can support green digital marketing through four main mechanisms: product traceability, sustainability-claim verification, digital product passports, and immutable provenance records. For Central Vietnam, these mechanisms can be adapted to sectors such as OCOP products, organic agriculture, eco-tourism, local textiles, and certification-heavy products.

Business models in the Central region, including sustainable agriculture, ecotourism, and sustainable fashion, can leverage blockchain to enhance transparency

in green digital marketing. This technology not only helps ensure product traceability but also contributes to mitigating greenwashing risks and improving transparency in customer data practices. The application of blockchain will promote the sustainable development of businesses in the Central region, while strengthening consumer trust and engagement.

#### **4.3. Challenges in applying blockchain in central Vietnam**

Although blockchain offers significant potential for green digital marketing in Central Vietnam, the deployment of this technology in practice still faces some significant challenges. Businesses in this region, despite their strong development potential, face several issues regarding costs, knowledge, and support policies, making it difficult to implement blockchain in green marketing strategies. Below are three main challenges that Central Vietnam businesses face when implementing blockchain in green digital marketing.

##### **4.3.1. High implementation costs**

One of the biggest challenges for the application of blockchain in green digital marketing in Central Vietnam is the cost of deployment. Blockchain is a complex technology that requires a robust technological infrastructure and relatively high initial investment costs. Small and medium-sized enterprises, especially those operating in fields such as sustainable agriculture, ecotourism, or sustainable fashion, often do not have sufficient budget to invest in this technology.

Blockchain implementation may require substantial investment in infrastructure, system integration, governance, and human resources, which can be a significant barrier for SMEs (Lacity, 2018; World Economic Forum, 2020). Although blockchain may bring long-term benefits, its initial cost may exceed the financial capacity of many SMEs in Central Vietnam.

In the sustainable agriculture industry, for example, businesses may need to build monitoring and recording systems for product data from cultivation to distribution. This not only requires investment in blockchain software but also in product monitoring and authentication systems, which can become a financial burden for many small businesses.

##### **4.3.2. Lack of awareness and expertise in technology**

Another major challenge when deploying blockchain in Central Vietnam is the lack of awareness and expertise in this technology within the business community. Although blockchain has become a prominent trend in many global industries, for businesses in Central Vietnam, this technology is still a new and difficult concept to

understand. Businesses, especially small businesses, may not have sufficient knowledge about blockchain to fully assess the benefits and potential of this technology in green marketing.

The adoption of blockchain is often constrained by limited technical expertise, governance challenges, interoperability issues, and uncertainty about viable business models (Lacity, 2018; World Economic Forum, 2020). Businesses in Central Vietnam, due to a lack of expertise, may face difficulties in implementing blockchain effectively, from choosing the right technology platform to building transparent and sustainable marketing strategies.

This also reflects the lack of training and skills development programs in the business community in this region. The shortage of highly skilled personnel in blockchain technology can make it difficult for businesses to develop effective blockchain systems, thereby reducing their competitiveness in the green marketing industry.

#### **4.3.3. Lack of specific policy support**

Finally, an important factor hindering the widespread deployment of blockchain in Central Vietnam is the lack of support policies from government agencies. Although blockchain is considered an advanced technology with many potential applications in various fields, in Vietnam in general and Central Vietnam in particular, support policies for blockchain deployment in green marketing strategies are still limited.

Although Vietnam has taken steps toward developing a legal foundation for the digital technology industry and digital assets, specific regulatory guidance for blockchain applications in green marketing and sustainability-claim verification remains limited (National Assembly of Vietnam, 2025; European Commission, 2023). Businesses in Central Vietnam not only lack information about financial support policies but also face difficulties in identifying legal regulations related to the application of blockchain in green marketing. In addition, another important factor is the lack of support in connecting businesses with technology providers, start-ups, and blockchain developers. This lack of collaboration opportunities reduces the ability to access and apply suitable blockchain solutions in the green digital marketing industry.

A clear regulatory framework can reduce uncertainty, support responsible deployment, and improve stakeholder trust in blockchain-based systems (World Economic Forum, 2020; National Assembly of Vietnam, 2025). The government can also play an important role in creating a favorable legal environment for businesses to deploy blockchain and green marketing.

The challenges in deploying blockchain in Central Vietnam, including high costs, lack of awareness and technological expertise, as well as the absence of specific support policies, need to be addressed to maximize the potential of this technology in green digital marketing. Businesses in this region need support from technology providers, government agencies and relevant stakeholders to overcome these barriers and apply blockchain effectively, helping to develop sustainably and enhance transparency in green marketing strategies.

## **V. CONCLUSION AND RECOMMENDATIONS**

To promote the effective adoption of blockchain in green digital marketing in Central Vietnam, coordinated efforts are needed from government agencies, enterprises, universities, research institutions, and technology start-ups. The following recommendations are proposed.

### **5.1. Financial and technical support for SMEs**

Small and medium-sized enterprises in Central Vietnam often face financial and technical barriers when adopting blockchain-based solutions. Therefore, government agencies and financial institutions should provide targeted support through preferential loans, innovation funds, tax incentives, and pilot funding programs. These mechanisms can help businesses reduce initial deployment costs and test blockchain applications in areas such as OCOP product traceability, organic agriculture, eco-tourism, and sustainable fashion.

In addition to financial support, technical assistance is also necessary. SMEs should be supported in selecting suitable blockchain platforms, designing traceability systems, integrating blockchain with existing digital marketing tools, and ensuring the quality of input data. Pilot projects should be encouraged before large-scale implementation so that businesses can evaluate feasibility, costs, and benefits in practice.

### **5.2. Regulatory framework for blockchain-based green claims**

A clear regulatory framework is essential for applying blockchain to green digital marketing. Regulations should clarify how environmental data, product-origin information, sustainability claims, and consumer data can be recorded, verified, and shared through blockchain-based systems. In particular, there should be common standards for green claims, product traceability, third-party verification, and data auditing.

Because blockchain cannot guarantee the accuracy of input data by itself, independent verification mechanisms are necessary. Government agencies can cooperate with environmental certification bodies, industry associations, and technology providers to develop guidelines for

verifying sustainability claims. This would help reduce greenwashing risks, protect consumers, and increase business confidence in adopting blockchain-based transparency solutions.

### 5.3. Enterprise–university–start-up collaboration

The successful implementation of blockchain in green digital marketing requires collaboration among enterprises, universities, research institutions, and technology start-ups. Universities and research institutions can provide training programs, technical consultation, and applied research on blockchain, digital marketing, data governance, and sustainability verification. At the same time, start-ups can offer flexible and cost-effective blockchain solutions suitable for SMEs.

Enterprises should be encouraged to cooperate with technology start-ups through pilot projects, innovation labs, internship programs, and joint research activities. Such collaboration can help businesses access technical expertise, reduce implementation risks, and develop practical blockchain applications for regional sectors such as agriculture, tourism, fashion, and local crafts.

Overall, blockchain adoption in green digital marketing should not be viewed only as a technological investment, but as part of a broader strategy for transparency, trust building, and sustainable business development. With appropriate financial support, regulatory guidance, and collaborative innovation, businesses in Central Vietnam can use blockchain-based traceability to strengthen green claims, improve consumer trust, and enhance their competitiveness in sustainability-oriented markets.

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