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A NEW PROPOSAL FOR CRYPTOCURRENCY TAXONOMY: DEFINING LAYERS AND DIMENSIONS THROUGH THEIR INTRINSIC VARIABLES

UMA NOVA PROPOSTA DE TAXONOMIA DE CRIPTOMOEDAS: DEFININDO CAMADAS E DIMENSÕES COM BASE EM SUAS VARIÁVEIS INTRÍNSECAS.

UNA NUEVA PROPUESTA DE TAXONOMÍA DE CRIPTOMONEDAS: DEFINIENDO CAPAS Y DIMENSIONES A PARTIR DE SUS VARIABLES INTRÍNSECAS

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DOI: 10.54899/dcs.v23i87.4283
Recibido: 19/01/2026| Aceptado: 22/01/2026| Publicación en línea: 02/02/2026.

ABSTRACT

In the developing theoretical framework surrounding crypto-assets, a recurring challenge lies in categorizing the distinct types within this domain. Christoffersen (1995), whose work underpins this discussion, describes taxonomy as the process of identifying, naming, and organizing taxa into a coherent system that reflects the relationships between the units observed in nature. In the digital landscape, which is increasingly interconnected through technological progress, investors rely on diverse information channels—such as financial analysts, news outlets, financial organizations, and social media platforms—to guide their decisions regarding cryptocurrency investments. This article aims to develop a taxonomy for classifying cryptocurrencies through the methodologies of Nickerson *et al*. (2013) and Kundisch *et al*. (2021). As the main result of this research, the new taxonomy proposed for classifying cryptocurrencies consists of three layers, eleven dimensions, and forty characteristics. As the universe of cryptocurrencies expands, we suggested further studies to add new iterations to this proposed taxonomy.

Keywords: Criptoassets. Criptocurrencies. Dimensions. Layers. New Taxonomy.

RESUMO

No desenvolvimento do arcabouço teórico dos criptoativos, um desafio recorrente reside na categorização dos diferentes tipos nesse domínio. Christoffersen (1995), cujo trabalho fundamenta esta discussão, descreve a taxonomia como o processo de identificar, nomear e organizar táxons em um sistema coerente que reflita as relações entre as unidades observadas na natureza. No ambiente digital, cada vez mais interconectado pelo progresso tecnológico, os investidores recorrem a diversos canais de informação — como analistas financeiros, veículos de notícias, organizações financeiras e plataformas de mídias sociais — para orientar suas decisões

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sobre investimentos em criptomoedas. Este artigo tem como objetivo desenvolver uma taxonomia para a classificação de criptomoedas com base nas metodologias de Nickerson *et al*. (2013) e Kundisch *et al*. (2021). Como principal resultado desta pesquisa, a nova taxonomia proposta para classificar criptomoedas é composta por três camadas, onze dimensões e quarenta características. À medida que o universo das criptomoedas se expande, sugerem-se estudos futuros para incorporar novas iterações a essa taxonomia proposta.

Palavras-chave: Criptoativos. Criptomoedas. Dimensões. Camadas. Nova Taxonomia.

RESUMEN

En el desarrollo del marco teórico que rodea a los criptoactivos, un desafío recurrente radica en la categorización de los distintos tipos de criptoactivos. Christoffersen (1995), cuyo trabajo sustenta esta discusión, describe la taxonomía como el proceso de identificar, nombrar y organizar taxones en un sistema coherente que refleje las relaciones entre las unidades observadas en la naturaleza. En el entorno digital, cada vez más interconectado gracias al progreso tecnológico, los inversionistas recurren a diversos canales de información —como analistas financieros, medios de comunicación, organizaciones financieras y plataformas de redes sociales— para orientar sus decisiones sobre inversiones en criptomonedas. Este artículo tiene como objetivo desarrollar una taxonomía para la clasificación de criptomonedas mediante las metodologías de Nickerson *et al*. (2013) y Kundisch *et al*. (2021). Como principal resultado de esta investigación, la nueva taxonomía propuesta para clasificar las criptomonedas consta de tres capas, once dimensiones y cuarenta características. A medida que el universo de las criptomonedas se expande, se sugieren estudios futuros para incorporar nuevas iteraciones a esta taxonomía propuesta.

Palabras clave: Criptoactivos. Criptomonedas. Dimensiones. Capas. Nueva Taxonomía.

INTRODUCTION

Following the global financial crisis and the consequent erosion of trust in traditional financial systems, alongside growing skepticism toward government and central bank policies, Nakamoto (2008) introduced Bitcoin as a crypto-ass*et al*ternative to fiat currencies (Paule-Vianez *et al*., 2020). The subsequent adoption of crypto-assets was closely linked to the diffusion of blockchain technology, which enables peer-to-peer transactions without the need for a third-party certifying authority (Casino *et al*., 2019).

Since 2008, the determinants driving the demand for crypto-assets have evolved significantly. According to García-Monleón *et al*. (2023), this evolution can be understood in terms of successive stages. Initially, crypto-assets were associated with the cyberpunk movement and the pursuit of independence from institutional monetary control. Adoption then expanded among technologically advanced early adopters, followed by users seeking anonymity, as exemplified by the Silk Road ecosystem, where psychological factors played a central role. Subsequently, speculative motives and profit expectations became dominant, particularly among miners and investors. With the emergence of Ethereum, tokenization and sustainability gained relevance, later reinforced by metaverse applications that emphasized gamification and social interaction. During the COVID-19 crisis, crypto-assets were increasingly perceived as investment alternatives amid systemic market uncertainty, a trend further intensified by the rise of non-fungible tokens (NFTs), driven by sustainability concerns and fear of missing out (FOMO).

By July 2024, the total market capitalization of more than 9,000 listed cryptocurrencies had surpassed USD 1 trillion (CoinMarketCap, 2024). Notably, cryptocurrencies with higher user adoption dominate market value, with Bitcoin and Ethereum jointly accounting for approximately 67% of total market capitalization (CoinMarketCap, 2024). In this context of substantial market value and increasing acceptance, identifying cryptocurrencies that offer relatively secure conditions for capital allocation becomes essential to support informed investment decisions. Although cryptocurrencies are widely recognized for their volatility (Duan & Urquhart, 2023), investors still seek to optimize risk-adjusted returns (Díaz *et al.*, 2023). Consequently, classifying cryptocurrencies into distinct groups or classes may help investors assess acceptable levels of risk.

Several studies have proposed taxonomies or typologies for cryptocurrencies (Fry & Ibiloye, 2023; Hartwich *et al.*, 2023; Inozemtsev, 2021; Lipatnikov, 2020; Marple, 2021; Sai *et al.*, 2021). Existing research includes qualitative approaches (Arslanian & Fischer, 2019; Van Der Merwe, 2021), quantitative analyses (Fry & Ibiloye, 2023), and text-mining techniques (Kose *et al.*, 2020), as well as classifications focused on specific characteristics, such as blockchain centralization (Sai *et al.*, 2021), initial coin offerings (Lausen, 2019), NFTs (Hartwich *et al.*, 2023), cryptocurrency wallets (Karantias, 2020), regulatory aspects (Inozemtsev, 2021), and fraud schemes (Bartoletti, 2021).

However, these taxonomies generally address isolated features rather than integrating the full set of dimensions relevant to cryptocurrencies. Based on the existing literature and empirical evidence, no study has yet proposed a comprehensive taxonomy grounded in intrinsic variables common to all cryptocurrencies. Therefore, this paper aims to develop a taxonomy that incorporates multiple layers, dimensions, and characteristics—such as intended use, degree of centralization or decentralization, underlying blockchain structure, and maturity—using the methodological frameworks of Nickerson *et al*. (2013) and Kundisch *et al*. (2021). The proposed taxonomy seeks to provide a coherent theoretical framework to support future research and classification efforts, while acknowledging that ongoing technological evolution will require continuous refinement and expansion.

THEORETICAL FRAMEWORK

Understanding Taxonomy in Research

A recurring challenge in various fields is organizing objects of interest into taxonomies. Biology, in particular, has thoroughly examined this issue, creating numerous classification systems that structure the natural world's complexity and lay the groundwork for further research in the discipline.

Within this tradition, Christoffersen (1995) defines taxonomy as the process of identifying, naming, and organizing taxa into a terminological system that reflects the relationships among taxonomic units observed in nature. Under this definition, taxonomy represents a fundamental scientific activity, concerned primarily with the discovery, ordering, and communication of patterns among biological taxa. Similar classificatory frameworks have been adopted in several branches of the social sciences, where taxonomies play a crucial role in organizing complex domains and facilitating analytical understanding (Nickerson *et al*., 2013).

This study adopts a phenetic taxonomy, which classifies elements based on overall similarity, drawing on theoretical foundations originally developed in biology. Phenetic taxonomy seeks to arrange operational taxonomic units—elements within a given universe—into a stable and practical classification system. A classification is considered natural when, on average, members within each group are more similar to one another than to members of other groups at the same hierarchical level. Because classification should incorporate all available information, including both superficial attributes and internal structural characteristics, similarity is computed using data matrices that describe the defining characteristics of the elements under analysis (Sokal, 1986).

The application of taxonomic methods extends well beyond biology. In the field of management, Miller and Roth (1994) developed a taxonomy of manufacturing strategies by examining eleven dimensions—such as price, differentiation, production volume flexibility, quality, performance, speed, service, post-sale support, promotion, distribution, and service level—across a sample of three hundred industries. Based on intrinsic characteristics within these dimensions, the authors identified three strategic archetypes: caretakers, characterized by limited emphasis on developing competitive capabilities; marketers, oriented toward competitiveness through marketing-related dimensions, particularly distribution, promotion, and product positioning; and innovators, which emphasize design changes and rapid product development (Miller & Roth, 1994).

Similarly, in systems theory, Delaurentis and Crossley (2005) proposed a taxonomy for analyzing system-of-systems problems. Their framework categorized systems according to three primary dimensions: system type, level of control, and connectivity. Within each dimension, specific characteristics were identified to better capture the complexity of large-scale systems, enabling more effective analytical tools and methods than those confined to single-domain classifications. The taxonomy was empirically validated through its application to complex cases, including airline resource allocation and the United States National Transportation System, both of which integrate technological and human systems and are characterized by significant uncertainty (Delaurentis & Crossley, 2005).

In the context of digital platforms, Sester *et al*. (2006) developed a taxonomy of virtual product communities (VPCs). Their analysis identified two primary categories of community providers—in-house and outsourced—while revealing a broader range of user interests that define VPCs. These interests encompass social networking, product-specific communities, service and post-sale communities, brand communities, price comparison platforms, sales inducement communities, and user-to-user sales communities, highlighting the multifaceted nature of digital interaction environments (Sester *et al*., 2006).

Key Related Previous Studies

Lausen (2019) developed a taxonomy for Initial Coin Offerings (ICOs) using the methodological framework proposed by Nickerson *et al*. (2013). The primary objective of this taxonomy was to support regulatory decision-making and public policy formulation by systematically classifying crypto-assets. The study analyzed a sample of 60 cryptocurrencies, focusing on investor rights and intrinsic characteristics of cryptocurrencies. By identifying and organizing fourteen dimensions derived from regulatory documents, industry debates, and empirical observations, the taxonomy provided structured insights into the design and functional attributes of crypto-assets. The resulting classification framework enables precise identification of features that may trigger regulatory oversight, offering a comprehensive, explanatory model that consistently differentiates tokens across observed cases (Lausen, 2019).

Adopting a didactic, introductory perspective, Arslanian and Fischer (2019) proposed a simplified taxonomy aimed at facilitating understanding of crypto-assets, based primarily on their use cases and functional characteristics. The authors begin by distinguishing whether a token is fungible, meaning that it is functionally identical and interchangeable with other units of the same crypto-asset. Fungible tokens are further divided into three broad categories: payment tokens, typically associated with cryptocurrencies used as mediums of exchange; investment tokens, which represent financial investments in underlying assets or ventures; and utility tokens, designed to grant access to or consumption of a digital service. Non-fungible tokens, by contrast, are categorized by transferability: transferable tokens, which can be exchanged or sold to new owners, and non-transferable tokens, which are inherently inalienable and bound to a specific holder (Arslanian & Fischer, 2019).

Focusing on blockchain infrastructure, Nijsse and Litchfield (2020) proposed a taxonomy of consensus mechanisms employed in blockchain systems, drawing on an analysis of sixty-nine blockchains documented in the literature. Their taxonomy organizes consensus mechanisms across seven dimensions. These include resource scarcity, referring to the difficulty of replacing, accessing, or creating the resources required for consensus; fault tolerance, which addresses the system's resilience to malfunctioning or malicious nodes; and block validation, concerning the process by which participants are selected to propose new blocks. Additional dimensions encompass transaction confirmation mechanisms, which may be deterministic or probabilistic; network format, distinguishing between synchronous, asynchronous, or partially synchronous communication; network accessibility, ranging from public to private or hybrid models; and network communication, describing how transaction and block data are exchanged among nodes. Together, these dimensions provide a comprehensive framework for comparing and understanding blockchain consensus designs (Nijsse & Litchfield, 2020).

Addressing fraudulent behavior in crypto-asset markets, Bartoletti *et al*. (2021) conducted an extensive analysis of academic literature on cryptocurrency-related scams and developed a taxonomy to classify these schemes systematically. The authors compiled and standardized data from multiple sources, resulting in a dataset comprising 47,075 scam reports linked to cryptocurrencies. Based on this dataset, they proposed a classification framework encompassing schemes such as Ponzi schemes, malware attacks, fake cryptocurrency services, reward-based scams, blackmail, fraudulent ICOs, and money laundering. Their findings indicate that most scams are associated with Bitcoin, though not because of its intrinsic blockchain characteristics, but rather because it is commonly used as a payment method. The authors argue that as native cryptocurrencies of other blockchains gain wider adoption, similar fraudulent schemes are likely to emerge across those ecosystems. The taxonomy offers valuable insights into the distribution and correlation of scam types and provides actionable recommendations to mitigate cryptocurrency fraud (Bartoletti *et al*., 2021).

Sai *et al*. (2021) contributed to the literature by conducting a systematic review of blockchain centralization and synthesizing findings from 89 academic articles. Using the taxonomy development methodology proposed by Nickerson *et al*. (2013) and subsequently refining it through expert interviews, the authors developed a taxonomy of blockchain centralization. The taxonomy identifies six key categories—application, operation, incentive, consensus, network, and governance—through which blockchains can be evaluated for centralization. The study highlights the negative implications of centralization, including increased security risks, and identifies research gaps, particularly the limited empirical analysis of centralization in prominent platforms such as Ethereum (Sai *et al*., 2021).

From a quantitative and financial perspective, Fry and Ibiloye (2023) proposed a taxonomy of cryptocurrencies grounded in time-series analysis and traditional asset classification methods. The authors examined daily price data, denominated in U.S. dollars, from January 1, 2020, to September 28, 2022, covering the ten largest cryptocurrencies by market capitalization, major fiat currencies, and leading technology stocks. Using four distinct statistical approaches—including distributional distance measures and GARCH-based models—the study classified cryptocurrencies based on their return dynamics. The results suggest that cryptocurrencies are predominantly speculative assets, with Bitcoin and possibly Solana representing partial exceptions. Stablecoins, despite their design objectives, exhibited vulnerabilities and volatility patterns similar to other crypto-assets. Overall, the findings reinforce the view that most cryptocurrencies function more like speculative instruments than traditional currencies (Fry & Ibiloye, 2023).

In the context of the metaverse and non-fungible tokens (NFTs), Hartwich *et al*. (2023) developed a taxonomy to address the rapid evolution and conceptual ambiguity of these emerging phenomena. Following a systematic and iterative process based on the methodologies of Nickerson *et al*. (2013) and Kundisch *et al*. (2021), the authors structured the taxonomy into four layers, fourteen dimensions, and forty-two characteristics. Exclusivity markers were incorporated to indicate whether characteristics within each dimension are mutually exclusive. This framework enables a nuanced understanding of NFTs and their diverse applications, providing a structured approach to analyzing their technical, economic, and social attributes (Hartwich *et al*., 2023).

In summary, the literature demonstrates that the development of taxonomies for crypto-assets remains a nascent yet rapidly evolving field of theory. Existing taxonomies have addressed specific aspects of crypto-assets—such as ICOs, token functionality, consensus mechanisms, fraud schemes, centralization, market behavior, and NFTs—but often in isolation. These contributions collectively underscore the relevance of taxonomic approaches in organizing complexity and supporting both academic inquiry and practical decision-making. Building on these foundations, the next section presents the taxonomy proposed in this study, developed in accordance with the methodologies of Nickerson *et al*. (2013) and Kundisch *et al*. (2021), and conceptually aligned with the layered approach advanced by Hartwich *et al*. (2023).

METHODOLOGY

To create a framework for better understanding the field of cryptocurrencies and to establish a typology, a multi-layered taxonomy was developed following the steps of Nickerson *et al*. (2013), Kundisch *et al*. (2021), and Hartwich *et al*. (2023).

Taxonomies help structure complex, disordered data by assisting in understanding and analyzing different concepts and their characteristics, establishing a foundation for future research. Furthermore, we proposed a taxonomy for academics, investors, and regulators to establish regulations for crypto-assets.

We adopted the iterative taxonomy development process proposed by Nickerson *et al*. (2013). This process involves the following seven steps: (1) determine meta-characteristics; (2) determine final conditions; (3) decide on an empirical-to-conceptual (E-2-C) and conceptual-to-empirical (C-2-E) design approach; (4) identify or conceptualize objects, dimensions, and characteristics; (5) examine objects; (6) create the taxonomy; and finally, (7) check that we have met the previously determined final conditions. If not, repeat steps 3-7 until they are satisfied.

For this research, the objective final conditions were based on Nickerson *et al*. (2013): (1) a representative sample of objects was examined; (2) no new dimension or characteristic was added; (3) no dimension or characteristic was divided or merged; and (4) each cell is unique. Additionally, subjective final conditions ensure that a taxonomy is useful. We complete the development process when the taxonomy is concise, robust, comprehensive, extensible, and explanatory (Nickerson *et al*., 2013; Hartwich *et al*., 2023).

We conducted three iterations concerning the approach for constructing the taxonomy, summarized in Table 1. Initially, a conceptual-to-empirical approach was employed to seek foundational knowledge about cryptocurrencies from the existing literature. However, due to the need for more research addressing the subject of this work, the second iteration employed an empirical-to-conceptual approach to characterize existing cryptocurrencies.

Table 1

Summary of Iterations in Taxonomy Construction

Iteration	Approach	Data	Layers/Dimensions/Characteristics	Increment	Final Conditions
1	C-2-E	Existing literature on cryptocurrencies	03/05/2018	Initial layers, dimensions, and characteristics as a basis for subsequent iterations	Subjective and objective final conditions not met: taxonomy is not explanatory
2	E-2-C	Observation of the 20 cryptocurrencies with the highest market value	03/08/2025	The addition of three dimensions and seven characteristics	Objective final conditions not met: Added new dimensions and characteristics, requiring a reiteration of the process
3	C-2-E	Existing literature on cryptocurrencies and research in cryptocurrency communities	03/11/1940	The addition of three dimensions and fifteen characteristics	We met both the subjective and objective final conditions

In this iteration, we observed the 20 cryptocurrencies (listed in Table 2) with the highest market capitalization (as of June 2024) — these account for over 90% of the total market capitalization of all cryptocurrencies (Coin Market Cap, 2024). Finally, the third iteration revisited a conceptual-to-empirical approach to refine the characteristics observed in the second iteration (Nickerson *et al*., 2013; Hartwich *et al*., 2023; Kundisch *et al*., 2021).

Table 2

Top Twenty Cryptocurrencies by Market Value – June 2024

Cryptocurrency	Market Value in USD	Market Share (%)*
Bitcoin	$ 1.326.816.114.191,00	54,156%
Ethereum	$ 423.732.885.034,00	17,295%
Tether	$ 112.433.510.855,00	4,589%
BNB	$ 89.665.700.270,00	3,660%
Solana	$ 70.729.829.072,00	2,887%
USDC	$ 32.082.707.838,00	1,309%
XRP	$ 27.016.710.736,00	1,103%
Dogecoin	$ 20.431.303.880,00	0,834%
Toncoin	$ 16.745.512.014,00	0,683%
Cardano	$ 15.349.930.553,00	0,627%
Shiba Inu	$ 13.080.288.805,00	0,534%
Avalanche	$ 12.542.178.668,00	0,512%
TRON	$ 10.222.334.429,00	0,417%
Polkadot	$ 9.158.956.288,00	0,374%
Chainlink	$ 9.080.544.360,00	0,371%
Bitcoin Cash	$ 8.909.061.290,00	0,364%
NEAR Protocol	$ 6.724.563.420,00	0,274%
Polygon	$ 6.341.644.941,00	0,259%
Litecoin	$ 5.871.440.713,00	0,240%
Uniswap	$ 5.618.209.620,00	0,229%

* The denominator refers to the market value of all listed cryptocurrencies as of June 2024.

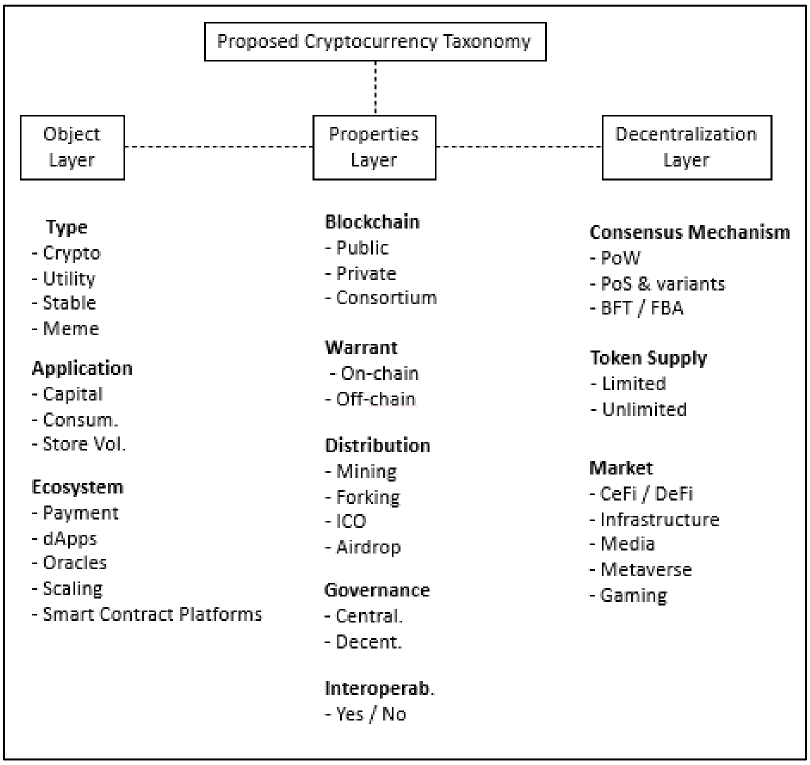
Source: Coin Market Cap (2024).

PROPOSED TAXONOMY FOR CRYPTOCURRENCIES

This study proposes a taxonomy for cryptocurrencies developed through three iterative cycles, following the methodological guidelines of Nickerson *et al*. (2013) and Kundisch *et al*. (2021) – Figure 1. The resulting taxonomy is structured into three layers, eleven dimensions, and thirty-nine characteristics, which are defined as mutually exclusive or non-exclusive according to the nature of each dimension. The taxonomy aims to capture intrinsic properties common to cryptocurrencies while remaining flexible enough to accommodate future developments in this rapidly evolving domain.

Figure 1

Proposed Taxonomy for Cryptocurrencies



The object layer classifies cryptocurrencies based on their functional and economic characteristics. It comprises three dimensions: type, application, and ecosystem. The type dimension distinguishes between cryptocurrencies, utility tokens, stablecoins, and meme-coins, reflecting differences in economic purpose and value formation (21shares & Coingecko, 2023; Prat *et al*., 2024; Ante *et al*., 2023). The application dimension aligns cryptocurrencies with traditional economic functions, distinguishing capital assets, consumable or transformable assets, and store-of-value assets. The ecosystem dimension captures the technological environment in which cryptocurrencies operate, including payment platforms, application-specific blockchains, centralized and decentralized applications, cross-chain platforms, oracles, scaling solutions, and smart contract platforms (21shares & Coingecko, 2023; Coinbase, 2024; Taherdoost, 2023).

The properties layer focuses on structural and governance-related attributes of cryptocurrencies. This layer includes five dimensions: blockchain, warrant, distribution, governance, and interoperability. Cryptocurrencies are classified according to whether their blockchains are public, consortium-based, or private (Barrera, 2020), and whether transactions occur on-chain or off-chain (Sharma *et al*., 2020). Distribution mechanisms capture how tokens enter circulation, including mining, forking, initial coin offerings (ICOs), and airdrops (Van Adrichem, 2019). Governance distinguishes between centralized and decentralized decision-making structures (Nagarajan, 2018), while interoperability refers to a cryptocurrency's ability to interact with other blockchain networks (Kotey *et al*., 2023).

The decentralization layer addresses how cryptocurrencies operate within distributed systems and markets. It comprises three dimensions: the consensus mechanism, the token supply, and the market. Consensus mechanisms include proof-of-work (PoW), proof-of-stake (PoS) and its variants, and Byzantine fault-tolerant models (Sharma *et al*., 2020). Token supply differentiates between cryptocurrencies with limited and unlimited issuance (Pernice *et al*., 2021). Finally, the market dimension situates cryptocurrencies within application sectors such as information technology services, centralized and decentralized finance, infrastructure, media, metaverse, and gaming (21shares & Coingecko, 2023).

Overall, the proposed taxonomy offers a coherent and extensible framework for classifying cryptocurrencies based on intrinsic variables rather than isolated features. By integrating functional, structural, and decentralization-related dimensions, the taxonomy contributes to a more systematic understanding of cryptocurrencies and provides a foundation for both theoretical research and practical applications, including investment analysis and regulatory assessment.

RESULTS AND DISCUSSIONS

Cryptocurrencies facilitate fast and low-cost cross-border transactions by eliminating intermediaries, thereby reducing transaction costs for both individuals and businesses. Compared to conventional financial systems, transaction settlement times are significantly shorter, which is particularly advantageous for firms that require timely payments to suppliers or employees. Moreover, blockchain-based systems record transactions in immutable and publicly accessible ledgers, enhancing transparency and accountability across the network (Awasthi & Dhandapani, 2024).

Within this context, the taxonomy proposed in this study contributes to structuring knowledge about cryptocurrencies by offering a systematic classification grounded in the theoretical literature. In addition to its conceptual relevance, the taxonomy also presents practical applicability for various stakeholders, including technology enthusiasts, developers, crypto-asset holders, and public authorities. In particular, it may assist government agents and legislators in addressing regulatory and taxation challenges associated with cryptocurrencies (Huang *et al*., 2023).

From a theoretical perspective, the taxonomy introduces precise and standardized terminology that can serve as a foundation for future research on cryptocurrencies. It delineates what cryptocurrencies represent through the object layer, how they are designed and structured through the properties layer, and how they operate in market environments through the decentralization layer. By integrating these dimensions, the taxonomy extends existing research on crypto-assets, which remains largely exploratory in nature (Hartwich *et al*., 2023). Although previous studies have proposed classifications for crypto-assets, cryptocurrencies themselves have often received limited and fragmented attention.

This lack of a detailed and systematic understanding of cryptocurrencies constitutes a gap in the literature that the proposed taxonomy seeks to address. Rather than offering an exhaustive framework, the taxonomy is designed to capture core classificatory knowledge while remaining adaptable to the evolving dynamics of the cryptocurrency ecosystem. In line with prior taxonomic research, its modular design allows for the inclusion of additional layers, dimensions, and characteristics as new empirical and theoretical developments emerge (Hartwich *et al*., 2023).

The taxonomy provides a foundational structure for future empirical and theoretical research by enabling clearer distinctions among cryptocurrencies and their intrinsic characteristics. Such differentiation is expected to enhance analytical precision and comparability across studies. Beyond academia, the taxonomy also holds practical relevance for developers, investors, legislators, and regulatory authorities.

For investors, the classification framework facilitates a more informed assessment of cryptocurrencies by highlighting their defining features and associated risk profiles. Developers may use the taxonomy to explore technical attributes, such as network security, consensus mechanisms, and mining or validation costs (Fauzi *et al*., 2020). Similarly, cryptocurrency buyers can evaluate which characteristics align with their expectations regarding utility, security, and potential value creation.

In the current regulatory environment, marked by ongoing debates over cryptocurrency governance and taxation, the taxonomy may serve as a valuable tool for policymakers. By distinguishing cryptocurrencies based on intrinsic characteristics, governments could adopt differentiated regulatory or tax treatments tailored to specific types of crypto-assets (Huang *et al*., 2023).

The intrinsic variables underlying the proposed taxonomy include, among others, transaction speed, security features, consensus mechanisms, market capitalization, user base, ecosystem utility, and regulatory compliance. A systematic examination of these variables enables a clearer understanding of how different cryptocurrencies operate and their potential risks and benefits.

By applying this taxonomy, investors can categorize cryptocurrencies based on their structural and market characteristics, enabling more informed decision-making aligned with individual risk preferences and investment objectives. For instance, risk-averse investors may prioritize cryptocurrencies with established networks and lower volatility, whereas more speculative investors may focus on emerging tokens with higher growth potential.

As the cryptocurrency landscape continues to evolve, future iterations of the taxonomy may incorporate emerging trends, technological innovations, and shifts in regulatory frameworks. These updates may reflect developments such as advances in blockchain architectures, the expansion of decentralized finance (DeFi), and regulatory changes that influence how cryptocurrencies are adopted and traded. Regular refinement of the taxonomy will help ensure its continued relevance and usefulness in a rapidly changing market environment.

CONCLUSION

Cryptocurrencies, being recent innovations, are developing rapidly in disorganized contexts. Although such conditions can offer great opportunities for success, they also make it more complex to understand the variety and possibilities of cryptocurrencies, both theoretically and practically. Thus, this work delivers a taxonomy that offers a better understanding of this phenomenon, following the recommendations of Nickerson *et al*. (2013) and Kundisch *et al*. (2021).

Considering the limitations of this work, both the market and the theory in cryptocurrencies are new and rapidly expanding areas, making it challenging to define an assertive taxonomy. As practice and theory in crypto-assets mature, the proposed taxonomy will naturally need adjustments. Although limited, this taxonomy is helpful as a substrate for building knowledge about cryptocurrencies.

Furthermore, the cryptocurrency taxonomy offers substantial advantages to multiple stakeholders: for regulators, it establishes a clear structure for oversight, aiding in the prevention of illegal activities and safeguarding consumers; for lawmakers, it provides a foundation for crafting laws and regulations that balance innovation with risk management; for investors, it supports the evaluation of cryptocurrency potential and risks, helping to make informed investment choices; for developers, it offers direction in the creation and enhancement of new cryptocurrencies and blockchain technologies. Ultimately, for the broader public, the taxonomy improves understanding of cryptocurrencies, encouraging their adoption.

However, it is essential to remember that the crypto-asset market is in its early stages. As these assets gain widespread adoption, each layer, dimension, and characteristic will likely need to expand and evolve, giving rise to new formats within the proposed taxonomy. In this context, we suggested investigating the behavior of cryptocurrencies based on their characteristics, or conducting research to identify new layers, expand dimensions, and add more characteristics to maintain an iterative process of continuous improvement of the taxonomy proposed in this research.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the financial support provided by the Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Grant No. E-26/200.164/2023.

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