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TOWARDS NEXT-GENERATION CRYPTOCURRENCY FOR GLOBAL ELECTRONIC COMMERCE

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ABSTRACT

Distributed Ledger Technology (DLT) has emerged as one of the transformational technologies of the last decade and its introduction is gathering significant pace around the world. Its desirable features have seen innovation in several use cases including identity management, supply chain verification, land registry, and many more. Perhaps the most important use case is payments using cryptocurrencies, where DLT can ensure secure, tamper-proof, verifiable transactions in a much simpler way as settlement and payment are the same processes. Many cryptocurrencies are being developed with various features that intend to address the challenges of the existing types and possibly attract a larger market share. When developing a new cryptocurrency, information about the existing cryptocurrencies is crucial. This ensures that new innovative features to address the limitations of the present alternatives are added. To facilitate the design of a better cryptocurrency alternative, this systematic review paper reviews the present cryptocurrencies and identifies weaknesses. The aim is to reveal the weaknesses of the present cryptocurrencies and highlight the possible issues that need attention to improve cryptocurrency and blockchain adoption. First, background information is discussed, followed by a description of the exact methodology used in this paper. Next, an analysis of the results is given, which includes a bibliometric overview, an analysis of gathered data and its properties, and the results of a literature quality assessment. Lastly, there is a discussion of the results of the analysis. The findings indicate that present cryptocurrencies still have various limitations including volatility, illiquidity, and insufficient data for modeling.

KEYWORDS: Systematic Review, Cryptocurrencies, Blockchain, Consensus.

1.0 INTRODUCTION

The rapid growth of the Internet and digitization of enterprises has significantly affected all economies across the world. The monetary sector has been directly influenced by technology due to the striking growth of e-commerce and e-payments. The traditional bank-based ecosystem is being disrupted by the digitization of financial services and the emergence of cryptocurrencies. In a recent survey carried out by Sitienei et al (2020) banks and financial services were ranked the most affected by rapid technological advancement.

Despite significant improvements in recent years, research carried out by Bayram (2020) on the globalization of financial services and cross-border banking performance indicates that the current payment systems still have two foremost deficiencies: first, lack of universal access to financial services for a large share of the world's population and secondly it indicated that there are inefficient cross-border retail payments.

Cryptocurrency technology and crypto tokens were originally envisioned to overcome these problems due to the ground-breaking potential of the underlying blockchain as well as the distributed ledger technology (DLT) (Bayram, 2020). However, cryptocurrency prices are highly volatile, responding strongly to global events and speculative concerns about the cryptocurrency market. As shown in Figure 1 below, the price of the Ether coin compared to U.S. dollars from Oct. 2017 to March 2018 was taken. During this period, ETH had an annualized return volatility of 120% in relation to USD. This shows high volatility for a medium of exchange or a store of value. It also turns cryptocurrencies into a highly risky asset class for certain investors and those involved in illegal activities, rather than a method of payment.

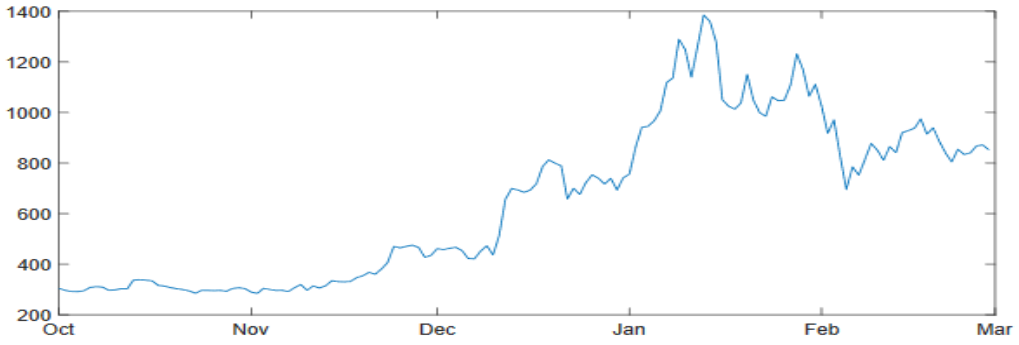

Figure 1: ETH/USD Price from 1 Oct 2017 to 28 Feb 2018 (source: Baillon, 2019).

According to Moin's et al (2020), research on Financial Cryptography, for a token to effectively function as currency, its purchasing power against goods and services must remain constant over the short to medium term. In this regard, there have been efforts to devise a framework to minimize the market volatility of cryptocurrencies while maintaining the present features of current crypto-technology. For this reason, many public and private entities have been investigating how this technology could provide an alternative to the present payment system and help in reducing the challenges faced currently. The Central Bank of Kenya (CBK) through a paper "Discussion paper on central bank digital currency" indicated that it has been monitoring these developments and is seeking public participation in the best way to deploy a central bank digital currency (The Central Bank of Kenya (CBK), 2022).

In research to explore the universal spread and growth of Bitcoin as a system and infrastructure enabling the use of Bitcoins by Bullmann et al, (2019), it was found that Cryptocurrencies are thriving. A decade since the discovery of Bitcoin, the current total market capitalization of the entire cryptocurrency market is $25.61 billion (Coinmarketcap, 2021). As of November 2019, Bitcoin was the world's sixth-largest currency in circulation. According to (Yin et al, 2020), the average daily exchange of digital tokens and cryptocurrencies has surpassed one percent of exchange in foreign exchange markets. Over the last five years, Bitcoin transactions and exclusive accounts have increased at a rate of nearly 60% per year (Huang et al, 2020).

2.0 Problem Statement

Several cryptocurrencies and Tokens already exist, and new cryptocurrencies are constantly being introduced in an attempt to support and improve the blockchain and crypto technology ecosystem. Furthermore, at the time of this research, the total market capitalization of all coins in the world was approximately $361,954,584,478. (TradingView, 2021). With so many cryptocurrencies and so much market capital, this research found that there was a need to review the weaknesses of the present cryptocurrencies to serve as the basis for the next generation cryptocurrency design as a contribution toward improving this technology.

3.0 OBJECTIVE

The objective of the study is to review the existing cryptocurrency weaknesses that limit its adoption to the current financial setup and usage in the present E-commerce environment.

4.0 METHODS

4.1 The Review Inclusion and Exclusion Criteria

Inclusion criteria deal with the study's characteristics and features, which must be included (Min, 2019). In contrast, exclusion criteria comprise the set of characteristics that need to filter out and exclude from the study. Inclusion and exclusion are the eligibility criteria, which can help improve the study's accuracy and produce sound and evocative results. The inclusion and exclusion criteria set for the current study are given in the below table.

Table 1: Material Inclusion and Exclusion Criteria source: (author).

INCLUSION	EXCLUSION
i) The articles published in 2016-to 2021 ii) Articles having good impact factor iii) Articles from popular computer science and information technology-based databases iv) Having keywords: Stable Cryptocurrency, Fiat Currency, cryptocurrency weaknesses, cryptocurrency in E-commerce v) The relevant aim, objectives, or hypothesized research articles, reports, thesis, and research papers (note: the literature type is ILR) vi) Supportive Qualitative and Quantitative materials vii) English Language viii) Complete abstract and practical implications with study limitations ix) Articles published after 2015	i) Irrelevant, unauthentic, or zero cited ii) Materials older than 2015 iii) Irrelevant factors must not be included in the study iv) UK Essay, blogs, and Wikipedia v) Other than the English language vi) Incomplete research materials

4.2 Systematic Literature Review Framework

To enhance rigor during the review process, this review was guided by Whittemore and Knafl's framework for literature review. This framework defines the process of conducting a research review as incorporating a problem formulation stage, a literature search stage, a data evaluation stage, a data analysis stage, and a presentation stage (Whittemore & Knafl 2005).

SLR Step 1: Systematic Review Problem Identification

Theoretical and empirical work in the past related to cryptocurrencies shows that several cryptocurrencies and Tokens already exist, and new cryptocurrencies are constantly being introduced in an attempt to support and improve the blockchain and crypto technology ecosystem. This research reviews weakness of the present cryptocurrencies in an attempt to form the basis for the next generation cryptocurrency design and contribute toward improving this technology.

SLR Step 2: Systematic Review Literature Search

The literature search was comprehensive but with a specific focus on blockchain and cryptocurrency facilitated the literature search stage. The search used "cryptocurrency weaknesses" as the keyword on the selected scientific search database. The selection criterion for the research databases was based on the total number of articles, conferences, and bibliographic entries. ACM Digital Library academic search database for computer science with the highest articles and bibliographic entries was used.

To cover a broad set of publications, the database was searched with the following string in the title, abstract, and keywords: {(cryptocurrency weaknesses) AND (publication date(01/01/2015 TO 03/30/2022))}. To ensure comprehensiveness, this research identified three eligible primary strategies as suggested by (McCarthy et al 2018). These include database searching, ancestry searching, and hand searching. On searching the identified database between2015 between march 2022, we identified 903 articles and 182 articles from other sources.

To identify and filter data sources, the study initially checked the importance of each article by analyzing the title, abstract, and keywords. If any sign of relevance appeared, the source was marked for further analysis. The study excluded sources that were duplicates, grey literature (i.e., editorials, work-in-progress), not applicable to the study, or not available in English as guided by the inclusion and exclusion criteria. This first relevancy assessment resulted in a sample of 620 potentially relevant articles. Afterward, a fine-grained relevance validation was made by accessing and reading the article abstracts, resulting in a final sample of 191 relevant sources. In this second relevance assessment, we excluded non-research articles and articles that did not relate to the weaknesses of cryptocurrency as shown in the PRISMA Tool Flow Chart in figure xx. EndNote citation management software was used to keep track of the articles reviewed.

SLR Step 3: Systematic Review Data Evaluation

The final sample for this systematic review included Journal articles. Due to this diverse representation of primary sources, this research used PRISMA Checklist (critical appraisal tool) to assess the informational value and quality of potential sources before they are included in the final report. No report was excluded based on this data evaluation rating system; however, the score was included as a variable in the data analysis stage. In general, Journals of low rigor and relevance contributed less to the analytic process.

SLR Step 4: Systematic Review Data Analysis

The study carefully reviewed and analyzed the 191 sources to identify cryptocurrency weaknesses and the potential causes. For each weakness, a name, description, source, and weight to show the frequency was recorded. A list of main features was created to aggregate the identified cryptocurrency weakness. The main feature is an aggregation of similar weaknesses consisting of the main feature name and the main feature description. If weakness fits into an existing main feature, the researcher assigned it accordingly; otherwise, a new main feature was created. For example, we aggregated the weaknesses "computer-generated" and "no physical form" to the main feature "virtual". The researcher also aggregated the weakness "potential for large losses" and "Valuation Fluctuates" to the main feature volatility.

Since different authors use different terms for the same weakness, we considered semantic ambiguities during the data analysis. To improve the readability of this research work we used the cryptocurrency weakness for the main feature in the remainder of this document since the main features represent the aggregation of similar weaknesses. To ensure that the study identified a reliable set of main features, the research aimed to reach theoretical saturation concerning the emerging weaknesses. Since no new main feature emerged in the last 27 data sources identified in the literature review, the team was confident it have reached theoretical saturation (The researcher reached a point in the analysis of data that sampling more data sources could not lead to more information related to cryptocurrency weaknesses).

To consolidate and critically evaluate the derived cryptocurrency weakness and their respective description, a focus group was formulated to review and provide feedback. The focus group discussion participants consisted of blockchain experts who had experience in dealing with blockchain. The final weaknesses and their description were revised according to the focus group outcome. For example, composite weaknesses were split into primary weaknesses.

SLR Step 5: Systematic Review Presentation

After the focus group review of the identified cryptocurrency weaknesses, 18 cryptocurrency weaknesses were revealed. To enhance visualization and interpretation, the 18 weaknesses are briefly described and presented in the matrix Table xx.

4.3 PRISMA Checklist Flow Diagram

The inclusion and exclusion criteria are key components of the systematic literature review. Inclusion criteria are everything, which a study needs to be included in the review. In contrast, exclusion criteria explain the factors, which would make a study ineligible and the study needs to exclude them from the review process. The assessment of multiple Systematic Reviews (AMSTAR) and preferred reporting item for systematic review and meta-analysis (PRISMA) tools are commonly used exclusion and inclusion checklist criteria. According to (Ding et al, 2020), AMSTAR tool is usually used for investigating the methodological quality of a literature review. On the other hand, Brown et al (2020) described PRISMA as a tool that focuses on systematic reviews through evaluating randomized trials, particularly in the evaluation of interventions. The PRISMA tool provides evidence-based items used for systematic reviews and Meta-analysis. The current study used PRISMA tools for the systematic review because of its importance to demonstrate the quality of reviews, allowing researchers to assess the weaknesses and strengths, and allowing replicating review methods. The PRISMA tool used during this study is given in the diagram below.

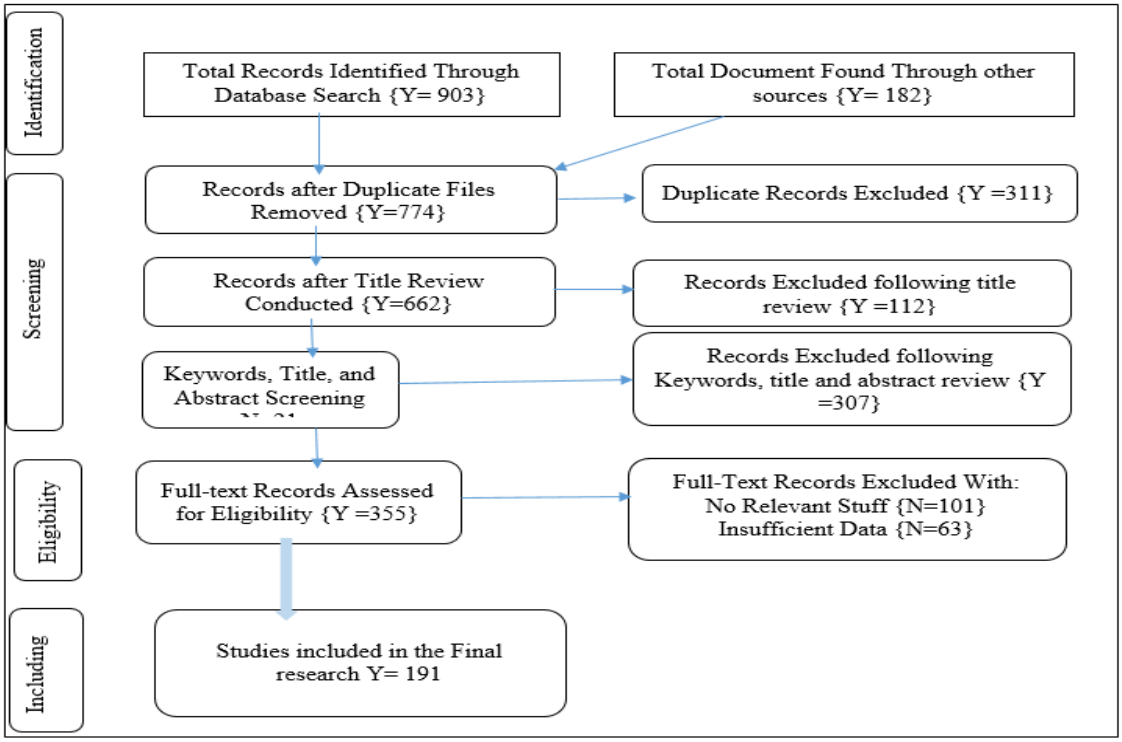

Figure 2: PRISMA TOOL & Paper Selection source: (author)

After deep insight and searching through ACM Digital Library, this study found research articles matching the keywords “volatility and other challenges in cryptocurrencies”. The

initial search yielded a total of 903 papers, with 182 additional sources being found outside of the initial search. Out of 1085 selected sources, this review found that 311 research papers were replicated. Other sources were excluded either because of the title, abstract keywords, or found irrelevant in the full-text review. For final data synthesis and data extraction, this study considered 191 sources for reviews, and 66 out of 191 were reviewed before reaching theoretical saturation.

4.4 Critical Appraisal Skills Program (CASP) Tool

The critical appraisal skills program is a generic tool for appraising or systematically assessing the trustworthiness, relevance, and results of published papers during a qualitative research process (Long et al, 2020). It helps researchers to extract meaning, relevant, and reliable information that exists in literature matching with the current study. For the current study as discussed above, the study relied on keywords and appraisal tools, which match the objectives and theme of the present study. For further elaboration and extracting relevant information, the researcher followed four steps, which guided to the completion of the current study task. The figure below shows the steps taken to select the relevant research materials.

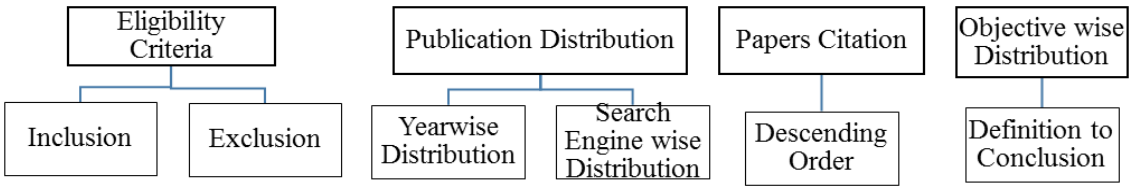

Figure 3: Critical Appraisal Skills Program Tool source: (author).

The eligibility criteria for inclusion and exclusion have been briefly discussed in the research methodology and PRISMA Tool framework. For publication distribution, the current study considered only the research articles that are been published after 2015 and for research journals, the researcher relied on ACM Digital Library academic search database for computer science with the highest number of articles and bibliographic entries. Paper citations have been considered as key focused, where the study considered only those papers that have more than 10 citations.

5.0 Synthesis and Data Analysis

Data synthesis is a statistical measure to combine the results of different studies and literature to obtain a qualitative estimate of the overall effect of a particular variable or intervention on a defined outcome (Ding et al, 2020). It helps researchers to combine the arguments, ideas,

findings, recommendations, and critical reviews of different researchers in a systematic manner. In the integrative literature review process of this study, the researcher focused on the arguments, ideas, judgments, and critical reviews of the previous studies related to the first objective of this study.

5.1 The Weakness of Existing Cryptocurrency Models Used in E-commerce

The literature review study exposed numerous weaknesses that hinder the adoption of cryptocurrency in e-commerce. The results identified were as follows.

Weakness 1: Highly Volatile

The characteristics of cryptocurrencies are that they have no controlling agency, and the cryptocurrency market is emerging and still small. They also lack governance are purely digital assets and are not backed by anything physical like a currency or commodity and there are no governments to enforce their use as a currency. This makes cryptocurrencies susceptible to speculative bubbles fueled by irrational speculative activity that leads to a high level of volatility (Moratis, 2021).

Weakness 2: Conversion issues

Cryptocurrency to cash or one cryptocurrency to another conversion is limited to a few vendors (Katsiampa, 2019). The few vendors that accept conversion also limit conversion monetary value to a little cash. Many conversion vendors prefer conversion for other cryptocurrencies. This affects the class of cryptocurrency holders that are willing to convert their cryptocurrency to fiat currency.

Weakness 3: Scalability

The generally acceptable country-wise currency exchange and banking transactions in different currencies have been made scalable. Cryptocurrencies however have not reached the scalability level of the present currencies (Lacity, 2020).

Weakness 4: Lack of Legislation

Digital currencies are decentralized virtual entities, and authorities are currently not geared to handle this advanced technology. Therefore, the lack of legislation regulating these digital currencies and providing any sort of user protection has become a huge challenge (Kondo et al, 2020).

Weakness 5: Illiquidity and trading costs

In research to evaluate volatility connectedness in the cryptocurrency market, Yi et al (2018) found that the cryptocurrency market is generally less liquid. They indicated that the supply of many cryptocurrencies is controlled, with new units released according to a pre-set timetable, and it should thus come as no surprise that the high volatility of cryptocurrency prices is liquidity-driven. This constrains the ability of investors to exit from their cryptocurrency positions. In their findings also, part of the issue is that there is also no uniformity in the treatment of cryptocurrency trading since some exchanges incorporate the inherent features of cryptocurrencies, while others offer bilateral trading, with some replicating the core features of electronic trading platforms.

Weakness 6: Custody, clearing, and settlement problems

Besides further regulatory clarity, institutional custodial solutions for cryptocurrencies are both legally and technologically complicated. Pandya et al (2019) in their research to investigate cryptocurrency adoption efforts and security challenges in different countries found out part of the complexity is driven by the public and private key management. This research further indicated that the cryptographic keys need to be safeguarded and custodial solutions, therefore, must include multi-layered security features that appropriately manage and control how custodial systems can access, use and verify these keys. When these security measures are inadequate, disastrous results can ensue.

Weakness 7: Valuation difficulties

There is no consensus valuation approach, there are no commonly accepted metrics, and reported pricing information may differ substantively across venues (Schär,2020).

Weakness 8: Interoperability

The ability of blockchains and cryptocurrencies to see, access, and share information across different blockchains or blockchain networks is still limited (Fauzi et al, 2020). Interoperability enhances transparency and increases the communication rate of blockchains. Presently the technology has been divided to make multiple uses of it in different industrial domains and separate forms of cryptocurrencies. The technology needs to be made interoperable for the internet dedicated to Blockchain and crypto exchange (Pandya et al, 2019).

Weakness 9: Cryptocurrencies are unpopular

A very small group of online merchants still only accept Cryptocurrencies. This makes it unfeasible to completely rely on cryptocurrency and blockchain-based tokens as a currency (Dennis & Disso, 2019).

Weakness 10: Regulatory and Legal Dilemmas

Cryptocurrencies are not regulated and do not benefit from the standard legal protections afforded by traded financial instruments. This leads to convoluted legal risks and inserts uncertainty, which can meaningfully influence both instability and risk management for these digital assets (Kang et al, 2021). There is also still no international consensus on how to best regulate cryptocurrencies (Yin et al, 2021).

Weakness 11: Diversity

Cryptocurrencies are qualitatively and technically diverse and incompatible. The various presently existing cryptocurrencies differ in several aspects, especially in terms of security, programmability, and governance characteristics (Valdeolmillos et al, 2019).

Weakness 12: Anonymity

To provide some form of privacy for users in the cryptocurrency ecosystem, cryptocurrencies like Bitcoin have designed their protocols to be pseudo-anonymous, where users use public key addresses to conduct their transactions rather than their actual real-world identities. Pseudonymity results in transactions being recorded as transfers of funds between one public key belonging to the payer to another public key belonging to the payee, thus preventing an observer from identifying the real-world identity of the payer and payee (Mnif, & Jarboui, 2021). However, complete anonymity opens the door to illicit activity that by definition cannot be investigated (Vukolić, 2015).

Weakness 13: The Technology Is Still Immature

According to Hughes et al (2019), cryptocurrencies are facing implementation obstacles beyond the lack of regulation and inactive obligations. Cryptocurrency and blockchain technology is emerging and is still immature in an ecosystem where other options are widely scalable and accepted over it. Kaur and Kaur (2020) also indicated that however long cryptocurrency technology has existed, not much has been done to expand it or enhance interoperability and legal use cases.

Weakness 14: Legal Obstacles

In addition to the lack of legislation, the other big obstacle that stands in the way of cryptocurrency holders like Bitcoin traders and users is the challenge to spend their holdings (Sharma et al, 2020).

Weakness 15: Usability

While cryptocurrency promises that it's accessible and decentralized, its complexity is restricting its user base to a narrow, homogeneous set of early adopters. According to Qureshi et al, (2020), Usability is one of the huge obstacles that hinder the cryptocurrency's path to mainstream adoption.

Weakness 16: Bad Imagery

The cryptocurrency industry association with shady business practices, high-profile hacks, environmental challenges, speculation, market manipulation, criminal associations, and a pronounced lack of regulatory clarity have created a perception and image problem (Bez et al, 2019).

Weakness 17: Data and modeling obstacles

There is no necessary data to model the future of cryptocurrencies. The detailed but narrow data set of actual transaction prices that cryptocurrency markets provide is inadequate for modeling purposes (Teker et al, 2020).

Weakness 18: expensive Mining process

Cryptocurrency mining is energy-intensive and makes the mining process to be expensive. The amount of electricity used to mine bitcoin according to Bouri et al (2019) has historically been high compared to any other usage in most countries.

Table 2: Cryptocurrency weaknesses derived from the literature source: (author).

SN	Cryptocurrency Weakness	Description	Weight out of 66	Percentage mentioned
1.	Highly Volatile	Cryptocurrency prices are highly volatile, responding strongly to global events and speculative concerns about the cryptocurrency market.	66	100%
2.	Conversion issues	Conversion remains a huge hurdle for Bitcoin vendors. As Bitcoin is not a fiat currency and is only limited to monetary value when converted to a cash equivalent, not many	61	92.42%

		vendors go for its conversions for other cryptocurrency types.		
3.	Scalability	Cryptocurrencies are less scalable	59	89.39%
4.	Lack of Legislation	Digital currencies are decentralized virtual entities. They are purely digital products, and authorities are currently not geared to handle this advanced technology. Therefore, the lack of legislation regulating these digital currencies and providing any sort of user protection has become a huge challenge.	52	78.79%
5.	Illiquidity and trading costs	The cryptocurrency market is generally less liquid	51	77.27%
6.	Custody, clearing, and settlement problems	Institutional custodial solutions for cryptocurrencies are both legally and technologically complicated.	49	74.24%
7.	Valuation difficulties	There is no consensus valuation approach, there are no commonly accepted metrics, and reported pricing information may differ substantively across venues.	45	68.18%
8.	Interoperability	The technology needs to be made interoperable for the internet dedicated to Blockchain and crypto exchange.	41	62.12%
9.	Cryptocurrencies are unpopular	The willingness of parties to accept the cryptocurrency as a standard of value in their mutual dealings is still an issue	32	48.48%
10.	Regulatory and Legal Dilemmas	cryptocurrencies are not regulated products and do not benefit from the standard legal protections afforded traded financial instruments.	27	40.91%
11.	Diversity	Cryptocurrencies are qualitatively diverse and not interchangeable (cryptocurrencies differ)	25	37.88%
12.	Anonymity	A problem for combating money laundering and countering terrorist financing or tax evasion	20	30.30%
13.	The Technology Is Still Immature	The technology is emerging and still immature in a system where other options are widely scalable and accepted over it.	20	30.30%
14.	Legal Obstacles	In addition to the lack of legislation, the other big obstacle that stands in the way of cryptocurrency holders like Bitcoin traders and users is the challenge to spend their holdings.	19	28.79%
15.	Usability	Buying and selling cryptocurrencies currently are difficult	15	22.73%
16.	Bad Imagery	Cryptocurrency still has a PR problem.	12	18.18%
17.	Data and	The detailed but narrow data set of actual	09	13.64%

	modeling obstacles	transaction prices that cryptocurrency markets provide is inadequate for modeling purposes.		
18.	Mining process	The mining process in cryptocurrencies takes up more electricity bills	03	4.55%

6.0 CONCLUSION

The results of this analysis as shown above indicated that there are several weaknesses in the present cryptocurrencies. To enhance visualization and interpretation, the 18 weaknesses are briefly described and presented in the matrix Table xx below. The frequency to show several sources that mentioned each weakness and the percentage concerning all reviewed papers before reaching theoretical saturation. Although research shows that Distributed Ledger Technology (DLT) and cryptocurrencies open up many opportunities, such as fast, efficient, traceable, and secure local and cross-border transactions, the above challenges must be addressed.

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