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The Effects of Blockchain Technology Adoption on Business Ethics and Social Sustainability: Evidence from Chinese FinTech Companies

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Abstract

Background and Aim: Blockchain is a disruptive technology that significantly improves transactions through enhanced transparency, security, traceability, and smart contracts. Although the technology consumes significant energy to produce, it has positively impacted social sustainability. This study examined the effects of blockchain technology adoption on business ethics and social sustainability.

Materials and Methods: Data was obtained from 247 CEOs and managers of fintech and financial companies. Out of the 300 electronic questionnaires that were sent to the CEOs, a total of 247 were completed and returned. The obtained P-value (<0.05) showed that the hypotheses were accepted at a 95% confidence level.

Results: The results showed that blockchain adoption positively impacts business ethics and social sustainability. The results also showed that business ethics has positive effects on social sustainability. Key managerial implications include policy formulations to enhance blockchain adoption and stakeholder onboarding.

Conclusion: The results indicate that blockchain adoption enhances transparency, security, traceability, and smart contracts in business or financial transactions. The study encourages businesses to adopt blockchain technologies to prevent fraud in financial transactions. Blockchain technology enables businesses to build trust through data sharing and transparency.

Keywords: Blockchain; Business Ethics; Social Sustainability; Corporate Social Responsibility

Introduction

Blockchain has been a transformative force in recording business transactions, enabling end-to-end traceability, and building smart contracts. In China, FinTech companies such as Ant Group and JD Digits have mastered the use of blockchain technology to improve transparency in financial transactions. JD and Ant Group have leveraged blockchain technology, big data, and advanced analytics to assess creditworthiness beyond the conventional methods (Venkatesh et al., 2020). Every participant within the supply chain can access and verify information before authorizing transactions (Chatterjee et al., 2023). It is also possible for participants to trace the transfer of ownership and costs to avoid paying more than the prevailing rates (Upadhyay Mukhuty et al., 2021). However, stakeholders must address nearly every good technology with ethical concerns. Among the key ethical concerns of blockchain technology are data misuse, cyberattacks, and widening digital inequalities (Bai et al., 2020). Most ethical concerns surround data privacy and transparency since business transactions involving blockchain technology are open to every participant (Venkatesh et al., 2020; Liao, 2023). Besides, the decentralized blockchain networks may be used for nefarious purposes such as money laundering or funding terrorism (Upadhyay Mukhuty et al., 2021). Despite some of these concerns being open to researchers, very few studies have examined the effects of blockchain technology adoption on business ethics.

Haryanto & Sudaryati (2020) define blockchain technology as a decentralized, immutable, and transparent digital ledger that records transactions across trading platforms, computers, or nodes. Blockchain differs from other digital transaction platforms because it operates on a peer-to-peer network where every participant or business has a copy of the entire ledger (Upadhyay Mukhuty et al., 2021). The technology relies on interconnected blocks containing validated transactions (Chatterjee et al., 2023; Venkatesh et al., 2020). The blocks are linked chronologically, creating an unbroken chain-link of validated information. Other participants within the transaction must authorize any change made to a single block for validation and chronology (Upadhyay Mukhuty et al., 2021). A consensus mechanism known as proof-of-work or proof-of-stake enables businesses to participate in making changes or adding new blocks to the

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network (Giacalone et al., 2021). This uniqueness makes blockchain technology invaluable for digital transactions where participants cannot access physical contracts or comprehensive paperwork.

Given the crucial role of digital transformations in sustainable supply chains, this study examines the relationship between blockchain technology adoption and social sustainability. Businesses that raise the importance of social sustainability understand the critical relationships with people, communities, and society (Bai et al., 2020). This study examines how blockchain technology can damage or improve the relationship between companies and people, surrounding communities, and society (Haryanto & Sudaryati, 2020). Moreover, identifying factors that affect sustainability may assist businesses in transforming their practices and providing solutions to issues affecting surrounding communities (Chatterjee et al., 2023). It is difficult to find substantive evidence in the previous studies that may help understand the relationship between social sustainability and blockchain technology adoption.

Objectives

The main objectives of the study include the following:

To determine the effect blockchain adoption has on the business ethics of Fintech Companies in China.

To examine how blockchain adoption relates to the social responsibility of Chinese FinTech companies.

To examine how business ethics relate to social sustainability and disruptive technologies such as blockchain.

Literature review

Blockchain and Business Ethics

Blockchain adoption has revolutionized supply chain transparency and security for larger corporations and SMEs. In the era of global trade and complex business transactions, ensuring transparency and security has been a major challenge for businesses (Upadhyay Mukhuty et al., 2021). Traditional supply chains dealt with various challenges, including counterfeiting, fraud, information gaps, and lack of trust. The vulnerabilities to fraud were mainly enhanced by a lack of technology to trace transactions, identify loopholes, and take necessary measures to limit fraud (Venkatesh et al., 2020). However, blockchain technology has transformed supply chains by offering decentralized and immutable ledgers that enhance transparency, traceability, and security (Bai et al., 2020). Blockchain technology records transactions, business ownership transfers, and goods movement within the supply chain. This enables end-to-end traceability of transactions, assisting organizations to identify causes of delays within the transaction period (Ltifi & Mesfar, 2022). The blockchain ledger enables participants to access and verify information regarding other participants. According to Ltifi & Mesfar (2022), this level of transparency and accountability was difficult to achieve without blockchain technology.

It is difficult to overestimate the significance of transparency in digital transactions. According to Chatterjee et al. (2023), blockchain technology promotes trust and accountability by allowing participants to monitor and audit financial transactions in real-time. To enhance accountability, blockchain technology provides what is known as an immutability feature (Bai et al., 2020). An immutable system ensures that altering or tampering with the data becomes virtually impossible once a transaction is recorded in the blockchain (Venkatesh et al., 2020). Blockchain technology achieves this significant advantage using cryptographic techniques and consensus mechanisms (Chatterjee et al., 2023; Upadhyay Mukhuty et al., 2021). For instance, a unique cryptographic hash such as digital fingerprints fortify transactions and protects against external interference. The complex mathematical algorithms create a consistent length of characters that is extremely difficult to manipulate (Ronaghi & Mosakhani, 2022). According to Bai et al. (2020), the consensus mechanisms allow participants to add new blocks to the transactions once validated by other participants. The validation makes it extremely difficult for anyone to tamper with the transactions or commit fraud.

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According to Haryanto & Sudaryati (2020), nothing testifies to the significance of transparency and security than the Blockchain-based Voting System. In Estonia, Brazil, and Switzerland, the blockchain-based voting system captured and identified voters using digital biometric data stored and encrypted in the voter database (Chatterjee et al., 2023). The blockchain-based voting system prevented double voting, double tabulations, or fraudulent practices during elections (Bai et al., 2020). Once voters have cast their votes, the blockchain-based voting system prevents anyone from tampering with the data or adding more votes (Venkatesh et al., 2020). The transparent and immutable ledger provides traceable transaction history, enabling voter observers to verify and validate the votes (Upadhyay Mukhuty et al., 2021). Other case studies include using blockchain in land registry and medical records management (Ltifi & Mesfar, 2022). The perceived transparency and security associated with blockchain technology continue to encourage various industries to adopt the technology.

China is home to thousands of FinTech companies that have adopted blockchain technology to enhance transparency in various financial transactions. Some of the top FinTech companies in China include Ant Group, Tencent, Lufax, Zhong An, Du Xiaoman Financial, Jimubox, Wallex, and Rong360. FinTech companies such as Ant Group rely on blockchain technology, big data, and analytics to assess the creditworthiness of small and medium enterprises (SMEs). The information enables SMEs to access loans quickly and support their business operations. The adoption of blockchain has enhanced transparency in various financial transactions. It has made it easier for businesses such as Ant Group to conduct sufficient and foolproof background checks on their customers before giving them access to loans. Blockchain technology is also supporting the country's economic growth by improving access to financial support.

Social Sustainability

Sustainability has become a strategic resource for organizations to improve their competitiveness. The social and environmental challenges, such as climate change, have prompted many organizations to seek long-term solutions to potential business challenges (Tan & Salo, 2023). Blockchain technology combines economic, environmental, and social pillars of sustainability on transparent platforms where businesses can evaluate their performance and make strategic adjustments (Pizzi et al., 2022). According to Tang et al. (2019), the economic impact of blockchain technology includes reduced transaction costs, improved access to financial services, and improved financial inclusion. Blockchain technology has also improved business response to challenges such as fraud associated with financial transactions (Bai et al., 2020). The transparent, secure, and immutable ledger reduces the chances of fraud and other transactional errors (Sousa et al., 2022). By using blockchain technology, companies increase their chances of generating higher revenue while reducing the chances of losses through fraud, erratic transactions, service delays, and inadequate access to financial services.

Although blockchain improves sustainability by tracking and verifying emissions, it has been associated with significant carbon emissions and climate change (Ltifi & Mesfar, 2022). The energy-intensive mining process generates significant carbon emissions into the atmosphere, making it one of the largest contributors to climate change (Bai et al., 2020). Blockchain mining relies on traditional fossil fuels to generate sufficient energy needed for new blocks on the blockchain (Upadhyay Mukhuty et al., 2021). According to Haryanto & Sudaryati (2020), energy consumption generates significant carbon emissions and may exacerbate the effects of climate change on vulnerable populations. Even those who cannot access blockchain technology may suffer the consequences of its production, such as increased temperatures, prolonged drought situations, and biodiversity loss. (Chatterjee et al., 2023) suggest potential solutions to the problem, including using clean energy to replace fossil fuels. Organizations generating blockchain technology can also reduce their carbon footprints by tracking all the sources of carbon emissions within the supply chain and replacing them with clean energy such as wind and solar.

Despite environmental concerns, blockchain technology supports various global social sustainability development goals (SDGs). For instance, blockchain reduces socioeconomic inequalities by improving access to financial services (Tang et al., 2019). The improved trust and transparency encourage various financial institutions to support small and micro enterprises (SMEs) and even larger corporations

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(Chatterjee et al., 2023). This enables companies to create jobs and support economic growth. Blockchain technology is used by the World Food Program (WFP) to provide cash assistance to refugees in Jordan, Syria, and other war-ravaged nations. The United Nations Women and World Identity Network (WIN) relies on blockchain technology to flag fraudulent and suspicious transactions and prevent child trafficking (Bai et al., 2020). BitGive is another organization using blockchain technology to improve transparency and accountability in charitable transactions. The SolarCoin Foundation uses blockchain technology to encourage businesses to use renewable energy sources in exchange for coins that can be redeemed for various items and prizes (Tang et al., 2020). Organizations like BanQu have also been using blockchain technology to improve financial access to the unbanked and low-income populations (Najjar et al., 2020). Blockchain has become essential for addressing various social inequalities, including improved access to financial services for those who cannot access mainstream lending services.

Research Gaps and Hypotheses

Research gaps are specific areas that have not received significant research despite their significance to the research problem. After examining data from the previous studies, the researcher identified an information gap in the relationship between business ethics and blockchain adoption. There was also an information gap in the relationship between blockchain adoption and social sustainability. These areas have not received sufficient investigations and may require additional research to provide more data. For instance, most studies have focused on the effects of blockchain technology on financial transactions. Only a few researchers have examined the potential link between blockchain technology and social sustainability. The study will also examine the relationship between business ethics and social sustainability.

H_1 Blockchain adoption positively impacts business ethics (BA – BE).

H_2 Blockchain adoption positively affects social sustainability (BA – SC).

H_3 Blockchain adoption positively affects corporate social responsibility and governance (BA – CSR).

H_4 Business ethics impacts positively on social sustainability (BE – SC)

Conceptual Framework

The proposed conceptual framework demonstrates the impact of blockchain adoption on business ethics. The conceptual framework also demonstrates the connection between blockchain adoption and corporate social responsibility. The research hypothesis states that "*Blockchain adoption positively impacts business ethics*". Based on the framework below, one can see the impact of blockchain adoption on business ethics, as evidenced by transparency, traceability, and security. Blockchain adoption eliminates fraudulent transactions through enhanced transparency and traceability. The following diagram demonstrates the proposed conceptual framework that the study will test.

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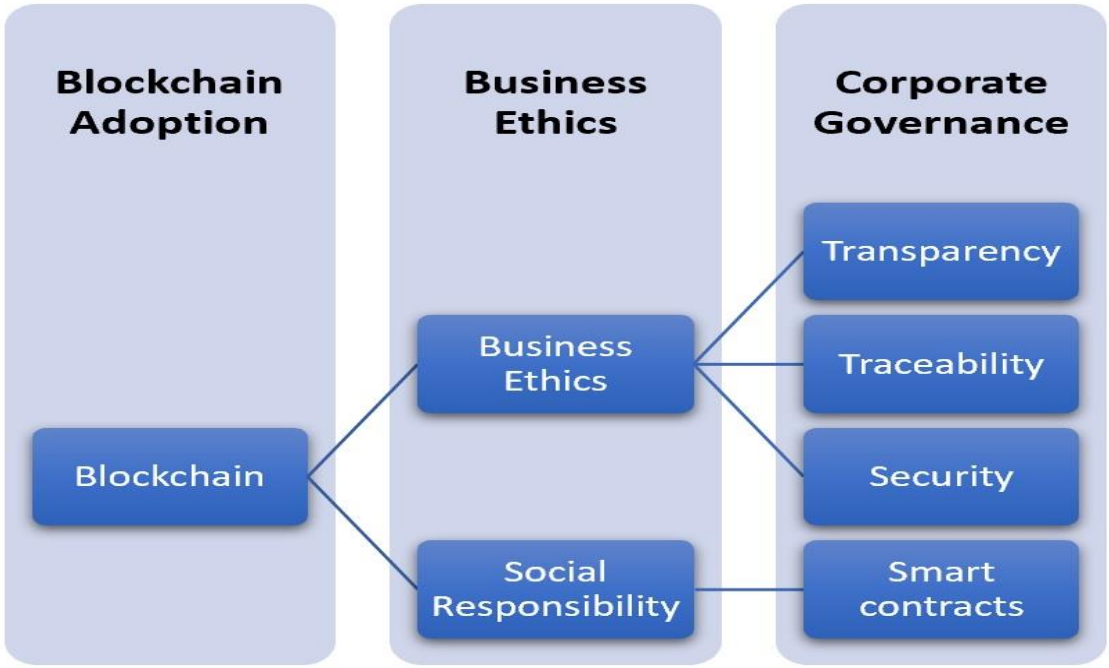

Figure 1: The proposed conceptual framework.

Methodology

Research paradigm

The selected research paradigm for this study is positivism. According to (), positivism relies on data to measure or quantify the observations. The paradigm argues that measurable observations or data help in deriving logical conclusions. For instance, this study examines the impact of adopting blockchain technology on business ethics. Information from various leaders representing FinTech organizations can be measured to determine their position on blockchain adoption. Besides, future researchers can verify measurable results on a similar topic.

Population and sample

The sample includes 300 leaders from FinTech companies in China. The leaders were drawn from 300 FinTech companies from Beijing, Macau, Guangzhou, Tianjin, Shanghai, and Qingdao. The sample 300 was selected because it represents at least 30% of the major FinTech companies nationwide. Although China has over 3,600 FinTech startups, about 1,000 can be considered medium to large organizations with sufficient capacity to invest in blockchain technology. The 30% is a sizeable representative for a population of about 1,000 organizations.

Research instrument (tools)

We chose electronic questionnaires because they are easy to produce, more accurate, easy to analyze, and cost-effective. The electronic questionnaires captured the four hypotheses and answered the research questions. We kept them closed-ended to allow participants to complete the questions within the shortest time possible. Out of the 300 electronic questionnaires sent to CEOs and managers of fintech and financial companies, 247 completed questionnaires were received.

Data collection

Data was collected using the 300 electronic questionnaires sent to the selected leaders. The study targeted 300 organizations that have implemented blockchain technology to improve their operations. First, the selected leaders were contacted using emails available on their organization's websites. The purpose of this contact was to seek consent for their study and inform researchers about the time they would be available. Only those who gave consent were sent questionnaires for their responses.

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Analysis and statistics

We then used Path analysis and SmartPLS software to test the research hypotheses. We selected the two software because of their ability to analyze causal relationships among multiple variables. The path analysis examines the relationship between variables using a series of structured linear regression. It may also help identify and remove outliers from the data sets.

Results

Table 1 shows all the variables used in the study, including mean and standard deviation. Table 2 shows discriminant validity and correlation, indicating a significant correlation among the studied variables. Table 3 summarizes the hypotheses and outcomes. The selected minimum value was 1, and the maximum value was 5 for all the items used in this study. For the descriptive statistics, the mean value of the items ranged from 2.112 to 3.886, and the standard deviation ranged from 0.345 to 0.859. The obtained P-value (<0.05) showed that the hypotheses were accepted at a 95% confidence level. The model of coefficients showed a correlation between blockchain adoption and business ethics. The study found that blockchain adoption positively impacted business ethics and social sustainability. The study also found that business ethics positively affected social sustainability. This indicates that a firm's business ethics impacts its relationship with stakeholders, surrounding communities, and society.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. deviation
Technological (TF)	247	3.257	0.345
Transparency (TR)	247	2.811	0.758
Business Ethics (BE)	247	3.876	0.859
Institutional (IF)	247	2.909	0.722
Organizational (OF)	247	2.112	0.641
Audit Committee (AC)	247	2.332	0.855
Board of Directors (BD)	247	2.998	0.435
Ownership Structure (OS)	247	3.114	0.392
Skill Development (SD)	247	2.923	0.711
Work Environment (WE)	247	3.778	0.533
Work Safety (WS)	247	2.234	0.698
Work Condition (WC)	247	3.886	0.789

Table 2: Discriminant Validity and Correlation

	TF	OF	IF	BE	TR	AC	BD	OS	WC	WE	WS	SD
TF	**0.787**											
OF	0.446	**0.689**										
IF	0.255	0.589	**0.745**									
BE	0.124	0.409	0.579	**0.838**								
TR	0.307	0.433	0.421	0.589	**0.761**							
AC	0.344	0.559	0.503	0.419	0.559	**0.857**						
BD	0.394	0.237	0.234	0.285	0.234	0.378	**0.933**					
OS	0.487	0.510	0.481	0.329	0.513	0.526	0.256	**0.829**				
WC	0.368	0.178	0.357	0.226	0.583	0.619	0.354	0.253	**0.775**			
WE	0.240	0.267	0.418	0.436	0.439	0.287	0.316	0.381	0.266	**0.832**	**0.895**	

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	TF	OF	IF	BE	TR	AC	BD	OS	WC	WE	WS	SD
WS	0.279	0.348	0.287	0.421	0.559	0.234	0.267	0.385	0.327	0.335		
SD	0.387	0.312	0.415	0.305	0.352	0.265	0.189	0.324	0.413	0.292	0.258	**0.937**

Table 3: Summary of Hypotheses

Hypothesis	Original Sample (β) (> 0.1)	Std. err	t-statistics (> 1.96)	*P*-Value (< 0.05)	Result
BA →BE (H_1)	0.289	0.033	4.278	0.006	Supported
BA →SS (H_2)	0.398	0.045	7.459	0.013	Supported
BA→CSR (H_3)	0.497	0.049	3.811	0.012	Supported
BE→SS (H_4)	0.314	0.052	11.379	0.007	Supported

Discussion

The data showed that most medium and large financial corporations have adopted blockchain technology to improve transactions and minimize fraud. The data shows a growing list of fintech startups in China, including Huobi, Bitmain, Airwallex, Animoca Brands, and Amber Group (Tang et al., 2020). These fintech startups enable financial institutions and manufacturing organizations to improve their operations. One of the top considerations for blockchain adoption is financial transactions. The fintech startups provide blockchain-based financial solutions, including buying, selling, and trading in digital currencies such as Bitcoin, Ripple, and Ethereum (Upadhyay Mukhuty et al., 2021). The fintech startups also provide collateralized loans across stable coins to enable small and medium enterprises to access financial services outside the mainstream lending platforms.

Blockchain and Ethics

The results showed that blockchain adoption had a significant positive impact on business ethics (Table 3). Blockchain adoptions improve key trust components of transparency, security, and traceability (Venkatesh et al., 2020). Traditional companies face significant challenges, including fraud, money laundering, and information gaps that increase the chances of making losses during transactions (Bai et al., 2020). However, the adoption of blockchain solves the problem by using a transparent and immutable ledger that provides all the information one may need about vendors, products, and previous transactions (Chatterjee et al., 2023). The enhanced transparency improves confidence among participants and encourages clean transactions. The immutable features secure data against potential interference by the participants or external parties (Haryanto & Sudaryati, 2020). Blockchain technology makes it nearly impossible to change the transaction blocks unless all participants validate it (Tang et al., 2020). Besides, one can trace products across the supply chain from when they leave the vendor to delivery. The study found that business ethics has improved significantly with adopting blockchain technology.

However, this does not ignore the potential dangers one may face when using disruptive technologies such as blockchain. According to Venkatesh et al. (2020), blockchain technology provides a transparent platform to access sensitive data from other participants. The blockchain ledger provides sensitive data that may be subject to misuse by unscrupulous characters (Chatterjee et al., 2023). Examples of potential data misuse include identity theft, phishing, money laundering, and other types of financial fraud. However, this can be solved through data encryption to ensure accessibility is only given to those with the right credentials (Bai et al., 2020). Data encryption protects sensitive information using codes that one can only unlock using authorized credentials and passwords (Upadhyay Mukhuty et al., 2021). Apart from data encryption, organizations must create awareness about potential risks they may face on digital platforms, including blockchain technology (Chaudhuri et al., 2021). The awareness may help the workforce avoid mistakes that

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compromise an organization's sensitive data. Examples include telling employees to avoid sharing data with individuals or organizations until they fully verify their background.

Blockchain and Social Sustainability

The study found a positive correlation between blockchain adoption and social sustainability (Table 3). Venkatesh et al. (2020) state that social sustainability focuses on the relationship between an organization and its key stakeholders. The social concept addresses inequalities, injustices, or practices that may harm innocent individuals (Chatterjee et al., 2023). Blockchain technology helps organizations secure financial transactions, preventing fraud while creating a safer platform for employees to conduct business transactions (Chatterjee et al., 2023). Blockchain adoption may also minimize digital inequalities among the workforce and surrounding communities. According to (Bai et al., 2020), digital inequality occurs when a section of the workforce is computer and data-literate, while another section cannot use digital devices because they lack knowledge and skills. The study found that most organizations began training the workforce on blockchain technology before implementation (Rainero & Modarelli, 2021). This enabled those with inadequate knowledge and skills to understand how to use digital platforms to conduct transactions (Haryanto & Sudaryati, 2020). The training also boosted employee morale, increasing overall productivity and chances of promotions and higher salaries.

Ethics and Social Sustainability

The survey showed that business ethics positively impacts social sustainability (Table 3). Business ethics focuses on moral practices that improve productivity without putting other lives at risk (Chaudhuri et al., 2021). Business managers can create an ethical culture that promotes equality, diversity, and communal responsibility. The improved relationship between an organization and its key stakeholders creates competitive advantages (Upadhyay Mukhuty et al., 2021). For instance, creating a positive and ethical organizational culture provides equal opportunities to the workers. This may boost morale among the workforce, increase productivity, and generate more revenue. Chatterjee et al. (2023) found that a happy workforce is likelier to achieve organizational goals than workers with unaddressed grievances. Moreover, a positive relationship between a business and surrounding communities may boost sales, reduce hostility, and improve consumer loyalty (Chatterjee et al., 2023). Business ethics unlocks significant opportunities for organizations to connect positively with their stakeholders and regulators (Chaudhuri et al., 2021). Moreover, business ethics enables a stable performance where one does not worry about negative reactions or litigations from aggrieved stakeholders.

Managerial Implications

The positive impact of blockchain adoption on business ethics indicates that managers should look beyond software needs when installing blockchain technology. The study found that blockchain improves confidence in financial transactions, and relationships among participants, and prevents fraudulent transactions (Chatterjee et al., 2023). Blockchain technology also prevents malicious transactions such as money laundering and funding terrorism (Bai et al., 2020). The findings indicate a need for managers to develop ethical policies concerning blockchain technology (Venkatesh et al., 2020). Managers should create awareness of potential risks associated with financial transactions and provide frameworks for responding to data misuse (Najjar et al., 2020). Managers should also develop training programs to impart useful skills that employees need to operate blockchain technology (Sreenivasan & Suresh, 2023). Managers should actively promote the adoption of blockchain technology by educating stakeholders on its importance and how to use it effectively.

Theoretical Implications

Theoretically, the study found that blockchain adoption impacts business ethics positively. The study found a positive correlation between blockchain adoption and social sustainability in the second hypothesis. The findings indicate a theoretical framework that may apply to various industries and businesses. For instance, blockchain technology is currently applicable in supporting digital currencies and digital transactions. However, the high level of transparency and security associated with blockchain technology may be used to improve voting systems and make them more credible and reliable (Dierksmeier & Seele,

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2020). Voting machines can be made more secure by using blockchain technology to protect votes and data from potential interference by internal and external forces (Bai et al., 2020). Given the critical aspect of voting to society, there is a need for better technologies that can protect people's will against potential tampering (Drobyazko et al., 2019; Sulkowski, 2019). Other potential applications of blockchain technology include medical records management and land registry to prevent fraud.

Limitations and Future Research

The study was limited to the impact of blockchain adoption on business ethics and social sustainability. However, these are only two application areas where blockchain technology can significantly impact business performance. The research needs to be expanded into other potential applications, including economic and environmental sustainability. The study identified key challenges associated with environmental sustainability and blockchain technology. Despite being a significant breakthrough in financial and business transactions, blockchain technology is still a significant environmental concern. The mining process generates significant carbon emissions and may worsen with growing blockchain adoption in various sectors. Researchers should examine how blockchain technology can be less harmful to the environment. Researchers may start by exploring the impact of clean energy sources such as wind and solar on blockchain mining. It is also crucial for researchers to explore the impact of blockchain on corporate governance.

Conclusion

Blockchain technology remains a transformative force in recording business transactions, enabling end-to-end traceability, and building smart contracts. The study used evidence from China to examine the effects of blockchain technology adoption on business ethics and social sustainability. Data was obtained from 247 CEOs and managers of fintech and financial companies. Out of the 300 electronic questionnaires that were sent to the CEOs, a total of 247 were completed and returned. The analysis was conducted using Path analysis and SmartPLS software to test the research hypotheses. The findings showed that blockchain adoption positively impacts business ethics. The high level of transparency, security, and traceability improves confidence among participants. The study also found that blockchain adoption had positive effects on social sustainability. The fourth hypothesis examined the impact of business ethics on social sustainability. The study found that strong business ethics supports social sustainability.

Recommendation

The study recommends the adoption of blockchain technology to improve transparency, security, and traceability in business transactions. The paper outlines various technological factors that organizations should improve to enable the adoption of blockchain technology. The factors include accessibility, disintermediation, immutability, and network control. Organizations should prioritize training their workers on blockchain technology to enhance accessibility and control over it. Employees should understand the types of information that should be shared over the network to minimize privacy concerns. There should be an audit committee to evaluate various business transactions and compliance with the regulatory requirements. The committees should provide regular reports to improve processes and enhance efficiency continuously. The study also recommends realigning the ownership structure with blockchain technology to enhance efficiency in decision-making and technical support.

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