



CRYPTOCURRENCIES IN THE NEW ECONOMY

Ant BULUT

Istanbul Commerce University, Turkey

Received: November 10, 2018

Accepted: December 12, 2018

Published: December 15, 2018

Abstract:

Developments in internet-based payment platforms employing the blockchain technology known as “cryptocurrencies” contributed their integration in the official payment systems. Because of the growing interest in cryptocurrencies, it is necessary to review existing cryptocurrency research literature and determine areas for future studies. This study gives an up to date summary of accessible literature on cryptocurrencies according to their subject of issues, theories, methods, and findings and provides direction for future research. A systematic literature review was carried out to examine accessible academic and reliable publications between 2010 and 2018. Based on results research limitations for individual, organizational, ecosystemic and discourse approaches are identified and the study concluded that there are still insufficient and uncovered issues related to the cryptocurrencies notably from a legal and regulatory point of view.

Keywords:

Digital Currency, Cryptocurrency

1. Introduction

After the global financial crisis in 2008, interest on digital currency has revived (Chuen, 2015). Developments in internet-based payment platforms employing the blockchain technology known as “cryptocurrencies” contributed their integration in the official payment systems. Use of digital currency allows faster, more flexible, and more innovative payments in financing goods and services compared to payment systems that are based on fiat currency. Digital currency is an electronic medium of exchange, unit of account, and store of value. Given the interest in digital currency this research article focuses on cryptocurrency.

A subset of a digital currency, cryptocurrency is a special class of digital currency and a form of programmable money which uses cryptographic algorithms in digital currency transactions for siber security and control platforms along with digital money supply. One of the most well well-known cryptocurrencies, Bitcoin uses a very complex cryptographic algorithm that requires a connected peer-to-peer network of computers to conduct computationally expensive mathematical processes (Velde, 2013).

Utilization of cryptographic currencies (“decentralized digital currency” or “cryptocurrency”) and open source software constitute decentralized consensus systems (DCS), which are based on peer-to-peer mechanism instead of central authority and depend on cryptography for consensus of network by verification (Glaser et al., 2015). Despite of the increasing interest in Bitcoin and growing of decentralized consensus systems it is very complicated for the mainstream financial institutions and public to accept and have an insight on them for further use. Bitcoin, cryptocurrency, DCSs are discussed broadly and widely in both financial instituons and regulators because of its distinctive and reformative new methods in monetary transactions (Brunnermeier, 2008). This brings the need to identify the cryptocurrency research limitations and to specify issues that have been addressed by reviewing existing academic literature.

This study is divided into three parts: In the first part research questions are given, the second part consists of the results and answers to the research questions the third part is summary of the study.

2. Literature Review

This study is based on a systematic literature review (SLR) to reach an understanding of a notion or something of an interest by defining, surveying and combining the findings of all relevant academic studies addressing targeted queries (Baumeister et al., 1997). There were two main steps followed: query and selection to identify the articles for the review. These steps were taken to determine state of intelligibility of cryptocurrency from generally accepted accessible sources of academic and public knowledge.

Study of Tsukerman 2015 was about the state of Bitcoin regulation. Consumer confidence and people trust in Bitcoin were necessary elements for regulators.

Trust was examined at institutional level in Zarifis et al.2015 study which offered insights on consumers perspective such as which aspects reinforce trust, which decrease trust and why.

Sas et al.2015 showed a user-centered approach and argued that cryptography areas to the exploration of Bitcoin has been limited and that a richer understanding of the issue of trust informed by Bitcoin users was important.

Lustig et al. 2015 use “power of algorithms to direct human action and to impact which information is considered true as concept to examine the culture of users of Bitcoin, a crypto-currency and payment platform.

Mai et al.2015 study emphasized impact of influential users on social media for bitcoin performance stating that community members differ in the frequency, volume, type, and quality of digital content they generate and consume, i.e influential people, such as opinion leaders, have disproportionate influence on others largely because they have greater exposure to mass media than their followers.

Hur et al. 2015 study aimed to find the degree to which the participation of a Bitcoin user is dependent on the speculative opportunities in the Bitcoin market and in this way tested Bitcoin’s competence against traditional currency.

Glaser et al. 2014 addressed different standpoint emphasizing users' intentions when changing their fiat currency into a digital currency and users’ interest regarding whether digital currencies is driven by its appeal as an asset or as a currency.

Georgoula et al. 2015 study, on the other hand, used Twitter user sentiments to show positive correlation of twitter sentiment ratio with Bitcoin prices.

An organizational approach adopted by Andrychowicz et al. 2016 study, designed an online protocol for playing a lottery, in a completely decentralized way that is secure even if no trusted third party is available to be used as a replacement for the online gambling sites.

Connolly et al.2015 compared organization adopters of Bitcoin from nonadopters according to their IT-readiness, innovativeness and social media presence.

The study of Ingram et al. 2015 focused on resilience of a new firm in an emergent field with limited resources and without a formal structure in case of extreme events that such entrepreneurial firms rely on their collective identity in forming resilient responses compared to mature firms characterised by formal structures and some slack resources.

Ingram et al. 2016 addressed new firms’ use of collective resources to build legitimacy arguing that local entrepreneurs seeking mainstream legitimacy behave like subsidiaries while simultaneously distinguishing themselves from the broader Bitcoin community as they seek legitimacy.

Kazan et al.2015 study examined companies’ digital business models within the bitcoin network and suggested that companies within the bitcoin network exhibits six generic digital business models which are in turn driven by three modes of value configurations with their own distinct logic for value creation and mechanisms for value capturing.

Studies like Chan et al.2017, D’Alfonso et al. 2016, ElBahrawy et al.2017, Hayes 2015, Hileman et al. 2017 analyzed cryptocurrencies statistically with historical data, market capitalization, number of users, and sectoral structure which gave insight about cryptocurrency market.

Other studies like Chiu et al.2014, Kondor et al. 2014, Sompolinsky et al. 2018, Tomaš et al.2015, Zohar 2015 were related with cryptocurrency transactional structure, volume of transactions, payment network that provide information about the impact of cryptocurrency on economy.

Cusumano 2014, Glaser et al. 2015, Van Alstyne 2014, Villarreal et al.2016 approached from a different point of view that question the reality, existence and true value of the cryptocurrencies while giving insights about other technological structures related with them.

Studies like Spenkeliink 2014, Meiklejohn et al. 2016, Harwick 2016 brought perspectives about social and industrial impact, challenges, adoption of cryptocurrencies.

The study of Polasik et al. 2016 argued market, economy, characteristics, and technological structure of Bitcoin as an innovation.

Studies of Brito et al. 2016, Chuen et al. 2015, Rosenberg 2011 were comprehensive views for cryptocurrencies, bitcoins and altcoins giving contextual information about their characteristics and structures.

Morisse 2015, Narayanan et al. 2017, Yli Huumo et al. 2016, Oshodin et al. 2016 gave information about the academic literature of bitcoin and cryptocurrencies.

Figure 1. underlines the issues for each approach of research topics. Issues grouped under individual approach are user sentiment, intentions, behaviour, content and consumer trust that based on cryptocurrency's utility experienced by individuals.

The study of Georgoula et al. 2015 measured the sentiment ratio of Twitter users concerning Bitcoins on a daily basis and found that measurements of collective mood based on the appropriate sentiment analysis can help to predict short-run movements in the value of Bitcoins.

User Intentions discussed in the study of Glaser et al. 2014 were used as a variable for Bitcoin volume traded at the exchange and within the Bitcoin system. The results showed that new Bitcoin users rather use it as an asset than as a currency and the correlation between the bitcoin volume traded and the number of payers for goods or services was negative.

Tsukerman 2015 study examined user behaviour in a way that its use for unlawful activity which did not require an institutional (and subpoenaable) intermediary which in turn created the popular imagination that Bitcoin is associated with online black markets, unsavory characters, and risks to consumers from hackers.

Hur et al. 2015 stated that the dominant view for Bitcoin's role of a legitimate currency was in question so the nature of Bitcoin was speculative but not as strong as being the sole reason in participating in Bitcoin market.

Mai et al. 2015 used the user-generated content and argued that the vocal minority and the silent majority exhibit distinct relationships with bitcoin performance, in terms of both transaction volume and returns.

Under trust issues Lustig et al. 2015 used concept of power of algorithms to direct human action and to impact which information is considered true to examine the culture of users of Bitcoin.

Zarifis et al. 2015 studied trust in business to consumer transactions carried out using digital currencies such as Bitcoin.

Sas et al. 2015 explored the specific trust challenges raised by the Bitcoin technology.

Under organizational approach Andrychowicz et al. 2016 study constructed protocols for secure multiparty lotteries using the Bitcoin currency, without relying on a trusted authority. The cryptographic "secure multiparty computation (MPC)" protocols are one of the most advanced types of multiparty protocols that can be performed digitally.

Connolly and Kick 2015 study used organizations' adoption to bitcoin issue and compare Bitcoin adopters and non-adopters according to their IT readiness, innovativeness, and social media presence.

Resilient behaviour by firms is examined in Ingram et al. 2015 study.

Ingram et al. 2016 study developed theory around legitimacy in a decentralised system and explained how a Bitcoin entrepreneur, while part of the larger Bitcoin community, distinguishes itself from the collective in order to be seen as legitimate among a new set of stakeholders.

Kazan et al. 2015 examined value creation by a firm and showed that value chain and value network driven business models commercialize their products and services for each value unit transfer, whereas value shop driven business models commercialize through subsidized and revenue generating users. Also value chain and value network driven bitcoin business models had the capabilities to create market entry barriers by leveraging their value delivery architectures and value stakeholder networks against prospective bitcoin rival firms.

For ecosystemic approach the studies grouped under economy issues were Chan et al. 2017, Chiu et al. 2014, D'Alfonso et al. 2016, Hayes 2015; studies under sociology issues were Cusumano 2014, Glaser et al. 2015, Tomaš et al. 2015, Villarreal et al. 2016, Zohar 2015; studies under ecology and system issues were ElBahrawy et al. 2017, Kondor et al. 2014, Spenkeliink 2014, Sompolinsky et al. 2018, Van Alstyne 2014; studies under industry were Harwick 2016, Hileman et al. 2017, Meiklejohn et al. 2016, Polasik et al. 2016.

For the discourse approach issues under comprehensive view studies of Brito et al. 2016, Chuen et al. 2015, Rosenberg 2011 gave detail contextual information about cryptocurrencies, blockchain, and bitcoin; studies of

Morisse 2015; Narayanan et al. 2017; Yli Huomoet al. 2016, Oshodin et al. 2016 under literatural view were literature reviews for digital currencies, bloackchain, cryptocurrencies, and Bitcoin.

From the studies based on the results it was concluded that the studies relating to ecosystem and system issues are mostly examined.

DOI/IDT was the highest used model with the studies of Connolly et al.2015, Polasik et al. 2016, and Spengelink 2014.

Chiu et al. 2014 study used economic theory to understand the fundamental economic trade-offs and address relevant policy issues.

Hur et al.2015 study adopted perspective on technology acceptance and its two primary components: network effects and switching costs. They examined the existence of network effects within Bitcoin and its strength against conventional currency.

Lustig et al.2015 study described algorithmic authority as the legitimate power of algorithms to direct human action and to impact which information is considered true. They used this concept to examine the culture of users of Bitcoin, a crypto-currency and payment platform.

Polasik et al. 2016 study used both the theory of networks externalities and Diffusion of Innovations Theory. The combination of these two theories were to assess the early success of Bitcoin.

According to the study of Rosenberg 2011, modern cryptography had its basis in complexity theory and theory of computation.

Tsukerman 2015 study discussed the creation of a new theory of digital property based on blockchain technology that the advent of the blockchain as a trustless public ledger that allows for rivalrous digital property warrants a new theory of property as an information communication and storage system.

Villarreal et al.2016 based their work on Social Exchange Theory (SEXT) and analyzed bitcoin from the standpoint of fiat money.

Zarifis et as. 2015 study's model followed the theory of reasoned action where beliefs lead to actions thus trusting beliefs lead to trusting intentions and finally trust related behaviours.

With regard to the results of the theories used or mentioned in studies most of the literature reviewed were not followed a theory. Therefore following studies on cryptocurrencies may utilize this gap for further researches.

Table 1. shows the research methods applied according to the studies' authors.

Studies of Brito et al., 2016, Chuen et al. 2015, Cusumano 2014, Harwick 2016, Rosenberg 2011 were context driven. They did not follow any specific research method but mostly presented characterization of the study subject, or in a form of collective of academic journals, or were practice-based which means providing historical examples of the subject issue.

Andrychowicz et al. 2016 used transactions in the actual Bitcoin system for prototype implementation and constructed protocols which could be used in real life as a replacement for the online gambling sites for secure multiparty lotteries using the Bitcoin currency.

Connolly et al.2015 study used qualitative, categorical analysis to understand the current state of Bitcoin adoption.

Chan et al. 2017 study used statistical analysis in terms of log likelihood values, information criteria, goodness of fit tests, probability plots, quantile plots, plots of two important financial risk measures, back-testing using Kupiec's test and dynamic volatility and the data were the historical global price indices of cryptocurrencies which were obtained from the BNC2 database from Quandl.

Chiu et al. 2014 study developed general equilibrium monetary model for quantitative analysis and based their model on the alternating market formulation to study frictions that give rise to the usage of money while still keeping the distribution of balances analytically tractable.

D'Alfonso et al. 2016 compiled a quantitative analysis and made simplifying assumptions to assist with the creation of a 5-year predictive model for the price of each cryptocurrency. They compiled a Monte Carlo simulation to project the impact of various events occurring within a single time-series simulation. Data for qualitative research collected through interviews with industry professionals.

ElBahrawy et al.2017 study's statistical analysis focused on the market share of the different cryptocurrencies and was based on the whole history of the cryptocurrency market between chosen years.

Table 1. Methods Applied in Cryptocurrency Researches

Writer	Research Method Applied
Andrychowicz et al. 2016	Quantitative (Prototyping)
Brito et al., 2016	Context-driven (characterization)
Chuen et al. 2015	Context-driven (collective academic journals)
Cusumano 2014	Context-driven (practice-based)
Connolly et al. 2015	Qualitative (Categorical analysis)
Chan et al. 2017	Quantitative (Statistical Analysis, parametric distributions)
Chiu et al. 2014	Quantitative / modeling
D'Alfonso et al. 2016	Qualitative (Interviews) / Quantitative (linear regression, Monte Carlo analysis)
ElBahrawy et al. 2017	Quantitative (Statistical Analysis)
Georgoula et al. 2015	Quantitative / Empirical modeling
Glaser et al. 2014	Quantitative / Empirical modeling
Glaser et al. 2015	Qualitative (Taxonomy)
Hayes 2015	Quantitative (Regression modeling / cross-sectional analysis)
Hur et al. 2015	Quantitative (fixed effects regression and Poisson fixed effects)
Harwick 2016	Context-driven (practice-based)
Hileman et al. 2017	Qualitative (Taxonomy, web surveys)
Ingram et al. 2015	Qualitative (Interviews)
Ingram et al. 2016	Qualitative (Case Study)
Kazan et al. 2015	Qualitative (Case Study)
Kondor et al. 2014	Quantitative (modeling / Statistical Analysis)
Lustig et al. 2015	Qualitative (Grounded Theory: Interviews, surveys)
Mai et al. 2015	Quantitative (Contemporaneous Analysis, VEC/VAR Modeling)
Meiklejohn et al. 2016	Qualitative (Clustering Heuristic)
Morisse 2015	Qualitative (Data Analysis with Review of Literature)
Narayanan et al. 2017	Qualitative (Data Analysis with Review of Literature)
Oshodin et al. 2016	Qualitative (Data Analysis with Review of Literature)
Polasik et al. 2016	Quantitative (regression analysis)
Rosenberg 2011	Context-driven (collective academic journals)
Sompolinsky et al. 2018	Qualitative (content analysis)
Spengelink 2014	Qualitative (Interviews)
Sas et al. 2015	Qualitative (Framework)
Tomaš et al. 2015	Qualitative (Analysis with Review of Literature)
Tsukerman 2015	Qualitative (Analysis with Review of Literature)
Van Alstyne 2014	Qualitative (content analysis)
Villarreal et al. 2016	Quantitative (historical data analysis)
Yli Huomoet al. 2016	Qualitative (Data Analysis with Review of Literature)
Zohar, Aviv 2015	Qualitative (content analysis)
Zarifis et al. 2015	Qualitative (Framework)

Other studies include empirical modeling (Georgoula et al., 2015 Glaser et al. 2014), taxonomy (Hileman et al. 2017, Glaser et al. 2015), qualitative analysis with literature review (Yli Huomoet al. 2016, Tsukerman 2015, Tomaš et al. 2015, Oshodin et al. 2016, Narayanan et al. 2017, Morisse 2015), qualitative analysis with framework Zarifis et al. 2015, Sas et al. 2015).

Results showed that mostly qualitative methods applied in the studies. Researchers used mostly data gathering (historical data, surveys, interview and case studies), empirical modeling, regression analysis, statistical analysis and literature review.

Mai et al. 2015 study investigated the predictive power of social media metrics for bitcoin returns, as well as their dynamic relationships. Data of the research was collected from social media data which were for a short time period and also the language was mostly in english language.

Glaser et al. 2014 study was about the users' intentions when changing a domestic currency into a cryptocurrency like Bitcoin and had also limitations for the timing of data. Considering the users around the world the language and the data length for empirical researches would have made considerable difference on the results.

Study of Kazan et al. 2015 was about how bitcoin firms create and capture value through digital business models. However business models or cases for business models to be investigated was limited.

Study of Ingram et al.2016 was about how a new firm uses legitimacy in one community as a scaffold to build legitimacy in a different community, with different norms, and the role of the technology in facilitating this. However because of the anonymity of the users there were also several number of unidentified firms which is also the same limitation for Ingram et al. 2015 study and valid for the individual issues.

The study of Spenklink 2014 was about the factors influencing adoption and one of the datas which its model based on was opinion of multiple experts. As in the case under organisational issues number of experts for cryptocurrencies are also limited.

Villarreal et al.2016 study examined Bitcoin sociologically and empirically with regard to its global exchange, consumption, and institutionalization. However results were limited to English-speaking respondents, and although these respondents may be situated all over the world.

5. Conclusion

This study gives an up to date summary of accessible literature on cryptocurrencies but can not cover all the literature about cryptocurrencies so far since sources of information are limited to selected academic or expert community.

There are still insufficient and uncovered issues related to Bitcoin (or the cryptocurrencies) from a legal and regulatory point of view. The roles of parties in cryptocurrencies are not covered enough because of its anonymity also their social structure is not clear. We can also expect in the future researches of consumer protection rules, because of the complexities in understanding how cryptocurrencies work and the eventual risks that arise for consumers or end users. These areas need to be covered for future reseaches.

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