

# Knowledge Management and Cryptocurrencies: Review and Reflection

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**Abstract:** In this paper we try to reflect on how one of the financial phenomena of the last twenty years, namely cryptocurrencies, has been analysed by the scientific community of the Knowledge Management (KM) field. The issue is relevant because the raise of cryptocurrencies as an economic asset has been occurring in a time in which KM gained social prominence. And also because the evolution of cryptocurrencies should be also related to knowledge about their own value. Within this context, we present a literature review on papers that exist in the SCOPUS database about cryptocurrencies and KM. After analysing those papers, the general idea is that KM is very far away from the cryptocurrency phenomenon; the reason may be that it is very difficult to use the more common models available on KM to analyse cryptocurrencies; also the economic and social agents that might be interested in KM are not those who invest in cryptocurrencies; finally, the data available on cryptocurrencies are mostly speculative, and it is very difficult to make any scientific study on them. These conclusions may be of interest for the KM community at large, because they indicate a new subfield of research, and for practitioners, because they mean that there is not much science in the evolution of cryptocurrencies themselves. Finally, for policymakers, the findings mean the expanding the possibility of use of cryptocurrencies in societies may be extremely risky given their volatility and the lack of precise scientific knowledge about them. The paper is original because it relates to concepts that have only very seldom and scarcely put together.

**Keywords:** Cryptocurrencies, Knowledge management, Economic assets

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## 1. Introduction

Some twenty years ago, strange news began to emerge in the economic sections of journals about a new kind of “currency”; the fact the mentioned “currency” is really a “currency” is nowadays a topic of debate (see section 2). The “currency” was based on a “code”. And there was not even a certainty on the person that had created the “code”. The Human Species being bound on curiosity, the mystery arose interest in the “currency” and suddenly its value raised from 1 dollar to 100, then 10000 and even more. Suddenly “cryptocurrencies” multiplied and became known as a “investment of the middle class” attracting many youngsters whose appetency for technology was very big. Matters came to a high point when Elon Musk the world richest man decided to join the party. The Deutsche Bank said that “Cryptocurrencies are the new gold”. And, during COVID-19 bitcoin attained the value of 54.000 euros / 60000 dollars in November of 2021. At the time the forecast was that bitcoin would reach 500 000 dollars by 2030. Then suddenly, all went wrong, and in economic terms “the bubble burst”: in one year bitcoin devaluated by 75%. Countries that had accepted bitcoin as official money (like El-Salvador and Central African Republic) went into big trouble. And on the internet many so-called “experts” kept promoting the benefits of this new and “free of governments” “currency” that would serve as a definitive promoter of economic development and social prosperity.

Given the background that was just exposed, in this paper we want to explore what can KM science tell us about cryptocurrencies. For that we will analyse the papers that have been published on the topic in the SCOPUS database. We also will discuss the findings based on other outside sources. Therefore, the paper will be composed by the following six sections: 2. Concepts; 3. Theory on Cryptocurrencies; 4. Basic data on Cryptocurrencies; 5. Method; 6. Results; 7. Discussion; 8. Conclusions.

## 2. Concepts

Cryptocurrencies are digital creations, that, when traded, acquire value, which in turn makes possible to use those assets to buy goods and services. Some of these assets, in some specific circumstances are directly accepted as a form of payment. Otherwise, an owner of a cryptocurrency may try to sell that asset and use the cash he receives to buy other goods and services. In summary *“A cryptocurrency is a digital record of ownership of nominal balances  $m$  that can be used to pay for transactions; . For any transaction, the buyer gives instructions to transfer ownership of a certain amount of his balances to the seller.”* (Chiu, Kooeplt, 2018)

Cryptocurrencies are created using blockchain technology. Cryptocurrencies are created by private agents with no public intervention.

The most famous cryptocurrency are Bitcoin, followed by Ethereum among many others.

### 3. Theory on Cryptocurrencies

The price of a cryptocurrency is defined by what economists call “market forces”, and namely the following (Bloomenthal, 2022): *“the supply of the asset and the market’s demand for it, the cost of producing a crypto currency through the mining process, the number of competing cryptocurrencies, regulations governing its sale and use and finally media and news.”*

It is also very interesting to note that the immediate effect on cryptocurrencies is microeconomic, because the asset is owned by a single economic agent, but there are also some macroeconomic effects namely: potential financial instability, consumer protection issues, safety, energy intensity, that may be compared to the possible economic growth that might be generated by those assets (White. 2023).

Finally, in monetary economics “a coin” is a financial instrument that has the following characteristics: it may be used as a form of change, it may be used as a unit of count, it has immediate liquidity, it has no risk, other than the possible depreciation, and, finally, it does not generate any return. Put against that reference framework, bitcoins and other cryptocurrencies are not exactly “coins”; in fact, they are much more like “shares” that are traded in the stock market. This happens, mainly because these rather special “currencies” are valued as any other “asset” in the stock market, and in fact it is precisely because crypto may rise so much in value that they are seen as a “good investment” and an attractive one by so many people.

### 4. Basic data on Cryptocurrencies

In terms of price, Bitcoin started to be traded at virtually nothing in 2010, and in the beginning of 2011 it was worth one dollar; then the rise began, the asset going from 2000 dollars to 20000 in 2017, and then to 3000 at the end of 2018, and then rising to 64 400 in April 2021, then falling back to half of that one month later, rising again to 66000 in November 2021, and decreasing back to 15000 dollars last November. Currently (mid- August of 2023), the value of a bitcoin is in the 296000 dollars. What a rollercoaster.

### 5. Method

We search the SCOPUS database for papers with the following keywords:

Keyword 1	Keyword 2	Total	Business and Management	Management related	Excluded
Cryptocurrency	Knowledge Management	13	0	7	6
Bitcoin	Knowledge Management	19	0	8	11
Ethereum	Knowledge Management	8	2	3	5

We ended up only with 18 papers. It is this set of papers that we will analyse in the following section.

### 6. Results

The impact of blockchain technology in organizational KM has been studied among others by Suciú and al, 2020, who created a model on the application of private Blockchains to knowledge evolution, ownership and transfer; socio-economic and cultural aspects of integrating blockchain in the knowledge transfer systems were also discussed.

In fact, the analysis of cryptocurrencies has been done in quite exploratory ways:

- On visualization: Yue, Shu, Zhu, Papadopoulos, and Liu, (2019,162), present BitExTract, “an interactive visual analytics system, aimed at exploring the evolutionary transaction patterns of Bitcoin exchanges from exchange versus exchange and the exchange versus client perspective. In particular, BitExTract observes the transactions between exchanges over time via a massive sequence view, depicting the trading network of exchanges and their temporal transaction distribution. BitExTract also examines and compares the evolution patterns of transactions between different exchanges.”
- On forecasting: Dzenopoljac and Bontis (2020) analyzed the ability of twitter to predict the evolution of the cryptocurrency market. They found that public information arrivals have a positive impact on

the volatility returns, but they cannot eliminate the variability of the volume. Snihovyi, Ivanov, and Kobets, (2015) managed to forecast more than 70% of the price variation of cryptocurrencies using Machine Learning algorithms. Soloviev, and Belinskij (2018) constructed indicators of critical and crisis phenomena in the volatile market of cryptocurrency, and tested those indicators successfully in the last five crisis to date; Lunesu and Marchesi (2016) analysed the relation of Bitcoin's trading and the web search and social volumes about Bitcoin and also if public sentiment, expressed in large-scale collections of daily Twitter posts, be used to predict the Bitcoin market, obtaining significant cross correlation outcomes. Matta, Lunesu, Marchesi (2015) studied the relationship between Bitcoin's trading volumes and the queries volumes of Google search engine, achieving significant cross correlation values, demonstrating search volumes power to anticipate trading volumes of Bitcoin currency.

- On decision making: Adsawinnawanawa and.Keeratipranon, N (2022,1) propose an algorithm for sharing similar knowledge on Monte Carlo algorithm (SSKMC) "to help to decide the action when the agent faces a new experience (unseen state), resulting a small growth in the forecast net worth growth"; Boonpeam Werapun, and Karode (2021,768) analyze the phenomena of "arbitrage" related to cryptocurrencies. They find that "high profit, derived from exploiting market inefficiencies, is correlated with the high risk, and therefore, risk-reducing in the cryptocurrency investment is a crucial topic made even more important because there is a high learning curve for beginners in this market." Afanasev, Dneprovskaya, Kliachin, and Demidko (2018,1) consider that "a huge amount of computer power is used improperly, and namely to run the cryptocurrency mining algorithms, 17 % of the entire global computer power is currently used; with the development of digital technologies, new opportunities arise for a dramatic improvement in data processing and knowledge mining; big corporations should learn how to use distributed computer power and to control themselves while using technology"; Kaur, Sahdev, Singh, Garg, (2021) analyse bitcoin as a concept and from the point of view of the consumer; they compare bitcoin with other assets on variance and correlation, and analysis its dependency on technology; the question of the "Digital Gold" is addressed and the discussion assumes particular relevance since that fall in value that occurred in 2021.
- On privacy and regulations: In the early days of the bitcoin phenomenon, (Ben Sasson and al, 2014 and Androulaki, and Karame, 2014) proposed Zerocash and ZeroCoin as trading devices guaranting privacy; more recently (Lee, Kim, and Oh (2023) proposed Azeroth on Ethereum; after that, Xu, Chen, Gao, Carburnar, ad Shi (2020,316) propose a privacy-preserving exchange scheme, PrivateEx, "in order to preserve the privacy of the exchange of different assets and guarantee the correctness, fairness, and privacy of exchange of assets in the system." Jourdan, Blandin, Wynter, and Deshpande (2019) show that it is very easy for identities to be leaked within the financial transactions of bitcoin and even a weak attacker with little knowledge about mining can do it. Finally, Kanday Batth (2021) analyse the use of hindi mnemonics as a way to generate private keys to wallets
- On regulation: To counter that variability that makes the market very vulnerable, Kim and Lee 2018 suggest policy risk management methods using international standards such as ISO.

## **7. Discussion**

It clearly seems that cryptocurrencies are not an issue that have interested the KM community so far. No paper has been published in any academic journal with relation to the phenomenon. Only one paper (Afanasaev and al, 2018) was published in a Conference Proceedings of a major conference on KM. The main reason for this situation is, we believe, that KM is mainly focused on organizational issues, and in consequence cryptocurrencies fall absolutely outside the KM realm. This occurrence is in itself a pity, because, as all the literature we found points out, the correct management of cryptocurrencies is all about the use of knowledge and in fact, the only way to make a profit, be it individual, organizational or societal from the use of cryptocurrencies is to use knowledge well.

The topics addressed by the literature relating KM to cryptocurrencies – namely visualization, forecasting, decision making, privacy and regulations and regulation, are important if not decisive for the agents that invest in the new currencies but have nothing to do with the KM models. One paper (Adsawinnawanawa and.Keeratipranon, 2022) addressed the knowledge sharing phenomena, but only as feature of an algorithm.

Therefore, we believe that cryptocurrencies could open a new a very interesting field of theoretical possibilities for the KM science because the theory would have to be adopted so that it would be possible to address the phenomenon in scientific terms. This could be a very significant step to bridge the gap between KM science and

Economic science, and also to make KM more relevant not only in organizational terms but also in economic and societal terms. Sometimes it feels as if KM is just seen as “another tool” to address organizational problems, and not “THE TOOL” to analyse the use of knowledge in society, a bit like what happens with Human Resource Management and Development in relation with competences and HR. So in the end, the analysis of cryptocurrencies might be strategically useful for the KM community.

## **8. Conclusions**

According to the SCOPUS database, the analysis of KM relating to cryptocurrencies has been done only in a handful of papers. The topics addressed (visualization, forecasting, decision making, privacy and regulations and regulation), are important if not decisive for the agents that invest in the new currencies but have nothing to do with the KM models. It would be therefore interesting and essential to try to define how the more common and known KM models – like the SECI model or others – might be used in relation to the cryptocurrencies. This would mean that we would know exactly what is the knowledge that is involved in the transaction of cryptocurrencies, a fact that in itself is not clear at all. In fact one idea that might explain the lack of scientific studies related to cryptocurrencies in the KM is the absence of theories that explain the evolution of the cryptocurrencies value. Up to now there is too much data, much information and almost no knowledge, let alone wisdom. Currently there are many models in the KM arena that might be used to address cryptocurrencies, and that might be useful. However the two communities seem to be going in separate ways, and ultimately it is the society that loses. The use of KM in cryptocurrencies would make the crypto market more transparent and efficient.

## **References**

- Adsawinnawanawa, E. Keeratipranon, N. (2022) The Sharing of Similar Knowledge on Monte Carlo Algorithm applies to Cryptocurrency Trading Problem Proceedings of the 2022 International Electrical Engineering Congress, IEECON 2022.
- Afanasev, M. Dneprovskaya, N., Kliachin, M. Demidko, D. (2018) Digital transformation of the knowledge management process Proceedings of the European Conference on Knowledge Management, ECKM, 1, pp. 1–8 2018
- Androulaki, E. Karame, G.O. (2014) Hiding transaction amounts and balances in Bitcoin Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 8564 LNCS, pp. 161–178 2014
- Ben-Sasson, E. Chiesa, A. Garman, C. Tromer, E. Virza, M. (2014) Proceedings - IEEE Symposium on Security and Privacy, pp. 459–474, 6956581 2014
- Bloomenthal A (2022) What determines bitcoin’s price <https://www.investopedia.com/tech/what-determines-value-1-bitcoin/>
- Boonpeam, N. Werapun, W. Karode, T. (2021) The arbitrage system on decentralized exchanges ECTI-CON 2021 - 2021 18th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology: Smart Electrical System and Technology, Proceedings, pp. 768–771, 9454673
- Chiu J, Koepl J (2017) The Economics of Cryptocurrencies– Bitcoin and Beyond\* [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3048124](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3048124)
- Dzenopoljac S, Bontis, N. (2020) Social media as a proxy for intellectual capital: Twitter posts in the cryptocurrency market Gunay, International Journal of Web Based Communities, 18(1), pp. 1–20 2020
- Jourdan, M. Blandin, S. Wynter, L. Deshpande, P. (2019) Characterizing entities in the bitcoin blockchain IEEE International Conference on Data Mining Workshops, ICDMW, 2018-November, pp. 55–62, 8637561 2019
- Kanday, R. Batth, R.S. (2021) Development of hindi mnemonics for generating private keys used in hierarchical deterministic wallet Proceedings of 2nd International Conference on Computation, Automation and Knowledge Management, ICCAKM 2021, pp. 363–368, 9357729
- Kaur, N. Sahdev, S.L. Singh, G. Garg, A (2021) Bitcoin: An investment management tool-comparison between risk and average returns of different financial assets with BTC Proceedings of 2nd International Conference on Computation, Automation and Knowledge Management, ICCAKM 2021, pp. 351–356, 9357722
- Kim, C.Y. Lee, K. (2018) Risk Management to Cryptocurrency Exchange and Investors: Guidelines to Prevent Potential Threats International Conference on Platform Technology and Service, PlatCon 2018, 8472760 2018
- Lee G, Kim N, Oh J (2023) Azeroth: Auditable Zero-knowledge Transactions in Smart Contracts Jeong, H. IEEE Access, 2023
- Lunesu, I. Marchesi, M. (2016) Communications in Computer and Information Science, 631, pp. 155–172
- Matta, M. Lunesu, I. Marchesi, M. (2015) The predictor impact of web search media on bitcoin trading volumes - Proceedings of the 7th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, 1, pp. 620–626 2015
- Snihovyi, O. Ivanov, O. Kobets, (2015) Cryptocurrencies prices forecasting with anaconda tool using machine learning techniques V CEUR Workshop Proceedings, 2015, pp. 453–456 2018
- Soloviev, V. Belinskij, A (2018) Methods of nonlinear dynamics and the construction of cryptocurrency crisis phenomena precursors CEUR Workshop Proceedings, 2104, pp. 116–127
- Suciu, M.C. Năsulea, C. Năsulea, D (2020) Knowledge Decentralization in the Age of Blockchain: Developing a Knowledge-Transfer System Using Digital Assets Contributions to Management Science, pp. 261–274 2020

- White K (2022) Understanding the macroeconomic impact of cryptocurrency and stablecoin economics THE DIGITAL ECONOMY - Nov 4, <https://www.weforum.org/agenda/2022/11/the-macroeconomic-impact-of-cryptocurrency-and-stablecoin-economics/>
- Xu, L. Chen, L. Gao, Z. Carbutar, B. Shi, W (2020) PrivateEx: Privacy preserving exchange of crypto-assets on blockchain Proceedings of the ACM Symposium on Applied Computing, pp. 316–323
- Yue, X. Shu, X. Zhu, X. Papadopoulos, D. Liu, S. (2019) BitExTract: Interactive Visualization for Extracting Bitcoin Exchange Intelligence IEEE Transactions on Visualization and Computer Graphics, 25(1), pp. 162–171, 844004