

BLOCKCHAIN AND CRYPTOCURRENCY INNOVATION FOR A SUSTAINABLE FINANCIAL SYSTEM

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ABSTRACT – FinTech ecosystem and business model development are extensively discussed in the literature. The adoption of innovative technologies and digital transformation has impacted the approach to carrying on the businesses and channels that offer financial highly reliable and instinctive services and products. This study primarily deals with the identification of data sets. Also, a systematic review protocol was created using the PRISMA method to describe the hypothesis and rational and planned techniques of the study. Blockchain technology has been employed in an assortment of sectors and used by several nations for improving ecological supportability. In fact, blockchain technology has been effective to increase green production, tracking and preserving environmental degradation and pollution-related data, and collecting and analyzing the low carbon or green data in real time for more timely decisions. There is a scarcity of literature on studying the impact of blockchain and cryptocurrency on adopting FinTech and its sustainability. Therefore, the aim of this study is to add to this body of literature an investigation on the impact of Blockchain and Cryptocurrency adoption on FinTech for the environment-friendly nature.

ARTICLE HISTORY

Received: 10-7-2022

Revised: 8-9-2022

Accepted: 30-10-2022

KEYWORDS

*Fintech**Blockchain Technology**Cryptocurrency**Sustainability*

INTRODUCTION

In recent years, financial technology (FinTech) and the digital marketplace gained wide attention from a range of organizations (Anshari et al., 2019). Keeping up with digital transformation is vital for financial services to remain competitive and grow in the marketplace. Financial institutions can survive by adopting innovation and embracing digital changes to improve efficiency and performance within the business (Scardovi, 2017). The adoption of innovative technologies and digital transformation has impacted the approach to carrying on the businesses and channels that offer highly reliable financial and instinctive services and products (Mohamed & Ali, 2019). Digital businesses are turning out to be increasingly utilized, addressing a lot quicker, less expensive, and more secure method with regards to financial exchanges. FinTech alludes to the growing financial service that has been turning out to be progressively fundamental to the finance sector and consistently affects how innovation upholds and offers financial services. For example, in the construction sector, Fintech is a service used for modeling, valuing, and processing financial products like contracts, money, bonds, and shares. FinTech, according to Schueffel (2016), refers to the use of technology for improving financial services. Presently, FinTech has been applied to every kind of business from small to large enterprises in every single financial area. Another technology termed blockchain that has recently emerged offers companies in generating needed reporting data directly from their financial data and provides a more automated process. Nakamoto (2008) argued that this technology proceeds to develop and has been widely utilized in increasingly more business areas. Auditing, accounting, and finance are some of the sectors that could incredibly help the distributed registry and different elements of this one. As artificial intelligence (AI) and digital finance have an inexorably significant part in the financial sector market, cryptocurrency emerged as well. He et al. (2016) argued that the term cryptocurrency is derived from the fact that cryptographic techniques form the core of their implementation. Presently, the arrival of cryptocurrency has been followed by the rise of the first cryptographic money, termed Bitcoin in the year 2009, then followed by various experiments like Namecoin, iXcoin, Solidcoin, etc. The total number of different cryptocurrencies in the 2018 market was 1,737, including 918 tokens and 819 coins. The study by Mohamed and Ali (2019) reported that the combined market total value as the data report of CoinMarketCap was 269 billion US dollars.

Blockchain technology has been employed in an assortment of sectors and used by several nations for improving ecological supportability (Glavanits, 2020; Centobelli et al., 2021). In fact, blockchain technology has been effective to increase green production, tracking and preserving environmental degradation and pollution-related data, and collecting and analyzing the low carbon or green data in real time for more timely decisions. The authors such as Bai and Sarkis (2019), Saberi et al. (2019), and Mora et al. (2021) argued that blockchain has the capability of facilitating the development of a green economy (environment-friendly nature). FinTech holds increasing value in distributed-ledger technology (DLT) or cryptocurrency blockchain protocols. A number of FinTech organizations continue to explore DLT's potential usefulness in supply chain marketing, insurance, corporate banking, capital markets, and so on. However, the

implementation of the first blockchain was dependent upon restrictions that disallowed immediate or inescapable reception for these applications. The businesses hence followed an alternate way and, all around, present models that use traditional conventions like the DLT framework. Notwithstanding, this advanced blockchain technology carries us closer to accomplishing the objectives that appeared to be unreachable a couple of years prior, accomplishing security with minimal waste, manageable, strong, and tunable privacy as well as high performance. Eventually, DLT in FinTech will be able to exploit the full benefits of a blockchain. FinTech adoption of DLTs is expected to grow, however, the full potential of blockchain and cryptocurrency technologies might not be realized until there is effective and direct cooperation between the FinTech sector and the blockchain scientific community.

The objective of this study involves; (1) to discuss the drivers involved in FinTech applications, (2) to discuss the challenges in the adoption of FinTech applications, (3) to investigate the impact of adopting blockchain/cryptocurrencies on FinTech for an environment-friendly nature, (4) to measure the sustainability of FinTech for the environment-friendly nature.

LITERATURE REVIEW

Research on cryptocurrency in financial technology

Most academic researchers in cryptocurrencies have been either focused on the technical side of blockchain or informed trading and price manipulation: the ‘bubble-like’ or speculative nature of the asset (Vo & Yost-Bremm, 2020). The study of Urquhart (2017) supported Harris’s (1991) negotiation hypothesis and extended it through the identification of a statistical connection between cryptocurrency volume, unpredictability, and media attention. The study by Baur et al. (2018) reported that due to the lack of correlation in Bitcoin regarding conventional financial assets, the users have a speculative aim. Feng et al. (2018) have shown that order imbalances between market sellers and buyers preceded large price movements and suggest informed trading. Furthermore, Feder et al. (2017) found price manipulation of Bitcoin in the market by linking trading price responses and identifiable manipulative trades in the now-defunct exchange of Mt. Gox.

Difficulties in facing the cryptocurrency adoption

The study of Connolly and Kick (2015) investigated the comprehension of factors that have impacted the adopters and non-adopters of cryptocurrency in organizations by contrasting their degree of social media involvement, innovativeness, and IT readiness. This study suggested that the adoption of cryptocurrency by organizations is highly essential compared to the adoption by consumers because consumers are unable to utilize cryptocurrency when an organization do not accept it as one of the payment methods. This study adopts the theory of diffusion of innovation (DOI) for conducting the analysis and measuring the actual DOI. Hence, an organization can utilize this study outcome for the comparison between adopters and non-adopters of bitcoin for measuring the self-degree of availability in adopting bitcoins (Connolly & Kick, 2015).

Another study by Khairuddin et al. (2016) was performed to measure the experience of consumers concerning to Bitcoin system. This study conducted an interview with 9 bitcoin users. The study has highlighted three motivation types that consumers have towards owning bitcoins, namely perspective on the true value of the currency, power of consumers, and the anticipated role in the monetary revolution of bitcoin. These results underscore the importance of motivating consumers in adopting cryptocurrency and also the ability of blockchain to transform the worldwide financial service by utilizing the democratizing platform. Furthermore, this study recommended investigating cryptocurrency's materiality and evaluating the possibilities of technological interventions that would support it in the future (Khairuddin et al., 2016).

The study of Sas and Khairuddin (2017) investigated the knowledge and motive of consumers regarding cryptocurrency. This study was conducted in Malaysia and included an interview with 20 bitcoin users concerning the difficulty, trust, and experience faced by them when using bitcoins. The results of this study revealed that most of the respondents have utilized bitcoins to store values for the protection of savings or speculative investments. The authors of this study presented a classification of the main attributes of bitcoin as well as their impact on the trust of users, including reputation, up-regulation, embedded expertise, decentralization, and also the easiness, low cost, and transparency in a transaction for completing work in order to advance the trust theories of Human-Computer Interaction (HCI). From the results of this study, it was identified that there are a number of implications that would promote the overall trust of the consumers of bitcoin in the network as well as support for two-way transaction transparency, tools to support reversible transactions, and tools to materialize trust (Sas & Khairuddin, 2017).

Kazerani et al. (2017) conducted a study that investigated the usability levels of consumers on cryptocurrency and also the experience of cryptocurrency by scholars of Dalhousie University of Canada. This study examined the factors involved in the prevalence of bitcoin, as well as the impact of usability on adopting bitcoin by consumers. Participants were interviewed and their perspective on bitcoin usage was examined. The findings of this study contribute to a clear understanding of product usability, financial literacy, and bitcoin conceptual map which provide a contribution to the total experience of consumers while performing a task. The study suggested further research to be focusing on infrequent or beginner cryptocurrency consumers in future work; also, they need to consider a broader range of participants, especially those with different ages, financial literacy levels, and technical backgrounds (Kazerani et al., 2017).

Influences of Blockchain on the financial industry

Internet finance has risen the process of financial disintermediation process through platforms such as P2P, Yu 'ebao, and third-party payment platforms. The adoption of these service-heavy and asset-light business models has highly influenced the traditional banking financial businesses. The desire for online banking has caused traditional banks to introduce internet finance, however, the results are not optimal. This is also encouraging traditional banks to explore novel technologies and methods for enhancing their internet services. Zhao et al. (2018) argued that blockchain technology has the potential to fundamentally alter the existing finance and FinTech sector because of the development of data storage and transmission techniques. According to Cocco et al. (2017), blockchain technology also has the capability to effectively optimise the global transfer assets or financial infrastructure compared to the existing finance service. Nguyen (2016) identified blockchain has a significant impact on the financial industry for a longer period i.e., it offers minimal costs and brought innovative ideas to the financial industry. Blockchain technology has been effectively developed and applied by commercial banks with the aim of improving their centralized system. Underwood (2016) argued that financial business is cutting down the middleman by using the transparency, immutability, and security of the blockchain. Further, Hassani et al. (2018) argued that this technology provides financial organizations with both opportunities and risks. However, there is contradictory organizations' attitude toward blockchain due to the fact that many financial institutions play an intermediary role and have been rewarded for it, whereas the blockchain takes away that role (Hassani et al., 2018).

Transparency of Blockchain technology in Fintech

Moll and Yigitbasioglu (2019) defined blockchain as a DLT in which data, such as information used in transactions and communications, are stored in a publicly accessible digital block network. Nakamoto (2008) and Kokina et al. (2017) stated that a digital signature and timestamp are included in each of these blocks, making each block virtually unchangeable. Blockchain refers to the chain of digital blocks that are arranged in a particular way - a process called 'hashing' that makes up the chain of blocks (Nakamoto, 2008; Harris & Wonglimpiyarat, 2019; Angelis & da Silva, 2019). Using blockchain technologies, businesses will be able for exchanging services, goods, and information without relying on central authorities for enforcing commitments, validating transactions, verifying identity, or diminishing as many middlemen as possible. Specifically, firm and organizational efficiency can be enhanced, and costs can be reduced by being able to perform transactions more quickly and synchronizing them across fewer, but more diverse parties (Davidson et al., 2016).

The primary remarkable blockchain usage is in the turn of cryptocurrency development and operation (namely Ethereum, Bitcoin, and so on). Kimani et al. (2020) and Polvora et al. (2020) asserted that blockchain technology has been applied to the financial industry as well as to other industries like governance public sector, business operations, supply chain management, taxation, and the international trade industry. The study of Centobelli et al. (2021) concerning blockchain technology in the management sector investigated the advantages of blockchain data in certain areas such as consortium blockchain, artificial intelligence, edge computing, privacy and security, and supply chain management. Despite the fact that blockchain research is in the early phase, studies concurred that blockchain provides certain advantages that will help business to satisfy the needs of the Fourth Industrial Revolution (Dai & Vasarhelyi, 2017; Pham et al., 2018; Singh et al., 2019; Moll & Yigitbasioglu, 2019; Ahluwalia et al., 2020). Further, Lee (2019) predicted that this technology has fundamentally changed, in the event that, not supplant considerably a lot of the current finance and accounting services, hence proclaiming a 'totally new modern foundation'. Blockchain's allure gets from the capability of supporting straightforward information sharing, advancement of business processes, a decrease of working expenses, improvement in cooperative proficiency and improvement of a framework that does not require an unequivocal fuse of trust in its control, as on account of environmental sustainability (Francisco & Swanson, 2018).

Among different benefits, blockchain poses the scope of ecological maintainability issues and supports natural manageability, by using three primary systems concerning behavioral incentives, product origins, and resource rights (Hughes et al., 2019; Herweijer et al., 2018). Blockchain technology can ease the new method for environmental sustainability by monitoring and storing the data related to activities that have the responsibility over environmental and pollution degradation, and by examining low or green carbon information in real time, for prompt making of decisions and for enhancing the development of environment-friendly nature (Saberli et al., 2019; Bai and Sarkis, 2019). Glavanits (2020) argued that both academics and central authorities have understood the capability of blockchain for positively impacting Sustainable Development Goals (SDG). This study took California as an example concerning environmental goals that applied blockchain technology for monitoring and overseeing the groundwater of

Sacramento, or the Share & Charge project, was implemented primarily in the United Kingdom and followed by European Union, which stimulates blockchain usage for monitoring the electric cars' charging system. The study by Mora et al. (2021) described how blockchain can support sustainability from three different perspectives, depending on the degree to which blockchains are applied namely city administration, resource management, and service delivery. Bai and Sarkis (2017) argued that although blockchain has numerous positive advantages, the adoption of this technology poses a number of diverse ethical, managerial, and technical challenges, as well as implementation costs and high development (Bai & Sarkis, 2017). A few challenges were particularly associated with the sustainability and environmental dimensions such as how much energy is needed for the specific algorithms, computations, and processing in the blockchain (Truby, 2018; Saberli et al., 2018), as well as implementation concerns, particularly in wide-ranging implementations.

The growth in FinTech services leads to more usage of blockchain and cryptocurrencies. However, the applications of FinTech also have certain obstacles like those related to data security threats, money laundering issues, user retention, experience problems and similar, that FinTech startups are facing while implementing the technology in their business life cycle. There is a scarcity of literature on studying the impact of blockchain and cryptocurrency on adopting FinTech and its sustainability for an environment-friendly nature. Therefore, the aim of this study is to add to this body of literature with a preliminary investigation of the impact of blockchain/cryptocurrency adoption on FinTech for the environment-friendly nature, specifically addressing the following research questions; (1) What are the drivers involved in FinTech applications?, (2) What are the challenges involved in the adoption of FinTech applications? (3) What are the levels of impact of the adoption of blockchain and cryptocurrency on FinTech for the environment-friendly nature?, and (4) How to measure the sustainability of FinTech for the environment-friendly nature?

METHODOLOGY

This chapter defines and explains the methodological approach used for this study. This study's logical scheme approach is depicted in Figure 1. As discussed in this figure, this study primarily dealt with the identification of data sets. In this study, the Scopus database was selected due to the fact that it is used by most researchers worldwide and is the largest citation and abstract database of peer-reviewed papers. Also, a systematic review protocol was created using the PRISMA method to describe the hypothesis, rationale, and planned techniques of the study (Shamseer et al., 2015; Cioffi et al., 2020). The PRISMA has been primarily focusing on creating a dataset of papers. Afterwards, this study conducted content-based research for analyzing these papers' content, identifying the primary bibliographic information, as well as relevance to the adoption impact of blockchain and cryptocurrency technologies on FinTech. Further, VOSviewer and Microsoft Excel software was used to stratify and analyze the data (Meng et al., 2020). The following sections provide detailed insights into the analysis and results of this study.

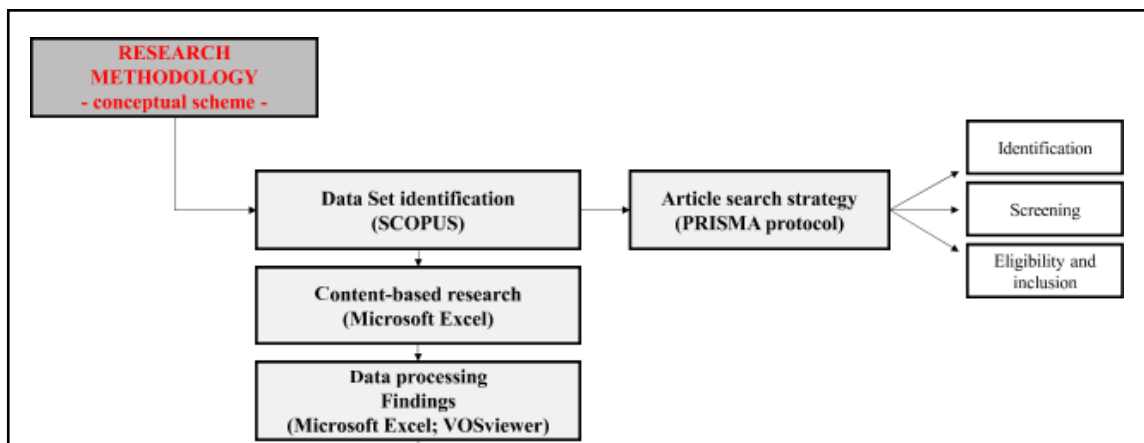


Figure 1. Conceptual Scheme (Parmentola et al., 2022)

The PRISMA protocol

A systematic literature review was conducted using the combined method named PRISMA for understanding the relevant research trends in FinTech (Moher et al., 2015). This protocol has been applied in various areas for supporting scholars to improve the meta-analyses and systematic reviews of their studies. The PRISMA protocol, like other systematic reviews, is generally an iterative technique and contains a checklist with a total of 27 items (Moher et al., 2015). A flow diagram is also included in this to help research practitioners in the steps involved (identification, screening, eligibility, and inclusion) in the process of systematic review. This method has been mainly focusing on planning, identifying, and evaluating papers for extracting and synthesizing the literature content, ensuring the replicability, transparency, and objectivity of bibliographic study (Tranfield et al., 2003). This study selected this PRISMA protocol method over other guidelines and standards due to the fact that it provides detailed insights on the way a literature review must be structured and reported, and asserts to provide an easy and clear analytic and methodological approach in the study (Moher et al., 2015; Snyder, 2019). Further, this protocol has been adopted recently by researchers for meta-analyses or systematic reviews for investigating the similar subject (Mardani et al., 2020; Magon et al., 2018; Macke & Genari, 2019; Buer et al., 2018). Figure 2 depicts the administration of this PRISMA protocol.

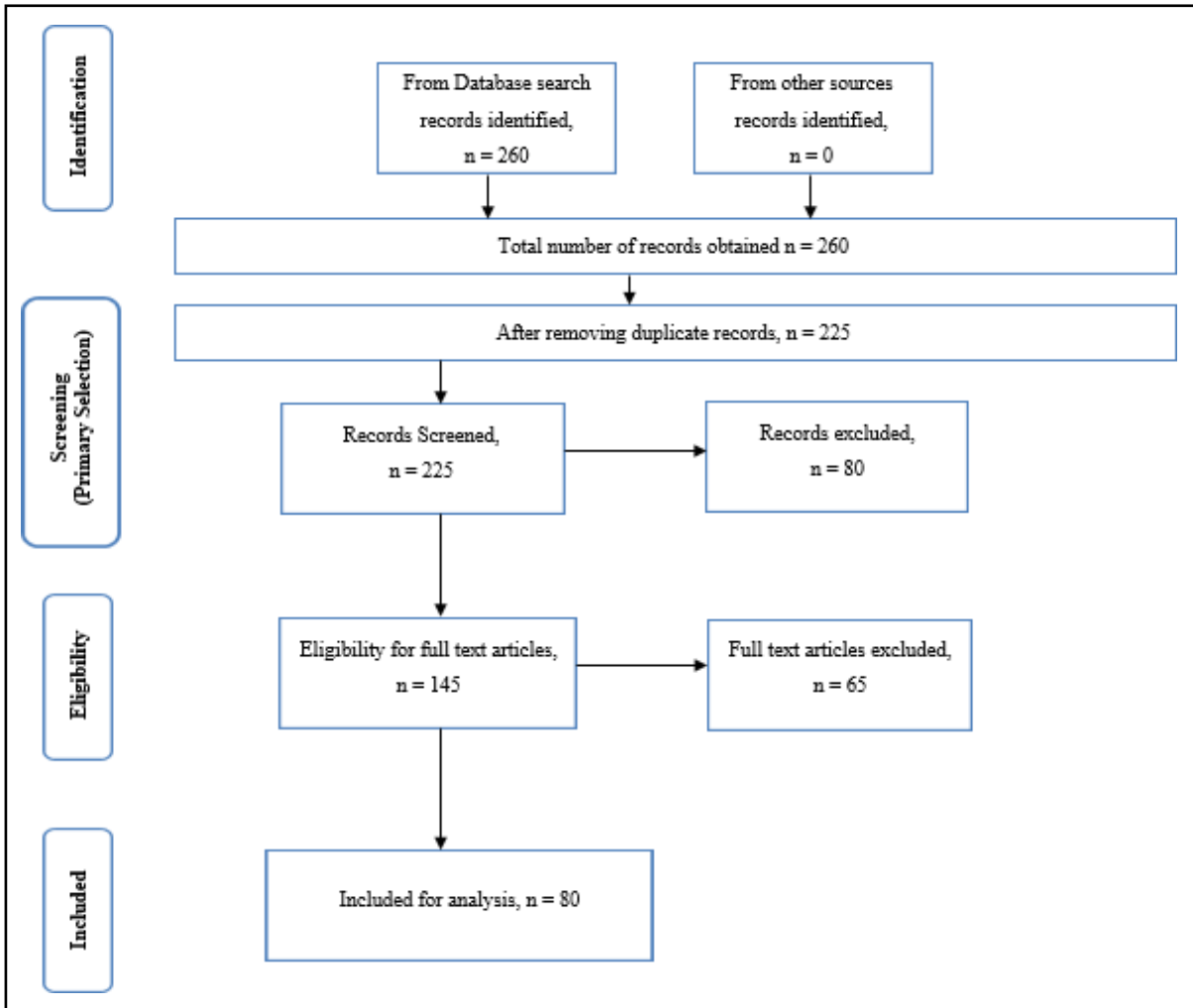


Figure 2. Systematic review process based on PRISMA protocol

Identification

In the PRISMA protocol, the first step involves the identification and selection of papers that need to be included in the systematic review. SCOPUS is a database that helps to provide an extensive collection of scientific journals that are extensively utilized in research (Macke & Genari, 2019; Alvarez Jaramillo et al., 2019). This study constructed a searchquery from this database, identifying keywords that we searched in the papers' abstract, title and keywords. This study is limited to particular document types like reviews or articles and excluded the editorials or notes, book chapters, and source type of scientific journals. Similarly, despite the fact that peer-reviewed academic journal articles are usually noted to beat the frontier of knowledge rather than other sources, this study excludes books and conference proceedings. There are two parts that comprise the search string; (1) the first set of words focused on environmental sustainability, and (2) the second set focused on the adoption impact of blockchain/cryptocurrency on FinTech applications. The *search* string as follow; (TITLE-ABS-KEY (blockchain) OR TITLE-ABS-KEY (cryptocurrency) OR TITLE-ABS-KEY (FinTech) OR TITLE-ABS-KEY (sustainab*) OR TITLE-ABS-KEY ("financial technology") OR TITLE-ABS-KEY ("ecol*") OR TITLE-ABS-KEY ("eco-friendly*") OR TITLE-ABS-KEY ("natural environment*") OR TITLE-ABS-KEY ("digital finance") AND TITLE-ABS-KEY (innovation) OR TITLE-ABS-KEY ("financial revolution") OR TITLE-ABS-KEY ("distributed ledger"). In this study, there was no time limit to the research papers. 260 academic papers were generated in the initial search process from 2015 (the published year of the first document) to 2021 (the period of investigation).

Screening

In this step, the PRISMA protocol has been used to define raw screening criteria for collecting a sample of papers. Then, the study performed the screening activity, and 80 papers were excluded by reading keywords or abstracts of these collected papers. The criteria for exclusion were found and outlined below; (E1) documents not published in peer-

reviewed international journals, (E2) duplicate documents, (E3) documents not in English, and (E4) documents not related to FinTech (non-related topics).

Eligibility and inclusion

According to PRISMA protocol, the final step in the review process has been related to the determination of eligibility and identifying papers to be included in the final sample. The papers that fit the criteria for this study were assessed after carefully reading each full-text article and determining if they met the criteria. Finally, this study only included the papers that discuss the adoption impact of blockchain and cryptocurrency technologies on FinTech primarily found among 20 unique objectives adopted by each member state of the UN from the year 2015 to ensure the achievement of the ambitious targets by 2035. Hence, at this step, the study excluded the topics that have not been related to environment-friendly nature. In total, 130 bibliographic records were found as a result of the search process. The criteria for eligibility and inclusion were found and outlined, which, documents with an aim of adoption impact of cryptocurrency and blockchain on FinTech associated with eco-friendly nature.

Content-based analysis

A Microsoft Excel spreadsheet was used to extract all the pertinent data of the bibliographic analysis, such as title, abstract, keywords, names and affiliations of authors, name of the journal, publication year, and the citation record. The datasets have been integrated into other data with regard to the objectives of the review for supporting the total coding workflow. A set of options and dimensions was selected in this study for classifying the selected 160 articles. The first dimension has been associated with the study's nature and with the industrial and geographical scope of the study, while the others have been associated with the objective of the study: namely, the drivers, challenges, and adoption impact of blockchain and cryptocurrency on FinTech.

Data processing method

Furthermore, this study performed co-occurrence and bibliographic coupling analysis with the help of VOSviewer software. This software can be utilized for constructing bibliometric networks (Van Eck & Waltman, 2010; Giuliani & Biggi, 2020). In the networks, items (i.e., the objects of interest) are connected using co-citation links, bibliographic coupling, citation, co-occurrence, and co-authorship. VOSviewer was provided with files from bibliographic databases (Scopus) that are used to construct a network. Java programming language was used to develop the VOSviewer software. A cluster of items was created. Data were analyzed through different networks.

A fractional counting method was applied in this study. This method has been used to diminish the document's impact on many researchers (Waltman & van Eck, 2015; Eck & Waltman, 2009). In fractional counting, when an author co-authored a document with other authors, each of the n co-authorship links has a strength of 1/n. As a result, the total strength of the n co-authorship ties equals 1. This differs from the complete counting scenario, in which each of the n co-authorship relationships has a strength of 1, resulting in a total strength of n (Zhao & Strotmann, 2011).

RESULTS AND DISCUSSION

All the articles were subjected to keyword mapping. The study discovered keywords like FinTech, use, approach, process, finance, risk, need, problem, adoption, and investor using the VOS Viewer application. It is depicted in the diagram below (Figure 3).

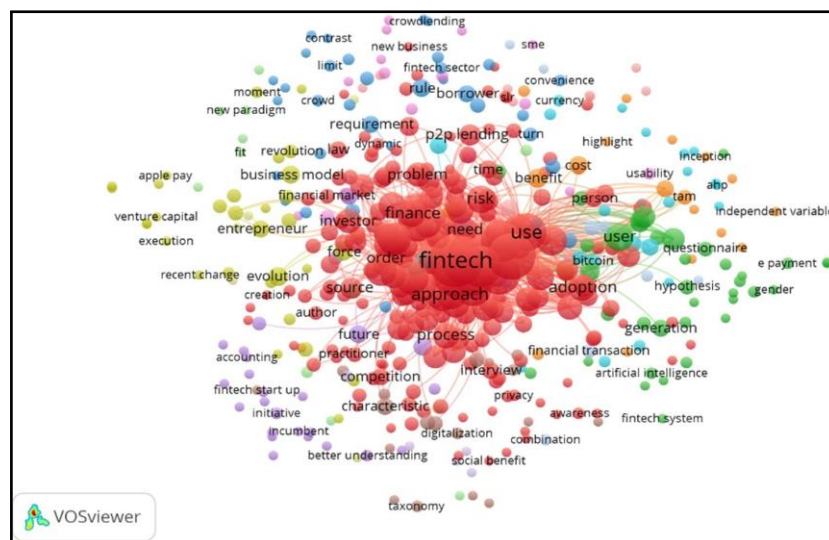


Figure 3. Keywords identified in VOSviewer for content-based analysis (Source: Suryono et al., 2020)

Research on Fintech

Researchers on the FinTech concept are generally concerned with evaluating FinTech (such as financial instruments and machines) and the ethical and social effects of using robots(Coeckelbergh, 2016). Furthermore, fintech can increase the value of financial servicesbecause it modulates financial technology (Nomakuchi, 2018). Monitoring, analyzing, and controlling financial services must pursue reporting and compliance in order to achievesuccessful goals in the financial industry as a result of technology's evolution and application in the design and delivery of financial products (Mehrotra, 2019). Many studies examined FinTech adoption from the perspective of both consumer perception and technology (Mathur et al., 2018; Fernando & Touriano, 2018; Nomakuchi, 2018; Ryu, 2018; Iman, 2018; Stewart & Jurjens, 2018; Huei et al., 2018; Hu et al., 2019). Fintech's historical development, business models, ecosystems, and FinTech investment types have been suggested as advancedstudy topics (Lee & Shin, 2018; Gomber et al., 2017; Puschmann, 2017). Data security and data privacy are important concerns to be noted in the development of FinTech. However,there have been a number of research investigating how to work with data-based processes in a secure manner, such as by means of strong authentication operations (Kim & Hong, 2016). To achieve this, it is necessary to refine the implementation of innovative FinTech andintegrate the experiences of many nations. There are a number of nations that establish regulatory “sandboxes” as an approach to supporting startups of FinTech (Azarenkova et al., 2018; Buchak et al., 2018). The purpose of this is to create a safe and limited space to test thetechnology, services, products, or/and business models of financial technology operators (Davis et al., 2017; Tsai & Kuan-Jung, 2017).

Research on Cryptocurrency and Blockchain

Cryptocurrencies are digital currencies protected by encryption. Dogecoin, Peercoin, Bitcoin, Dash, Ripple, Litecoin, and Ethereum are some of the popular cryptocurrencies (Todorof, 2019). A blockchain is said to be "secure by encryption" if an encryption system has been applied to it. Additionally, as blockchain technology is centralized worldwide, it is not subject to any government restrictions (Milian et al., 2019). Nonetheless, this technology has several loopholes and vulnerabilities that can be exploited, such as allowing operations without following regulatory rules (Bello & Perez, 2019). The following four advantages have been identified in blockchain technology according to (Dimbean-Creta, 2017); (1) every user has a copy of millions of transactions, including visible updates, (2) every user can access the database free of charge, (3) uses network technology , and each ledger can be modified with complex algorithms.

Drivers for the FinTech service

As seen in Table 1, a few drivers were identified in research on general FinTech innovation processes as well as research on social technology innovation processes. These drivers are discussed below.

Table 1. Drivers and barriers for the general FinTech Innovation process

Drivers	Authors
Regulatory frameworks	Haddadd and Hornuf (2019); Punschmann (2017)
Venture capital	Haddadd and Hornuf (2019)
Unfulfilled needs and market incompleteness	Zavolokina et al. (2016a); Weichert (2017); Gomber et al. (2017); Punschmann (2017); Haddadd and Hornuf (2019)
Social challenges	Arena et al. (2018)
Macroeconomic conditions	Weichert (2017); Zavolokina et al. (2016a); Haddadd and Hornuf (2019)
Technology development and digitization	Zavolokina et al. (2016a); Weichert (2017); Gomber et al. (2017); Punschmann (2017); Haddadd and Hornuf (2019)
Increased outsourcing of financial business functions by traditional financial institutions	Gomber et al. (2017); Punschmann (2017)

Issues/Challenges in FinTech, Blockchain, Cryptocurrency

The study summarized the reviewed articles based on the issues or challenges encountered in FinTech, Blockchain, and cryptocurrency. There were 5 articles that discussed FinTech issues/challenges, 10 for Blockchain and 20 for cryptocurrency. Manyarticles cited in this review address more than one challenge/issue associated with FinTech, Blockchain, and cryptocurrency

Table 2. Articles discussed the issues/challenges in FinTech

Issues/Challenges associated with FinTech	References
Security and resilience; enhancing the stability of the systems; technology infrastructure efficiency;	Pollari (2016)
Innovation; Collaboration.	Teja (2017)
Cybersecurity; compliance; cooperation with industry participants; Infrastructure to support Fintech; rapidly transforming financial systems; Monitoring and enforcing increasingly demanding regulatory requirements	Arner et al., (2016)
On fast-changing, rapidly growing and cross-border markets; Branding; intellectual	Medeiros and Chau (2016)
Jurisprudence. Property, compliance, regulatory, activities Regulation of access to banking platforms; network structure of banking; weak/lack of incentives; reluctance to agree on standards; no individual gains in competitive advantage; Co-ordination amongst competing institutions;	Milne (2016)

Table 3. Articles discussed the issues/challenges in Blockchain

Issues/Challenges associated with Blockchain	References
Limited adoption; newness.	Kshetri (2017)
Setting up is too time demanding; cost and managerial overhead.	Preuveneers et al., (2017)
Depends upon the trustworthiness of those providing the feedback;	Ryan (2017)
Lack of decentralization; offline readiness.	
Risk of business failure.	Folkinshteyn and Lennon (2016)
Computing power; industrial standardization; cybersecurity; storagecapacity; interoperability with existing legacy systems; scalability; illicit commerce; regulatory compliance.	Letourneau and Whelan (2017)
Interoperability and standards; governance; disintermediation.	Collomb and Sok (2016)
Undesirable delays due to update; Storage burden issues over time.	Bohme et al., (2015)
The number of transactions; block size limit; processing power and computational speed; security; costs; scalability; no standardized implementation; high hardware costs; significant energy consumption; performance.	Cocco et al., (2017)
Illegal practice detection and tracking; effective government	Swan (2017)
Regulation; unresolved technical issues; complicated technology;scalability.	
Trust between citizens and the services they access; identity authentication and verification.	Wolfond (2017)

Table 4. Articles discussed the issues/challenges in Cryptocurrency

Sustainability findings	References
Cybercrime; anonymity; illegal activity; International standard of regulation.	Piazza (2016)
Legal recognition; cybersecurity; loss of value.	Low and Teo (2017)
Token of value; medium of exchange; silk road; energy consumption during mining; price volatility; lack intrinsic value; stolen, lost, or destroyed; state regulation.	Tsukerman (2015)
Federal regulations; price volatility; a poor store of value; acceptance as a monetary standard; multimillion-dollar hacks; fraudulent investment schemes; wild price volatility.	Kiviat (2015)
Traceability; illegal activities.	Broseus et al., (2016)
Disrupts government activities; anonymity; government regulation; illicit transactions.	Hendrickson et al., (2016)
Cybercrime; anonymity; illegal activities.	Masoni et al., (2016)
Currency stability; price volatility; illegal activities; limited payment laws and regulation.	Trautman and Harrell (2017)
Usability acceptability; illegal activity.	Kim et al., (2017)
System failure risks; little or no regulatory system; store of value; volatility of the price; lacking governmental and central bank support.	Allen (2016)
Fluctuations in exchange rate; illegal activities; limitations in mining.	Barre (2015)
Illicit transactions; anonymity.	Huang (2015)
Price volatility; financial security; currency.	Prentis (2015)
Tax collection; classification; fluctuating value; price volatility; illegal activities.	Wiseman (2016)
Trust; the cost of production; risk of loss; double-spending; sustainability.	Dowd and Hutchinson (2015)
Limited regulation; illegal activities.	Ajello (2015)
Funding terrorism; tax evasion; money laundering; online gambling; trafficking of illegal goods.	Small (2015)
Tax evasion; anonymity; general decline in value; volatility;	Pittman (2016)
Illicit activities; fraud; user/developer error; risk of business failure; security risk; code/crypto error risk; regulatory risk; viability; user interfaces.	Folkinshteyn and Lennon (2016)
Cybersecurity; illegal activities; anonymity.	Extance (2015)

Sustainability in FinTech

This study identified five articles on FinTech sustainability and reviewed them. Table 5 summarized these articles. Despite some articles addressing different topics or studying different nations, the overall theme is FinTech sustainability.

Table 5. Article based on FinTech Sustainability

Sustainability findings	References
The performance of conventional banks has been significantly influenced by sustainability disclosure, whereas the performance of Islamic banks had no effect.	Nobanee and Ellili (2016)
Corporate financial performance and sustainability practices are positively correlated.	Alshehhi et al., (2018)
The model unites consumers, stockholders, investors, owners, farmers, and owners into a platform that improves public involvement, empowerment, and transparency in agriculture	Anshari et al., (2019)

field. FinTech allows digital marketplaces to become a valuable platform for agricultural transactions and can be accessed from anywhere.

Financial business places a high value on decision-making processes. Decision-making at the highest level contributes to organizational goals and sustainable development.

Al Muhairi and Nobanee (2019)

In the evaluation of the effectiveness and modernity of the financial organization, it was found that the large share of borrowed capital in the structure of the organization's sources of financing led to considerable instability of the financial situation.

Alhadhrami and Nobanee (2019)

CONCLUSION

The current review study obtained 260 articles from the SCOPUS database using the systematic literature review (SLR). The selection of these articles was based on the selection of titles and abstracts of the papers. Further, thematic analysis and annotated bibliography were then used, and finally, 80 articles were included for analysis. From SLR, the FinTech study was separated into two areas: blockchain and cryptocurrency technologies. However, the Fintech adoption of blockchain and cryptocurrency and its impact on the environment was the main research theme. Based on the meta-analysis, the FinTech research challenges start by establishing the frameworks of FinTech (Eickhoff et al., 2017; Basole & Patel, 2018; Abdullah et al., 2018), incorporating appropriate business models for each nation (Chandra et al., 2018). Government policies and regulations are clearly affected by the conditions described above (Davis et al., 2017; Gomber et al., 2017; Hung & Luo, 2016; Abubakar & Handayani, 2018; Tsai & Kuan-Jung, 2017). In this industry, rules should adapt to technological advances according to broad principles (Abubakar & Handayani, 2018). Multiple numbers of nations are thus using the concept of a regulatory sandbox to foster FinTech start-ups (Azarenkova et al., 2018; Anugerah & Indriani, 2018). Consumer protection is also a benefit of monitoring the platform because Fintech requires a lot of personal data (Chiu, 2017; Anugerah & Indriani, 2018). Infrastructure and data security need to be constantly improved on this basis (Dimbean-Creta, 2017; Ivashchenko et al., 2018; Wang et al., 2019; Brownsword, 2019). Additionally, FinTech companies need to work with traditional financial firms including banks (Mehrotra, 2019; Riyanto et al., 2018; Hung & Luo, 2018). As a strategic partner, FinTech is a necessary part of banks' digital transformation (Fermay et al., 2018).

Following this, the study continues to develop a conceptual framework for the adoption of FinTech based on perceptions that trust, brand image, technology risk, build attitudes, intentions, government support, and user innovation developed (Chang et al., 2016; Abdullah et al., 2018; Belanche et al., 2019; Fernando & Touriano, 2018; Ryu, 2018; Huei et al., 2018; Hu et al., 2019; Chandra et al., 2018). Moreover, the FinTech ecosystem and business model development are extensively discussed literature topics. Start-ups are receiving more attention due to the increase in the work skill of their experts (Lee & Shin, 2018; Gimpel et al., 2018; Zavolokina et al., 2016b; Gomber et al., 2016; Gomber et al., 2018; Puschmann, 2017; Ashta & Biot-Paquerot, 2018; Mathur et al., 2018; Basole & Patel, 2018; Dimbean-Creta, 2017; de Luna et al., 2019). FinTech researchers are interested in a variety of technologies like big data (Liu et al., 2018), artificial intelligence (Day et al., 2018), robotic- advisors (Coeckelbergh, 2016; Belanche et al., 2019), and algorithms for decision support (Lee, 2019b; Serrano, 2018; Hsueh & Kuo, 2017). Further, FinTech research can yield a variety of benefits, involving legislation, monitoring, security, and so on. This review study adds to the knowledge of the digital finance concept where FinTech practitioners' experiences are a key part of the digital finance expansion. The selection of journal databases, papers, and proceedings can serve as a source of quality material for FinTech research.

The study will help future scholars to study the evolution of FinTech research from year to year. Future researchers will also be able to review references based on the requisites of their study by the classification of articles in this review. FinTech adoption can be discussed in the field of information systems, incorporating behavioral and user acceptance models (Mathur et al., 2018; Fernando & Touriano, 2018; Nomakuchi, 2018; Ryu, 2018; Iman, 2018; Stewart & Jurjens, 2018; Huei et al., 2018; Hu et al., 2019). Also, collaboration with other businesses by FinTech is conceivable (Suryono et al., 2019). Fintech must also be included in the education sector (Kursh & Gold, 2016) for preparing potential employees for the market (Nicoletti, 2017).

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CONFLICT OF INTEREST

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