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IMPACT OF BLOCKCHAIN TECHNOLOGY AND ITS COMPONENTS ON TOURISM OUTCOMES WITH THE MEDIATING ROLE OF SUPPLY CHAIN MANAGEMENT

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ABSTRACT

Purpose- The current research "investigates the impact of blockchain technology and its components on tourism outcomes with the mediating role of supply chain management .It reviews concepts such as tourism, blockchain technology, and supply chain management through the structural equation modeling method, and investigates the mediating role of supply chain management.

Methodology- A questionnaire was used to collect data. Its validity was checked by experts as content validity, construct validity by confirmatory factor analysis in smart pls software, and its reliability by using Cronbach's alpha coefficient in SPSS software.

Findings. The population under study included tourists from tourist centers of the Tehran province and the sample size was determined by using the Morgan Krejcie table to be 384 people. Kolmogorov-Smirnov tests, confirmatory factor analysis test and structural equation modeling were used to analyze the data in smart pls software.

Conclusion- The results showed that blockchain technology and its components have led to favorable outcomes such as the sustainable development of tourism destinations, the creation of tourism opportunities, the increase in tourism demand in Iran, the attraction of tourists, the increase in tourism business activities, the adoption of blockchain in the tourism industry, and supply chain management plays a mediating role in this effectivity.

Keywords: Blockchain technology, tourism, supply chain management, tourism destinations.
JEL Codes: L86 , L83, M11

1. INTRODUCTION

The emergence of the Internet has created the concept of e-tourism; it means the digitalization of all processes and value chains in the tourism industry, travel, and hospitality, which enables organizations to have maximum productivity and effectiveness. Here, a relatively new development is a change from electronic tourism to smart tourism, which involves the transition from the digital domain to a digital and physical domain. This occurs with the gradual replacement of websites by sensors and smartphones, and the shift from information to big data. The main exchanges are no longer B2B (Business-to-Business), B2C (Business-to-Consumer), and C2C (Customer-to-Customer), but general-private-consumer collaboration. Blockchain is another step in this gradual process of technical progress and not only provides new opportunities but may be a serious threat to many current shareholders (Treiblmaier 2020). Nowadays, tourism products often involve the transfer of money across national borders and between partners who previously had no business relationship. Therefore, a certain trust is required, and intermediaries are often used to reduce the risk of non-fulfillment of contracts. However, the intermediaries themselves must also be trusted in these cases, and obviously, they receive a percentage of the commission. Cryptocurrencies based on blockchain technology enable the easy exchange of money without the need for trusted third parties, which makes possible the emergence of new forms of customer-to-customer (C2C) transactions in the primary and secondary markets of tourism products (Önder and Treiblmaier 2018). Blockchain is a distributed database consisting of a list of transaction packets called blocks that are connected. One of these blocks, which are also generally called distributed ledgers, cannot be modified under normal conditions, because they are accepted as part of the entire chain in a complex decentralized way. Blockchain technology is not managed by a central server, but by a peer-to-peer network where decentralized nodes hold copies of the entire blockchain. The task of adding and verifying new transaction records is performed by miners (Narayanan et al. 2016). Operating systems such

as Ethereum have emerged in the wake of Bitcoin, and enable a secure conclusion of online agreements between parties who do not even need to know each other through the establishment of so-called smart contracts based on blockchain technology. The power of digital currencies in combination with smart contracts can prove very disruptive technologies for many industries (Giancaspro 2017). Technically, there are different blockchain systems based on different data structures and consensus mechanisms, including public, private, and permissioned. A public blockchain (eg, Bitcoin, Ethereum) is an open system whereby anyone can participate freely, while a private blockchain is a closed system that limits participation to authorized individuals. slow down Finally, several companies operate a permissioned blockchain or consortium that acts as a semi-closed system (Kunnigber et al., 2019).

Certainly, blockchain is still in the early stages of its formation and many individuals do not have the necessary and sufficient knowledge and confidence about the potential power of this technology. Nevertheless, innovation in blockchain architecture and its applications is proceeding rapidly. Blockchain as a decentralized and open structure has attracted the attention of many experts and even governments in a short time. The extreme fluctuations in the price of Bitcoin and other digital currencies, and their contradictory regulations, have caused many individuals to have a negative view of these currencies. It is noteworthy that digital currency is only one application of blockchain technology. However, the main obstacle is the lack of widespread adoption of blockchain. A comprehensive participation and gaining more knowledge can actualize its potential.

Add sentences stating the flow of the paper. Tourism has been developed by information technology in three stages. The last decade of the 20th century, the first decade of the 21st century and after 2010 until now. Using the Internet as a communication tool with the market in the first stage changed the business model of many tourism organizations with a focus on creating new forms of value in the tourism supply chain in the second stage. Then, in the third stage, new social systems based on information and communication technologies were developed and evolved, which co-create the tourism experience with the participation of supply and demand, and the participation of tourists in tourist destinations and providing highly personalized services to them through these technologies. brought along In fact, in the third stage, travel and tourism has been fundamentally transformed by the influence of information technology. . Therefore, there is a growing consensus among researchers that the world is entering the era of smart tourism.

2. THEORICAL FOUNDATION OF RESEARCH

2.1. Smart Tourism

Nowadays, smart tourism destinations are at the top of research in tourism, and the efforts of researchers to provide models, tools, and strategies to stabilize the process of intelligent configuration of destinations are very promising. Any smart tourism destination provides advanced services, a high degree of innovation, and the presence of open, interconnected, and shared processes to improve the quality of life of residents and tourists. Smart tourism destination comprehends technology, people, and institutions. Creating a smart tourism destination requires the linking of technologies, systems, services, and capabilities within an organic network that is multi-sector and flexible enough for future developments, besides having free access (Del Vecchio and Passiante 2018). The smart tourism ecosystem has problems such as data privacy, safety, and management. Blockchain technology, which is based on the Merkel tree algorithm and a decentralized ledger, offers ready-made solutions to the above problems. Blockchain technology provides the benefits of increased efficiency, transparency, and certainty. However, the smart integration of tourism with blockchain may create its problems (Yadav et al. 2021). True smart tourism focuses on the needs of tourists by combining information and communication technologies, maximizing tourist satisfaction, and improving the effectiveness of resource management. The application of smart techniques in tourism, besides creating fundamental changes in tourist behavior and directing demand, has also drastically changed the functions and structure of the tourism industry (supply aspect). As it seems, tourism will continue to grow and change dramatically in the foreseeable future with a wider and more use of smart devices and technologies in various sectors (Wang et al. 2016). Another technological advancement that changes the tourism industry is artificial intelligence. AI has many implications for smart tourism; for example, AI helps collect data and integrate it with databases and supports analytics of globally used platforms in providing details. The psychological profile of potential tourists can change the accuracy of predicting customer interests (Jessop 2018). Smart tourism requires, during its development, bridging between digital and physical institutions and activating artificial intelligent machines, environment, public-private consumer collaboration, mutual sharing, and an ecosystem enabled by big data (Beverungen et al. 2019; Nam et al. 2019). These things, as prerequisites for smart tourism, bring serious challenges such as data privacy, data security, and data management (Hawlitschek et al. 2018).

2.2. Blockchain Technology

Blockchain as an evolving technology is expected to improve competitive advantages through innovative platforms in business models (Tseng et al. 2020). Blockchain use cases as an innovative technology have increasingly attracted the attention of tourism companies. To date, the literature examines the benefits of blockchain instead of examining the early adoption of this technology by organizations and innovators (Maiso et al., 2024). Blockchain-based applications can replace traditional loyalty programs, solve rate integrity issues, and manage service provider credentials and passenger identity. The first adopters of blockchain technology have always seen improvements in their competitive advantage and brand position (Park et al., 2020).

The emergence of blockchain technology can completely transform the global economy. Blockchain, as an emerging technology, is of great importance and current attention in the tourism industry. Small economies are leading in using this digital technology. For example, Caribbean economies are launching their first digital legal license, and Aruba is developing a blockchain platform to boost tourism revenue. Blockchain technology has significant and important consequences in the development of tourism because of the speed of adoption (Kwok and Koh 2019). Blockchain technology, which is used in the digital currency Bitcoin, is believed to have the ability to meet challenges to achieve end-to-end transparency. This tool, as a network tool to facilitate business operations, uses peer-to-peer technology to share and verify data. Blockchain technology uses public key encryption to verify transactions on the Internet and defend cyber security, and against threats such as ransomware, Trojans, worms, rootkits, and botnets (Maleh et al. 2020).The fintech revolution, crowdfunding, and blockchain-based funding have dramatically reduced borrowing and lending transaction costs.(Boreiko and Vidusso2019)

2.3. Supply Chain Management

Blockchain includes, based on the supply chain, smart contracts, product traceability, execution tracking, stock control, transactions, settlement, and immutability of information, which have improved the market, economy, and performance of the performance as participation growth. Blockchain has also had marginal effects on participation efficiency (Kim and Shin 2019). Digital information sharing platforms can enhance various types of supply chain capabilities, which can ultimately improve various supply chain performance outcomes. In addition, various theories of information technology and management can be used to strengthen these relationships (Zu et al., 2022).

The beneficiaries of the supply chain should combine and incorporate blockchain into their activities because blockchain transactions become in this way easier, more reliable, and traceable (Kshetri 2014) and cooperation between supply chain members based on cost savings and increased productivity in the supply chain continues their advancement (Hald and Kinra 2019; Queiroz and Wamba 2019). Blockchain implementation strengthens consumer trust and enables them to track the entire product path throughout the supply chain with full confidence (Saberi et al. 2019). Blockchain traceability helps prevent counterfeit goods through the supply chain. So the supply chain will benefit greatly in savings and performance (Alazab et al. 2021). Studies have shown that blockchain can solve supply chain challenges and include several major strategic goals for supply chain management such as cost, quality, and speed (Alazab 2014).

Digital transformation plays a key role in improving information sharing and information processing in the supply chain. Supply chains require multiple data and document exchanges and can significantly benefit from digital information sharing (Sorosubalsi et al., 2024).

As supply chains involve multiple stakeholders and become more complex and dynamic in nature, digital information sharing platforms (DIS) supported by blockchain and cloud technologies enable information sharing, exchange and processing in operations, finance, customer relations and The sustainability functions of SCs help (Jabbar and Dani, 2020). A large number of monetary transactions and data exchanges, documentation resulting from reservations, required approvals, information processing, shipment tracking, collaboration, customs clearance, payment tracking, taxation, product authentication, customer service, The release report and compliance with regulations are done in supply chains (Zheng et al., 2020).

Alasfar, (2024) in an article entitled "The effect of supply chain management and logistics on competitive advantage and organizational performance: a field study in tourism organizations in Syria" showed that there is a strong relationship between supply chain management, logistics, competitive advantage and organizational performance. has it. Supply chain management and logistics have shown a positive and significant effect on competitive advantage and organizational performance. In order to achieve competitive advantages and organizational performance, the organization will save money if they put enough emphasis on supply chain management and logistics structures.

Bentalha, (2024) in an article entitled "Sustainable supply chain management in tourism: understanding the potential possibilities of environmental performance" showed that the goal of sustainable logistics management is to ensure sustainable economic, environmental and social stability that leads to long-term sustainable development. The global push towards sustainable development is driving the adoption of sustainable logistics practices in tourism-related logistics management, with a particular focus on meeting environmental performance goals. The findings show that coordinated, collaborative and integrated logistics resources can increase the efficiency of the supply chain in the tourism industry.

Chadhori et al., (2024) in an article titled "Resilience strategies to mitigate "severe" disruptions in the sustainable tourism supply chain" showed that sustainable tourism performance during a severe disruptive event (e.g., the Covid-19 health crisis), rather than an individual impact It depends on the combined effect of their tourism resilience strategies and risks. Adnani et al., (2023) in an article entitled "The role of innovation and information sharing in supply chain management and commercial performance of halal products in tourism destinations" showed that information sharing and innovation play a significant mediating role in the relationship between management supply chain and performance.

Al-Rawashedh et al., (2023) in an article titled "Supply Chain Management and Organizational Performance: The Moderating Effect of Supply Chain Complexity" showed that postponing the sharing of information quality and supplier strategic partnership has a strong positive effect on organizational performance. The relationship between information level and organizational performance is statistically significant. These findings show that organizations can improve their performance by implementing strategies to manage and optimize these factors in their supply chain. This study also showed that supply chain complexity as a moderator helps to increase organizational performance through interactions with supplier strategic partnership, information level, information sharing quality, sharing delay.

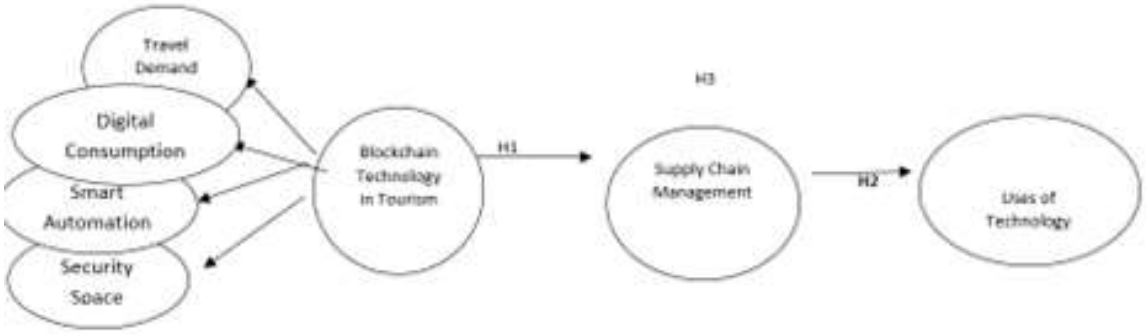
Wu and Zhang (2022) showed that smart production has raised higher requirements for the supply chain with the development of the new generation of information technology, and the synchronization of supply chain operations and the reliability of supply chain management is necessary. Zhou et al. (2022) showed a supply chain consisting of a supplier and a retailer (or two competing retailers) where the supplier and retailer can use blockchain technology to ensure authentic product information. Paul et al. (2022) showed that radio frequency identification technology based on blockchain technology can help manage the complexities of tea supply chain management, transparency, and traceability in the industry. Alazab et al. (2021) showed that the technology acceptance and use theory does not have a significant effect on the intention to adopt blockchain, while intra-organizational trust has a significant effect on the relationship between technology acceptance and use theory and acceptance intention. Baralla et al. (2021) showed that local food and drink can become a suitable combination to attract tourists and promote the region. Blockchain-based system for food supply chain management has been designed and developed for food tracking. This platform ensures transparency, efficiency and reliability through smart contracts. Luo and Zhou (2021) showed that the traditional tourism industry urgently needs digital technologies to reduce costs and increase efficiency. Blockchain, as an emerging technology, promises a reformed tourism industry as it provides a trusted platform for connecting tourism companies and tourists.

Thus, the research hypotheses are as follows:

1. The impact of blockchain technology on supply chain management is significant.
2. The impact of supply chain management on the favorable outcomes of tourism is significant.
3. The impact of blockchain technology on the favorable outcomes of tourism with the mediating role of supply chain management is significant.

Uses of technology, supply chain management, blockchain technology in tourism, travel demand, digital consumption, smart automation, security space

Exhibit 1: The Conceptual Model of the Research



3. RESEARCH METHOD

The current research is applied and descriptive-analytical. Data is analyzed by confirmatory factor analysis and path analysis by structural equation modeling. As for collecting information, the theoretical part of the data extracted the data through the library method, and the practical part through the questionnaire and the field method. Its statistical population includes tourists from the tourism centers of the Tehran province, and the sample size was 384 people because of the unlimited statistical population. The data collection tool was a researcher-made questionnaire. The validity of the questionnaire as content and formal validity was confirmed by experts, and the validity of the construct and structure was confirmed by confirmatory factor analysis in smart pls software and the reliability of the questionnaire by using Cronbach's alpha coefficient in spss software. Kolmogorov-Smirnov tests were used to analyze the data and for the normality test. A structural equation modeling test was used for path analysis and model validation in smart pls software.

4. RESEARCH FINDINGS

4.1. Descriptive Statistics

As the results of the descriptive part show, 48.7% of the questionnaire respondents are men and 51.3% are women. As for education, 9.6% have a diploma or post-diploma, 53.1% have BSc, 28.9% have MSc, and 8.3% have studied up to the doctorate level. As for age, 8.6% of individuals are between 18 and 25 years old, 12.2% between 26 and 30 years old, 44.3% between 31 and 40 years old, 0.24% between 41 and 50 years old, and 10.9% are over 50 years old. The variables all have an acceptable value in the average index. Because it is in the range of 3 and if the variable is in this range, the variables have a favorable status in the statistical population according to the 5-point Likert scale in the questionnaire.

4.2. Inferential Statistics

First, we examine the external and internal model of the research in the partial least squares method, and then the model validation and the hypotheses.

4.2.1. Examining the External Model of Research

A traditional criterion for reliability control is Cronbach's alpha, which shows an estimate of reliability based on the internal correlation of indicators. If this coefficient is higher than 0.70, internal consistency is confirmable. PLS path models also use, besides Cronbach's alpha coefficient, compound or composite reliability to evaluate reliability. If the value of this index is higher than 0.70, the composite reliability of the model is also confirmable. Table 1 describes the results.

Table 1: Composite Reliability and Cronbach's Alpha

Research variables	Composite reliability	Cronbach's alpha
Smart automation	0.801	0.734
Travel demand	0.869	0.775
Security space	0.798	0.731
Tourism blockchain technology	0.905	0.885
Supply Chain Management	0.858	0.794
Digital consumption	0830	0.794
Results and consequences	0.885	0.848

As Exhibit Table1 shows, the gained values are higher than 0.70, so the measurement models have good reliability.

4.2.2. Evaluation of Convergent and Divergent Validity of Measurement Models

The most important validity under investigation is convergent validity to confirm the validity of measurement models. This type of convergent validity means that the set of indicators explains the main construct.

Table 2: Calculation Results of Average Variance Index

Research variables	Variables
Smart automation	0.575
Travel demand	0.698
Security space	0.572
Tourism blockchain technology	0.551
Supply Chain Management	0.550
Digital consumption	0.620
Results and consequences	0.525

As Table2 shows, the value of AVE for all variables is higher than 0.5. Therefore, convergent validity of measurement models is desirable (Table3).

Table 3: Factor Loadings Table

Dimensions	Component	Row	Code	Frequency (index weight)	Factor loadings
Results and consequences	-	1	Improving the level of tourism	8	0.675
		2	Sustainable development of tourist destinations	8	0.680
		3	Creating tourism opportunities	9	0.820
		4	Increasing tourism demand in Iran	8	0.663
		5	Attracting tourists	10	0.753
		6	Increasing commercial tourism activities	7	0.758
		7	Blockchain adoption in tourism	10	0.723
Supply Chain Management	-	8	Quality management	8	0.775
		9	Cost management	9	0.632
		10	Management of speed and reliability	8	0.731
		11	Risk reduction	7	0.788
		12	Stability and flexibility	7	0.773
Tourism blockchain technology	Travel demand	13	Demand for speed in service delivery using technologies	10	0.841
		14	Demand for quality services using technologies	10	0.836
		15	Demand to diversify services using technologies	10	0.813
	Digital consumption	16	- Using the digital world	7	0.797
		17	Creating digital networks between passengers	7	0.764
		18	Demand for digital information	8	0.802
	Smart automation	19	Smartening of processes	9	0.679
		20	Smartening the provision of travel services	8	0.760
		21	Smartening communication with tourists	7	0.830
	Security space	22	Creating an atmosphere of trust	8	0.613
		23	Establishing security in the travel payment gateway	10	0.793
		24	Providing travel insurance and using safe and secure ways	8	0.845

4.2.3. Model Fitting

The general fitting index of the model or the GOF index, which is calculated as the geometric mean of the explained variance R^2 and the average quality of the COMMUNALITY measurement model, is as follows:

Equation 1: $GOF = \sqrt{\overline{Communality} \times \overline{R^2}} = 0.591$

The overall fitting of the model is favorable based on the gained coefficient, because this value is higher than 0.35, so the overall fitting of the model is confirmable.

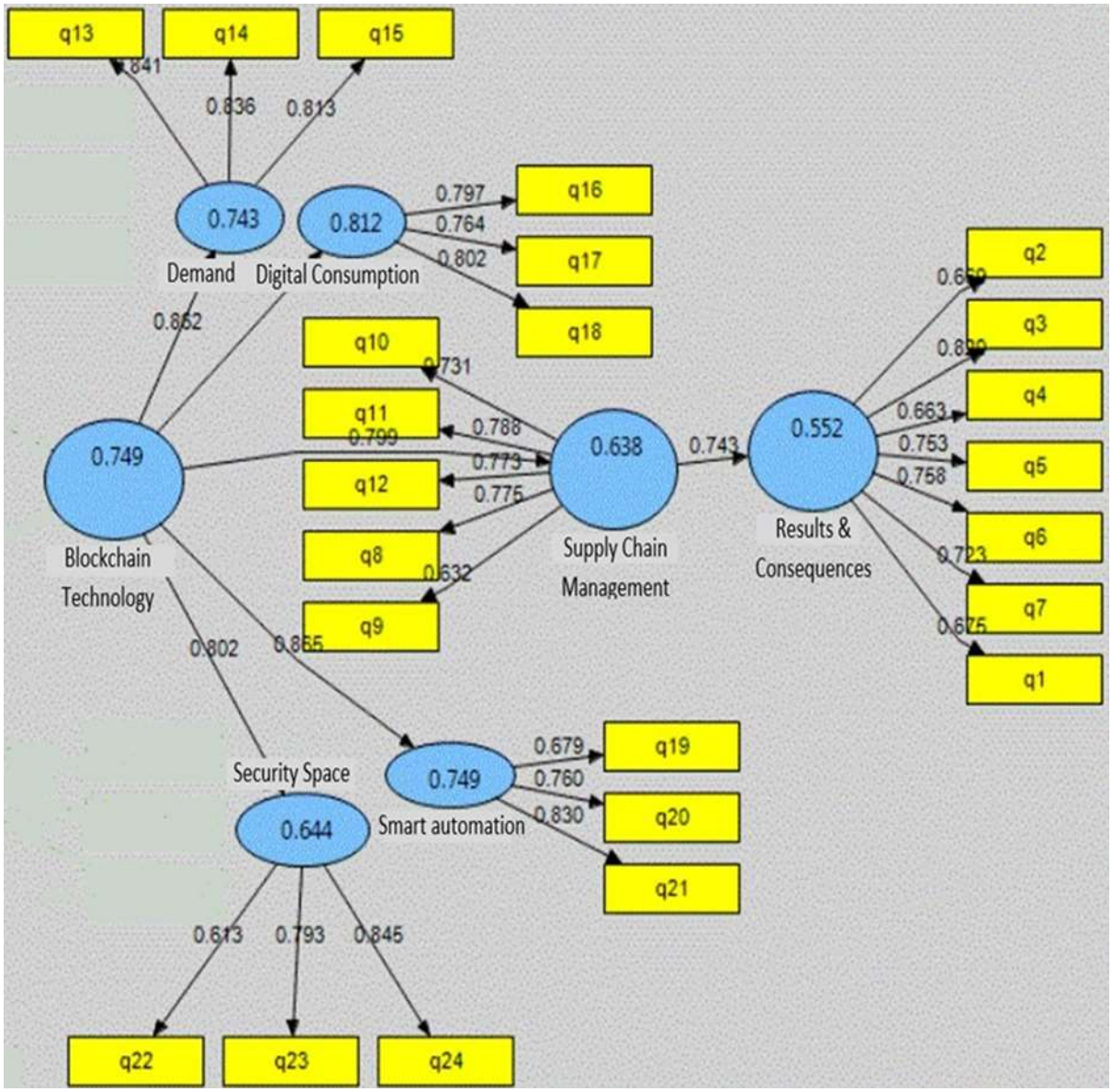
4.2.4. Structural Model Evaluation

The structural equation model has been used to evaluate the overall model. The critical value must be greater than 1.96 based on the significance level of 0.05; the parameter value lower than this is not considered important in the model. Exhibits 5,6 show the results.

4.2.5. Standard Coefficients

Overall model measurement and hypothesis results in standard mode presented in Exhibit 2

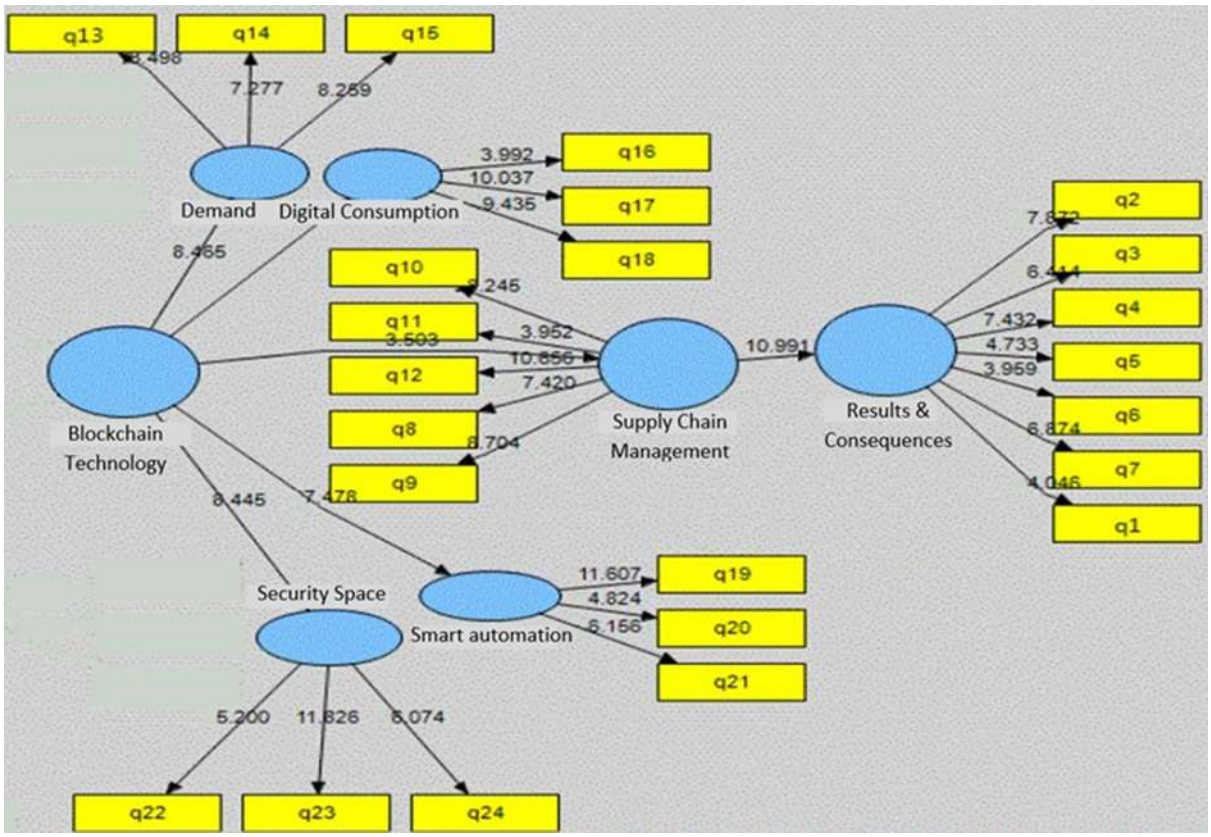
Exhibit 2: Overall Model Measurement and Hypothesis Results in Standard Mode



4.2.6. T-Value Coefficients

Exhibit 3 shows the significance level of path coefficients. A significance level greater than 1.96 and less than -1.96 is acceptable.

Exhibit 3: Measurement of the Overall Model and the Results of the Hypotheses in a Significance Mode



As Exhibit 3 shows, the path coefficients have a good level of significance because they are more than 1.96.

4.3. Results of the Statistical Analysis

The path analysis method has been applied to examine the causal relationship between the research variables and verify the hypotheses.

The first hypothesis: the impact of blockchain technology in tourism on supply chain management:

As Figures 2 and 3 show, the path coefficient is 0.799, which has a level of 3.503 and is desirable, because it is higher than 1.96. Therefore, the path coefficient is confirmed.

The second hypothesis: the effect of supply chain management on results and consequences:

As Diagrams 2 and 3 show, the path coefficient is 0.743, which has a level of 10.991, which is favorable because it is higher than 1.96. Therefore, the path coefficient is confirmed.

The third hypothesis: The impact of blockchain technology in tourism on the results and consequences of the mediation of supply chain management is significant.

The Sobel test is used to investigate the mediating role of the supply chain management variable:

Equation 2 : $$\boldsymbol{Z-value=\frac{a\times b}{\sqrt{(b^2\times s_a^2)+(a^2\times s_b^2)+(s_a^2\times s_b^2)}}}$$

Where:
a: Path coefficient value between the independent variable and mediator variable: 0.799
b: Path coefficient value between mediator variable and dependent variables: 0.734
Sa: standard error of the path between independent and mediator: 0.04

Sb: standard error of the mediator and dependent path: 0.05

As the Sobel test formula and the mentioned values reveal, the value of the significance level is 4.357, which is higher than 1.96, and therefore the mediator role is confirmed.

The VAF coefficient is used to calculate the impact.

$$VAF = \frac{a \times b}{(a \times b) + c}$$

Where:
a: Path coefficient value between the independent variable and mediator variable: 0.799
b: Path coefficient value between the mediator and dependent variables: 0.734
C: coefficient of the path between independent and dependent: 0.502
As the VAF coefficient and the mentioned values show, the coefficient value is 0.542.
The following table shows a summary of the results (Table 4).

Table 4: Summary of Hypothesis Test Results

Hypothesis	Independent variable	Mediator variable	Dependent variable	Path coefficient	Significance	Result
1	Blockchain technology in tourism	-	Supply Chain Management	0.799	3.503	Confirmed path
2	Supply Chain Management	-	Results and consequences	0.743	10.991	Confirmed path
3	Blockchain technology in tourism	Supply Chain Management	Results and consequences	0.542	4.357	Confirmed path

As Exhibit 7 shows, significant coefficients have good values because they are all higher than 1.96. Therefore, all three hypotheses are confirmable. The goodness of fit (GOF) value of 0.591 shows the overall fitting of the model. Because this value is higher than 0.35, the overall fitting of the model is confirmable.

5. DISCUSSION AND CONCLUSION

Comparing the results of the research with the conducted research and investigating the hypotheses of the research give the following results:

Alasfar, (2024) in a research showed that there is a strong relationship between supply chain management, logistics, competitive advantage and organizational performance. Supply chain management and logistics have shown a positive and significant effect on competitive advantage and organizational performance. Adnani et al., (2023) in a research showed that information sharing and innovation play a significant mediating role in the relationship between supply chain management and performance.

Wu and Zhang (2022) stated that the emergence of blockchain technology provides an opportunity to improve the supply chain ecosystem. Their results are in line with the results of the current research on supply chains.

Alazab et al. (2021) showed that the technology acceptance and use theory does not have a significant effect on the intention to adopt blockchain, while intra-organizational trust has a significant effect on the relationship between technology acceptance and use theory and acceptance intention. Treiblmaier (2020) shows that it is necessary to refer to economic theories to better understand how blockchain features will be formed in the future of the tourism industry and its main beneficiaries. His results are in line with the results of the current research on blockchain technology.

6. SUGGESTION

The research suggests, based on the results and consequences, to improve the level of tourism, and sustainable development of tourism destinations by creating tourism opportunities. Increasing tourism business measures and the use and acceptance of blockchain technology in tourism increase tourism demand in Iran and attract tourists from all foreign countries.

Quality management and cost management, based on the supply chain management, will create a favorable outlook for tourists, managing speed and reliability in travel will reduce risk, and high stability and flexibility improve the level of tourism in Iran.

Using blockchain technology in tourism improves the level of tourism through speed, quality, and diversity in providing services. Using digital technology and creating digital networks between travelers and digital information attracts tourists.

This industry can achieve a favorable vision of the country's tourism by making processes smarter, providing travel services, and communicating with tourists. Creating security at the travel payment portal, providing travel insurance, and using safe and secure methods create an atmosphere of trust on the part of tourists.

The following suggestions are for future researchers:

- Investigating the impact of blockchain technology components on supply chain management.
- Investigating the impact of blockchain technology components on tourism outcomes with the mediating role of supply chain management.
- Investigating the impact of blockchain technology components on tourism outcomes with the moderating role of tourists' characteristics.

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