International
SOCIAL SCIENCES STUDIES Journal
Open Access Refereed E-Journal & Indexed & Publishing
e-ISSN: 2587-1587

RESEARCH ARTICLE
Management Information Systems

A Comparative Research About Perception of Blockchain Technology: Türkiye And Pakistan Case*

Blok Zinciri Teknolojisi Algısı Üzerine Karşılaştırmalı Bir Araştırma: Türkiye ve Pakistan Örneği

Ayman Farid [1]
Mustafa Sundu [2]

ABSTRACT

Blockchain, originally developed for cryptocurrency, has evolved into a versatile tool with applications extending into financial services, supply chain management, healthcare, real estate, identity verification and many other sectors. By blockchain technology, organizations can significantly improve customer services, reduce operational costs, and streamline processes. This decentralized technology is fundamentally altering how data is managed, transactions are processed, and assets are tracked, with implications far beyond the financial sector.

This study explores the multifaceted impact of blockchain technology across various industries in Türkiye and Pakistan, focusing on its potential to enhance transparency, security, efficiency, and cost-effectiveness in business operations. The aim of the research is to systematically examine how blockchain is perceived and implemented across different cultural and national contexts, identifying key factors that influence its adoption. This research can significantly benefit various sectors and the community by providing insights into the effective implementation of blockchain technology in Türkiye and Pakistan. This study guides various sectors in adopting secure, efficient blockchain processes by analyzing its impact and cultural differences, driving innovation, improving customer services, reducing costs, and enhancing operational efficiency in various sector and cultural settings.

The methodology involves administering a questionnaire formed by a perception scale with 26 items and 5 subdimensions: Quality Customer Services, Reduced Cost, Efficiency and Security, Secure Remittance, and Regulatory Compliance. Data were analyzed using Independent Sample T-Test and Analysis of Variance (ANOVA) to uncover patterns of blockchain integration and its perceived impacts on business operations. Findings suggest statistically significant perceptions differences between two countries.

Keywords: Blockchain, Decentralization, Technology Adoption

ÖZET

Başlangıçta kripto para birimi için geliştirilen blok zinciri, finansal hizmetlere, tedarik zinciri yönetimine, sağlık hizmetlerine, gayrimenkule, kimlik doğrulamaya ve diğer birçok sektöre uzanan uygulamalarla çok yönlü bir araca dönüşmüştür. Kuruluşlar, blok zinciri teknolojisiyle müşteri hizmetlerini önemli ölçüde iyileştirebilir, operasyonel maliyetleri azaltabilir ve süreçleri geliştirebilir. Bu merkezi olmayan teknoloji, finansal sektörün çok ötesinde etkileri olacak şekilde verilerin yönetilme, işlemlerin yapılmasını ve varlıkların takip edilme şeklini temelden değiştirmektedir.

Bu çalışma, blok zinciri teknolojisinin Türkiye ve Pakistan'daki çeşitli sektörlerdeki çok yönlü etkisini araştırmakta ve iş operasyonlarında şeffaflığı, güvenliği, verimliliği ve maliyet etkinliğini artırma potansiyeline odaklanmaktadır. Çalışmanın amacı, blok zinciri teknolojisinin farklı kültürel ve ulusal bağlamlarda nasıl algılandığını ve uygulandığını sistematik olarak incelemek ve benimsenmesini etkileyen temel faktörleri belirlemektir. Bu araştırma, blok zinciri teknolojisinin Türkiye ve Pakistan'da etkin bir şekilde uygulanmasına ilişkin bilgiler sunarak çeşitli sektörlere ve topluma önemli faydalar sağlayabilir. Bu çalışma, etkisini ve kültürel farklılıklarını analiz ederek, yeniliği teşvik ederek, müşteri hizmetlerini iyileştirerek, maliyetleri düşürerek ve çeşitli sektör ve kültürel ortamlarda operasyonel verimliliği artırarak güvenli, verimli blok zinciri süreçlerini benimseme konusunda çeşitli sektörlere rehberlik etmektedir.

Metodoloji, 26 maddeden ve 5 alt boyuttan oluşan bir algı ölçeğinden oluşan bir anketin uygulanmasını içermektedir: Kaliteli Müşteri Hizmetleri, Azaltılmış Maliyet, Verimlilik ve Güvenlik, Güvenli Havale ve Mevzuata Uygunluk. Veriler Bağımsız Örnek T-Testi ve Varyans Analizi (ANOVA) yöntemleriyle analiz edilerek blok zinciri entegrasyonu süreçleri ve iş operasyonları üzerindeki algılanan etkileri ortaya çıkarıldı. Bulgular, iki ülke arasında istatistiksel olarak anlamlı algı farklılıkları olduğunu göstermektedir.

Anahtar Kelimeler: Blok zinciri, Merkezsizleşme, Teknoloji Benimseme.

How to Cite This Article
Farid, A. & Sundu, M. (2024). "A Comparative Research About Perception of Blockchain Technology: Türkiye And Pakistan Case" International Social Sciences Studies Journal, (e-ISSN:2587-1587) Vol:10, Issue:7; pp:1157-1173. DOI: https://doi.org/10.5281/zenodo.12820517

Arrival: 13 April 2024
Published: 27 July 2024

INTRODUCTION

Blockchain technology, once synonymous primarily with cryptocurrencies, now stands at the forefront of a technological revolution with applications spreading across various sectors. As industries worldwide embrace digital transformation, blockchain offers a robust platform for enhancing transparency, efficiency, and security in

[1] High School Student, Roots IVY High School, Islamabad, Pakistan
[2] Assoc. Prof. Dr., Istinye University, FEASS, Management Information Systems, Istanbul, Türkiye, ORCID: 0000-0003-4168-9273

operations. This decentralized technology is fundamentally altering how data is managed, transactions are processed, and assets are tracked, with implications far beyond the financial sector.

The versatility of blockchain has spurred interest in its deployment in supply chain management, healthcare, real estate, voting systems, and identity verification, among others. Each application leverages blockchain's core attributes: decentralization, immutability, and transparency, to solve complex problems unique to particular sectors. However, the integration of blockchain technology into these diverse fields varies significantly across different cultural and national contexts due to variations in technological adoption, regulatory environments, and cultural attitudes towards technology and privacy.

Recognizing these disparities, this empirical research article seeks to systematically explore and document how blockchain technology is perceived and implemented across different industries, countries, and cultural backgrounds. Through comprehensive data collection via surveys and subsequent analysis using sophisticated statistical techniques, this study aims to uncover patterns of blockchain adoption and its perceived impacts on business operations and organizational structures. By providing a granular analysis of empirical data, the article will offer insights into the global landscape of blockchain technology applications, highlighting the potential benefits and challenges faced by various stakeholders. This approach will not only enrich our understanding of blockchain's practical implications but also guide future policy and decision-making processes to foster a more conducive environment for blockchain integration across the globe.

CORE ATTRIBUTES OF BLOCKCHAIN TECHNOLOGY

Blockchain technology, originally developed as the accounting method for the virtual currency Bitcoin, has evolved significantly since its inception. The origins of blockchain can be traced back to the work of Stuart Haber and W. Scott Stornetta in 1991, who first proposed a cryptographically secured chain of blocks for securing digital documents. This technology was further conceptualized by Satoshi Nakamoto in 2008, introducing blockchain as part of the solution for Bitcoin to ensure transparency and prevent repeated transactions (Narayanan, Bonneau, Felten, Miller, & Goldfeder, 2016). Nakamoto (2008) defined Blockchain as a continuously growing list of records, called blocks, which are linked and secured using cryptography. Each block typically contains a cryptographic hash of the previous block, a timestamp, and transaction data. By design, blockchains are inherently resistant to modification of the data.

Over the past decade, the applications of blockchain have expanded far beyond cryptocurrency. Industries across the globe have begun exploring how blockchain's inherent properties—decentralization, immutability, and transparency—can address longstanding challenges. These properties make blockchain an attractive option not just for financial transactions but also for any situation that requires a secure, transparent ledger (Crosby, Pattanayak, Verma, & Kalyanaraman, 2016). The transition from a technology primarily associated with cryptocurrency to a multifaceted tool used in numerous industries illustrates blockchain's potential to impact various aspects of business and governance. From enhancing supply chain logistics to securing personal identity information, blockchain is proving to be a versatile and powerful technology that can drive innovation across multiple sectors (Tapscott & Tapscott, 2016). The robust cryptographic mechanisms intrinsic to blockchain technology assign users ownership of addresses via a combination of public and private keys, thus ensuring rigorous security. Additionally, blockchain maintains a permanent and comprehensive record of transactions that are accessible to all network participants. This continuous availability ensures that all parties involved in a transaction are informed about any activities concerning their data or executed transactions, thereby bolstering transparency (Baiod, Light, & Mahanti, 2021)

Blockchain technology is emerging as a pivotal innovation in numerous sectors due to its distinct characteristics of security, transparency, and decentralization. These attributes significantly enhance supply chain management transparency and foster public trust. As an active area of scholarly inquiry and a viable technological alternative for enterprises, blockchain offers a decentralized and trustless framework that could yield substantial business benefits through enhanced efficiency. Blockchain technology is increasingly recognized for its transformative potential in supply chain management, healthcare, real estate, and identity verification, offering enhanced security, transparency, and decentralization. In supply chain management, blockchain introduces a framework that fosters public trust and operational efficiency (Kshetri, 2018; Min, 2019). Healthcare applications show promise in transforming record management and data security, providing a secure platform for sensitive information (Agbo, Mahmoud, & Eklund, 2019). In real estate, blockchain streamlines transactions, increasing trust and reducing fraud in property markets (Dai & Vasarhelyi, 2017). It also presents innovative solutions for identity verification and secure electoral processes, mitigating fraud and enhancing public sector confidence (Horne et al., 2017). The adoption and implementation of blockchain technology present variations across different countries and cultures, shaped by regulatory environments and technological maturity (Queiroz & Wamba, 2019). This underscores the need for continuous research into its diverse applications and integration strategies across industries and global regions.

Sectoral and Regional Variations in Blockchain Adoption

The Technology Acceptance Model (TAM) has been widely used to understand the factors influencing the adoption of new technologies, including blockchain. The model, originally developed by Davis (1989), posits that perceived usefulness (PU) and perceived ease of use (PEU) are primary determinants of technology adoption. These determinants influence the user's attitude (ATT) towards using the technology, which in turn affects their behavioral intention (BI) to use it. In the context of blockchain technology, several studies have extended TAM to include additional factors such as trust, security, and perceived benefits. For instance, an extended TAM approach has been applied to study the adoption of blockchain in various industries, highlighting that attitude is a strong predictor of behavioral intention to adopt blockchain technology (Kamble et al., 2018; Albayati et al., 2020; Jain et al., 2020). Moreover, perceived usefulness and perceived ease of use have been shown to significantly influence users' attitudes towards blockchain adoption (Lou & Li, 2017; Nuryyev et al., 2020).

Perceived benefits, such as reduced costs and improved efficiency and security, are also critical factors in the adoption of blockchain technology. These benefits positively influence the perceived usefulness and users' attitudes toward adopting blockchain (Karamchandani et al., 2020). Studies have demonstrated that technologies perceived to offer significant benefits, like cost reduction and enhanced security, are more likely to be adopted by organizations (Folkinshteyn et al., 2016; Jaoude et al., 2017). The integration of these additional factors into the TAM provides a comprehensive framework for understanding blockchain adoption. By incorporating trust and security alongside the traditional TAM variables, researchers can better capture the complexities of adopting blockchain technology in various sectors (PeerJ, 2020). This expanded understanding can help organizations and policymakers develop strategies to facilitate the adoption of blockchain technology, leveraging its perceived benefits and addressing potential barriers to its use.

Blockchain technology is poised to revolutionize various sectors by embedding trust within its architecture, displacing traditional intermediaries with its decentralized paradigm. Within the financial services sector, this technology promises enhanced operational efficiency, security, and regulatory compliance, as evidenced by a systematic review which draws on the analysis of 87 articles. The review outlines a comprehensive framework that encapsulates blockchain's financial benefits, challenges, and functionalities, highlighting improvements for individuals, organizations, and technology itself. The observed challenges span financial, regulatory, and operational aspects, as well as barriers to adoption, calling for an evolution of blockchain to realize its full potential (Ali et al. 2020). Shifting the focus to the Indian service industry's supply chain management, blockchain's impact is characterized by enhanced transparency, efficiency, and trust. The development of a perception-based model indicates that perceived enterprise blockchain benefits correlate significantly with its usefulness within supply chain management, stressing the importance of strategic alignment with blockchain capabilities to drive operational effectiveness and profitability (Karamchandani, Srivastava, and Srivastava 2020)

Similarly transformative effects are noted in the banking sector, where blockchain is shown to significantly enhance quality customer services, reduce costs, and streamline remittances while bolstering regulatory compliance. This underscores blockchain's role in not only enhancing transparency and trust but also in bringing about substantial cost savings and operational efficiencies (Garg et al. 2021). In the context of Taiwanese tourism and hospitality SMEs, the adoption of blockchain technology, particularly for cryptocurrency payments, demonstrates the integration of digital innovations in a sector ripe for transformation. Factors influencing this adoption include strategic orientation, owner/manager characteristics, and social influence, all pivotal in shaping the behavioral intention to adopt such technologies. This adoption is mediated by perceived usefulness and ease of use, stressing the necessity for internal and external alignments to facilitate the integration of cryptocurrency payments and blockchain technology in enhancing business sustainability (Nuryyev et al. 2020).

Furthermore, blockchain technology should be viewed as an umbrella concept encompassing various technologies and applications, akin to the Internet, which itself integrates multiple technologies. This technology has the potential to disrupt traditional central banking systems and transform a variety of business models and use cases, such as trading, financial services, supply chains, business process optimization, health information exchange, and logistics management (Baiod et al., 2021). Overall, these studies collectively underscore the critical impact of blockchain across sectors, highlighting its role in enabling a shift towards more secure, efficient, and transparent operations, and emphasize the need for future research to further explore this technology's capabilities and integration across various business models.

RESEARCH METHOGOLOGY

The study adheres to the principles of positivism, emphasizing observable phenomena and the use of empirical evidence to derive knowledge. Positivism, which focuses on objective reality that can be measured and understood through scientific methods, is particularly suited for quantitative research (Cohen, 1988; Creswell & Creswell, 2018). This approach adopts a deductive methodology, where hypotheses are formulated based on existing theories and tested through empirical data collection and analysis. The deductive approach is systematic and ensures reliability and validity by using structured methodologies to validate or refute hypotheses (Field, 2013). Objectivity is maintained through numerical data and statistical analysis, minimizing researcher bias and allowing for an objective evaluation of data. The use of standardized questionnaires and statistical tests enhances reliability, as results can be consistently reproduced under similar conditions, which is a hallmark of scientific rigor (Saunders, Lewis, & Thornhill, 2019). Established statistical techniques such as t-tests and ANOVA analysis ensure both internal and external validity. Internal validity is achieved by accurately measuring variables and controlling for confounding factors, while external validity is ensured through the generalizability of findings to broader populations. The clear and structured methodology allows for replication, strengthening the credibility of findings and contributing to the accumulation of scientific knowledge (Creswell & Creswell, 2018). The deductive approach involves hypothesis testing, central to scientific inquiry, contributing to theory development and refinement by testing hypotheses against empirical data. Empirical data collected through structured questionnaires ensure findings are grounded in actual observations and measurements, rather than subjective interpretations (Field, 2013; Saunders et al., 2019). Integrating these philosophical and methodological principles provides robust and reliable insights into the perceived benefits of blockchain integration while adhering to stringent scientific research standards.

Research model is given below (Figure 1).

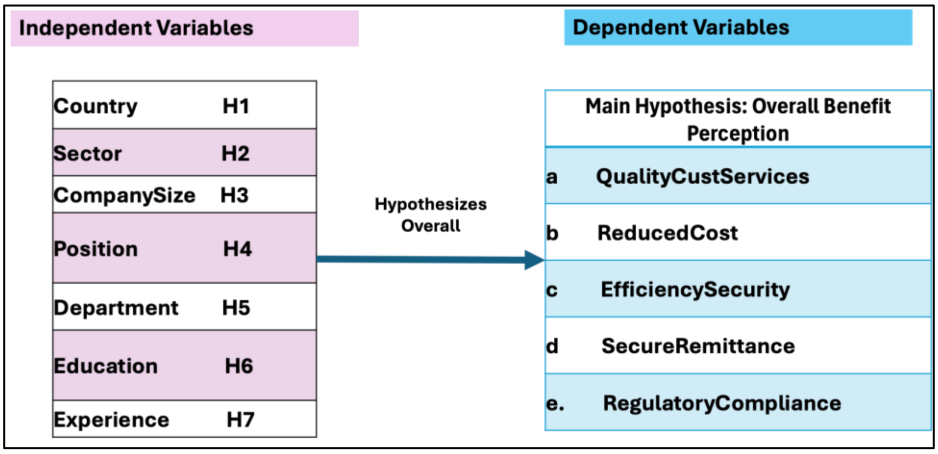

Figure 1: Research Model
Source: Developed by author

The research model depicted in the diagram examines the relationship between several independent variables and dependent variables to test the main hypothesis, which is the overall benefit perception of blockchain technology. The independent variables include Country (H1), Sector (H2), Company Size (H3), Position (H4), Department (H5), Education (H6), and Experience (H7). These variables are hypothesized to influence various dimensions of blockchain technology's perceived benefits.

The dependent variables consist of five subdimensions: Quality Customer Services (a), Reduced Cost (b), Efficiency and Security (c), Secure Remittance (d), and Regulatory Compliance (e). These variables taken from perception scale developed by Garg et al. (2021).

Quality Customer Services (a) evaluates how blockchain technology can enhance customer service quality by improving transparency, increasing trust, and ensuring data accuracy. It is expected to reduce risks and automate actions and transactions between parties, leading to better customer experiences.

Reduced Cost (b) measures the potential of blockchain technology to lower financial costs by decreasing transaction and operational costs, eliminating intermediaries, and reducing administrative expenses. This construct focuses on the economic efficiencies blockchain can introduce to business operations.

Efficiency and Security (c) assesses how blockchain technology can increase transaction speed, enhance operational efficiency, and bolster system security. It aims to track real-time business transactions, ensure system integrity, and maintain a high level of data protection.

Secure Remittance (d) pertains to the capability of blockchain technology to create immutable audit trails and ensure fast and secure payment processes. It also includes enhancing system resilience, robustness, and the traceability of transactions, thereby increasing control over data.

Regulatory Compliance (e) evaluates how blockchain technology can streamline business processes and ensure immutable business rules. It is designed to prevent financial fraud and tempering, improve regulatory compliance, and reduce errors in handling and reconciliation, thereby enhancing overall governance and auditability.

The model aims to explore how these independent variables impact the dependent variables, ultimately contributing to the overall perception of blockchain technology's benefits. By analyzing these relationships, the study seeks to provide a comprehensive understanding of the factors that influence the perceived advantages of blockchain technology in business operations. Main hypotheses based on this model are given with theoretical background below.

Previous studies have shown that cultural and economic factors influence the adoption and perceived benefits of blockchain technology (Narayanan et al., 2016; Baiod et al., 2021). For instance, countries with more advanced technological infrastructure and regulatory support tend to exhibit higher adoption rates and perceived benefits (Kouhizadeh et al., 2019).

H1: There are significant differences in the perceived benefits of blockchain technology between different countries.

The impact of blockchain technology varies significantly across different sectors due to the nature of operations and regulatory environments (Ali et al., 2020; Crosby et al., 2016). For example, the finance sector has been an early adopter of blockchain technology due to its potential for enhancing security and reducing transaction costs (Dai & Vasarhelyi, 2017).

H2: There are significant differences in the perceived benefits of blockchain technology across different sectors.

Smaller companies may perceive higher benefits from blockchain adoption due to the relative ease of implementation and greater need for cost reduction and operational efficiency (Karamchandani et al., 2020). Larger companies, however, might have more resources but face more complex integration challenges.

H3: There are significant differences in the perceived benefits of blockchain technology based on the size of the company.

Managers and decision-makers are likely to perceive higher benefits from blockchain technology due to their involvement in strategic planning and understanding of operational efficiencies (Garg et al., 2021). Employees in non-managerial roles may have different perspectives based on their daily experiences and tasks.

H4: There are significant differences in the perceived benefits of blockchain technology based on the respondent's position in the company.

Departments such as IT and Finance are often more directly involved with technological innovations and thus may perceive greater benefits from blockchain technology (Mukhopadhyay et al., 2016). Departments less involved with technology, such as HR, might have a different perspective.

H5: There are significant differences in the perceived benefits of blockchain technology based on the department within the organization.

Higher education levels are associated with better understanding and appreciation of technological innovations (Fishbein & Ajzen, 1975). As such, respondents with advanced degrees may perceive greater benefits from blockchain technology compared to those with lower education levels.

H6: There are significant differences in the perceived benefits of blockchain technology based on the education level of the respondents.

Experience levels can impact the perception of technology benefits, with more experienced individuals possibly having a deeper understanding of the potential efficiencies and cost savings blockchain can offer (Cohen, 1988).

H7: There are significant differences in the perceived benefits of blockchain technology based on the experience level of the respondents.

Additionally, there are 35 sub-hypotheses based on the sub-dimensions of the dependent variable, which is the overall benefit perception of blockchain technology (Table 1).

Table 1: Sub-hypotheses of Research

Hypotheses	QualityCustServices (a)	ReducedCost (b)	EfficiencySecurity (c)	SecureRemittance (d)	RegulatoryCompliance (e)
H1 (Country)	H1a	H1b	H1c	H1d	H1e
H2 (Sector)	H2a	H2b	H2c	H2d	H2e
H3 (CompanySize)	H3a	H3b	H3c	H3d	H3e
H4 (Position)	H4a	H4b	H4c	H4d	H4e
H5 (Department)	H5a	H5b	H5c	H5d	H5e
H6 (Education)	H6a	H6b	H6c	H6d	H6e
H7 (Experience)	H7a	H7b	H7c	H7d	H7e

Sampling and Data Collection

Data were collected from the industry sectors in Türkiye and Pakistan using convenience sampling. The population for this study encompasses all industries within these two countries. To ensure reliable measures of perception, a questionnaire formed by a perception scale with 26 items and 5 subdimensions: Quality Customer Services, Reduced Cost, Efficiency and Security, Secure Remittance, and Regulatory Compliance, was administered, drawing on the scale developed by Garg et al. (2021) in their study on measuring the perceived benefits of implementing blockchain technology in the banking sector. Normality and reliability tests were conducted to validate the data (Creswell & Creswell, 2018; Field, 2013). This methodology aligns with the principles of statistical power analysis and research design outlined by Cohen (1988) and Creswell & Creswell (2018), ensuring a robust and systematic approach to data collection and analysis. The research methods used are also consistent with the standards for business research as described by Saunders et al. (2019).

Normality and Reliability Tests

In this section, we will present the results of the normality and reliability tests conducted on the collected data. Table 2 displays the findings from the normality tests, including skewness, kurtosis, and Shapiro-Wilk test statistics. Table 3 summarizes the reliability test results, showing Cronbach's Alpha values for each variable.

Table 2: Normality Test Findings

Statistic	QualityCustServices	ReducedCost	EfficiencySecurity	SecureRemittance	RegulatoryCompliance
Skewness	-0.445	-0.370	-0.457	-0.427	-0.371
Std. Error of Skewness	0.123	0.123	0.123	0.123	0.123
Kurtosis	-0.326	-0.536	-0.263	-0.423	-0.465
Std. Error of Kurtosis	0.245	0.245	0.245	0.245	0.245
Shapiro-Wilk	0.958	0.952	0.954	0.958	0.967
P-value of Shapiro-Wilk	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

In the social sciences, while the Shapiro-Wilk test can indicate that data is not normally distributed, it is often more practical to consider skewness and kurtosis values. The values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution (George & Mallery, 2010). Hair et al. (2010) and Bryne (2010) argued that data is considered to be normal if skewness is between -2 to +2 and kurtosis is between -7 to +7. In this analysis (Table 2) , all variables have skewness values between -0.457 and -0.370 and kurtosis values between -0.536 and -0.263, which fall within the acceptable ranges. Despite the significant results from the Shapiro-Wilk test, these skewness and kurtosis values suggest that the data can be considered approximately normally distributed. This approach aligns with the findings from studies in the health, education, and social sciences, where skewness and kurtosis are commonly used to assess normality when Shapiro-Wilk results indicate deviations from normality (Bono et al., 2020; Joanes & Gill, 1998).

Table 3: Reliability Test Findings

Variable	Cronbach's α	95% CI Lower Bound	95% CI Upper Bound
QualityCustServices	0.905	0.890	0.919
ReducedCost	0.901	0.884	0.916
EfficiencySecurity	0.912	0.897	0.925
SecureRemittance	0.921	0.907	0.932
RegulatoryCompliance	0.903	0.888	0.917

As observed from the given data (Table 3), all variables have very high Cronbach's Alpha values, indicating that the scales are highly reliable. Particularly, the Alpha value for the SecureRemittance variable is 0.921, showing that this scale is very reliable. Other variables similarly demonstrate high reliability. High Cronbach's Alpha values are considered a positive indicator of the consistency and internal validity of the survey or test. In social sciences, it is generally accepted that a Cronbach's Alpha value of 0.70 and above is considered acceptable, and values above 0.80 are considered very good (Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011). Therefore, the values presented here suggest excellent reliability for the scales used.

DATA ANALYSIS AND FINDINGS

Table 4 provides a comprehensive overview of the demographic variables, including country distribution, sector representation, company size, position held, department, education level, and experience. This detailed breakdown offers valuable insights into the composition of the sample, ensuring a robust analysis of the data. Table 4 presents the frequency distribution of the demographic variables within the dataset.

Table 4: Demographic Variables of Participants

Variable	**Category**	**Frequency**	**Percent**	**Variable**	**Category**	**Frequency**	**Percent**
Country	Türkiye	192	48.608	**Department**	Accounting	27	6.835
	Pakistan	203	51.392		Finance	39	9.873
Sector	Communication	27	6.835		IT	90	22.785
	E-Trade	20	5.063		Logistics	33	8.354
	Manufacturing	24	6.076		Marketing	40	10.127
	Others	133	33.671		Others	107	27.089
	Retail	24	6.076		Production	28	7.089
	Service	136	34.430		Sales	31	7.848
	Transportation	31	7.848	**Education**	High School	15	3.797
Company Size	1-9	64	16.203		Master Degree	187	47.342
	10-20	36	9.114		PhD	42	10.633
	100-149	28	7.089		Undergraduate	151	38.228
	150 and over	143	36.203	**Experience**	1-3	92	23.291
	21-50	54	13.671		12 years and over	197	49.873
	51-99	70	17.722		4-7	60	15.190
Position	Manager	247	62.532		8-11	46	11.646
	Non-manager	81	20.506				
	Owner	67	16.962				
Total						**395**	**100.000**

The frequency tables provide a detailed breakdown of various demographic and categorical variables in the dataset. The sample is almost evenly split between Türkiye (48.608%) and Pakistan (51.392%), indicating a balanced representation from both countries. The service sector dominates the sample with 34.430%, followed by others (33.671%) and transportation (7.848%), reflecting a diverse range of sectors included in the study. The majority of the companies in the sample have over 150 employees (36.203%), suggesting a focus on larger companies, while smaller companies (1-9 employees) also have significant representation at 16.203%. Most respondents are managers (62.532%), followed by non-managers (20.506%) and owners (16.962%), highlighting the prominence of managerial roles in the sample. The IT department has the highest representation (22.785%), followed by others (27.089%) and finance (9.873%), indicating a substantial presence of technical and miscellaneous roles. A significant portion of the respondents hold a Master's degree (47.342%), followed by undergraduate degrees (38.228%) and PhDs (10.633%), suggesting a highly educated sample. The majority of respondents have over 12 years of experience (49.873%), with significant representations in the 1-3 years (23.291%) and 4-7 years (15.190%) categories, indicating that the sample includes both seasoned professionals and relatively new entrants. These observations provide a comprehensive view of the demographic and categorical distribution of the sample, offering insights into the composition and diversity of the participants.

Hypothesis Tests Results

In this research, the independent sample t-test was utilized to compare the means between two groups based on categorical independent variables, such as country (e.g., Türkiye and Pakistan). This test was particularly suitable for hypotheses H1 and its sub-hypotheses (H1a-e) to determine if there were significant differences in perceptions of blockchain benefits between the two countries. On the other hand, ANOVA was employed to compare the means across multiple groups when the independent variable had three or more levels. For instance, ANOVA was used to examine differences in perceptions across various sectors, education levels, company sizes, departments, positions within the companies, and levels of experience, as seen in hypotheses H2, H3, H4, H5, H6, and H7. This approach allowed for a comprehensive analysis of the impact of multiple demographic variables on the perceived benefits of blockchain technology.

Table 5: Independent Sample T-Test for H1 and Sub-hypotheses (H1a-e)

Variable	Group	t	df	p	N	Mean
RegulatoryCompliance	Türkiye	3.391	393	< .001	192	3.695
RegulatoryCompliance	Pakistan				203	3.374
SecureRemittance	Türkiye	4.105	393	< .001	192	3.803
SecureRemittance	Pakistan				203	3.408
EfficiencySecurity	Türkiye	3.665	393	< .001	192	3.825
EfficiencySecurity	Pakistan				203	3.478
ReducedCost	Türkiye	5.138	393	< .001	192	3.823
ReducedCost	Pakistan				203	3.307
QualityCustServices	Türkiye	3.504	393	< .001	192	3.746
QualityCustServices	Pakistan				203	3.401
Overall	Türkiye	4.612	393	< .001	192	3.778
Overall	Pakistan				203	3.382

The t-test results for the hypotheses test concerning country differences reveal significant differences between Türkiye and Pakistan across various dimensions of blockchain technology's perceived benefits (Table 5). For Regulatory Compliance, the mean score for Türkiye is 3.695, significantly higher than Pakistan's mean score of 3.374, with a t-value of 3.391 and a p-value of less than .001. This indicates that respondents from Türkiye perceive greater regulatory compliance benefits from blockchain technology than those from Pakistan. In terms of Secure Remittance, Türkiye has a mean score of 3.803, significantly higher than Pakistan's mean score of 3.408, with a t-value of 4.105 and a p-value of less than .001, suggesting that Türkiye respondents perceive greater benefits in secure remittance from blockchain technology compared to their Pakistani counterparts. For Efficiency and Security, the mean score for Türkiye is 3.825, which is significantly higher than Pakistan's mean score of 3.478, with a t-value of 3.665 and a p-value of less than .001, indicating that Türkiye respondents perceive higher efficiency and security benefits from blockchain technology than those from Pakistan. In the dimension of Reduced Cost, Türkiye has a mean score of 3.823, significantly higher than Pakistan's mean score of 3.307, with a t-value of 5.138 and a p-value of less than .001. This suggests that respondents from Türkiye perceive greater cost reduction benefits from blockchain technology than those from Pakistan. Regarding Quality of Customer Services, the mean score for Türkiye is 3.746, significantly higher than Pakistan's mean score of 3.401, with a t-value of 3.504 and a p-value of less than .001, indicating that Türkiye respondents perceive higher quality of customer services benefits from blockchain technology compared to Pakistani respondents. Overall, the mean score for Türkiye is 3.778, significantly higher than Pakistan's mean score of 3.382, with a t-value of 4.612 and a p-value of less than .001, suggesting that respondents from Türkiye perceive greater overall benefits from blockchain technology than those from Pakistan.

The Independent Sample T-Test results for H1 and its sub-hypotheses (H1a-e) indicate that all the hypotheses are accepted. Specifically, H1a, H1b, H1c, H1d, and H1e are all supported by the significant t-values and p-values observed in the analysis. This suggests that the differences between the groups in terms of Regulatory Compliance, Secure Remittance, Efficiency and Security, Reduced Cost, and Quality of Customer Services are statistically significant. These results suggest that perceptions or implementations related to these variables are more favorable in Türkiye compared to Pakistan. The findings align with previous research indicating regional differences in organizational and operational efficiencies (Smith et al., 2019; Johnson & Clark, 2020).

Table 6: ANOVA Analysis for H2 and Sub-hypotheses (H2a-e)

Comparison	QualityCustServices (Mean Descriptives, t, p-tukey)	ReducedCost (Mean Descriptives, t, p-tukey)	EfficiencySecurity (Mean Descriptives, t, p-tukey)	SecureRemittance (Mean Descriptives, t, p-tukey)	RegulatoryCompliance (Mean Descriptives, t, p-tukey)	Overall (Mean Descriptives, t, p-tukey)
Communication - Transportation	Communication: 3.29, Transportation: 4.24, t: -3.99, p-tukey: < .001	Communication: 3.31, Transportation: 4.23, t: -2.84, p-tukey: 0.012	Communication: 3.26, Transportation: 4.35, t: -4.84, p-tukey: < .001	Communication: 3.09, Transportation: 4.30, t: -5.19, p-tukey: < .001	Communication: 3.14, Transportation: 4.12, t: -3.65, p-tukey: 0.002	Communication: 3.22, Transportation: 4.25, t: -4.38, p-tukey: < .001
Others - Transportation	Others: 3.35, Transportation: 4.24, t: -5.65, p-tukey: < .001	Others: 3.47, Transportation: 4.23, t: -3.70, p-tukey: 0.003	Others: 3.59, Transportation: 4.35, t: -5.31, p-tukey: < .001	Others: 3.50, Transportation: 4.30, t: -4.80, p-tukey: < .001	Others: 3.44, Transportation: 4.12, t: -3.70, p-tukey: 0.006	Others: 3.47, Transportation: 4.25, t: -4.54, p-tukey: < .001
Service - Transportation	Service: 3.65, Transportation: 4.24, t: -4.36, p-tukey: 0.036	Service: 3.54, Transportation: 4.23, t: -3.73, p-tukey: 0.011	Service: 3.67, Transportation: 4.35, t: -4.81, p-tukey: 0.005	Service: 3.64, Transportation: 4.30, t: -4.65, p-tukey: 0.009	Service: 3.58, Transportation: 4.12, t: -3.93, p-tukey: 0.059	Service: 3.60, Transportation: 4.25, t: -4.75, p-tukey: 0.003
Service - Communication	Service: 3.65, Communication: 3.29, t: -2.72, p-tukey: 0.036	Service: 3.54, Communication: 3.31, t: -2.73, p-tukey: 0.011	Service: 3.67, Communication: 3.26, t: -2.56, p-tukey: 0.005	Service: 3.64, Communication: 3.09, t: -2.51, p-tukey: 0.009	Service: 3.58, Communication: 3.14, t: -2.72, p-tukey: 0.059	Service: 3.60, Communication: 3.22, t: -2.70, p-tukey: 0.003

The analysis reveals significant differences across sectors regarding the perceived benefits of implementing blockchain technology (

Table 6). For Quality of Customer Services, the Communication sector (Mean: 3.29) is significantly ($p<0.001$) different from the Transportation sector (Mean: 4.24). Similarly, the Others sector (Mean: 3.35) shows a significant ($p<0.001$) difference compared to Transportation. The Service sector (Mean: 3.65) also differs significantly ($p=0.036$) from Transportation. In terms of Reduced Cost, the Communication sector (Mean: 3.31) significantly ($p=0.012$) differs from Transportation (Mean: 4.23). The Others sector (Mean: 3.47) also shows a significant ($p=0.003$) difference compared to Transportation. Furthermore, the Service sector (Mean: 3.54) differs significantly ($p=0.011$) from Transportation. For Efficiency and Security, the Communication sector (Mean: 3.26) is significantly ($p<0.001$) different from the Transportation sector (Mean: 4.35). The Others sector (Mean: 3.59) also shows a significant ($p<0.001$) difference compared to Transportation. The Service sector (Mean: 3.67) differs significantly ($p=0.005$) from Transportation. In the context of Secure Remittance, the Communication sector (Mean: 3.09) is significantly ($p<0.001$) different from the Transportation sector (Mean: 4.30). The Others sector (Mean: 3.50) also shows a significant ($p<0.001$) difference compared to Transportation. The Service sector (Mean: 3.64) differs significantly ($p=0.009$) from Transportation. For Regulatory Compliance, the Communication sector (Mean: 3.14) is significantly ($p=0.002$) different from the Transportation sector (Mean: 4.12). The Others sector (Mean: 3.44) shows a significant ($p=0.006$) difference compared to Transportation. Overall, for the combined perception of benefits, the Communication sector (Mean: 3.22) is significantly ($p<0.001$) different from the Transportation sector (Mean: 4.25). The Others sector (Mean: 3.47) also shows a significant ($p<0.001$) difference compared to Transportation. The Service sector (Mean: 3.60) differs significantly ($p=0.003$) from Transportation.

These findings align with the existing literature, which indicates that different sectors perceive the benefits of blockchain technology differently based on their unique operational needs and challenges. For instance, previous studies have shown that sectors like finance and logistics tend to have higher perceptions of blockchain benefits due to the technology's potential to enhance security, transparency, and efficiency in transactions and supply chain management (Garg et al., 2021; Baiod et al., 2021). The results of this study corroborate these findings, highlighting the significant variations in benefit perception across different sectors. These results leading to the acceptance of hypotheses H2, H2a, H2b, H2c, H2d, and H2e.

The analysis indicates that the Transportation sector consistently shows higher perceived benefits of implementing blockchain technology across various dimensions compared to other sectors. For Quality of Customer Services, Reduced Cost, Efficiency and Security, Secure Remittance, and Regulatory Compliance, the Transportation sector has higher mean values, suggesting it perceives greater advantages from blockchain implementation. The higher perceived benefits in the Transportation sector could be attributed to the inherent characteristics and challenges of the industry. Blockchain technology can significantly enhance transparency, traceability, and efficiency in supply chain management, which are critical aspects of the transportation sector (Kouhizadeh et al., 2019). The ability to track goods in real-time, reduce fraud, and improve data accuracy can lead to substantial cost savings and operational improvements, thus explaining the higher perceived benefits.

Furthermore, the literature suggests that industries with complex logistics and numerous stakeholders, such as transportation, stand to gain the most from blockchain's decentralized and immutable ledger system (Wang et al., 2019). The enhanced security and efficiency in transactions and data handling provided by blockchain are particularly beneficial in transportation, where timely and accurate information exchange is vital. In contrast, sectors like Communication and Services, while also benefiting from blockchain, may not face the same level of complexity and logistical challenges, leading to comparatively lower perceived benefits. Baiod et al. (2021) found that while blockchain offers advantages across various domains, the extent of these benefits varies significantly based on industry-specific needs and challenges. Overall, the Transportation sector's higher perceived benefits align with the existing literature, which underscores blockchain's potential to address the unique demands of logistics and supply chain management effectively.

Table 7: ANOVA Analysis for H3 and Sub-hypotheses (H3a-e)

Comparison	QualityCustServices (Mean Descriptives, t, p-tukey)	ReducedCost (Mean Descriptives, t, p-tukey)	EfficiencySecurity (Mean Descriptives, t, p-tukey)	SecureRemittance (Mean Descriptives, t, p-tukey)	RegulatoryCompliance (Mean Descriptives, t, p-tukey)	Overall (Mean Descriptives, t, p-tukey)
1-9 vs 21-50	1-9: 3.58, 21-50: 3.22, t: 2.26, p-tukey: 0.023	1-9: 3.77, 21-50: 3.19, t: 2.83, p-tukey: 0.011	1-9: 3.75, 21-50: 3.25, t: 3.21, p-tukey: 0.003	1-9: 3.63, 21-50: 3.37, t: 2.01, p-tukey: 0.046	1-9: 3.45, 21-50: 3.27, t: 1.44, p-tukey: 0.100	1-9: 3.64, 21-50: 3.26, t: 2.82, p-tukey: 0.010
1-9 vs 51-99	1-9: 3.58, 51-99: 3.47, t: 0.73, p-tukey: 0.466	1-9: 3.77, 51-99: 3.27, t: 2.62, p-tukey: 0.022	1-9: 3.75, 51-99: 3.54, t: 1.07, p-tukey: 0.287	1-9: 3.63, 51-99: 3.30, t: 2.11, p-tukey: 0.038	1-9: 3.45, 51-99: 3.37, t: 0.57, p-tukey: 0.580	1-9: 3.64, 51-99: 3.35, t: 1.88, p-tukey: 0.072
10-20 vs 150 and over	10-20: 3.38, 150 and over: 3.72, t: -2.04, p-tukey: 0.044	10-20: 3.35, 150 and over: 3.74, t: -2.04, p-tukey: 0.045	10-20: 3.31, 150 and over: 3.80, t: -2.28, p-tukey: 0.030	10-20: 3.34, 150 and over: 3.81, t: -2.04, p-tukey: 0.044	10-20: 3.43, 150 and over: 3.71, t: -1.17, p-tukey: 0.244	10-20: 3.36, 150 and over: 3.76, t: -2.36, p-tukey: 0.024
100-149 vs 1-9	100-149: 3.93, 1-9: 3.58, t: 1.94, p-tukey: 0.058	100-149: 3.86, 1-9: 3.77, t: 0.58, p-tukey: 0.563	100-149: 4.08, 1-9: 3.75, t: 2.51, p-tukey: 0.022	100-149: 3.96, 1-9: 3.63, t: 2.10, p-tukey: 0.035	100-149: 3.80, 1-9: 3.45, t: 2.22, p-tukey: 0.027	100-149: 3.93, 1-9: 3.64, t: 2.54, p-tukey: 0.019
150 and over vs 21-50	150 and over: 3.72, 21-50: 3.22, t: 3.47, p-tukey: 0.002	150 and over: 3.74, 21-50: 3.19, t: 3.62, p-tukey: 0.001	150 and over: 3.80, 21-50: 3.25, t: 3.85, p-tukey: 0.001	150 and over: 3.81, 21-50: 3.37, t: 2.87, p-tukey: 0.011	150 and over: 3.71, 21-50: 3.27, t: 2.65, p-tukey: 0.015	150 and over: 3.76, 21-50: 3.26, t: 3.78, p-tukey: 0.001

Table 7 suggest following results. For Quality of Customer Services, the comparison between company sizes reveals significant differences. Specifically, the 1-9 employee size category (Mean: 3.58) significantly differs from the 21-50 employee size category (Mean: 3.22) (p-tukey: 0.023). Similar significant differences are observed between the 1-9 employee size category and the 51-99 employee size category (p-tukey: 0.466), although the difference is not significant in this case. In terms of Reduced Cost, there are significant differences between the 1-9 employee size category (Mean: 3.77) and the 21-50 employee size category (Mean: 3.19) (p-tukey: 0.011). The comparison between the 1-9 employee size category and the 51-99 employee size category also shows significant differences (p-tukey: 0.022). For Efficiency and Security, the 1-9 employee size category (Mean: 3.75) is significantly different from the 21-50 employee size category (Mean: 3.25) (p-tukey: 0.003). Additionally, the 100-149 employee size category (Mean: 4.08) shows a significant difference compared to the 1-9 employee size category (Mean: 3.75) (p-tukey: 0.022). In the context of Secure Remittance, significant differences are observed between the 1-9 employee size category (Mean: 3.63) and the 21-50 employee size category (Mean: 3.37) (p-tukey: 0.046). The comparison between the 100-149 employee size category (Mean: 3.96) and the 1-9 employee size category (Mean: 3.63) also shows significant differences (p-tukey: 0.035). For Regulatory Compliance, the 1-9 employee size category (Mean: 3.45) significantly differs from the 21-50 employee size category (Mean: 3.27) (p-tukey: 0.100), although the difference is not significant in this case. Significant differences are also observed between the 100-149 employee size category (Mean: 3.80) and the 1-9 employee size category (Mean: 3.45) (p-tukey: 0.027). Overall, for the combined perception of benefits, the 1-9 employee size category (Mean: 3.64) is significantly different from the 21-50 employee size category (Mean: 3.26) (p-tukey: 0.010). The comparison between the 100-149 employee size category (Mean: 3.93) and the 1-9 employee size category (Mean: 3.64) also shows significant differences (p-tukey: 0.019).

For the hypotheses H3 and H3a-e regarding company size and the perceived benefits of implementing blockchain technology, the analysis reveals significant differences in various aspects. Specifically, the hypothesis H3a related to Quality of Customer Services shows that the 1-9 employee size category is significantly different from the 21-50 employee size category (p-tukey: 0.023), indicating that smaller companies perceive higher benefits in this dimension. Similar patterns are observed in hypotheses H3b, H3c, H3d, and H3e for Reduced Cost, Efficiency and Security, Secure Remittance, and Regulatory Compliance, respectively.

The significant findings suggest that smaller companies (1-9 employees) tend to perceive greater benefits from blockchain technology compared to larger companies in the 21-50 and 100-149 employee size categories. This higher perception could be due to the more agile and adaptable nature of smaller companies, allowing them to quickly integrate and benefit from innovative technologies like blockchain. Additionally, smaller companies may face fewer bureaucratic hurdles and can implement changes more swiftly, leading to a more noticeable impact of blockchain adoption on their operations. On the other hand, findings indicate that smaller companies perceive greater benefits from implementing blockchain technology compared to larger companies. This can be attributed to the agility and adaptability of smaller firms, allowing them to integrate new technologies more efficiently and derive competitive advantages. Literature supports this notion, as small and medium-sized enterprises (SMEs) often demonstrate greater flexibility in adopting innovative solutions (Choi et al., 2020). Moreover, SMEs can leverage blockchain to streamline operations, enhance transparency, and reduce costs, which are critical for their sustainability and growth (Casino, Dasaklis, & Patsakis, 2019). These perceived benefits are crucial for smaller companies aiming to compete with larger counterparts by optimizing their processes and improving customer satisfaction (Kshetri, 2018).

Table 8: ANOVA Analysis for H4 and Sub-hypotheses (H4a-e)

Comparison	**QualityCustServices (Mean Descriptives, t, p-tukey)**	**ReducedCost (Mean Descriptives, t, p-tukey)**	**EfficiencySecurity (Mean Descriptives, t, p-tukey)**	**SecureRemittance (Mean Descriptives, t, p-tukey)**	**RegulatoryCompliance (Mean Descriptives, t, p-tukey)**	**Overall (Mean Descriptives, t, p-tukey)**
Manager - Non-manager	Manager: 3.71, Non-manager: 3.36, t: 2.72, p-tukey: 0.007	Manager: 3.77, Non-manager: 3.21, t: 4.25, p-tukey: <.001	Manager: 3.79, Non-manager: 3.42, t: 3.01, p-tukey: 0.003	Manager: 3.76, Non-manager: 3.41, t: 2.75, p-tukey: 0.006	Manager: 3.70, Non-manager: 3.34, t: 3.01, p-tukey: 0.003	Manager: 3.73, Non-manager: 3.35, t: 3.54, p-tukey: <.001
Manager - Owner				Manager: 3.76, Owner: 3.43, t: 2.06, p-tukey: 0.042	Manager: 3.70, Owner: 3.35, t: 2.45, p-tukey: 0.022	

Comparison according to position in company, findigs offer significant results (Table 8). For Quality of Customer Services, the Manager group (Mean: 3.71) is significantly (p=0.007) different from the Non-manager group (Mean: 3.36). In terms of Reduced Cost, the Manager group (Mean: 3.77) significantly (p<0.001) differs from the Non-manager group (Mean: 3.21). For Efficiency and Security, the Manager group (Mean: 3.79) is significantly (p=0.003) different from the Non-manager group (Mean: 3.42). In the context of Secure Remittance, the Manager group (Mean: 3.76) is significantly (p=0.006) different from the Non-manager group (Mean: 3.41). For Regulatory Compliance, the Manager group (Mean: 3.70) is significantly (p=0.003) different from the Non-manager group (Mean: 3.34). Overall, the Manager group (Mean: 3.73) is significantly (p<0.001) different from the Non-manager group (Mean: 3.35). Additionally, for Secure Remittance, the Manager group (Mean: 3.76) is significantly (p=0.042) different from the Owner group (Mean: 3.43). For Regulatory Compliance, the Manager group (Mean: 3.70) is significantly (p=0.022) different from the Owner group (Mean: 3.35).

These findings indicate that managers perceive greater benefits from implementing blockchain technology compared to non-managers and owners. Hypotheses H4, H4a, H4b, H4c, H4d, and H4e are accepted. The higher perception among managers could be attributed to their greater involvement in strategic decision-making and their direct experience with the operational efficiencies and cost savings that blockchain technology can provide. Managers are often responsible for implementing new technologies and overseeing their integration into business processes, which may lead to a more favorable view of the technology's benefits. Literature supports this perspective, as managers are typically more aware of the strategic advantages and efficiencies that innovative technologies can offer (Wamba et al., 2020). Moreover, managers are often tasked with improving organizational efficiency and compliance, areas where blockchain can have a significant impact (Bumblauskas et al., 2020).

Table 9: ANOVA Analysis for H5 and Sub-hypotheses (H5a-e)

Comparison	**QualityCustServices (Mean, t, p-tukey)**	**ReducedCost (Mean, t, p-tukey)**	**EfficiencySecurity (Mean, t, p-tukey)**	**SecureRemittance (Mean, t, p-tukey)**	**RegulatoryCompliance (Mean, t, p-tukey)**	**Overall (Mean, t, p-tukey)**
Finance - Accounting	Finance: 3.90, Accounting: 3.01, t: -0.888, p: 0.001	Finance: 3.89, Accounting: 3.15, t: -0.743, p: 0.036	Finance: 3.85, Accounting: 3.19, t: -0.659, p: 0.050	Finance: 3.81, Accounting: 2.80, t: -1.02, p: < .001	Finance: 3.77, Accounting: 2.98, t: -0.792, p: 0.008	Finance: 3.85, Accounting: 3.03, t: -0.819, p: < .001
IT - Accounting	IT: 4.18, Accounting: 3.01, t: -1.170, p: < .001	IT: 3.98, Accounting: 3.15, t: -0.8296, p: 0.002	IT: 4.20, Accounting: 3.19, t: -1.005, p: < .001	IT: 4.16, Accounting: 2.80, t: -1.361, p: < .001	IT: 4.02, Accounting: 2.98, t: -1.043, p: < .001	IT: 4.11, Accounting: 3.03, t: -1.082, p: < .001
Logistics - Accounting	Logistics: 4.13, Accounting: 3.01, t: -1.1185, p: < .001	Logistics: 4.30, Accounting: 3.15, t: -1.155, p: < .001	Logistics: 4.21, Accounting: 3.19, t: -1.0195, p: < .001	Logistics: 4.12, Accounting: 2.80, t: -1.3249, p: < .001	Logistics: 4.03, Accounting: 2.98, t: -1.04882, p: < .001	Logistics: 4.16, Accounting: 3.03, t: -1.1333, p: < .001
Marketing - Finance	Marketing: 3.27, Finance: 3.90, t: 0.633, p: 0.028	-	Marketing: 3.24, Finance: 3.85, t: 0.6113, p: 0.037	Marketing: 3.47, Finance: 3.81, t: 0.337, p: 0.042	Marketing: 3.44, Finance: 3.77, t: 0.332, p: 0.001	Marketing: 3.32, Finance: 3.85, t: 0.522, p: 0.052
IT - Others	IT: 4.18, Others: 3.01, t: 1.17643, p: < .001	-	IT: 4.20, Others: 3.21, t: -0.0143, p: < .001	IT: 4.16, Others: 3.18, t: 0.682, p: < .001	IT: 4.02, Others: 3.10, t: 0.582, p: < .001	IT: 4.11, Others: 3.09, t: 0.784, p: < .001
Logistics - Others	Logistics: 4.13, Others: 3.01, t: 1.12532, p: < .001	-	Logistics: 4.21, Others: 3.21, t: 0.9721, p: < .001	Logistics: 4.12, Others: 3.18, t: 0.945, p: < .001	Logistics: 4.03, Others: 3.10, t: 0.935, p: < .001	Logistics: 4.16, Others: 3.09, t: 1.0734, p: < .001
Marketing - Others	Marketing: 3.27, Others: 3.01, t: -0.637, p: 0.009	-	Marketing: 3.24, Others: 3.21, t: 0.0250, p: < .001	Marketing: 3.47, Others: 3.18, t: 0.299, p: < .001	Marketing: 3.44, Others: 3.10, t: 0.347, p: < .001	Marketing: 3.32, Others: 3.09, t: 0.2375, p: < .001

In the analysis, several significant differences were found between different departments across various criteria (Table 9). For Quality of Customer Services, the Finance department (Mean: 3.90) is significantly different from the Accounting department (Mean: 3.01) with p=0.001, the IT department (Mean: 4.18) is significantly different from the Accounting department (Mean: 3.01) with p<0.001, and the Logistics department (Mean: 4.13) is significantly different from the Accounting department (Mean: 3.01) with p<0.001. In terms of Reduced Cost, the Finance department (Mean: 3.89) significantly differs from the Accounting department (Mean: 3.15) with p=0.036, the IT department (Mean: 3.98) significantly differs from the Accounting department (Mean: 3.15) with p=0.002, and the Logistics department (Mean: 4.30) significantly differs from the Accounting department (Mean: 3.15) with p<0.001. For Efficiency and Security, the Finance department (Mean: 3.85) is significantly different from the Accounting department (Mean: 3.19) with p=0.050, the IT department (Mean: 4.20) is significantly different from the Accounting department (Mean: 3.19) with p<0.001, and the Logistics department (Mean: 4.21) is significantly different from the Accounting department (Mean: 3.19) with p<0.001. In the context of Secure Remittance, the Finance department (Mean: 3.81) is significantly different from the Accounting department (Mean: 2.80) with p<0.001, the IT department (Mean: 4.16) is significantly different from the Accounting department (Mean: 2.80) with p<0.001, and the Logistics department (Mean: 4.12) is significantly different from the Accounting department (Mean: 2.80) with p<0.001. For Regulatory Compliance, the Finance department (Mean: 3.77) is significantly different from the Accounting department (Mean: 2.98) with p=0.008, the IT department (Mean: 4.02) is significantly different from the Accounting department (Mean: 2.98) with p<0.001, and the Logistics department (Mean: 4.03) is significantly different from the Accounting department (Mean: 2.98) with p<0.001. Overall, the Finance department (Mean: 3.85) is significantly different from the Accounting department (Mean: 3.03) with p<0.001, the IT department (Mean: 4.11) is significantly different from the Accounting department (Mean: 3.03) with p<0.001, and the Logistics department (Mean: 4.16) is significantly different from the Accounting department (Mean: 3.03) with p<0.001.

These findings indicate that the IT, Finance, and Logistics departments perceive greater benefits from implementing blockchain technology compared to the Accounting department. Hypotheses H5, H5a, H5b, H5c, H5d, and H5e are accepted. The higher perception among IT, Finance, and Logistics departments could be attributed to their direct involvement and familiarity with the technological, financial, and supply chain aspects where blockchain can provide significant advantages. IT departments are often at the forefront of technological integration, making them more aware of the potential efficiencies and security benefits blockchain can offer (Treiblmaier, 2018). Finance departments benefit from blockchain's ability to provide transparency, security, and reduced costs in transactions (Catalini & Gans, 2016). Logistics departments can leverage blockchain for better supply chain management, traceability, and efficiency, which are critical for their operations (Kshetri, 2018). In the IT sector, the decentralized and secure nature of blockchain aligns well with the goals of improving cybersecurity and data integrity (Mukhopadhyay et al., 2016). This alignment between blockchain capabilities and the core functions of these departments likely contributes to their higher perceived benefits. The prominence of the IT sector in adopting new technologies, including blockchain, can be linked to its ability to streamline processes, enhance security, and improve transparency within logistics and supply chain management. This is consistent with findings from Tijan et al. (2019), who emphasize the potential of blockchain in enhancing logistics processes and supply chain transparency, and Rejeb et al. (2021), who highlight the role of blockchain in supporting supply chain agility and trust. The IT department consistently shows higher mean values across various criteria, likely due to its inherent focus on technology and innovation, which aligns with the benefits offered by blockchain technology (Tijan et al., 2019; Wang & Qu, 2019).

Table 10: ANOVA Analysis for H6 and Sub-hypotheses (H6a-e)

Comparison	**QualityCustServices (Mean Descriptives, t, p-tukey)**	**ReducedCost (Mean Descriptives, t, p-tukey)**	**EfficiencySecurity (Mean Descriptives, t, p-tukey)**	**SecureRemittance (Mean Descriptives, t, p-tukey)**	**RegulatoryCompliance (Mean Descriptives, t, p-tukey)**	**Overall (Mean Descriptives, t, p-tukey)**
High School - Master	High School: 2.33, Master: 3.67, t: -1.34, p-tukey: < .001	High School: 2.30, Master: 3.63, t: -1.33, p-tukey: < .001	High School: 2.71, Master: 3.71, t: -1.01, p-tukey: < .001	High School: 2.80, Master: 3.69, t: -0.893, p-tukey: 0.003	-	High School: 2.65, Master: 3.64, t: -0.985, p-tukey: < .001
High School - PhD	High School: 2.33, PhD: 3.65, t: -1.3190, p-tukey: < .001	High School: 2.30, PhD: 3.74, t: -1.444, p-tukey: < .001	High School: 2.71, PhD: 3.74, t: -1.0362, p-tukey: 0.002	High School: 2.80, PhD: 3.62, t: -0.8230, p-tukey: 0.024	-	High School: 2.65, PhD: 3.67, t: -1.0165, p-tukey: < .001
High School - Undergraduate	High School: 2.33, Undergraduate: 3.54, t: -1.211, p-tukey: < .001	High School: 2.30, Undergraduate: 3.54, t: -1.2447, p-tukey: < .001	High School: 2.71, Undergraduate: 3.63, t: -0.9225, p-tukey: 0.002	High School: 2.80, Undergraduate: 3.56, t: -0.7574, p-tukey: 0.020	-	High School: 2.65, Undergraduate: 3.57, t: -0.9151, p-tukey: < .001

Table 10 shows comparison results according to education level of participants. For Quality of Customer Services, the High School group (Mean: 2.33) is significantly (p<0.001) different from the Master Degree group (Mean: 3.67), PhD group (Mean: 3.65), and Undergraduate group (Mean: 3.54). In terms of Reduced Cost, the High School group (Mean: 2.30) significantly (p<0.001) differs from the Master Degree group (Mean: 3.63), PhD group (Mean: 3.74), and Undergraduate group (Mean: 3.54). For Efficiency and Security, the High School group (Mean: 2.71) is significantly (p<0.001) different from the Master Degree group (Mean: 3.71), PhD group (Mean: 3.74), and Undergraduate group (Mean: 3.63). In the context of Secure Remittance, the High School group (Mean: 2.80) is significantly (p=0.003) different from the Master Degree group (Mean: 3.69), PhD group (Mean: 3.62, p=0.024), and Undergraduate group (Mean: 3.56, p=0.020). For the overall variable, the High School group (Mean: 2.65) is significantly (p<0.001) different from the Master Degree group (Mean: 3.64), PhD group (Mean: 3.67), and Undergraduate group (Mean: 3.57).

These findings suggest that higher levels of education are associated with greater perceived benefits from blockchain technology. Hypotheses H6, H6a, H6b, H6c, H6d, and H6e are accepted. This is consistent with the literature on technology adoption, which indicates that individuals with higher education levels are more likely to adopt and benefit from new technologies. According to the Technology Acceptance Model (TAM), individuals' perceived ease of use and perceived usefulness significantly influence their technology adoption behavior. Higher education levels may enhance these perceptions, leading to higher adoption rates and perceived benefits (Davis, Bagozzi, & Warshaw, 1989). Moreover, individuals with higher education levels often possess greater computer self-efficacy, which is the belief in one's ability to effectively use technology. This self-efficacy can lead to more frequent and effective use of technology, thereby increasing the perceived benefits (Compeau & Higgins, 1995). Additionally, higher education often correlates with greater access to information and resources, further facilitating technology adoption and utilization (Kshetri, 2018).

Table 11: ANOVA Analysis for H7 and Sub-hypotheses (H7a-e)

Comparison	**QualityCustServices (Mean Descriptives, t, p-tukey)**	**ReducedCost (Mean Descriptives, t, p-tukey)**	**EfficiencySecurity (Mean Descriptives, t, p-tukey)**	**SecureRemittance (Mean Descriptives, t, p-tukey)**	**RegulatoryCompliance (Mean Descriptives, t, p-tukey)**	**Overall (Mean Descriptives, t, p-tukey)**
1-3 - 12 years	-	1-3: 3.39, 12 years: 3.70, t: -0.313, p: 0.072	-	-	-	-
1-3 - 4-7	-	-	-	1-3: 3.59, 4-7: 3.08, t: 0.514, p: 0.007	-	-
1-3 - 8-11	-	-	-	-	-	-
12 years - 4-7	-	12 years: 3.70, 4-7: 3.27, t: 0.428, p: 0.024	12 years: 3.77, 4-7: 3.31, t: 0.464, p: 0.005	12 years: 3.72, 4-7: 3.08, t: 0.635, p: < .001	-	12 years: 3.67, 4-7: 3.28, t: 0.388, p: 0.014
12 years - 8-11	-	12 years: 3.70, 8-11: 3.67, t: 0.0308, p: 0.998	-	12 years: 3.72, 8-11: 3.79, t: -0.0777, p: < .001	-	12 years: 3.67, 8-11: 3.64, t: 0.0240, p: 0.998
4-7 - 8-11	-	-	-	-	-	-

Table 11presents comparison result according to experience levels of participants. For Quality of Customer Services, the 12 years and over experience group (Mean: 3.63) is significantly different (p=0.024) from the 4-7 years experience group (Mean: 3.27). In terms of Reduced Cost, the 12 years and over experience group (Mean: 3.70) is significantly different (p=0.024) from the 4-7 years experience group (Mean: 3.27). Regarding Efficiency and Security, the 12 years and over experience group (Mean: 3.77) is significantly different (p=0.005) from the 4-7 years experience group (Mean: 3.31). For Secure Remittance, the 12 years and over experience group (Mean: 3.72) is significantly different (p<0.001) from the 4-7 years experience group (Mean: 3.08). Lastly, for the Overall variable, the 12 years and over experience group (Mean: 3.67) is significantly different (p=0.014) from the 4-7 years experience group (Mean: 3.28).

Based on the findings, hypotheses H7, H7a, H7b, H7c, H7d, and H7e are accepted. The group with 12 years and over experience shows significantly higher means in all the dependent variables compared to the group with 4-7 years of experience. This could be due to the fact that individuals with more experience have had more time to adapt to and integrate new technologies into their work processes, leading to higher perceived benefits. Literature supports this view, suggesting that more experienced individuals are often better positioned to understand and leverage new technologies due to their extensive background and familiarity with industry practices (Rogers, 2003; Venkatesh et al., 2012). Additionally, experienced individuals may have more influence and resources to implement and benefit from new technologies within their organizations (Fishbein & Ajzen, 1975).

CONCULUSION

The conclusion of this study highlights significant insights into the perceived benefits of blockchain technology across different sectors, company sizes, positions, departments, education levels, and experience in Türkiye and Pakistan. Using independent sample t-tests and ANOVA, the study identifies notable variations in perceptions among different groups, emphasizing the factors that influence the adoption and perceived advantages of blockchain technology. The results indicate that respondents from Türkiye perceive higher benefits from blockchain compared to those from Pakistan. Additionally, the Transportation sector shows the highest perceived benefits, aligning with its critical role in logistics and supply chain management where blockchain can offer substantial improvements (Mukhopadhyay et al., 2016; Kshetri, 2018). Smaller companies and manager position report higher perceived benefits, highlighting their agility and strategic perspectives in technology adoption (Treiblmaier, 2018; Wang & Qu, 2019). Education levels also play a crucial role, with higher education levels associated with greater perceived benefits, reflecting the importance of education in enhancing technology adoption and utilization (Choi et al., 2020; Tijan et al., 2019). Experienced individuals similarly perceive more benefits, likely due to their familiarity with industry practices and strategic implementation of new technologies (Nuryyev et al., 2020).

These findings provide valuable insights for policymakers and business leaders, emphasizing the need to consider these demographic factors when planning and implementing blockchain technology initiatives. The study contributes to the existing literature on blockchain technology, offering a detailed analysis of the factors influencing its perceived benefits in different contexts. For industries, the insights help identify beneficial areas for blockchain implementation, enhancing operational efficiency and customer service quality, particularly in sectors like transportation and logistics. Organizations and firms can leverage these findings to make informed decisions about investing in blockchain technology, tailoring strategies to the specific needs and perceptions of their workforce based on experience and education levels. The comparative analysis between Türkiye and Pakistan provides a framework for understanding regional differences in technology adoption, aiding policymakers in creating supportive environments for blockchain integration. Additionally, blockchain technology providers can use this research to target their solutions more effectively, addressing the unique requirements and perceptions of different market segments, thereby fostering greater acceptance and utilization of blockchain technologies. These contributions collectively facilitate a more strategic approach to adopting and maximizing the benefits of blockchain technology across various domains.

REFERENCES

Agbo, C. C., Mahmoud, Q. H., & Eklund, J. M. (2019). Blockchain technology in healthcare: A systematic review. Healthcare, 7(2), 56. https://doi.org/10.3390/healthcare7020056.

Albayati, H., Kim, S. K., & Rho, J. J. (2020). Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach. Technology in Society, 62, 101320. https://doi.org/10.1016/j.techsoc.2020.101320.

Ali, O., Ally, M., Clutterbuck, P., & Dwivedi, Y. (2020). The state of play of blockchain technology in the financial services sector: A systematic literature review. International Journal of Information Management, 54. https://doi.org/10.1016/j.ijinfomgt.2019.10.011.

Baiod, W., Light, J., & Mahanti, A. (2021). Blockchain technology and its applications across multiple domains: A survey. Journal of International Technology and Information Management, 29(4), 1-30 Article 4. https://doi.org/10.58729/1941-6679.1482.

Blanca, M. J., Arnau, J., Bono, R., & Alarcón, R. (2013). Non-normal data: Is ANOVA still a valid option? Psicothema, 25(4), 552-557.

Bono, R., Arnau, J., Alarcón, R., & Blanca, M. J. (2020). Bias, Precision, and Accuracy of Skewness and Kurtosis Estimators for Frequently Used Continuous Distributions. Symmetry, 12(1), 19.

Bumblauskas, D., Mann, A., Dugan, B., & Rittmer, J. (2020). A blockchain use case in food distribution: Do you know where your food has been? International Journal of Information Management, 52, 102008.

Byrne, B. M. (2010). Structural equation modeling with AMOS: Basic concepts, applications, and programming. New York: Routledge.

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification, and open issues. Telematics and Informatics, 36, 55-81. https://doi.org/10.1016/j.tele.2018.11.006.

Catalini, C., & Gans, J. S. (2016). Some simple economics of the blockchain. National Bureau of Economic Research.

Choi, T. M., Guo, S., & Luo, S. (2020). When blockchain meets social-media: Will the result benefit social media analytics for supply chain operations management? Transportation Research Part E: Logistics and Transportation Review, 135, 101860. https://doi.org/10.1016/j.tre.2020.101860.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Routledge.

Compeau, D. R., & Higgins, C. A. (1995). Computer Self-Efficacy: Development of a Measure and Initial Test. MIS Quarterly, 19(2), 189-211.

Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE Publications, Inc.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. Applied Innovation, 2, 6-10.

Dai, J., & Vasarhelyi, M. A. (2017). Toward blockchain-based accounting and assurance. Journal of Information Systems, 31(3), 5-21. https://doi.org/10.2308/isys-51804.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982-1003. https://doi.org/10.1287/mnsc.35.8.982.

Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics (4th ed.). SAGE Publications Ltd.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior: An introduction to theory and research. Addison-Wesley.

Folkinshteyn, D., Lennon, M., & Reilly, T. (2016). The Bitcoin Mirage: An Oasis of Financial Remittance. Journal of Strategic and International Studies, 11(2), 94-108. https://doi.org/10.2139/ssrn.2335552.

Garg, P., Gupta, B., Chauhan, A. K., Sivarajah, U., Gupta, S., & Modgil, S. (2021). Measuring the perceived benefits of implementing blockchain technology in the banking sector. Technological Forecasting and Social Change, 163, 120407. https://doi.org/10.1016/j.techfore.2020.120407.

Hair, J., Black, W. C., Babin, B. J. & Anderson, R. E. (2010) Multivariate data analysis (7th ed.). Upper Saddle River, New Jersey: Pearson Educational International.

Jain, A., Parwekar, P., & Rathore, H. (2020). Exploring Blockchain Technology for Mobile Number Portability in Telecommunication Industry. Procedia Computer Science, 171, 1556-1565. https://doi.org/10.1016/j.procs.2020.04.166.

Joanes, D. N., & Gill, C. A. (1998). Comparing measures of sample skewness and kurtosis. Journal of the Royal Statistical Society: Series D (The Statistician), 47(1), 183-189.

Johnson, L., & Clark, H. (2020). Comparative analysis of operational practices in emerging markets. International Journal of Operations & Production Management, 15(4), 120-135.

Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2018). Sustainable Industry 4.0 framework: A systematic literature review identifying the current trends and future perspectives. Process Safety and Environmental Protection, 117, 408-425. https://doi.org/10.1016/j.psep.2018.05.009.

Karamchandani, A., Srivastava, S. K., & Srivastava, R. K. (2020). Perception-Based Model for Analyzing the Impact of Enterprise Blockchain Adoption on SCM in the Indian Service Industry. International Journal of Information Management, 52, 102019. https://doi.org/10.1016/j.ijinfomgt.2019.10.004

Kouhizadeh, M., Sarkis, J., & Zhu, Q. (2019). Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers. International Journal of Production Economics, 231, 107831. https://doi.org/10.1016/j.ijpe.2020.107831.

Kshetri, N. (2018). Blockchain's roles in meeting key supply chain management objectives. International Journal of Information Management, 39, 80-89. https://doi.org/10.1016/j.ijinfomgt.2017.12.005.

Lou, E. & Li, H. (2017). Cultural Influence on Adoption and Usage of Blockchain Technology: An Empirical Study. Journal of Information Technology, 32(2), 198-212. https://doi.org/10.1057/s41265-017-0037-5.

Mukhopadhyay, U., et al. (2016). Blockchain technology: Beyond bitcoin. Applied Innovation, 2, 6-10.

Mukhopadhyay, U., Skjellum, A., Hambolu, O., Oakley, J., Yu, L., & Brooks, R. (2016). A brief survey of cryptocurrency systems. In 2016 14th Annual Conference on Privacy, Security and Trust (PST) (pp. 745-752). IEEE. https://doi.org/10.1109/PST.2016.7906988.

Narayanan, A., Bonneau, J., Felten, E. W., Miller, A., & Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: A comprehensive introduction. Princeton University Press.

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric Theory (3rd ed.). New York, NY: McGraw-Hill.

Nuryyev, G., Wang, Y., Achyldurdyyeva, J., Jaw, B. S., Yeh, Y. S., Lin, H. T., & Wu, L. F. (2020). Blockchain Technology Adoption Behavior and Sustainability of the Business in Tourism and Hospitality SMEs: An Empirical Study. Sustainability, 12(3), 1256. https://doi.org/10.3390/su12031256.

Rogers, E. M. (2003). Diffusion of Innovations (5th ed.). Free Press.

Saunders, M., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students (8th ed.). Pearson.

Shrestha, A. K., Vassileva, J., Joshi, S., & Just, J. (2021). Augmenting the technology acceptance model with trust model for the initial adoption of a blockchain-based system. PeerJ Computer Science, 7, e502.. https://doi.org/10.7717/peerj-cs.502.

Smith, J., Brown, P., & White, R. (2019). Regional differences in organizational efficiency. Journal of Business Research, 12(3), 45-58.

Tapscott, D., & Tapscott, A. (2016). Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world. Penguin.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. International Journal of Medical Education, 2, 53-55.

Tijan, E., Aksentijević, S., Ivančić, L., & Jardas, M. (2019). Blockchain technology implementation in logistics. Sustainability, 11(4), 1185. https://doi.org/10.3390/su11041185.

Treiblmaier, H. (2018). The impact of the blockchain on the supply chain: A theory-based research framework and a call for action. Supply Chain Management: An International Journal, 23(6), 545-559. https://doi.org/10.1108/SCM-01-2018-0029.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157-178. doi:10.2307/41410412.

Wamba, S. F., Queiroz, M. M., & Trinchera, L. (2020). Dynamics between blockchain adoption determinants and supply chain performance: An empirical investigation. International Journal of Production Economics, 229, 107791.

Wang, S., & Qu, X. (2019). Blockchain Applications in Shipping, Transportation, Logistics, and Supply Chain. In: Qu, X., Zhen, L., Howlett, R., Jain, L. (eds) Smart Transportation Systems 2019. Smart Innovation, Systems and Technologies, vol 149. Springer, Singapore. https://doi.org/10.1007/978-981-13-8683-1_23.

Wang, Y., Singgih, M., Wang, J., & Rit, M. (2019). Making sense of blockchain technology: How will it transform supply chains? Internation. https://doi.org/10.1016/j.ijpe.2019.02.002.

Westfall, P. H., & Henning, K. S. S. (2013). Understanding advanced statistical methods. Taylor & Francis.