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Is it a New Tulip Mania Age?
A Comprehensive Literature Review Beyond Cryptocurrencies, Bitcoin, and Blockchain Technology

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ABSTRACT

Although cryptocurrencies and blockchain technology can be considered new advances, they have started to be recognized widely, and this has been discussed and investigated in lots of research studies. In parallel, the primary purpose of this study is to investigate the development and evolution of cryptocurrencies and blockchain technology over the past years in the academic world. To this end, 334 scholarly journal articles are examined to: (1) conduct a comprehensive literature review in the field of cryptocurrencies and blockchain; (2) identify the possible trends and changes in this field over the ten years; (3) compare the publishing productivity of journals; and (4) guide future research in this field. The results highlight that the researchers mainly concentrate on legal and ethical issues of them; their benefits, challenges, and risks; their conceptualization, evolution, and future; the economic dimension of them; and financial and accounting related issues of them.

KEYWORDS

Bitcoin, blockchain, content analysis, cryptocurrency, digital currency, trend analysis, virtual currency

1. INTRODUCTION

Blockchain technology and cryptocurrencies including Bitcoin, Ethereum, Litecoin, etc. are emerging digital phenomena across the world and one of the hot topics in the industry especially in the financial one (Raymaekers, 2014; Todorov, 2017). A cryptocurrency is knowns as an independent currency which uses cryptography for its creation (Todorov, 2017). In parallel with the development of cryptocurrencies and cryptography, and advances in decentralized computers have also led to the emergence of an innovative technology called blockchain (Wright & Filippi, 2015). Briefly, blockchain technology supports businesses and individuals to make transactions without the approval of third-parties (Underwood, 2016).

After the spread and recognition of cryptocurrencies and blockchain technology across the globe, many online stores, platforms, and especially start-ups have announced that they accept cryptocurrencies as a means of payment (Raymaekers, 2014). Although cryptocurrencies and blockchain technology have started to be proliferated among businesses and individuals, there is also a debate among academics, businesses, and even individuals that this proliferation can be a bubble and we can be involved in a tulip mania age (Shane, 2017).

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In the light of advances in cryptocurrencies and blockchain technology, this study aims (1) to conduct a comprehensive literature review in the field of cryptocurrencies and blockchain, (2) to identify the possible trends and changes in this field over the ten years, (3) to compare the publishing productivity of journals about the cryptocurrencies and blockchain technology subject, (4) to guide future research about cryptocurrencies and blockchain. To achieve these objectives, relevant articles that are published between 2008 and 2017 in refereed scholarly journals are investigated systematically as a part of content analysis. After the analysis of relevant papers, 334 articles are selected and schemed based on analyzed article themes.

In this paper, firstly, general information about cryptocurrencies, Bitcoin, and blockchain technology is introduced. After that, research methodology and study findings are presented, and the study is concluded and discussed by highlighting the key findings, trends, and research gaps in the field of cryptocurrencies and blockchain technology.

2. CRYPTOCURRENCIES AND BITCOIN

Cryptocurrencies or virtual currencies can be recognized as a technological advance in payment processing (Luther, 2016) and they can be considered as a computer-generated commodity rather than like a monetary currency (Cusumano, 2014). A cryptocurrency, which is an unregulated and digital currency, can be defined as a medium exchange that uses cryptography to secure, validate, and control the transactions (Mikołajewicz-Woźniak & Scheibe, 2015). Some of the main characteristics of these currencies are that they have a higher velocity of circulation, they carry a negative interest rate, and so they cannot be used as a measure of savings.

Cryptocurrencies can also differ from the traditional currency. For example; cryptocurrencies are not generally accepted to be used as a payment method for goods and services (Luther & White, 2014). In other words, although cryptocurrencies can be used as a medium exchange, it is apparent that they are not a common medium of exchange in anywhere. Cryptocurrencies also differ from other digital payments like PayPal by not requiring an intermediate party like a bank and by having no legal tender status (Lee et al., 2015). The main reason is that cryptocurrencies have a decentralized control rather than a centralized control as in the central banking systems. These differences imply that the value of cryptocurrencies is not issued by a central bank and online transactions are sent directly from one party to another without going through a financial institution (Raymaekers, 2014).

Bitcoin is known as the first decentralized and pioneered cryptocurrency that was designed by Satoshi Nakamoto, who is an anonymous programmer, in 2008 (Dowd & Hutchinson, 2015). This decentralized structure of Bitcoin signifies that Bitcoin is built on a transaction log which is distributed across a network of participating computers (Böhme, Christin, Edelman, & Moore, 2015). In other words, the creation of a bitcoin and the validation of bitcoin transactions depend on the trust among the Bitcoin community network instead of any central authority like a bank (Dowd & Hutchinson, 2015). The community verifies the transactions and maintains the integrity of the system, and there is only one monetary rule which is dictated by the Bitcoin protocol by Satoshi Nakamoto. Nakamoto (2009) defines Bitcoin as a cash system "based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party" (p. 1).

Moreover, the answer to the question of how a bitcoin is produced is a process called mining (Andy, 2015). Mining starts with incoming bitcoin transactions. Users who have bitcoins and want to transfer them, send transaction messages to the computers running Bitcoin software in the community network (Andy, 2015; Sompolinsky & Zohar, 2018). Computers or individuals in the community network are known as miners. When transactions come, miners start to compete with each other for the right to aggregate the transactions into batches called blocks. Mining is a mathematical process, and miners try to solve a magical number that is encrypted alongside the transaction (Andy, 2015; Todorov, 2017). The finding of this number is very hard, and it requires much electricity and computing resources (Andy, 2015). The winner, who solve the problem first, is rewarded with a bitcoin due

to devoting his computing resources to solve the problem, and the block is added to the blockchain which is an online ledger including the records of each bitcoin transaction. As a result, this mining process eliminates the role of central authority, and it shows that new bitcoins are not generated through the interaction of monetary policy instruments of central banks, commercial banks, or bank customers (Brühl, 2017).

The size of Bitcoin blockchain is 161,904 MB by the end of March 2018 (Blockchain Size, 2018). The blocks are recorded in chronological order in the blockchain. It guarantees that if a consumer has already spent his bitcoins in somewhere, then he cannot transfer his bitcoins to other consumers (Andy, 2015). This transfer will be rejected.

Bitcoins that are mined or purchased are stored in digital wallets which are available as desktop software, mobile application, and web wallets (Todorov, 2017). A wallet company, which can be considered as somewhat a third-party intermediary, requires consumers' bank account or credit card information to deposit or withdraw or exchange bitcoins (Cusumano, 2014).

There were about 1.7 million and 10.6 million bitcoins in the circulation in 2010 and 2013, respectively (Bitcoins in Circulation, 2018). Additionally, its market price was $702 at the end of 2013 (Market Price, 2018). Today, there are about 17 million Bitcoins in the circulation by March 25, 2018, and its market price is about $8,600. These statistics indicate that the value of a bitcoin is volatile due to the changing relationship between supply and demand (Mikołajewicz-Woźniak & Scheibe, 2015). Additionally, it should not be forgotten that Bitcoin software limits the supply to 21 million bitcoins, and it is estimated that this number may be reached by the year 2140 (Dowd & Hutchinson, 2015).

Although Bitcoin is considered as a faster, cheaper, and more convenient alternative medium of exchange regarding other payment mechanisms, it also has some difficulties (Raymaekers, 2014). One of the main difficulties is the problem of trust to service providers, price stability, technology performance, precise regulation, and compelling benefits. Service providers should serve reliable and available platforms that can handle millions of transactions for their customers and consumers must feel safe that their bitcoins cannot be stolen from digital wallets or lost if their exchange disappears. Additionally, it is evident that the mining process requires an intensive computational resource and electricity that decrease the supply of bitcoins and create a challenge for the adoption of Bitcoin (Andy, 2015).

Bitcoins also lack regulations, and it increases the potential use of bitcoins by criminals. In the Bitcoin ecosystem, a user's or miner's identity is not checked or verified, so it makes the use of bitcoins in criminal activities easier (Böhme, Christin, Edelman, & Moore, 2015).

Another difficulty is wide price fluctuations in the value of bitcoin can make an adverse effect on consumers, and such fluctuations affect the adoption of Bitcoin negatively as a payment method by consumers. Additionally, if a consumer makes an accidental or unwanted purchase with his bitcoins, this payment is irreversible. In addition to this effect, although a bitcoin can look like a cheaper currency, the conversion from regular currency into and out of it cannot be more convenient than using traditional currencies (Raymaekers, 2014).

Although Bitcoin dominates the market, its success has led to the emergence of other cryptocurrencies called alt-coins. Some of the notable alt-coins are Ethereum, Ripple, Litecoin, Dash, and Dogecoin (Luther, 2016). The market price of these alt-coins is about $600, $0.63, $160, $418, and $0.0035, respectively by March 25, 2018 (Coin Market Prices, 2018; Coin Market Cap, 2018). On the other hand, if someone is interested in having cryptocurrency, he or she probably choose Bitcoin due to its familiarity and the most prominent network (Luther, 2016). It indicates that the evolution of cryptocurrencies like Bitcoin and alt-coins will continue to provide us with the opportunity to consider alternative online payment systems.

3. BLOCKCHAIN TECHNOLOGY

It is stated that blockchain technology will reduce the role of one of the most critical economic and regulatory actors in our society called middleman (Wright & Filippi, 2015). In other words, it can be said that blockchain technology will revolutionize the industry and commerce and make an essential economic change on a global scale (Underwood, 2016).

Blockchain technology, which combines peer-to-peer networks, cryptographic algorithms, distributed data storage, and a decentralized consensus mechanism, allows businesses and individuals to make transactions without the approval of third-parties (Underwood, 2016; Wright & Filippi, 2015). It can be defined as "a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties" (Crosby et al., 2016, p. 7; Underwood, 2016). In other words, it means "blocks of data that are connected via a cryptographic chain" (Letourneau & Whelan, 2017, p. 1). In a blockchain technology, each transaction is verified by consensus of a majority of the participants. In other words, to assure that ledgers in different participating parties are consistent, some protocols are required (Zheng et al., 2017). Although there are different types of consensus algorithms, the most-widely use one is Proof-of-Work (Yuan & Yang, 2016). This algorithm asks a complicated computational process in the authentication, and it requests participating parties, which are called nodes, to run hashing functions continuously (Yuan & Yang, 2016; Zheng et al., 2017). Another consensus algorithm is Proof-of-Stake. When it is compared to Proof-of-Work, it saves energy by only requiring larger amount of stake like the number of coins. The main reason is that it is assumed that individuals with more coins will a less tendency to attack the network. In addition to these two algorithms, there are also various algorithms such as Delegated Proof-of-Stake, Proof-of-Movement, Ripple, Tendermint, and Practical Byzantine fault tolerance. When a consensus is secured, and a transaction is entered the ledger, this transaction can never be erased (Crosby et al., 2016). The ledger cannot also be controlled or owned by a central authority, and any individual can view all verified transactions in the given ledger (Underwood, 2016).

If we summarize it, each past or present online transaction can be verified at any time in the future by a distributed consensus, and this verification process does not require the identification of the parties involved (Crosby et al., 2016). Additionally, blockchains provide security, anonymity, and data integrity without any third-party organization in control of the transactions, so they avoid information leakage, decrease transaction time, eliminate transaction intermediaries, reduce the risk of fraud and cybercrime, and they allow companies or related parties to observe each transaction easily (Underwood, 2016; Yli-Huumo et al., 2016).

Bitcoin is the most popular example using blockchain technology. It is obvious that blockchain is the core or backbone technology of Bitcoin (Andy, 2015; Crosby et al., 2016). Although blockchain is not a controversial issue itself, it is debatable when it is used for Bitcoin (Crosby et al., 2016). The main reason is that blockchain allows a multibillion-dollar global market of anonymous transactions without any governmental control. However, the importance and value of blockchain do not depend on the value of Bitcoin (Davidson, Filippi, & Potts, 2016; Yli-Huumo et al., 2016).

Blockchains can be both used by financial and non-financial applications. Financial institutions and banks consider using blockchains. For example; Nasdaq uses its LINQ blockchain to record private securities transactions (Underwood, 2016). Additionally, master and visa try to explore some applications of their current business models on blockchains. IBM, Samsung, Overstock, Amazon, UBS, Citi, eBay, and Verizon Wireless also investigate alternative uses of blockchain for their applications. Nowadays, for example; Porsche tests blockchain applications in its vehicles (Newsroom, 2018). Additionally, Walmart has been announced a patent called smart package which employs blockchain-based tool to track package contents, environmental conditions, location, etc. (Cointelegraph, 2018).

There are also non-financial applications of blockchains. For example; blockchain can allow businesses or individuals to keep proof of the existence of all legal documents, health records, notary,

marriage licenses, or loyalty payments in the music industry (Crosby et al., 2016). For example; if blockchain is used in notary public, a document can be verified easily without a need for centralized authority, so blockchain eliminates the need for expensive notarization fees and ineffective ways of transferring documents.

The evolution of blockchain has also led to the emergence of new concepts such as tokenization, smart-contracts, and smart properties. Tokenization transforms some form of asset into a digital token like Bitcoin (Aru, 2017; Dale, 2018). Tokens represent money as well as other things (Aru, 2017). It is obvious that the prices of different altcoins in the blockchain setting vary from each other. The main reason behind this variation is that the demand for a certain Blockchain product such as Steemit, Dash, Zcash, LAToken, and WishKnish determines the value and ultimate market price of its token. It implies the reason why Bitcoin is widely accepted by sellers than Litecoin.

Furthermore, the growth of blockchain also contributes to the development of smart-contracts and smart properties (Wright & Filippi, 2015). The smart-contract technology was invented by Nick Szabo in 1994 (Letourneau & Whelan, 2017). Smart contracts can be defined as "computer codes that enable relatively straightforward transactions to occur automatically" (p. 2). In other words, smart contracts use computerized transaction protocols to execute the terms of contracts agreed upon by individuals of a blockchain (Underwood, 2016).

An example can explain how smart contracts work. For example; a Chinese company A (buyer) buys products from an American company B (seller) and a company C (carrier) delivers the products to company A (Letourneau & Whelan, 2017). To deliver and receive products, some arrangements must be made, and some documents must be verified which will require long steps between the buyer's bank and the seller's bank. On the other hand, smart contracts along with blockchain technology make these steps be tracked easily. They eliminate some steps such as using brokers. It is evident that standardization of blockchain supports the development of smart contracts, helps intellectual property transfers safer, makes government contracting and supply-chain services happen faster, and decreases intermediary, compliance, and auditing costs.

Blockchain can also be used as a supportive tool for the deployment of the Internet of Things (Wright & Filippi, 2015). It is evident that the Internet of Things involves billions of networked Internet-enabled devices that cannot be trusted or even malicious. At that point, blockchain technology can be used as a central mechanism that facilitates private, secure, and trustless machine-to-machine coordination and it offers smart properties. Each device or each tangible property that is registered in a blockchain is called a smart property. Smart contracts are used to control smart properties over the Internet or by other machines. The main purpose of a blockchain is that it keeps the relationship between Internet-enabled machines at any time. Moreover, smart contracts distribute related rights and obligations of connected devices. This cryptography-based technology ensures that only specific people can access to the property's features.

In summary, it is evident that blockchain technology is not only applied to cryptocurrency ecosystem but it can also be used in various environments where some forms of transactions are done (Yli-Huumo et al., 2016). Additionally, it seems that blockchain technology has a great potential to change the way how transactions are conducted in everyday life.

4. RESEARCH METHODOLOGY

Cryptocurrencies and blockchain technology have been drawn the attention of various disciplines such as economics, finance, and information technologies over the years. Academics have contributed to the literature by investigating these advances from different perspectives, and the content of articles published by academics gives us an idea about the evolution of the research in cryptocurrencies and blockchain technology.

This study embraces content analysis as a research methodology to enlighten the evolution of cryptocurrencies and blockchain technology in the academic research setting. Content analysis, which

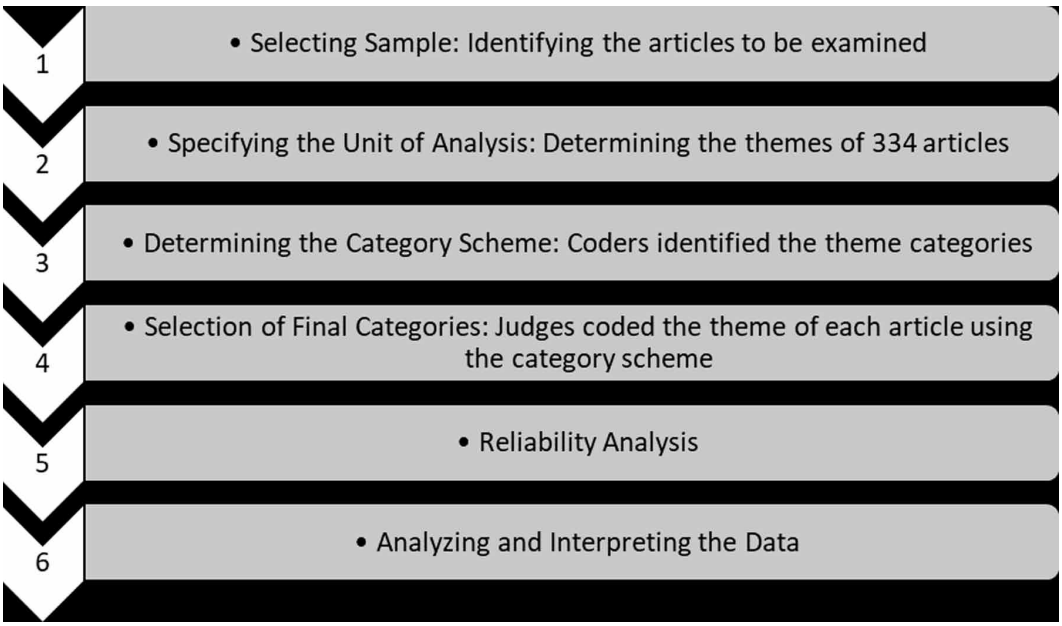
is an observational research method, is defined as "a research method that uses a set of procedures to make valid inferences from the text" (Kolbe & Burnett, 1991; Weber, 1990, p. 117).

Figure 1 shows the six steps of the methodology. The first step includes the identification of relevant articles and the selection of the sample. The second stage involves the specification of unit analysis. The third step comprises the identification of the theme categories by coders and their decisions on the category scheme. After that, the fourth step consists of the selection of the final categories from the category scheme created by coders. The fifth stage includes the reliability analysis which is conducted to find out the agreement level of the judges. Lastly, the sixth stage consists of the analysis of the collected data.

4.1. The First Step: Sample Selection

To search for relevant papers and select sample, two databases including ProQuest ABI/INFORM Collection and EBSCOhost Academic Search Complete are selected as scientific resources due to their scholarly comprehensiveness (see Table 1). The search and selection processes are adapted from Yli-Huumo et al. (2016). Figure 2 shows that 415 papers are initially investigated when the search protocol is applied in the scientific databases. The first inclusion and exclusion round are based on the titles and publication year of the retrieved papers. Authors identified possible keywords that can indicate a research study in the field of cryptocurrencies and blockchain technology. The identified keywords are cryptocurrency, cryptocurrencies, virtual currency, virtual currencies, digital currency, digital currencies, Bitcoin, and blockchain. In parallel, the papers that are published between 2008 and 2017 and are involving one of these keywords or any combination of these keywords in their titles are included in the scope of the study. All paper titles are examined by two authors carefully, and 358 papers are selected. It indicates that 57 papers that are not related to the research topic are excluded from the sample. After this process, duplicated papers are removed from the sample, which leads to the selection of 343 papers. In the second round, two authors are analyzed the abstracts of the papers, and any paper is not excluded from the sample. However, there are some papers which are unclear, and two authors read them in detail. Finally, 334 papers are included in the sample of the study.

Figure 1. The steps of the methodology (Adapted from Nasir, 2005, p. 444)



Related data regarding each article are also extracted. The data includes the title of the article, authors of the article, the journal that the article is published in, publication subject, and the publication for each article.

On the other hand, the papers are excluded based on the following three criteria: (1) papers without full-text availability, (2) papers where their main language is not English, (3) papers that are not published in scholarly peer-reviewed journals.

4.2. The Second Step: Specification of Unit of Analysis

It is stated that "word," "word sense," "sentence," "theme," "paragraph," and "whole text" are used in the content analysis to identify the basic unit of test to make a classification (Weber, 1990). In this study, the unit of analysis is chosen as the "theme" of articles. In this sense, abstracts and if it is necessary, full-texts of 334 articles are reviewed to identify the themes. A theme reflects what is studied in the given article. The articles are categorized (1) to identify the main themes that are

Figure 2. Sample selection process (Adapted from Yli-Huumo et al., 2016)

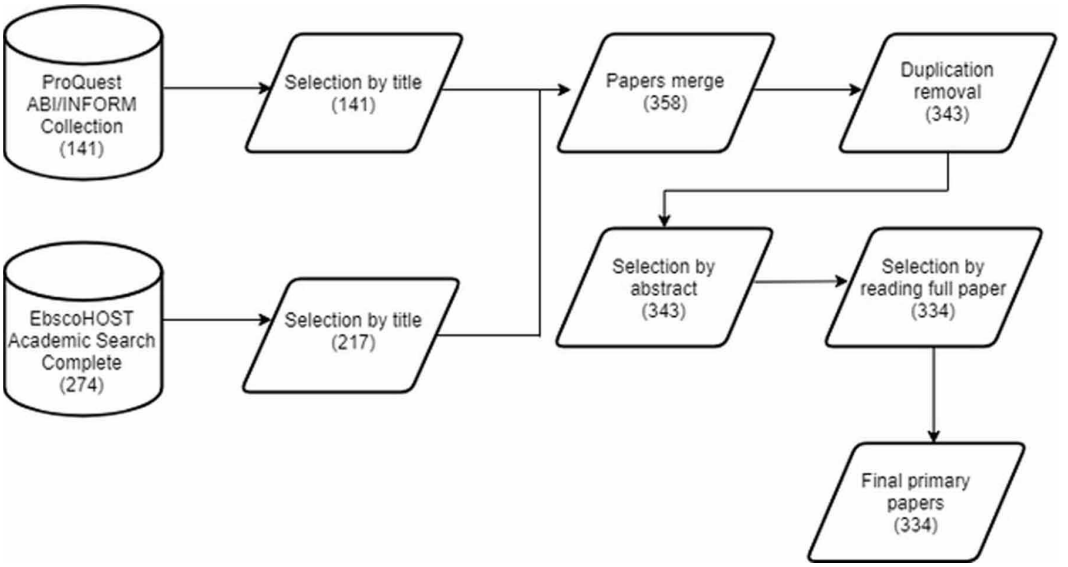


Table 1. Databases and their scopes

Database	Scope
ProQuest ABI/INFORM Complete	ABI/INFORM Complete which has a gold standard among the business research databases is launched in the 1970s. This database covers a huge amount of content including important full-text journals and many sought-after titles from the business press as well as key trade publications, dissertations, conference proceedings, and market reports. It includes all content found in ABI/INFORM Global, ABI/INFORM Dateline, and ABI/INFORM Trade and Industry. It also includes ABI/INFORM Archive, which offers a deep backfile of many of the most important business journals of the last century (ProQuest, 2018).
EbscoHOST Academic Search Complete	Academic Search Complete is one of the world's valuable, comprehensive, and multi-disciplinary database. It includes 8,500 full-text periodicals, more than 7,300 peer-reviewed journals. In addition to full text, it also offers indexing and abstracts for more than 12,500 journals and includes 13,200 publications involving monographs, reports, conferences, and proceedings, etc. (Ebsco, 2018).

investigated in the cryptocurrencies and blockchain literature, (2) to determine the distribution of the themes of cryptocurrencies and blockchain over the years, and (3) to show the distribution of cryptocurrencies and blockchain articles in various journal disciplines.

4.3. Step Three: Determination of the Category Scheme

In this study, a new category scheme is developed specifically for this research. Two coders including a Ph.D. student and a master's student in the Department of Information Technology and Systems were trained to analyze the extracted list of themes by two authors. Each coder independently aggregated 334 articles into a smaller number of categories. These coders were trained to group articles that were related in scope, and they could generate any number of categories all they wanted. Whereas the Ph.D. student aggregated all themes under 12 categories, the master's student combined all themes under 13 categories.

4.4. Step Four: Selection of Final Category Scheme

In this step, categories generated by two coders in the previous step were evaluated by the authors and decreased the final category to 11 theme categories by considering the common theme categories generated by two coders and the context of the study. Table 2 includes the final category scheme. The following list also includes the description of each theme category in detail.

1. Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems category includes articles which investigate the application of these technologies in different sectors and systems such as digital records, education, telecom, financial, and health industries, and vehicular, governmental, residential, and data sharing systems.
2. Technical & Technological Dimension of Cryptocurrencies and Blockchain Technology category contains articles which examine underlying technical infrastructure of these technologies and technical improvements.
3. Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology category consists of articles which include emergent, general information, overview, history, evolution, and future of these technologies, and recent developments about them.
4. Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology category includes articles which focus on current laws and regulations. Additionally, articles which examine privacy and anonymity, and ethical issues such as money laundering, financing of terrorism, and cybercrime are included in this category.
5. Economic Dimension of Cryptocurrencies and Blockchain Technology category contains articles which propose economic solutions by using these technologies, include economic values, price discovery, price fluctuations, market efficiencies and inefficiencies, and market analysis.
6. Financial & Accounting Dimension of Cryptocurrencies and Blockchain Technology category includes articles which focus on investment, portfolios, stocks, market value, tax reporting, exchange rate determination, crowdfunding and articles which deal with accounting.
7. Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology category consists of articles which aim to outline advantages, disadvantages, benefits, challenges, and risks of these technologies in different industries, businesses, and the world. Additionally, articles dealing with challenges of technical implementation of these technologies are included in this category.
8. Philosophical & Ontological Dimension of Cryptocurrencies and Blockchain Technology category includes articles which analyze cryptocurrencies and blockchain technology from philosophical and ontological perspectives.
9. Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology category involves articles which focus on the potential use, adoption of, and intention to use cryptocurrencies and blockchain technology by users and various industries.

10. Impacts & Implications of Cryptocurrencies and Blockchain Technology category includes articles which aim to outline impacts and implications of cryptocurrencies and blockchain technology on financial markets, businesses, economy, accounting, education, healthcare, real estate, and consumers' goods.
11. Statistics Dimension of Cryptocurrencies and Blockchain Technology category contains articles which make statistical inferences from the related data.

4.5. The Fifth Step: Reliability Analysis

Reliability analysis was conducted with two independent judges whether the themes of 334 articles could be placed into the same categories. In this sense, two judges (Ph.D. candidates at the Department of Management Information Systems) were given the list of themes of 334 articles extracted in the second step and final category scheme extracted in the fourth step. After that, they independently assigned each theme of each article to one of the 11 theme categories that best describe the content of the article. Each article was assigned only in one theme category.

There are different ways to assess the reliability. One of them is a percentage match that identifies the interjudge reliability. It is calculated by counting the number of themes that were assigned to the same category by the two judges. Table 3 shows that two judges achieved a satisfactory level of interjudge reliability of 89% exceeding the recommended coefficient agreement which is 85% (Kaasarjian, 1977). On the other hand, some researchers criticize the percentage agreement for reliability as an inadequate way (Rust & Cooil, 1994; Grayson & Rust, 2001). In this sense, in this study, Cohen's Kappa which ranges between -1 and +1 to test interrater reliability was conducted (McHugh, 2012). In this research, Cohen's Kappa is 0.87. The Kappa result, which is between 0.81 and 1.00, is interpreted as almost perfect agreement (McHugh, 2012).

Additionally, Perreault and Leigh's reliability index, which is another way to assess the reliability, is calculated (Perreault & Leigh, 1989). This index (I_r) equals 0.88 indicating a satisfactory reliability achievement. This reliability assessment results state that the category scheme is clearly defined and can be used in this study with little or no ambiguity.

Table 2. Final list of category schemea

Number	Theme Categories
1	Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems
2	Technical & Technological Dimension of Cryptocurrencies and Blockchain Technology
3	Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology
4	Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology
5	Economic Dimension of Cryptocurrencies and Blockchain Technology
6	Financial & Accounting Dimension of Cryptocurrencies and Blockchain Technology
7	Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology
8	Philosophical & Ontological Dimension of Cryptocurrencies and Blockchain Technology
9	Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology
10	Impacts & Implications of Cryptocurrencies and Blockchain Technology
11	Statistics Dimension of Cryptocurrencies and Blockchain Technology

5. RESEARCH FINDINGS

This part covers the sixth step of the methodology that is the analysis and interpretation of the data and presents the results related to the number of articles published over the past ten years, theme analysis and journal analysis.

5.1. Distribution of the Number of Articles

The results of the research over the past ten years are shown in Figure 3. Figure 3 illustrates the number of articles published per year in the field of cryptocurrencies and blockchain technology. Over 334 articles, only one paper is published in 2008 as a start. Until 2013, there is not a sufficient increase in the number of articles published. On the other hand, the total number of articles reaches 32, 61, and 79 in 2014, 2015, and 2017, respectively. In 2017, there is an obvious great increase in research articles and the total number of published articles in this year is 142.

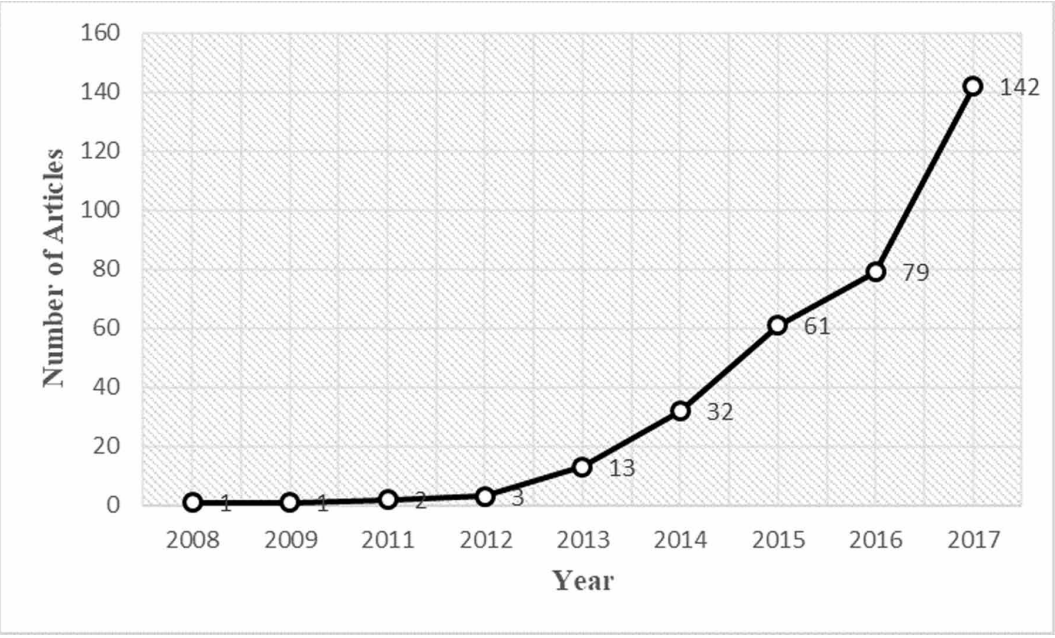
5.2. Theme Analysis

Figure 4 shows the percentage distribution of 334 articles by category themes. It is evident that the "Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology" (21%) is the most

Table 3. Reliability assessment

	Judges A and B
Number of matching (out of 334)	296
The percentage agreement	89%
Cohen's Kappa	0.87
Perreault and Leigh's index	0.88

Figure 3. The number of article per year



popular theme category in the literature. The research papers in this category mainly focus on the rethinking, discussing, and governance of Bitcoin and blockchain technology to create a legitimacy as a payment of system (Kiviat, 2015; Rutherford, 2017; Prentis, 2015; Tu & Meredith, 2015). Additionally, from the ethical point of view, the papers address some problems related to privacy, cybercrime, money laundering to finance terrorism and they also present solutions to protect privacy and prevent criminal activities (Huang, 2015; Irwin & Milad, 2016; Peck & Wagman, 2017; Angel & McCabe, 2015). The second most popular theme category is "Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology" (16%). The papers mainly investigate the potential value of using blockchain technology and cryptocurrencies for businesses in different industries including governmental, military, and other private industries. For example; using blockchain databases can overcome the problem of double taxation (Hyvärinen, Risius, & Friis, 2017), can decrease the transactional costs (Underwood, 2016), can lead to transformation of governmental processes (Ølnes, Ubacht, & Janssen, 2017), can decrease the financial and documentation burden (Labbé, 2017), can streght the security in the Internet of Things (Kshetri, 2017). On the other hand, there are also papers consider the challenges and risks of blockchain technology and cryptocurrencies for the global economy and businesses especially including banking, finance, and auditing (Rooney, Aiken, & Rooney, 2017; Richter, Kraus, & Bouncken, 2015; Vasek, 2015).

"Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology" (13%) theme category follows these two theme categories. The articles in this category mostly present a general overview about cryptocurrencies and blockchain technology (Aste, Tasca, & Di Matteo, 2017; Nofer et al., 2017; Underwood, 2016; Zohar, 2015) and determine the future role of them (Hurlburt, 2016; Kewell & Michael Ward, 2017; Luther, 2016; Mikolajewicz-Wozniak & Scheibe, 2015).

Furthermore, the studies in "Economic Dimension of Cryptocurrencies and Blockchain Technology" (12%) mainly consider the Bitcoin market, price formation, price fluctuations, main economic features of the currency market, relationship between price changes and volatility returns (Bouri, Azzi, & Dyhrberg, 2017; Cheung et al., 2015; Cheah & Fry, 2015; Ciaian, Rajcaniova, & Kancs, 2016; White, 2015; Kim et al., 2016).

Although, "Financial & Accounting Dimension of Cryptocurrencies and Blockchain Technology" (10%), "Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems" (7%), "Impacts & Implications of Cryptocurrencies and Blockchain Technology" (6%), and "Adoption and Intention to Use of Cryptocurrencies and Blockchain Technology" (6%) do not have significant impact rather than first four theme categories, these categories also involve certain numbers of articles. In the financial and accounting dimension, researchers mainly consider the taxation, accounting, return on investment of Bitcoin, financial asset capabilities, and crowdfunding, etc. (Barry, 2014; Hong, 2017; Stanley-Smith, 2015; Zhu & Zhou, 2016). Furthermore, in the following theme category, research papers indicate the importance of the application of blockchain in different industries including telecom, healthcare, and pharmacy, and in different fields such as vehicular communication systems, supply chain management, residential electricity production, and industry 4.0. (Ao Lei et al., 2017; Apte & Petrovsky, 2016; Darmwal, 2017; Peck & Wagman, 2017; Lu & Xu, 2017; Szewczyk, 2017; Sikorski, Haughton, & Kraft, 2017; Lee & Lee, 2017). In the impacts and implications dimension, there are articles stating the impacts of digital currencies or blockchain technology on monetary systems, financial services, international foreign currency exchange market, anti-money laundering enforcement, interactive gambling, and real estate industry (Łukasiewicz-Kamińska, 2015; Owens & Lavitch, 2013; Plassaras, 2013; Nordrum, 2017). On the other hand, in the dimension of adoption and intention to use, there are papers considering the adoption of blockchains and cryptocurrencies in the education, aircraft industry, payment systems, and gambling etc. (Connell, 2014; Chen et al., 2015; Madhwal & Panfilov, 2017; Neyer & Geva, 2017; Wang, Chen, & Xu, 2016).

Lastly, the theme categories of "Technical & Technological Dimension of Cryptocurrencies and Blockchain Technology" (5%), "Philosophical & Ontological Dimension of Cryptocurrencies and Blockchain Technology" (3%), "Statistics Dimension of Cryptocurrencies and Blockchain

Technology" (1%) include the least number of articles, respectively. In the technical and technological dimension, researchers investigate alternative configurations for different blockchain architectures, propose mechanism to reduce risk against to Sybil attacks and two-factor authentication to protect Bitcoin wallets, focus on facial recognition systems on digital currency platforms, and give technical information for mining etc. (Chow & Peck, 2017; Shi, 2016; Mann & Loebenberger, 2017; O'Leary, 2017). Moreover, in the philosophical & ontological dimension, authors present philosophical investigation of the ontological constitution of Bitcoin, a review of the blockchain, Libertarianism, and Socialist philosophies, and they also provide a philosophical account of how blockchain technologies are socially embedded. (Bjerg, 2016; Dupont, 2017; Swan, 2017). In the last dimension, researchers provide a statistical analysis of the log-returns of the exchange rate of Bitcoin versus the United States Dollar (Chu, Nadarajah, & Chan, 2015).

Table 4 also includes the distribution about the frequency of articles concerning each theme category.

Table 5 displays the frequency of articles for each year to find the possible change and trends over the years. Table 5 indicates that in 2008 and 2009, there is only one article published per year and there is not any published article in 2010. Satoshi Nakamoto introduced cryptocurrencies and blockchain technology in 2009, so it is expected that it will have started to take the attention of academics in the following years. After these years, academics start to focus on and discuss mostly "Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology" in 2011, 2012, 2013. It is also apparent that academics continue to investigate cryptocurrencies and blockchain technology from legal and ethical perspectives frequently in the following years. In 2014, academics begin to publish more articles in this field. Although they mainly concentrate on "Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology," they also start to consider "Financial &

Figure 4. Percentage of articles based on theme

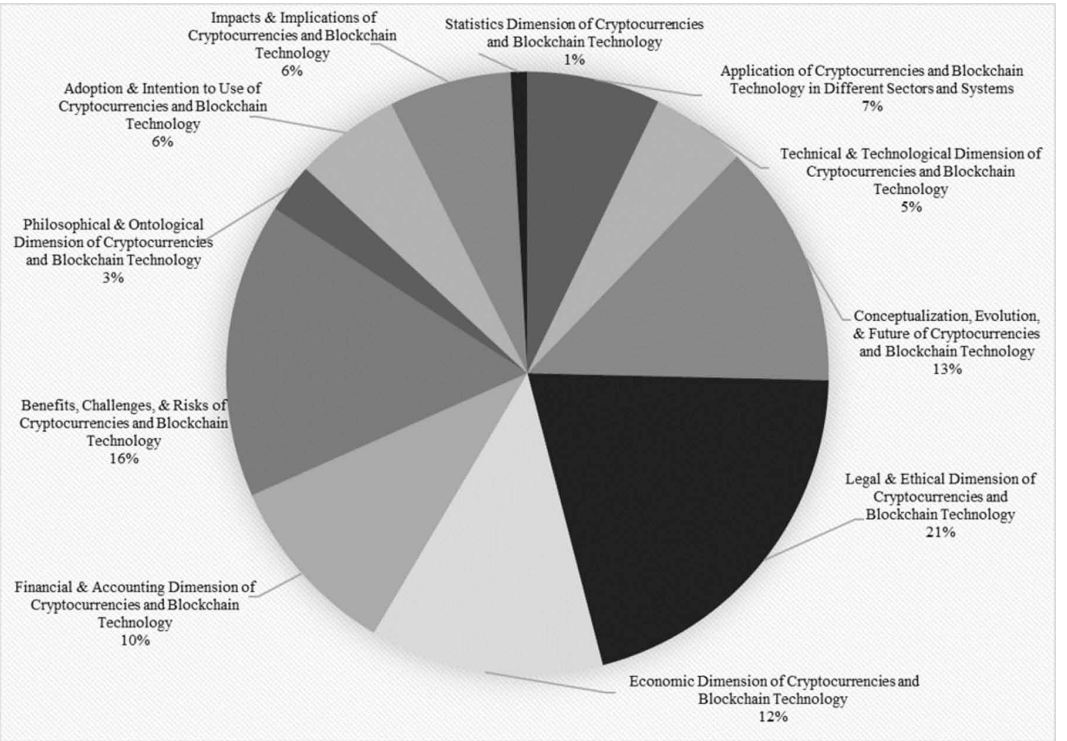


Table 4. The number of article per theme

Theme	Frequency of Article	% of Article
Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems	24	7%
Technical & Technological Dimension of Cryptocurrencies and Blockchain Technology	17	5%
Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology	44	13%
Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology	69	21%
Economic Dimension of Cryptocurrencies and Blockchain Technology	41	12%
Financial & Accounting Dimension of Cryptocurrencies and Blockchain Technology	33	10%
Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology	53	16%
Philosophical & Ontological Dimension of Cryptocurrencies and Blockchain Technology	9	3%
Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology	19	6%
Impacts & Implications of Cryptocurrencies and Blockchain Technology	22	6%
Statistics Dimension of Cryptocurrencies and Blockchain Technology	3	1%
Total	**334**	**100%**

Accounting Dimension of Cryptocurrencies and Blockchain Technology" and publish articles related with "Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology." It can be inferred that in parallel to their conceptualization, evolution, and future, cryptocurrencies and blockchain technology begin to be recognized as a financial medium.

Moreover, in 2015, academics investigated "Economic Dimension of Cryptocurrencies and Blockchain Technology," and they also continued to analyze legal and ethical issues of cryptocurrencies and blockchain technology as well as their conceptualization, evolution, and future. It indicates that these advances start to take attention of other disciplines including finance, accounting, and economics. In 2016, academics continued to argue the dimensions of legal and ethical, economics, conceptualization, evolution, and future of cryptocurrencies and blockchain technology. Additionally, they pay attention to "Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology." It can imply that cryptocurrencies and blockchain technology spread over and gain a validity among individuals, businesses, and other related parties.

In 2017, cryptocurrencies and blockchain technology become hot topics in the academic world and academics explicitly start to examine these topics. They mainly scrutinize "Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology." Additionally, they contemplate "Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems" and also "Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology" at the least. It is expected that these new developments were recognized by many individuals and businesses after their introduction. In this sense, it has led to the investigation of current, and potential applications of cryptocurrencies and blockchain technology and this investigation reveal the importance of the analysis of benefits, challenges, and risks of cryptocurrencies and blockchain technologies for the parties who want to adopt them.

Figure 5 demonstrates the change of each theme category over time. It is seen that "Benefits, Challenges, & Risks of Cryptocurrencies and Blockchain Technology" had a great climb up in 2017. In addition to this theme category, there is also an obvious rise in the theme of "Application of Cryptocurrencies and Blockchain Technology in Different Sectors and Systems" in 2017. It shows that cryptocurrencies and blockchain technology takes more attention to many disciplines, businesses and even individuals in this year, so academic world investigate the current and possible application and

Table 5. Theme category analysis of 334 articles for each year

Theme	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
1	0	0	0	0	0	0	0	1	5	18	**24**
2	0	0	0	0	0	0	1	4	3	9	**17**
3	0	1	0	0	1	0	5	11	12	14	**44**
4	0	0	0	2	2	6	10	18	14	17	**69**
5	0	0	0	0	0	3	4	13	12	9	**41**
6	0	0	0	0	0	0	8	4	8	13	**33**
7	0	0	0	0	0	0	2	4	10	37	**53**
8	0	0	0	0	0	0	0	0	4	5	**9**
9	1	0	0	0	0	1	1	2	7	7	**19**
10	0	0	0	0	0	3	1	3	3	12	**22**
11	0	0	0	0	0	0	0	1	1	1	**3**
Grand Total	**1**	**1**	**0**	**2**	**3**	**13**	**32**	**61**	**79**	**142**	**334**

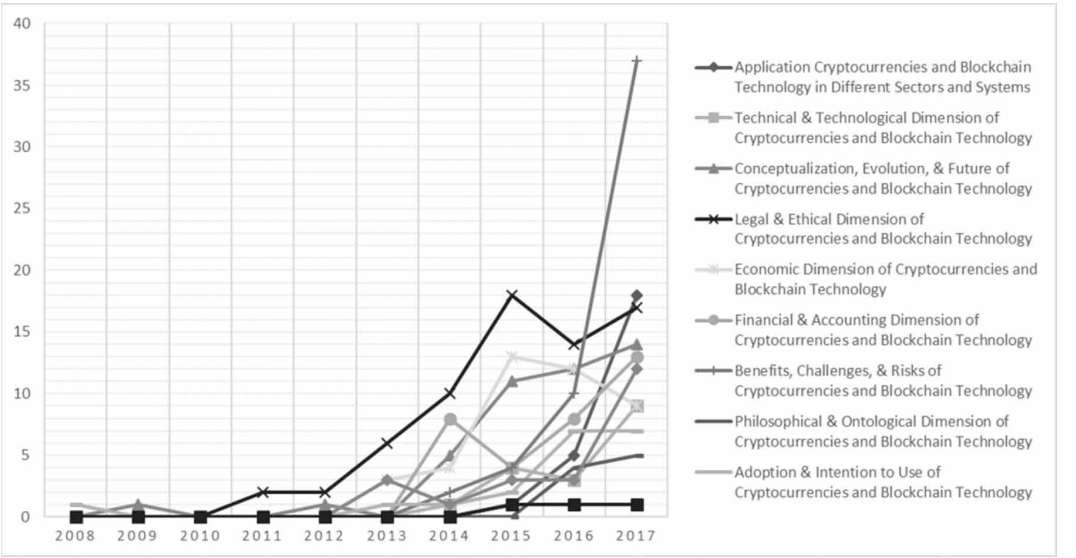
benefits, challenges and risks of these advances for banks and other financial industries, individuals, and several public and private industries such as government, military, music, and digital art etc.

Furthermore, Figure 5 shows that "Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology" also took the attention of academics even if it is little. The reason can be that cryptocurrencies and blockchain technology start to be newly understood and recognized by related parties, so in the following years after 2017, it can mark a new period of research scope change to the investigation of the adoption and intention to use of cryptocurrencies and blockchain technology. Additionally, in 2017, while "Adoption & Intention to Use of Cryptocurrencies and Blockchain Technology" increases, there is also flow up in the theme category of "Technical & Technological Dimension of Cryptocurrencies and Blockchain Technology." This result can state that while the recognition of cryptocurrencies and blockchain technology increases, more technical and technological problems, needs, or solutions start to arise.

On the other hand, "Legal & Ethical Dimension of Cryptocurrencies and Blockchain Technology" takes the attention of academics tremendously by starting in 2012 and it flows up in 2015. Although studies mainly continue to focus on this dimension, this theme category witnesses a drop down in 2016 and 2017. It may indicate that researchers begin to give low importance to legal and ethical aspects which have already been discussed in the previous years.

Although "Economic Dimension of Cryptocurrencies and Blockchain Technology" gains popularity in 2015, the research scope of academics shifts toward to "Conceptualization, Evolution, & Future of Cryptocurrencies and Blockchain Technology" and "Financial & Accounting Dimension of Cryptocurrencies and Blockchain Technology." These two theme categories continue to gain popularity between 2015 and 2017. It can be inferred that society and businesses are introduced with new developments, and they have not learned yet what these developments are, so they sustain to want to know what these advances mean in detail, how they evolve, and what their future is. Additionally, these results indicate that these advances are accepted as a financial medium, and it starts to change the attention of researchers toward the financial and accounting aspects of cryptocurrencies and blockchain technology.

Figure 5. Change and trend analysis of theme categories over years



5.3. Journal Analysis

Figure 6 illustrates the results of the journal analysis in between 2008 and 2017. Figure 6 only involves the journals that published more than one article about cryptocurrencies and blockchain technology. The journals that published one article are grouped into one group called "Other" due to better visualization and listing of 334 articles. The results indicate that "IEEE Spectrum" journal reaches to highest share among 334 articles by publishing 12 articles about cryptocurrencies and blockchain technology during 2008-2017. Furthermore, "PLOS ONE" and "International Financial Review" journals share the second place in the list with ten articles each. "Communications of the ACM" and "Strategic Change" journals also share the third place in the list by publishing nine articles each in between 2008 and 2017.

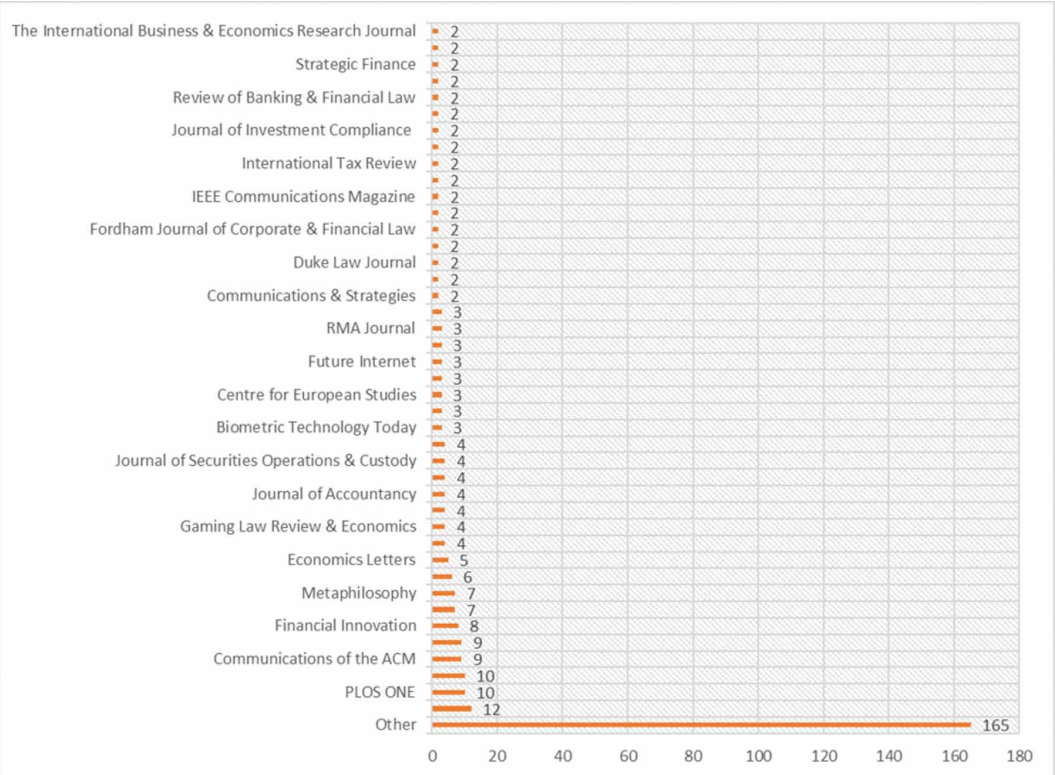
Additionally, Table 6 shows the number of articles in detail that are published in each journal during 2008-2017. Table 6 illustrates that although journals mentioned above give importance to publishing about cryptocurrencies and blockchain technology in recent years, "Strategic Change," "Metaphilosophy," and "Technology Innovation Management Review" journals are promising by starting to publish lots of articles in 2017 in the field of cryptocurrencies and blockchain technology.

Furthermore, Table 7 shows the distribution of a number of articles regarding the journal subject area. Some journals are covering more than one subject areas, so some articles are represented more than one time. Table 7 indicates that the research papers included within the scope of the study are published in scholarly journals covering law, banking and finance, business and economics, management, engineering, computer applications, accounting, technology, medical sciences, and computers subject, respectively.

6. CONCLUSION AND DISCUSSION

The study aims to identify trends, patterns, and research gaps, and to enlighten future of cryptocurrencies and blockchain technology, and to provide researchers with a map for investigating unexplored sides of cryptocurrencies and blockchain technology. In this sense, the content of articles, which are published in scholarly peer-reviewed journals, are analyzed to understand advances in cryptocurrencies and blockchain technology over the years.

Figure 6. Number of articles per journal



In the initial years, there is only one research paper that starts to take the attention of academics in 2008 and 2009. The main reason can be that although Bitcoin is the first created cryptocurrency, there is a pre-cryptocurrencies year including B-Money and Bit Cold (Marr, 2017). After that, Satoshi Nakamoto shares his article by sending it to a mailing list about cryptography in 2008 and 2009, Bitcoin software become public, and transactions start to be recorded and validated in the blockchain. In parallel, researchers are curious about the definition, conceptualization, and future of cryptocurrencies and blockchain technology, as well as their adoption by individuals and industries after these advances, are introduced by Satoshi Nakamoto.

After these years, the legal and ethical dimension of cryptocurrencies and blockchain technology starts to gain importance. Especially, in 2014 and the following years, legal and ethical issues have continued to be a hot issue. In this sense, many research articles considering cryptocurrencies and blockchain technology from a legal and ethical perspective are published in those years. The breaking point can be that in 2014, a criminal activity makes a tremendous effect in the world. Mt. Gox which, was the world's largest Bitcoin exchange, goes offline and 850,000 Bitcoins which is valued at 450 million dollars at that time were stolen (Marry, 2017). Such activities take the attention of researchers, and they have continued to examine the illegal activities arising from the anonymity in transactions such as buying drugs, laundering money, supporting terrorist acts, and other related cybercrimes. In addition to the legal and ethical perspective, researchers have continued to examine evolution and future of cryptocurrencies and blockchain technology in the following years.

Cryptocurrencies have been only mined so far, and in 2010, someone uses them to buy for two pizzas by spending his or her 10,000 bitcoins (Marr, 2017). After that, cryptocurrencies and blockchain technology start to spread among individuals and industries. The market capitalization

Table 6. Journal analysis of 334 articles for each year

Journal	2008	2009	2011	2012	2013	2014	2015	2016	2017	Total
Communications & Strategies	0	0	0	0	0	0	0	2	0	**2**
Computer	0	0	0	0	0	0	0	0	2	**2**
Duke Law Journal	0	0	0	0	0	0	2	0	0	**2**
Finance Research Letters	0	0	0	0	0	0	0	2	0	**2**
Fordham Journal of Corporate & Financial Law	0	0	0	0	0	0	1	1	0	**2**
Harvard Journal of Law & Technology	0	0	0	0	0	2	0	0	0	**2**
IEEE Communications Magazine	0	0	0	0	0	0	0	0	2	**2**
Indiana Journal of Global Legal Studies	0	0	0	0	2	0	0	0	0	**2**
International Tax Review	0	0	0	0	0	0	0	1	1	**2**
Journal of Financial Crime	0	0	0	0	1	1	0	0	0	**2**
Journal of Investment Compliance	0	0	0	0	0	2	0	0	0	**2**
Journal of Money Laundering Control	0	0	0	0	0	0	0	1	1	**2**
Review of Banking & Financial Law	0	0	0	0	0	0	1	1	0	**2**
Science	0	0	0	0	0	0	1	1	0	**2**
Strategic Finance	0	0	0	0	0	0	0	0	2	**2**
The Independent Review	0	0	0	0	0	0	0	2	0	**2**
The International Business & Economics Research Journal	0	0	0	0	0	0	2	0	0	**2**
Biometric Technology Today	0	0	0	0	0	0	1	0	2	**3**
Cato Journal	0	0	0	0	0	0	3	0	0	**3**
Centre for European Studies	0	0	0	0	1	1	0	0	1	**3**
Computer Law & Security Review	0	0	0	1	0	0	0	0	2	**3**
Future Internet	0	0	0	0	1	0	0	1	1	**3**
MIT Sloan Management Review	0	0	0	0	0	0	0	0	3	**3**
RMA Journal	0	0	0	0	0	0	0	1	2	**3**
The Banking Law Journal	0	0	0	0	1	0	1	1	0	**3**
CPA Journal	0	0	0	0	0	1	0	0	3	**4**
Gaming Law Review & Economics	0	0	1	0	2	0	0	0	1	**4**
IT Professional Magazine	0	0	0	0	0	1	0	1	2	**4**
Journal of Accountancy	0	0	0	0	0	0	0	0	4	**4**
Journal of Internet Banking and Commerce	0	0	1	0	0	0	0	2	1	**4**
Journal of Securities Operations & Custody	0	0	0	0	0	0	0	3	1	**4**
Virginia Tax Review	0	0	0	0	0	1	2	0	1	**4**
Economics Letters	0	0	0	0	0	0	1	2	2	**5**
Technology Innovation Management Review	0	0	0	0	0	0	0	0	6	**6**
Journal of Payments Strategy & Systems	0	0	0	0	0	2	1	2	2	**7**
Metaphilosophy	0	0	0	0	0	0	0	0	7	**7**
Financial Innovation	0	0	0	0	0	0	0	7	1	**8**
Communications of the ACM	0	0	0	0	0	3	1	4	1	**9**
Strategic Change	0	0	0	0	0	0	0	0	9	**9**
International Financial Law Review	0	0	0	0	1	0	0	4	5	**10**
PLOS ONE	0	0	0	0	0	1	4	2	3	**10**
IEEE Spectrum	0	0	0	1	1	0	0	2	8	**12**
Other	1	1	0	1	3	17	40	36	67	**165**
Total	**1**	**1**	**2**	**3**	**13**	**32**	**61**	**79**	**142**	**334**

Table 7. Distribution of number of articles regarding journal subject area

Journal Subject Area	Number of Articles	Journal Subject Area	Number of Articles
LAW	77	ART	1
BANKING AND FINANCE	51	MACHINERY	1
BUSINESS AND ECONOMICS	35	COMPUTER ENGINEERING	1
MANAGEMENT	24	COMPUTER GRAPHICS	1
ENGINEERING	20	DATABASE MANAGEMENT	1
COMPUTER APPLICATIONS	16	ELECTRICAL ENERGY	1
ACCOUNTING	15	ELECTRONIC DATA PROCESSING	1
TECHNOLOGY	13	ENVIRONMENTAL STUDIES	1
MEDICAL SCIENCES	13	GEOLOGY	1
COMPUTERS	11	HANDICAPPED	1
ECONOMIC SYSTEMS AND THEORIES, ECONOMIC HISTORY	10	HUMANITIES	1
INTERNET	10	BIOLOGY	1
PUBLIC FINANCE, TAXATION	10	MICROCOMPUTERS	1
DATA COMMUNICATIONS AND DATA TRANSMISSION SYS	9	PATENTS, TRADEMARKS AND COPYRIGHTS	1
PHILOSOPHY	8	COMPUTER NETWORKS	1
POLITICAL SCIENCE	8	PHARMACY AND PHARMACOLOGY	1
SCIENCES	7	GEOGRAPHY	1
COMMUNICATIONS	6	PUBLIC ADMINISTRATION	1
EDUCATION	5	REAL ESTATE	1
HISTORY	5	SMALL BUSINESS	1
COMPUTER SECURITY	4		
INFORMATION SCIENCE AND INFORMATION THEORY	4		
INTERNATIONAL COMMERCE	4		
SPORTS & GAME	4		
CRIMINOLOGY AND LAW ENFORCEMENT	3		
ELECTRONICS	3		
SOCIOLOGY	3		
INVESTMENTS	3		
PHYSICS	3		
SOFTWARE	2		
ECONOMIC SITUATION AND CONDITIONS	2		
INTERNATIONAL DEVELOPMENT AND ASSISTANCE	2		
LIBRARY AND INFORMATION SCIENCES	2		
MATHEMATICS	2		
MILITARY	2		
OFFICE EQUIPMENT AND SERVICES	2		
TELEVISION AND CABLE	2		
TELEPHONE AND TELEGRAPH	2		

of Bitcoin reaches $1 billion in 2013 and continued to increase (Grant Thornton, 2017). The first Bitcoin ATM in the world is opened in San Diego, California in 2013 (Futurism, n.d.). The Judge Amos Mazzant of Texas accepts Bitcoin as a currency or form of money, and The German Federal Ministry of Finance also recognizes Bitcoin as a form of private money in 2013. After this progress, cryptocurrencies and blockchain technology take the attention of other disciplines including finance, accounting, and economics. Especially, in 2014 and the following years, many research studies embrace cryptocurrencies and blockchain technology across economic, financial, and accounting standpoints.

In 2017, researchers begin to pay attention to the application of cryptocurrencies and blockchain technology in different sectors and systems, their impacts and implications among businesses and individuals, and especially they give high importance to benefits, challenges, and risks of cryptocurrencies and blockchain technology. This trend can indicate that cryptocurrencies and blockchain technology gain high penetration among different industries and people. The following examples are one of the signs of the wide acceptance of these advances. Blockchain technology has started a revolution in the fintech industry in 2017 and banks including Barclays, Citi Bank, Deutsche Bank, and BNP Paribas have announced that they have been investigating new ways which can work with cryptocurrencies especially with Bitcoin (Marr, 2017). Additionally, Bitcoin is accepted as a financial medium by KFC Canada, Playboy, Subway, Microsoft to buy content on Xbox and Windows Store, Expedia, Zynga, Bloomberg to buy online newspapers, T-Mobile Poland, and lots of online stores and platforms (Chokun, 2018). According to Financial Times, academics including the world's best-known economists also decide to develop their own cryptocurrency called Saga in 2018. (Nguyen et al., 2018). These examples imply that the categories including adoption; impacts and implications; benefits, challenges, and risks; applications will continue to be the focus of researchers.

Additionally, when the acceptance of cryptocurrencies and blockchain technology gets wider, the technical and technological dimension will start to gain importance. Because both individuals and businesses will start to face with technical and technological problems when they start to mostly use these digital tokens and platforms in their daily lives. Although some of the disciplines including philosophy, ontology, and statistics get the less attention from researchers, cryptocurrencies and blockchain technology can be still investigated from these perspectives.

Apart from this theme analysis of cryptocurrencies and blockchain technology, academic journal analysis also provides some inferences about cryptocurrencies and blockchain articles. The results indicate that articles are mostly published in journals having a subject area of law. Also, journals having subject are of banking and finance, business and economics, management, engineering, computer applications, accounting, technology, medical sciences, and computers are popular among researchers who are interested in the publication of studies about cryptocurrencies and blockchain technology.

7. LIMITATIONS

In the scope of the study, some study limitations must also be addressed. It is evident that research articles are only obtained from only two databases, so the research can be enhanced by expanding the number of databases and so the number of articles. In addition to this limitation, this study only focuses on articles that are published only in scholarly peer-reviewed journals. However, trade publications, dissertations, conference proceedings, and market reports can also be investigated.

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