EDGAR DA MATTA DUARTE FATTORI

Institutionalizing a Financial Innovation: The Case of Initial Coin Offerings (ICOs)

Trabalho de formatura apresentado à Escola Politécnica da Universidade de São Paulo para a obtenção do diploma de Engenheiro de Produção.

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I dedicate this work to my family, for their endless support,
to my friends, for their companionship and encouragement,
and to Brazil’s public universities, for making this dream possible

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RESUMO

As criptomoedas tornaram-se um tema central nos mercados financeiros devido à sua natureza descentralizada, que desafia as instituições tradicionais. Entre os mecanismos financeiros desenvolvidos nesse ecossistema, as Initial Coin Offerings (ICOs) surgiram como instrumentos inovadores de captação de recursos corporativos baseados em tecnologia blockchain. No entanto, o rápido crescimento desse mercado revelou lacunas regulatórias significativas, culminando em crises como o colapso da FTX, que expuseram fragilidades sistêmicas e desencadearam um processo global de aprendizado e reestruturação institucional.

Esta tese analisa a evolução regulatória das ICOs como um processo de aprendizado coletivo e construção de capacidades dentro de um ecossistema financeiro-tecnológico. O estudo identifica quatro fases que descrevem a trajetória de institucionalização da inovação nesse ecossistema:

(1) uma fase pioneira de experimentação desregulada (2013–2016), marcada pela exploração tecnológica e ausência de coordenação institucional;

(2) uma fase reativa de resposta e contenção regulatória (2016–2018), na qual surgem as primeiras medidas de reconhecimento e tentativa de controle;

(3) uma fase de crise sistêmica e reflexão (2020–2022), em que colapsos como o da FTX evidenciam falhas estruturais e estimulam o aprendizado entre jurisdições; e

(4) uma fase de consolidação e coordenação global (2023–2025), caracterizada pela implementação de arcabouços como o Markets in Crypto-Assets Regulation (MiCA) na União Europeia e o Digital Commodities Consumer Protection Act (DCCPA) nos Estados Unidos.

Ao adotar uma abordagem processual, o estudo demonstra que a regulação das ICOs evoluiu por meio de interações entre empresas, reguladores e participantes de mercado — configurando um caso de inovação aberta em nível de ecossistema, em que o aprendizado e a construção de capacidades são distribuídos e colaborativos. A pesquisa contribui para as literaturas de gestão da inovação e governança financeira, ao mostrar como inovações disruptivas podem transitar da experimentação para instituições regulatórias formais e sustentáveis.

Palavras-chave: Initial Coin Offerings (ICOs); criptomoedas; gestão da inovação; inovação aberta; aprendizado institucional; arcabouço regulatório; FTX; MiCA; DCCPA; construção de capacidades.

ABSTRACT

Cryptocurrencies have become a central topic in financial markets due to their decentralized nature, which challenges traditional institutions. Among the mechanisms developed within this ecosystem, Initial Coin Offerings (ICOs) have emerged as innovative instruments for corporate fundraising through blockchain-based token issuance. However, the rapid expansion of this market revealed substantial regulatory gaps, culminating in crises such as the FTX collapse, which exposed systemic vulnerabilities and prompted a global process of institutional learning and regulatory redesign.

This thesis examines the evolution of ICO regulation as a process of collective learning and capability building within a financial-technological ecosystem. The study identifies four empirically grounded phases that depict how innovation in this ecosystem emerged, evolved, and became institutionalized:

(1) a pioneering stage of unregulated experimentation (2013–2016), marked by technological exploration and lack of oversight;

(2) a reactive phase of regulatory response and containment (2016–2018), featuring early legal recognition and institutional adaptation;

(3) a systemic-crisis and reflection phase (2020–2022), when events such as the FTX collapse revealed governance gaps and accelerated cross-jurisdictional learning; and

(4) a phase of consolidation and global coordination (2023–2025), characterized by comprehensive frameworks such as the EU's Markets in Crypto-Assets Regulation (MiCA) and the U.S. Digital Commodities Consumer Protection Act (DCCPA).

Through a process-based approach, the research demonstrates that ICO regulation evolved through iterative interactions among firms, regulators, and market participants — an expression of open innovation at the ecosystem level, where learning and capability building are distributed rather than centralized. The study contributes to innovation-management and financial-governance literature by showing how disruptive financial technologies transition from experimentation to formalized and sustainable institutional structures.

Keywords: Initial Coin Offerings (ICOs); cryptocurrencies; innovation management; open innovation; institutional learning; regulatory framework; FTX collapse; MiCA; DCCPA; capability building.

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LIST OF ABBREVIATIONS

TUD	Technische Universität Darmstadt
ICO	Initial Coin Offering
MiCA	Markets in Crypto Assets Regulation
DeFi	Decentralized Finance
PBC	People Bank of China
CEN	Financial Crimes Enforcement Network
AML	Anti Money Laundering
KYC	Know Your Customer
FSA	Financial Services Agency
NYFDS	New York Department of Financial Services
BTC	Bitcoin
CFTC	Commodities Futures Trade Comission
CEA	Commodity Exchange Act
AMLD 5	Anti Money Laundering Directive
FCA	Financial Conduct Authority
DLT	Distributed Ledger Technology
UK	United Kingdom
ESMA	European Securities and Markets Authority
MiFID	Markets and Financial Instruments Directive
AIFMD	Alternative Investment Fund Managers Directive
ESA	European Supervisory Authorities
EIOPA	European Insurance and Occupational Pensions Authority
EBA	European Bank Authority
CBRC	China Bank Regulatory Comission
SEC	Securities and Exchange Comission
DCCPA	Digital Commodities Consumer Protection Act
DARE	Digital Assets and Registered Exchange
FSB	Financial Stability Board
IMF	International Monetary Fund
BIS	Bank for International Settlements
CAPS	Crypto Assets service providers
ART	Asset referenced token

NFTs	Non-Fungible Tokens
CBDCs	Central Bank Digital Currencies
EMT	E-money Tokens
FSMA	Financial Services and Markets Act
CTF	Counter Terrorist Financing
PSA	Payment Services Act
VASP	Virtual Asset Provider
FIU	Financial Intelligence Unit
ROI	Return on Investment

1. INTRODUCTION

The study of Initial Coin Offerings (ICOs) and their regulatory evolution represents not only a significant subject in corporate finance but also an exceptional instance of innovation management in practice. The decentralized financial technologies that underpin ICOs have created a new frontier for funding entrepreneurial ventures. From the perspective of innovation management, the emergence, crisis, and adaptation of ICO mechanisms may be understood as a process of capability development unfolding at the ecosystem level, which this study aims to elucidate.

An Initial Coin Offering (ICO) is a blockchain-based fundraising mechanism that allows emerging ventures to raise capital by issuing digital tokens to investors, typically in exchange for cryptocurrencies such as Bitcoin or Ether. While technologically grounded in smart contracts and decentralized ledger systems, the ICO represents a financial and organizational innovation that reconfigures how resources are mobilized and governance is distributed in early-stage projects. Unlike traditional funding models mediated by financial institutions or venture capital firms, ICOs enable direct, global, and decentralized participation, often involving communities of users, developers, and investors. This hybrid nature, combining technological infrastructure with new institutional arrangements, positions ICOs as both a technological artifact and an innovation in market design and organizational coordination.

This study, grounded in financial regulation and market analysis, mirrors the dynamics of organizational learning and capability-building described in Melo et al. (2020), who examined how organizations develop systematic competencies to manage innovation projects. In their framework, innovation capabilities emerge through a process of transformation across four phases: closed mode, open driver, vanguard project, and project-to-organization. These phases reflect how organizations progress from isolated experimentation to formalized structures capable of sustaining innovation over time. Although this research was not explicitly framed within a specific model, its findings are discussed considering prior studies within organizational domains, thereby bridging insights between ecosystem-level and firm-level innovation management. This study demonstrates that the early phase of cryptocurrencies (pre-2014) is dominated by technological pioneers and fragmented initiatives. The subsequent phase corresponds to the ICO boom of 2017–2018, when experimentation expanded rapidly through open networks and decentralized participation. The FTX collapse in 2022 reveals systemic vulnerabilities and triggering institutional learning. Finally, the emergence of comprehensive regulations such as the EU's Markets in Crypto Assets Regulation (MiCA) and the U.S. Digital

Commodities Consumer Protection Act (DCCPA) illustrates an organization phase—where governance, coordination, and regulatory infrastructures begin to formalize the previously experimental ecosystem. Thus, this study extends prior discussion on how a new open innovation project management capability in the firm-level to an ecosystem level.

1.1. Objectives

This study aims to understand the process of institutionalization of Initial Coin Offerings (ICOs) as an ecosystem-level innovation. It seeks to explain how this funding mechanism evolved from a technological and organizational experiment into a legitimized institutional practice, highlighting the capabilities, governance structures, and regulatory adaptations that supported its stabilization over time. Through this interdisciplinary framing, the thesis integrates perspectives from corporate finance, innovation and organizational learning to explain how new governance models emerge in the context of financial disruption.

Specifically, this integration seeks to:

Describe the historical evolution of ICO regulation and analyze the emergence of governance practices within this ecosystem.

Identify the distinct phases through which the ICO regulatory system evolved—ranging from unregulated experimentation to global institutionalization.

Interpret major crises, particularly the FTX collapse that catalyzed collective learning and reconfiguration of regulatory capabilities.

Explain how emerging frameworks such as the Markets in Crypto-Assets Regulation (MiCA) in the EU and the Digital Commodities Consumer Protection Act (DCCPA) in the U.S. represent the consolidation of a previously experimental innovation system; and

Demonstrate the methodological pluralism of this approach, showing that a literature review in financial regulation can also function as a process-mapping tool for studying innovation and capability building.

Through this conceptual framing, the thesis argues that ICOs are not merely a financial innovation but also a laboratory of innovation management, where technological creativity, organizational adaptation, and institutional learning converge to form a new paradigm of financial governance.

Throughout the thesis, the term organization refers not to an individual firm but to the ICO ecosystem as a whole—a network of issuers, investors, developers, and regulators that collectively builds and stabilizes innovation capabilities. As consequence, capability building

is interpreted as the ecosystem's progressive ability to coordinate technological, organizational, and regulatory innovations, transforming fragmented experimentation into an integrated system of governance.

This thesis seeks to answer the following question: How do Initial Coin Offerings (ICOs) become institutionalized as an innovation within financial ecosystems? To address this, the study aims to:
(1) reconstruct the regulatory and institutional evolution of ICOs;
(2) interpret this trajectory as a process of innovation and capability building; and
(3) connect these empirical findings to theories of open innovation and institutional learning.

2. INITIAL COIN OFFERING

2.1. What is an ICO?

Initial Coin Offerings (ICOs) are innovative entrepreneurial mechanisms that enable firms to raise capital by issuing and selling digital tokens to investors (Fisch & Momtaz, 2019). These tokens are created and secured through blockchain technology, which ensures data integrity, transparency, and transaction immutability across decentralized networks.

To understand ICOs more comprehensively, it is necessary to examine both the types of tokens issued and the multidimensional context in which they operate. Tokens can generally be classified into three categories:

1) Currency tokens, used as mediums of exchange and stores of value;
2) Security tokens, which represent investment contracts or equity-like instruments backed by blockchain assets;
3) Utility tokens, designed to grant access to specific products or services within a platform's ecosystem (Howell et al., 2018).

Beyond these typologies, ICOs exist at the intersection of law, technology, economics, and finance, confronting several ongoing challenges such as price volatility, fraud, and the persistent absence of comprehensive regulation (Moxoto et al., 2024).

At the core of the ICO mechanism lies blockchain itself—a distributed ledger system that allows data and value to be securely recorded and transmitted without reliance on a central authority. This technology eliminates issues such as the double-spending problem (Pilkington, 2015) and enables global coordination of financial operations across decentralized databases (Adhami et al., 2017). Furthermore, the emergence of Decentralized Finance (DeFi) has expanded the potential of blockchain applications by allowing peer-to-peer transactions and financial services independent of traditional intermediaries or government oversight.

Within this architecture, ICOs exemplify open innovation in a financial ecosystem, where new technologies, governance mechanisms, and investment practices evolve through experimentation and collective adaptation among multiple actors.

2.2. The importance of ICOs for corporate finance

ICOs have become increasingly significant in the landscape of corporate finance, providing alternative mechanisms for fundraising that transcend traditional venture capital and initial

public offerings (IPOs). According to Cypherhunter, by 2024 the global ICO market had achieved an estimated capitalization of USD 11.72 billion across 1,641 offerings, demonstrating the growing institutional relevance of this financing model.

Through blockchain-based token issuance, firms at various stages of maturity can access global capital markets without the geographical and regulatory constraints of conventional finance (Ofir & Sadeh, 2019). This inclusiveness enables smaller or early-stage enterprises often overlooked by venture capital to secure funding directly from investors.

Several characteristics explain the appeal of ICOs:

- **Cost efficiency**, as blockchain's security architecture eliminates the need for financial intermediaries;
- **Liquidity creation**, through secondary markets that allow investors to trade tokens and achieve early exits;
- **Democratization of investment**, offering non-specialized participants access to innovative projects and early-stage ventures (Adhami et al., 2017; Block et al., 2021).

Beyond their financial advantages, ICOs also contribute to the evolution of innovation management in finance, as they promote transparency, decentralization, and collective governance. As regulatory frameworks mature, ICOs serve as both a financing instrument and a laboratory for systemic learning, illustrating how financial and technological innovations co-develop through interaction between enterprises, investors, and regulators.

2.3. The importance of regulatory issues in this context

The novel design and the unknown aspects of the cryptocurrencies present several concerns regarding regulation. On one side, even if the claim of a trustless technology, the regulators are responsible for avoiding fraud, misuse, and mistakes since the system is still governed and developed by human beings (Bodo & Filippi, 2024).

On the other hand, it is necessary to understand whether ICOs would receive the status of securities within this regulation (Sabrina T Howell et al., 2018). This comprehension gains in importance, mainly because of the connection between understanding the status of tokens, the applicability of the already-developed laws and rules for securities to the modern regulatory framework of ICOs, and consequently, the necessary adjustments needed to regulation to maintain both mechanisms coherently working with the most significant incentive to economic growth.

3. INNOVATION IN ECOSSYSTEMS

Innovations are rarely the result of isolated efforts within a single company; rather, they emerge from collaboration among multiple organizations that share resources, knowledge, and complementary capabilities. This network of firms, universities, startups, investors, and government institutions forms what scholars refer to as an innovation ecosystem. Within these ecosystems, innovation depends on interaction and alignment among participants who contribute distinct but interdependent components of a broader solution. As Moore (1993) first proposed in his concept of the business ecosystem, markets resemble biological systems in which diverse actors co-evolve and depend on one another to create and sustain value. In such contexts, the success of innovation relies on coordination and complementarity rather than individual effort. Adner (2006, 2017) highlights that the success of an innovation is determined by the degree of alignment between ecosystem partners, since each contributes a complementary piece of the value proposition. Similarly, Jacobides, Cennamo, and Gawer (2018) emphasize that companies in an ecosystem perform different but mutually reinforcing roles, generating joint value through collaboration and specialization. Gomes et al. (2018) further show that cooperation among partners fosters knowledge integration, resilience, and adaptability, enabling the system to innovate more effectively.

Digital Technologies, such as blockchain, artificial intelligence, and online platforms—play a crucial role in enabling and coordinating these interactions. By reducing transaction costs, increasing transparency, and allowing distributed decision-making, these technologies make collaboration possible at scale. Over time, ecosystem participants develop collective capabilities, including shared governance routines, operating standards, and joint learning practices. As demonstrated by Melo et al. (2020), capability development occurs progressively through experimentation and feedback, both within organizations and across entire ecosystems where multiple actors learn to innovate together.

Understanding innovation from this ecosystem perspective is therefore essential for analyzing how new practices, such as Initial Coin Offerings (ICOs), emerge, evolve, and become institutionalized. ICOs exemplify how technological, organizational, and regulatory actors co-create a new form of financing grounded in blockchain infrastructure. Studying this process sheds light on how innovations transition from experimentation to legitimacy, becoming recognized and stable components of an ecosystem’s governance structure. In this way, the institutionalization of ICOs illustrates the broader dynamics through which

innovations in digital and financial technologies gain credibility, sustainability, and systemic integration.

4. METODOLOGY

4.1. Search strategy

This study adopts a process-based methodological design aimed at reconstructing the regulatory learning trajectory of the Initial Coin Offering (ICO) ecosystem. A systematic literature review is employed as a process-tracing instrument that captures how the ICO ecosystem has evolved.

This approach recognizes that secondary information academic publications, regulatory reports, and industry analyses can serve as empirical evidence of systemic learning and capability building. By interpreting patterns of discourse, reform, and institutional change within these sources, the literature review becomes a methodological tool for observing how financial innovations mature. In this sense, the review is not merely descriptive but analytical, enabling the identification of recurring mechanisms of innovation, coordination, and policy evolution within the global ICO landscape.

To ensure conceptual rigor, the data collection process followed the Who–How–What model proposed by Ibrahim (2008) and refined by Booth et al. (2016). This structure provided clarity and internal coherence to the review, aligning the scope of research with the innovation-management lens adopted in the thesis. Within this framework, WHO represents the entities affected by ICO regulation (issuers, investors, regulators, and platforms); HOW captures the mechanisms of regulation and their impact on ICO operations; and WHAT concerns the observable consequences of these mechanisms for corporate finance and innovation. Accordingly, the simplified research question is defined as:

How do innovation mechanisms emerging from digital technologies become recognized and legitimized within innovation ecosystems?

To address this question, (Randolph, 2007) a review was conducted across major interdisciplinary and specialized databases. The search focused on two principal sources: Google Scholar, which offers broad cross-disciplinary coverage, and SSRN, which concentrates on law, finance, and regulatory innovation. Initial search strings combined conceptual and thematic keywords such as:

(“regulatory consequences” OR “regulation impact” OR “legal implications”) AND (“ICO” OR “initial coin offerings” OR “token sales”) AND (“enterprise financing” OR “business funding” OR “corporate finance”).

Given differences in indexing systems and database functionalities, particularly in SSRN, this string was refined to the core query “ICO regulations” to ensure more consistent and inclusive results. The initial search produced 384 documents from Google Scholar and 107

documents from SSRN. Each abstract was reviewed to verify its relevance to cryptocurrency regulation, innovation, and governance.

The study complemented academic literature with reputable non-academic sources, such as regulatory publications, think tank reports, and credible financial journalism. This hybrid data strategy ensured the inclusion of contemporary developments. Over the review process, we identified that FTX breakdown were an important event over the development of ICO`s. Thus, to engage with important events, targeted keyword searches (e.g., "FTX breakdown regulation", "post-FTX reforms") were executed in Google Scholar and institutional repositories.

Additionally, the backward snowballing method (Wohlin, 2014) was applied to expand the dataset by tracking citations within key articles and regulatory documents. This technique allowed for the identification of foundational studies and relevant earlier analyses that contributed to shaping contemporary regulatory approaches to ICOs and decentralized finance.

Altogether, 121 documents met the inclusion criteria, comprising 38 academic papers, 28 legal and regulatory documents, 34 industry and journalistic analyses, and 21 institutional or multilateral reports. These sources reflect a comprehensive set of perspectives across law, finance, economics, and technology mirroring the multidisciplinary nature of the ICO phenomenon.

Each source was analyzed through an iterative interpretive process, consistent with process tracing. The analytical framework examined:

1. The regulatory event or context discussed;
2. The actors involved (e.g., national regulators, firms, investors, supranational organizations);
3. The responses and outcomes (laws, frameworks, failures, or adaptations); and
4. The learning or capability-building implications derived from each case.

This interpretive coding enabled the reconstruction of a chronological and thematic narrative of regulatory evolution. A visual map was develop to help making sense of the data, followed by a temporal bracketing (Langley, 1999) to help identify main phases withing the process. The findings reveal four interrelated phases in the evolution of ICO regulation:

1. **Pioneering experimentation (2013–2016)** – characterized by technological exploration and regulatory absence;
2. **Reaction and containment (2016–2018)** – marked by the first formal interventions and fragmented oversight;
3. **Systemic crisis and reflection (2020–2022)** – triggered by failures such as the FTX collapse, generating cross-jurisdictional learning;

4. **Global consolidation (2023–2025)** – represented by comprehensive regulatory frameworks such as the *Markets in Crypto-Assets Regulation* (MiCA) in the EU and the *Digital Commodities Consumer Protection Act* (DCCPA) in the United States.

While the use of secondary data offers broad temporal and geographic insight, it also presents inherent limitations related to publication lag, disciplinary fragmentation, and the uneven transparency of national regulators. To mitigate these issues, data triangulation was performed across academic, institutional, and industry sources. The goal of this methodological design is not to predict regulatory outcomes but to identify and interpret recurring learning patterns, consistent with the exploratory orientation of this study.

By tracing how regulatory systems evolve, the research provides a processual account of how disruptive financial innovations, as ICOs, transition from unregulated experimentation to structured, legitimate, and sustainable institutional systems.

4.2. Why a Literature review to collect the events of ICO

In the complex aftermath of the FTX collapse, the need for a new regulatory consensus among major economies has become increasingly evident. Since this event, numerous jurisdictions have been developing new frameworks, as the *Markets in Crypto-Assets Regulation* (MiCA) in the European Union, the *Virtual Assets Regulatory Authority* (VARA) in the United Arab Emirates, and several other initiatives across different countries (Arner et al., 2024).

In this context, and considering the challenges posed by Decentralized Finance (DeFi) and cryptocurrencies more than fifteen years after their inception, it is essential to evaluate the current global regulatory landscape and to examine how emerging reforms may reshape the use of ICOs as instruments of corporate finance.

This literature review therefore serves a dual purpose. Beyond mapping the state of regulation, it functions as a methodological tool for reconstructing the innovation process within the ICO ecosystem. By systematically examining secondary information, as peer-reviewed studies, regulatory reports, and legal or industry publications the review enables the identification of patterns of experimentation, crisis, and learning that characterize the institutionalization of this financial innovation. In this sense, the literature review itself operates as a process-tracing mechanism, allowing the observation of how regulatory and organizational capabilities evolve through iterative adaptation and policy feedback.

Accordingly, the review aims to:

1. Assess the regulatory frameworks that governed ICOs prior to the FTX collapse;
2. Identify recurring trends and failures in earlier regulatory approaches; and

3. Evaluate the consequences and future implications of the new frameworks for the process of institutionalization of innovation.

Employing a systematic-review methodology, the study analyzes literature published between 2015 and 2025 to provide both descriptive insight and theoretical interpretation of the global learning process surrounding crypto regulation. The expected contribution is to offer conceptual tools for understanding how regulatory systems develop innovation capabilities, transforming disruptive financial technologies into stable and legitimate governance structure.

5. FINDINGS

5.1. Events Chronology

The findings of this research are organized to reconstruct the process underlying the institutionalization of the Initial Coin Offering (ICO) ecosystem. The findings follow a chronological and analytical narrative that connects historical events, institutional reactions, and patterns of learning. Each turning point in the history of cryptocurrencies, from early technical experimentation to the post-FTX consolidation of regulatory frameworks, is treated as a moment in the evolution of an innovation system.

The chapter unfolds first with several contextualization and then in four interconnected stages with dense processes and consequences:

Table 1: Timeline of phases and events.

Phase	**Time Frame**	**Main events**	**Description/Turning points**	**Learning and institutionalization**
1 -Pioneer experimentation	2013-2016	- Creation of first ICO (2013) - Mt. Gox collapse (2014) - Early regulatory notes (FinCEN–US, 2013; PBoC–China, 2013)	Initial phase of unregulated experimentation with blockchain and token issuance. Crises like Mt. Gox reveal vulnerabilities and the need for protection mechanisms.	Emergence of awareness of risk and first steps toward understanding crypto regulation; ecosystem learning through failure.
2 – Reaction and Containment	2016-2018	- Bitfinex hack (2016) - ICO Boom (2017–2018) - China ICO ban (2017) - First regulations (Japan PSA 2017; EU AMLD5 2018; UK FCA warnings)	Period of accelerated innovation and speculative growth, followed by regulatory responses aiming to contain market excesses and fraud.	Regulators begin to intervene; first governance routines and compliance practices emerge—start of institutional learning.
3 – Systemic crisis and reflection	2020-2022	- Terra/LUNA collapse (2022) - FTX collapse (2022) - Reports from FSB, IMF, BIS, G20 (2023)	Major systemic crises expose structural flaws and interdependencies between exchanges and stablecoins. International organizations call for harmonized governance.	Crises act as "vanguard projects," triggering collective reflection and cross-jurisdictional coordination; recognition of the need for global standards.
4 – Global Consolidation	2023-2025	- MiCA (EU, 2023) - FSMA (UK, 2023) - DCCPA (US, 2023) - Brazil's Virtual Assets Act (2022, implemented 2024) - Payment Services Act (Japan, 2023)	Adoption of comprehensive global regulatory frameworks integrating crypto markets into traditional financial systems; alignment with international standards	Institutionalization of innovation: regulation becomes a mechanism of innovation governance; establishment of stable, legitimate, and scalable ICO ecosystem.

Despite differences in policy style, all groups participate in the same innovation process: the collective construction of regulatory capabilities through iterative learning.

These phases represent the maturation of an innovation ecosystem, showing how governance, legitimacy, and capability evolve through feedback loops linking technology, markets, and institutions. Regulation, in this view, becomes both a product and an enabler of innovation, a mechanism through which decentralized experimentation transforms into organized, sustainable systems.

The subsequent sections apply this logic: Section 5.2 give a general overview of the ICO contexts and then section 5.3 begins by mapping the events that anchor this process, while later subsections trace the temporal progression that connects these milestones into the broader narrative of ecosystem learning and capability building.

5.2. Qualifying some concepts

The grouping of countries proposed by Arner et al. (2024) serves here not as a static classification, but as a lens through which to observe how different institutional contexts have developed regulatory capabilities at varying speeds. Each group reflects a distinct mode of experimentation and adaptation within the broader innovation cycle.

Exploring and explaining the various groups of regulatory initiatives is necessary to gain a deeper understanding and develop a comprehensive assessment of crypto regulation worldwide.

It is understood that the crypto regulation initiatives can be divided today into four main groupings: 1) The largest one includes the European Union, United Kingdom, Hong Kong, Singapore, Japan, Switzerland, United Arab Emirates, and Australia, and consistently looks for the implementation of a coherent and similar crypto regulation. This group understands crypto mainly as a market to be regulated soon; 2) Includes principally China and understands the need for strong prohibitions in the crypto industry with limited chance of changes soon; 3) Includes mostly emerging economies and even though previous harsh measures for cryptocurrencies have been made in the past, this group is changing its approach towards the first group; 4) The last group consists only in the United States, which has a big number of peculiarities due to the actual functioning of the regulatory entities inland. (Arner et al., 2024).

A comprehensive classification for the distribution explained above is designed in the table below:

Table 2: Regulatory Groups and Their Characteristics.

Members	Historical position	Perspective

EU, UK, Hong Kong, Singapure, Japan	Market to be regulated	Regulated and economy included
China	Strong prohibitions	Prohibitions
Brazil, India and Indonesia	Restrictions	Slowly economy included
USA	Mixed regulation	Economy included

Nonetheless, this framework and regulatory groups exist and are relevant in today's world, and several changes and processes have led to this point. In this chapter, the objective is to outline the key events that have contributed to the development of the regulatory framework for ICOs and to the development of the innovation process behind ICO.

5.3. Temporal bracketing of the institutionalization process

To better develop a comprehensive assessment of the regulation, this part of the study focuses on the significant events over the last 10 years preceding the FTX collapse, the biggest breakdown in the history of the ICO innovation and a big markdown for the innovation process of this technology.

Through this analysis, it was possible to assess the trends and evolving landscape of cryptocurrency and ICO regulation and its consequences for the innovation process during this period.

The crypto-related events that, following the literature, were more influential to the landscape of crypto before the FTX breakdown were: 1) Mt. Gox Collapse (2014); 2) the Bitfinex Hack (2016); 3) the China ICO ban; 4) ICO Boom (2018); 5) SEC regulation shift (2018); 6) Terra and UST collapse (2022).

It is also crucial to describe the reactions of members of the regulatory groups as examples of the directions and shifts in regulatory policies taken by the groups, given the impossibility of evaluating the reactions of all group members in each event.

Before 2014, ICOs were still an emerging and marginal phenomenon due to the late development of this financing mechanism. The first recorded ICO occurred only in 2013, and over the following four years, fewer than a dozen were officially recognized worldwide (Bellavitis et al., 2020). Consequently, early regulatory attention was directed primarily toward cryptocurrencies in general rather than ICOs specifically, as the broader crypto market was still defining its structure and scope in the years preceding the ICO Boom of 2017–2018. To better understand the whole innovation process, the phases are going to be detailed.

5.3.1. Pioneering experimentation

When analyzed before the beginning of the meaningful events with crypto, the regulatory framework was pretty insipient in all the groups.

At this point, most countries had no significant regulations, and cryptocurrency regulation was decentralized and unclear. In this context, several countries still deserve a mention regarding regulation as a form of exemplifying the regulatory mood in the groups.

The UK (Group 1) first considered regulating crypto assets in Q1 2014, when it launched an initiative to clarify how crypto assets should be taxed (Bellavitis et al., 2020).

China (Group 2) had already started the most restrictive regulating philosophy against cryptocurrencies, with a notice emitted by the PBC (People´s Bank of China) dating from 2013, prohibiting financial and payment institutions from dealing with bitcoin-based transactions.

India (Group 3) made its first cautionary advice about the risks of trading Bitcoin in 2013 but made no straightforward advances toward formal regulation (Xiong & Luo, 2024a).

The United States (Group 4) made the first movement towards regulation through a note from FinCEN (Financial Crimes Enforcement Network), stating that cryptocurrencies would fall under its rules, marking a landmark for crypto regulation as it was the first real regulatory movement by an entity towards the official creation of crypto regulation. (Financial Crimes Enforcement Network, 2013). In this context of unknown technology, some events were markdowns to the evolution process.

5.3.1.1 Mt Gox Collapse (2014)

Mt Gox was a platform created in 2010 for trading cards but was transformed into a platform focused on dealing with Bitcoins in 2011. The company continued its growing trajectory, reaching in 2013 the impressive quote of 70% of the total amount of Bitcoins traded worldwide.

Nonetheless, while the Mt. Gox exchange was growing, the company faced several security breaches and internal issues, including a 2011 theft and problems with the stability of its withdrawal system in 2012. This process continued until the Mt. Gox collapse, when Mt. Gox had approximately 850,000 Bitcoins, worth around $ 450 million, stolen from its users' accounts due to a hack on the system. This failure culminated in a request for bankruptcy, and further investigation revealed that a significant amount of Bitcoins had been stolen over several years, clarifying the need for regulators to protect users and customers from the outrageous growth in value and applications of cryptocurrencies (Ishikawa, 2017).

The Mt. Gox incident damaged Group 1 and their insipient and unclear regulation at the time, in unique Japan, where the Mt. Gox exchange was located. Therefore, Japan updated its Payment Service Act in 2017 and created the first clear regulatory framework for crypto assets worldwide.

The first regulatory framework at the national level was established through several definitions that significantly impacted crypto-related possibilities. The most relevant measures taken were: 1) Legal recognition of cryptocurrencies as property; 2) Establishment of a Registration System for Cryptocurrency Exchanges; 3) Anti Money Laundering (AML) and Know your Customer (KYC) Requirements; 4) Establishment of Consumer Protection Measures; 5) Regular Inspections and Oversight by the Japanese financial regulator; 6) Requirement of a minimum amount of information in ICOs; 7) Creation of a regulatory Sandbox for crypto and blockchain enterprises (Payment Services Act (Japan, 2017 Amendments), 2017).

Within these measures, Japan could grant legal status to cryptocurrencies, allowing a series of financial-related activities to be executed under the law by various players. Thanks to this new status and regulations, many possibilities were presented to the Japanese market. For the first time, exchanges and regulated businesses were allowed to engage in crypto-related operations. This, combined with the growing and apparent concern of the Financial Service Agencies (FSA), created a safer environment for crypto within Japan, resulting in greater confidence in the overall environment from the perspective of the general population.

As a consequence of these perceptions, Japan became an early protagonist in the Cryptocurrency market, being responsible for more than 50% of the total Bitcoin volume at the beginning of 2018. This was followed by the Dolar, with 24% of the total currency volume, and the Euro, with 13% of the total currency volume (FinCity Tokyo, 2021).

This reaction and prevalence of Japan in the context of crypto in the immediate aftermath of the Payment Services Act of 2017, which intensified the regulation requirements for this market, suggests a relationship between the popularization of crypto in Japan and this tightened regulatory framework.

Besides Japan, there were relevant changes in the USA (Group 4). As an immediate response to the events of Mt. Gox, The NYDFS (New York Department of Financial Services) issued a public order initiating a process for accepting licensing applications for virtual exchanges under the New York Banking Law (NYDFS Grants First Charter To A New York Virtual Currency Company, 2015). To be considered valid, those exchanges needed to follow

the regulatory process known as BitLicense, a framework proposed in July 2014 for public comment.

This framework also presents a series of standard measures with the Japanese one, such as the obligation to create a system of registration of operations, some anti-money laundry policies, and customer protection measures, particularly the responsibility to safeguard customer assets, policy that should prohibit the crypto exchange of doing transactions with the virtual currencies of the clients (NYDFS, 2014). This last policy would have supposedly been enough to avoid or at least mitigate the damage caused by Mt. Gox, as the obligation to maintain and track assets would have made plausible the perception that the stolen funds had been held for years.

These two changes and suggestions mark the beginning of a more structured and institutional approach to crypto regulation from regulatory entities that already recognize and understand the importance of such regulation, despite the current unstructured framework.

5.3.2. Reaction and Containment

Following the initial phase of unregulated experimentation, the years between 2016 and 2018 marked a decisive turning point in the institutionalization of the cryptocurrency and ICO ecosystem. This period can be characterized as the Reaction and Containment phase, during which regulators around the world began to move from observation to intervention. The rapid growth of crypto markets and the emergence of major security breaches—such as the BitFinex hack (2016)—revealed the systemic risks of technological innovation operating without established governance mechanisms. As a result, key regulatory authorities in the United States, Europe, and Asia started to define the first formal boundaries for this new form of finance. These actions were not only reactive but also formative: they represented the first collective effort to contain volatility while preserving innovation, a mark of early institutionalization processes. In this sense, the period reflects a crucial stage in the learning trajectory of the ecosystem, where experimentation encountered formal oversight, and innovation began to transition from an open frontier into a regulated, adaptive system.

5.3.2.1 Regulatory conditions after the BitFinex Hack (2016)

Bitfinex is one of the world's largest and most renowned cryptocurrency exchanges, having started its operations in 2012. The exchange enhanced its power and status through a series of advanced trading tools and features offered on the platform, including margin trading, lending, and an extensive range of order types. Besides that, the company was also part of

developing one of the biggest stable coins existing, called Tether, which is pegged to the US dollar.

Nonetheless, BitFinex faced a significant security breach at the beginning of 2016, losing from its wallets around 120,000 BTC, at the time worth 72 million US dollars (Oosthoek & Doerr, 2021). This incident pushed new discussions and considerations about the securities norms and protocols around cryptocurrencies (Xiong & Luo, 2024b). This discussion arose primarily due to the vulnerability of BitFinex's multi-signature wallet system, which was exploited to generate security breaches that enabled the theft of funds.

This event also had special importance for the crypto regulation for several reasons; first of them, it was the first significant event related to cryptocurrencies after the annunciation of the new categorization of cryptocurrencies as commodities and, consequently, the first significant event in which the CFTC (Commodities Futures Trade Commission) was also responsible for a ruling. As a consequence of this new status, BitFinex was fined CFTC in 75 thousand dollars for offering illegal off-exchange financed retail commodity transactions in Bitcoin and other cryptocurrencies required for American CEA (Commodity Exchange Act), for failing to register as a futures commission merchant (Commodities Futures Trading Commission) and for not complying with the minimum security requirements for exchanging commodities.

This event also represents a milestone for general crypto regulation in the USA, marking the CFTC's step up to improve the country's overall regulatory framework. It also highlights a trend and growing concern among the largest countries regarding the global crypto regulatory framework.

This trend is confirmed by the significant influence on the USA (Group 4), particularly through the structured influence of the CFTC on cryptocurrencies. Through CFTC Staff Advisory No. 18-14, the CFTC utilized this moment and situation to emphasize and provide direction to the crypto market. This direction was given via measures such as 1) Enhanced Market Surveillance, 2) Close Coordination with the CFTC Coordination Group, 3) Large Trader Reporting, and 4) Outreach to Members and Market Participants. To reiterate this ruling, in 2018, the Federal Court confirmed the C FTC's authority in the judgment of the case of My Big Coin, confirming its position as one of the authorities in the cryptocurrency theme (Commodities Futures Trading Commission, 2018).

Additionally, this event also incentivized changes in European Union policy related to cryptocurrencies (Group 1). At the beginning of 2018, the EU adopted the Anti-Money Laundering Directive (AMLD5) and the Crypto-Asset Regulation, which is perceived as the

first turning point regarding crypto regulation in Europe. This new regulation is a milestone of crypto regulation in Europe since it was the first subjection of crypto businesses to regulation in Europe. This regulation led to several obligations from the side of the businesses, such as following the Know Your Customer (KYC) principle and Anti Money Laundering (AML) laws. Additionally, exchanges began to be required to verify customer identities, conduct due diligence on transactions exceeding 10,000 euros, report suspicious activities to national authorities, and register with the national financial regulator to operate in a particular country. Aligned with these measures, the non-compliant businesses become eligible to a series of heavy punishments, as heavy fines and even the prohibition of operation in the European Union (AMLD5, 2018). This new regulation was responsible for several changes in the crypto panorama in Europe. The new compliance costs have caused small and unregulated businesses to experience difficulties and shut down.

In this scenario, it is possible to see a big shift in the panorama of crypto regulation in the world. At this point, cryptocurrencies were already perceived by the regulators as a technology and financial product with high potential, as with high risk. With this logic in mind, the government began to openly regulate the crypto market in some of the world's largest economies, although with a greater focus on the security aspects of crypto regulation at present. This line of action is also important because of the signal it sends to next year, each day more the common argumentation of crypto owners and businesses that any kind of regulation would disturb the theoretically perfect environment is less taken into consideration face the several risks the cryptocurrencies and all its scenario is offering for the open society.

5.3.2.2. Regulatory conditions after the ICO Boom (2017-2018)

The third important event to be mentioned, the formation of the regulatory framework that led to the FTX debacle, is the first one that is not correlated to an incident or hack.

The so-called ICO Boom was a massive popularization in this financial means at the end of 2017 and the beginning of 2018. The number of ICOs started in 2017 and aligned with its performance, yet in 2016, it raised only 28 million dollars in the first quarter of 2017. Nonetheless, the ICO market went through stellar growth in the next quarter, increasing by almost 4 times, bringing in around 600 million dollars. The development continued in the next quarters, surpassing the 1 Billion line in the third quarter and almost doubling again the rise in the last quarter, surpassing the amount of 2 Billion dollars raised, as shown below (Crunchbase, 2018).

Figure 1: Evolution of ICO numbers and funding (2017)(Crunchbase, 2018).

At the end of the year, the Wall Street Journal estimated a rise of $4,9 billion in 2017. This rise in the year changed the panorama and the level of awareness of the population about the matter, creating a completely new era for cryptocurrencies.

To understand the phenomenon of the popularization of ICOs, it is important to understand the main reasons that brought this new market to the forefront of popular knowledge.

It is understood that the ICOs achieved such a rise, based on several characteristics that this kind of investment faced. The first of them is the existence of a self-supplier market. Within the growing success of the diverse cryptocurrencies and the blockchain technologies shift (Marc Pilkington, 2022), some of the investors who successfully entered this market kept investing in cryptocurrencies, creating an accumulative effect that contributed to the stellar growth seen in 2017.

After that, with the development of this market and the constant evolution of the regulations around it, ICOs were slowly accepted by institutional investors willing to diversify their portfolios. This process was also responsible for a growth in interest and publications about the subject, introducing this kind of investment to more possible investors each day.

On the other side, the formalization and recognition in more environments of cryptocurrencies as a valid and serious way of investing, intensified the reliability of this investment and also between the adepts of the initial concept of the blockchain technologies as investments. The feeling of freedom connected to the ICOs, the simplicity of success indicators, and the advantages faced by the pre-existing crowdfunding platforms, that now could achieve the same final objective, but with several extra possibilities, also presented a serious reason for the growth.

At least, the dynamic of execution of an ICO became also an important factor for both investors and enterprises. Compared with its “older cousin”, the IPO, the ICO presented itself as an easier and cheaper way of raising funds for an enterprise. To explain in further detail, several metrics are extremely attractive when the ICO is compared to the IPO. The two most appealing of them are price and time invested (Marc Pilkington, 2022). While the IPO takes an average of six months and costs between 7 and 15 percent of the total funds raised, the ICO takes an average of two months and costs around 3 percent of the total funds raised, which means one-third of the time and between half and one-fifth of the costs.

Therefore, this several reasons justifying the stellar and consistent growth of ICOs, the concerns of constant growth in these rates became clear and the regulatory bodies of several countries found themselves obligated to challenge to rule for the first time a kind of investment business that was in the billion dollars’ worth but had an extremely decentralized way or organization that made extremely hard to define the proper jurisdiction to lead this regulatory chapter (Daniel Heller, 2017). In this context, for the first time, a strong movement towards regulation was possible in several countries simultaneously.

Beginning with Group 1, there was for the first time an intense official reaction from the UK. The reaction started with a warning from the FCA in the middle of 2017 making several warnings about the Initial Coin Offerings, emphasizing the exposure to fraud in a still unregulated environment, explaining the high risk involved in these investments and informing about the fact that lots of the ICOs happen themselves outside of UK, making impossible to the government at that point to offer the minimum protection to the investor (Financial Conduct Authoriry, 2017). Months later in the same year, there was another publication, called “FCA Feedback Statement on Distributed Ledger Technology (DLT)” stating that from that moment on, ICOs could fall into FCA direct regulation, if they: 1) are an investment under the UK regulated Activities Order(RAO) of 2001; 2) are a security token similar to shares, bonds or derivatives; 3) are a collective Investment Scheme (CIS); 4) are an alternative investment fund (AIF).

Besides those movements, there was in March of 2018 the creation of a cryptoassets taskforce comprising the FCA, the Bank of England, and the HM Treasury (His Majesty's Treasury) to assess the situation of cryptoassets and its risks. At the end of 2018, a report presented the UK's approach to this new investment form was published. This report defined officially the categories of crypto assets, recommended the extension of the already existing regulations, and again highlighted the risks related to market integrity and financial crime in this environment (Großbritannien et al., 2018). After that, there was also a publication of a consultation paper from the FCA, looking for feedback about its proposes for crypto assets, which were several as a clarification of which assets would fall into the RAO regulations, an explanation about the legal requirements for firms intending to deal with crypto assets and a consumer guidance to protect and clarify technically the reality of this new investment (Financial Conduct Authoriry, 2019).

With a similar approach to the UK, the European Union, also from regulatory Group 1, had intensified its influence in the crypto market after the so-called ICO Boom. The first step of the new posture of Europe toward crypto regulation was both statements emitted by the European Securities and Markets Authority (ESMA). The first of them, about ICOs as a whole, alerted to the high risk of financial loss and fraud, as a consequence of the unclear regulation and consequently absence of protection from the European financial institutions as a whole (European Securities and Markets Authority [ESMA], 2017b). On the same date, there was another alert focused on the enterprises. This other alert stated the need for these ICOs to accord with the already existing financial laws valid in Europe and the necessity to comply with the Prospectus Directive (required information to be published before offering securities), the MiFID (Markets and Financial Instruments Directive), and the AIFMD (Alternative Investment Fund Managers Directive) (ESMA, 2017a).

After that, it is important to mention another alert from a European institution, at this time the European Supervisory Authorities (ESAs), comprising the ESMA, the European Insurance and Occupational Pensions Authority (EIOPA), and the European Bank Authority (EBA) also restating the market volatility, the potential loss risks and the absence of consumer protection (ESMA, ß2/2018). This behavior and warning from several institutions show an agreeable and congruent policy front on cryptocurrencies inside Europe. Another point already mentioned before, but that is important to repeat to clarify the state of regulation in Europe at this point, is the 5AMLD, which was also a cross-European policy that was effectively adopted in July of 2018, after the ICO Boom, that has as main goals increasing the regulatory of scope of ICOs and cryptocurrencies from the side of the European institutions and enhance the

features of consumer protection through new stated transparency obligations from the side of the businesses (AMLD5, 2018).

Following the trend of profound changes and regulation shifts as a consequence of the ICO Boom is also important to mention the China (Group 2) case. China's behavior toward ICO is much more intense than the other groups already studied. The first movement of China as a consequence of the ICO Boom was the release from the Legislative Affairs Office of the State Council of a document tailored by the China Bank Regulatory Commission (CBRC) of a draft of the rules for handling illegal fundraising and indicated the intension in regulate ICOs (Deng et al., 2018). Nonetheless, in this article there was a mistake, comprising only the newly regulated investments that were supposed to sum a principal payment and an interest rate (Legislative Affairs Office of the state Council, 2017). As a result, this part of the document did not include the ICO in the regulation focused on crowdfunding.

Given the current regulatory situation, China published a general ICO ban in September 2017. An association between several of the most relevant Chinese economic institutions, such as the People's Bank of China (PBC), Cyberspace Administration of China (CAC), Ministry of Industry and Information Technology (MIIT), State Administration for Industry and Commerce (SAIC), China Banking Regulatory Commission (CBRC), China Securities Regulatory Commission (CSRC), and China Insurance Regulatory Commission (CIRC) published the “Public Notice on preventing risks of fundraising through coin offering”. This publication changed completely the reality of ICOs in China, by: 1) defining ICOs as unauthorized crowdfunding activities with the issuance of tokens; 2) requiring the cessation of all the activities around ICOs, with an instruction to refund investors; 3) prohibiting every kind of participation from financial institutions in any part of a token process; 4) confirming the tasks of regulatory authorities to audit and punish the not compliant stakeholders (PBC, 2017). There were also other notes related to the matter, but it is understood that there was an absence of determinations correlated to the possibility of investments in foreign countries, also keeping a dubious status to the investors of overseas cryptocurrencies (Deng et al., 2018).

At least, the USA (Group 4) also underwent several changes in its cryptocurrency policy after the ICO Boom. For the first time, the USA's Securities and Exchange Commission (SEC) pronounced itself on the theme of ICOs. The SEC concluded that the ICO of the DAO (Decentralized Autonomous Organization) was a security (SEC, 2017/No. 81207), starting a whole new era of ICO regulation. The ICO of the DAO group that generated this shift in regulation, was an ICO made in Ether that raised around 150 million dollars. The purpose of the ICO was to create a venture fund, in which, through the acquisition of the tokens, the owner

would have the rights to vote and participate in the decisions of the fund (SEC, 2017/No. 81207).

The Supreme Court defined the ICO of DAO as an investment contract, as described in the famous Howey Case (SEC v. W.J. Howey). The so-called Howey test, described in this trial in 1946, defines 4 characteristics an investment needs to be considered a security. The criteria of the test were: 1) The need for an investment of money; 2) The existence of a common enterprise, understood as a company shared between one promoter of its activity and multiple investors; 3) The investors need to expect profits from their investment; 4) The profit shall come from the well succeed entrepreneurship or management from others (SEC v. W.J. Howey Co., 1946).

Analyzing the case of the DAO ICO as an example of the application is possible to confirm that: 1) There was money investment since there was cryptocurrency payment; 2) promoters were stimulating and advertising the fund, and there were also investors; 3) The fund had clearly stated in its activities the goal of offering returns; The fund had stated in its activities the goal of offering returns; (SEC, 2017/No. 81207) 4) Even though there was an understanding from the SEC, that the votes themselves could not constitute managerial effect, the curators of the projects could influence through their abilities in the returns, therefore, confirming the application and the success of the Howey law in the DAO ICO case. At this point, the scenario starts to point out in the USA that the simple existence of anything similar to traditional shareholders would make it likely for a financial institution to regulate the matter (Deng et al., 2018).

At this point in regulatory history, it is possible to see, for the first time, a vast regulatory movement connected to crypto, stemming from the consequences of the enormous growth in cryptocurrency usage. It is a huge concern for the regulatory institutions, that, nonetheless, still are not able to support and develop steady and consistent regulatory frameworks, with several overlaps, as in the USA, which at this point was responsible for the regulation with no clear distinction of responsibilities (Emmert, 2022) as SEC and CFTC, for example, and several superficial or not sufficiently broad regulations, such as the UK and the EU's announcements about their incapacity to offer proper protection for customers, and China, which even with the purpose of strict regulation has not yet been able to have regulations covering the multiple possible situations involving cryptocurrencies.

5.3.2.3. Aftermath of Regulatory Changes

In the context of growing regulation worldwide, the next important event to analyze and understand, aiming for a comprehensive understanding of crypto regulation, is to examine the markets' reactions to these changes. At the same time, the growth, the more significant returns, and the entrance of institutional investors in this market increased awareness and general knowledge among diverse sectors of society about this form of investment. The regulation that followed this evolution raised concerns about the industry's reaction.

The blockchain, cryptocurrencies, and ICO industries emerged from traditional regulators' ideas and concepts of an independent financial system. Nonetheless, with the new regulatory trend, the industry has undergone several changes in the amount and characteristics of new ICOS created after the boom, as well as the geography of ongoing ICOs. This process was a direct consequence of the regulatory efforts of leading economies and a response from other countries, which, in several cases, attempted to improve their attractiveness to this market, presenting another challenge to the regulation of ICOs. The effects of those changes and reactions in the ICO numbers and geographical location in the Boom and the first years afterward are shown in the tables below:

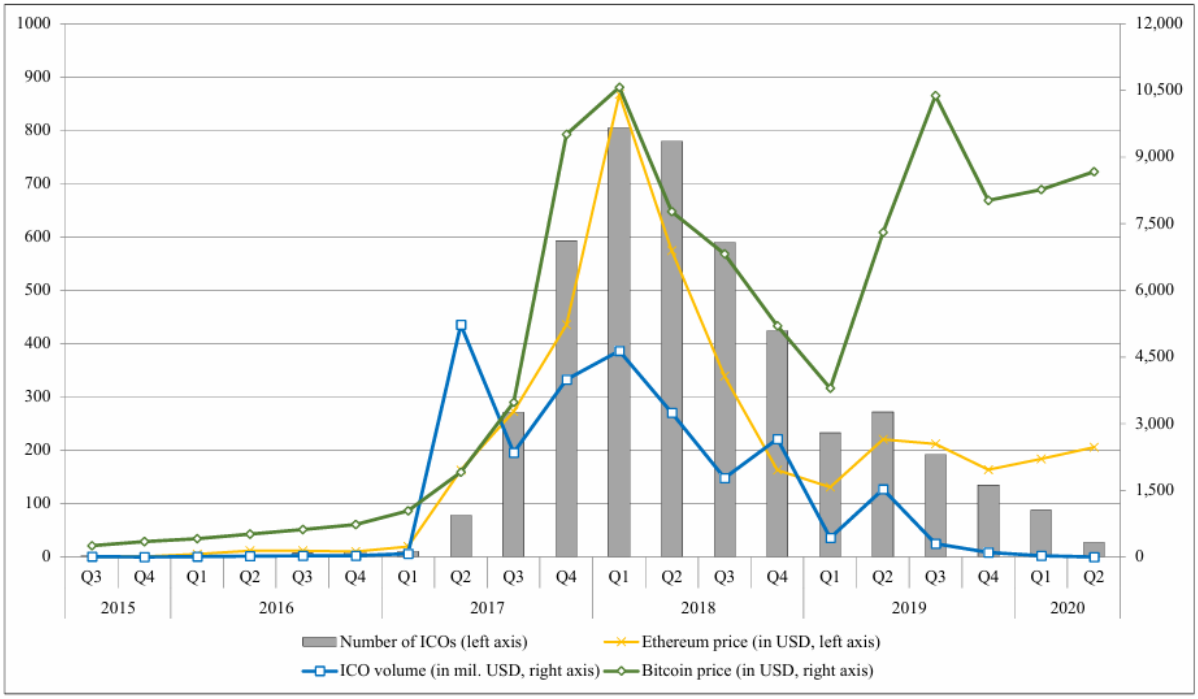

Figure 1. Evolution of the number of ICOs, ICO volume, and Bitcoin price.

Figure 2: Evolution of ICOs, ETH and BTC from 2015 to 2020 (Bellavitis et. al., 2021).

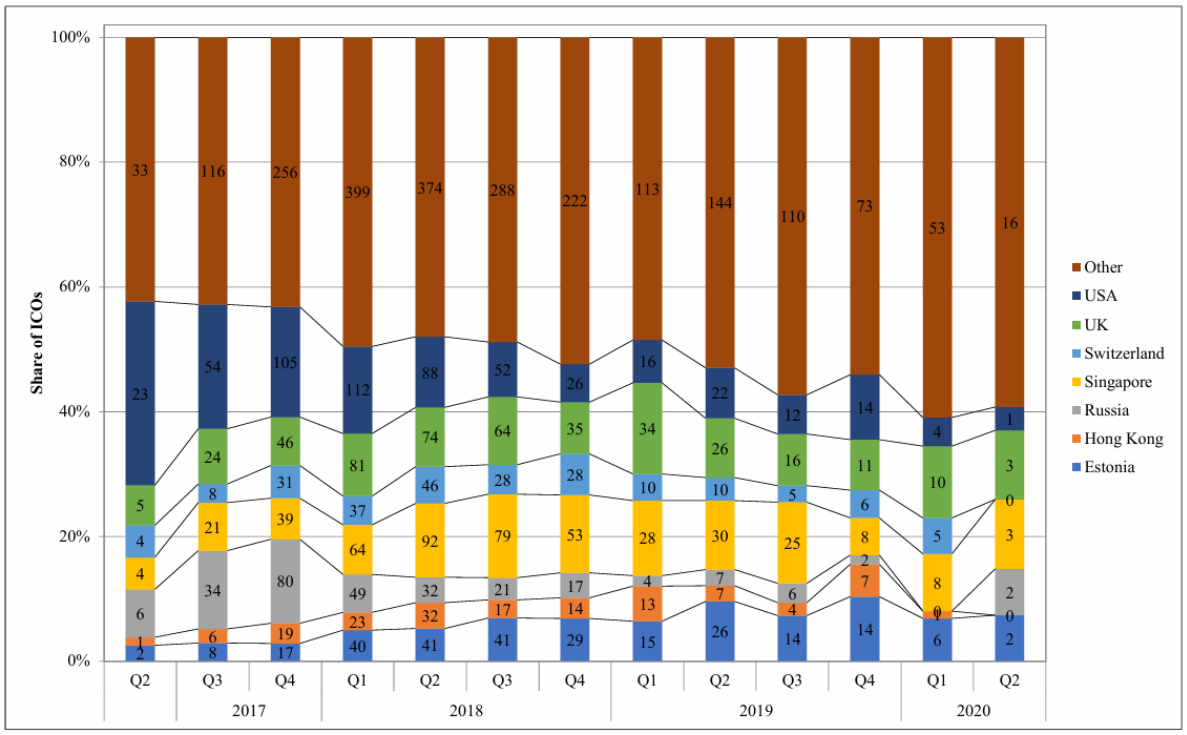

Figure 3: Geographical distribution of ICOs from 2016 to 2020(Bellavitis et. al., 2021).

The figure 2 helps us understand some of the effects of new regulations on the general market panorama. We can see relatively steady growth in ICOs until Q1 of 2018, when the growth finally stops and a new tendency of deceleration in the number of ICOs and the amount raised for them starts. This phenomenon was explained by the suggestion of reduced ICO activity and crowdfunding activity connected to a more restrictive regulation (Bellavitis et al., 2021).

The second table, for instance, shows the geographical configuration of ICOs within the evolutionary changes in their regulation worldwide.

In the most considerable growth inside the ICO market, when considering the number of ICOs, from Q3 2017 to Q4 2017, with an increase of around 300 ICOs from one quarter to another, it is possible to see the shares of these new ICOs from each country. While in Q3 2017 the United States had a total of 54 ICOs from a total amount of 271, almost 20% of the total of ICOs worldwide, Singapore had a total of 21 ICOs, around 8% of the total amount, in Q2 2020, a moment when the whole ICO market was slowing down, the United States had one single ICO, from a total of 27 (less than 4%), Singapore had 3, representing more than 11% of the total of ICOs worldwide in this quarter.

This data shows the size of the dynamics change inside the ICO and crypto market during this time, possibly connected to some countries' new and more burdensome regulations.

Other countries have tried to create a relatively more friendly regulatory framework for cryptocurrencies than the most prominent players from the beginning of the ICO Boom.

In other words, the new balance and regulation analysis after the growth seen in regulations is a more profound question to be answered and understood, since the first years after the Boom showed a mix of downsides and upsides in regulation since the policy of regulations interfered directly in the results and the economic growth possibly provided not only for the ICO but also from the entrepreneurial activity connected to it. In this context, it is also essential to remember the increasing “regulatory competition” that has started to appear between several countries (Sabrina T Howell et al., 2018), which brought even more complex questions into the pool of challenges for national regulators in this market at this moment (Bellavitis et al., 2021).

This could be exemplified by the Singapore case, in which a country that had adopted such a friendly policy toward ICO, that was even called the “jurisdiction of choice” in a report from the American audit and consulting PWC in 2018. This case also fortifies the thesis of the regulatory competition that could have started to be created between the countries, since Singapore adopted a friendly posture to IPO, when its bigger neighbors China and South Korea opted for a total ban for the first time, possibly benefiting from it and becoming a regional reference for the theme and even a leader in the ICO matter worldwide (Bellavitis et al., 2021).

Therefore, it is possible to see the shift and the changes in the whole scenario, with the biggest countries in the cryptocurrencies and ICO markets losing share space in this market, while other countries, such as Switzerland, the already mentioned Singapore, and Malta, developed regimes to attract crypto investments (Feinstein & Werbach, 2021).

In this context, Feinstein & Werbarch (2021) proposed to evaluate the impact of regulation in several hypotheses. The study tested effects on: 1) changes in the country classification of cryptocurrencies; 2) pursuance of AML (Anti-Money laundering) policies; 3) pursuance of anti-fraud actions; 4) creation of bespoke regulations. In this context, it was impossible to reject the so-called null hypothesis about the regulations' consequences in cryptocurrencies, which states the negative impact of regulations in the in-jurisdiction trade volume (Feinstein & Werbach, 2021). Besides that, it was also tested for variations and results in the global trade volume and the price. The results were that a variation in the international trade volume is highly model-dependent, without the possibility of finding any significance in this context. The price variation analysis could occasionally see some significance, suggesting the possibility of abnormal price returns connected to regulation, but with high model dependence in the result found (Feinstein & Werbach, 2021).

At this point, even though there is not any substantial proof of the impact of regulators and new regulations on cryptocurrencies' returns, regulators have made several declarations and expressed concerns about the possibility of chilling the evolution of the latest technology through sharper and stricter regulation (Scott Cohn, 2018). This mixture of factors creates a dangerous scenario for cryptocurrencies in the aftermath of its most significant growth until that point since even though there is no proof at this moment from the influence of regulations in the evolution of blockchain technology as an investment form, there are signals of priorities shift and a will of stimulating a technology in regulators from some of the biggest economies worldwide, while the mission and the function of them is to keep the safety of the market.

5.3.3. Systemic crisis and reflection

After several years of fragmented adaptation and gradual regulatory progress, the cryptocurrency and ICO ecosystem entered a period of systemic crisis and reflection between 2020 and 2022. This phase represents a turning point in the institutionalization of innovation, when multiple crises exposed the structural weaknesses of an ecosystem that had expanded faster than its governance capabilities. Events such as the Terra/LUNA collapse and, shortly after, the FTX breakdown, revealed the risks of excessive centralization, inadequate transparency, and the lack of standardized global oversight. Yet, from an innovation-management perspective, these breakdowns functioned as powerful learning mechanisms, triggering a collective re-evaluation of governance principles and coordination models. For the first time, regulators, exchanges, investors, and policymakers converged around a shared understanding that sustaining technological innovation required robust institutional foundations. In this sense, the 2020–2022 period was not merely a crisis of confidence but a stage of deep systemic reflection that redefined the boundaries between experimentation and regulation, paving the way for the coordinated consolidation that followed.

5.3.3.1.Regulatory conditions after the Terra and Ust collapse (2022)

The sixth and last event to be mentioned is the collapse of the group Terra. To understand this process, it is essential to have a basic understanding of Terra and Luna. Terra was a cryptocurrency exchange developed by TerraForm Labs, which created its cryptocurrency to offer services and applications to a significant user base (Liu et al., 2023). For this purpose, Terra created its first token, LUNA, whose owners would benefit from a share of the exchange's fees, access the applications, and speculate on the token's value.

In this context, from the perspective of a new exchange, Terra introduced a stablecoin called UST, pegged to the dollar, to offer a safe exchange, simulating the reserves that standard banks provide. Nonetheless, this coin differs from stablecoins pegged to the dollar through an off-chain mechanism. The mechanism used to peg the UST was a mechanism in which the 1 dollar of UST would always be worth 1 dollar of LUNA, and for this reason, the balance would be kept by the balance provided for the traders of the coins (Liu et al., 2023). When one falls between the values they were pegged to, there is pressure from the market to buy this cryptocurrency for a price under $ 1 and change immediately to the cryptocurrency above $ 1. In this process, with the easy profit chance in such a safe operation, the prices would automatically balance themselves, keeping the crypto pegged. That means, for one of the coins to effectively fall, and it could only happen if the owners of one of the coins stop converting them for the other coin, resulting in an excess of LUNA in the market and consequently impossibility of new conversions to UST, since in this scenario it would be less valuable.

It is also important to highlight that one factor that made the whole balance even more complicated, was the high yields paid for Terra to establish the exchange and estimate the deposits from the clients (Xiong & Luo, 2024a). Since its inception, the Terra exchange has offered depositors a 19.5% yield. Nonetheless, around May, large withdrawals began to occur on the platform, resulting in the debugging of the UST and LUNA's dollar peg, which caused both coins to lose almost all their value.

Following this event, new regulations focused on stablecoins emerged, which, although not directly related to ICOs, have proven to be significant tools for ICOs, as seen in the Terra exchange case.

The reactions were from the UK (Group 1), which made a public consultation on its new rules for stablecoins in 2023 through the discussion paper 23/4. The regulations focus on fiat-backed stable coins, which means the need for assets to be referenced by a fiat currency or holding reserves equivalent to the values of the cryptocurrency. Besides that, the paper and the regulatory intentions also highlight the objective of regulation of stablecoins from the side of the FCA (Financial Conduct Authority) under the Financial Services and Markets Act of 2000 (Financial Conduct Authoriry, 2023). Along with these measures, the Bank of England and the Prudential Regulation Authority also issued papers discussing the possibilities and risks connected to the use of stablecoins in payment systems, deposits, and so-called e-money.

The other reaction comes from the United States (Group 4), where the Senate has released the Digital Commodities Consumer Protection Act (DCCPA) to regulate cryptocurrencies. This Act designates Bitcoin, Ethereum, and digital assets in general as

commodities, defining the responsibility of regulating and controlling them as the CFTC (Commodities Futures Trading Commission) with the obligation of registration and compliance with the rules of this institution for all exchanges, brokers, and custodians (Digital Commodities Consumer Protection Act (DCCPA), 2022). Besides that, this Act also required openness about the fees being charged from the users and the trading risks connected to the cryptocurrency trade, mandated anti-manipulation measures to prevent wash trading and insider trading, enforced anti-fraud provisions, and clarified the differences between commodities and securities, for the first time clearly defining what part of the cryptocurrencies would be regulated for the SEC and what would be regulated for the CFTC (Digital Commodities Consumer Protection Act (DCCPA), 2022).

For the first time in the history of cryptocurrencies, it was possible to observe and understand a clear and comprehensive movement towards regulation, with institutions dividing responsibilities and avoiding the overlapping and consequent flaws that result from this overlap in regulation. This provided an expectation of a safer and steadier crypto environment, especially in the US.

5.3.3.2.Timeline of updates in regulation until FTX Breakdown

At the end of this chapter, it is essential to highlight that the facts and law regulations mentioned are only a part of the total that happened in the regulatory groups mentioned in the beginning. They have been shown to clarify the changes and trends around the regulation of cryptocurrencies and ICOs during their existence. The laws and countries chosen have been chosen based on their economic and political relevance in the context of ICOs.

To better clarify this process, a comprehensive timeline is going to be presented below:

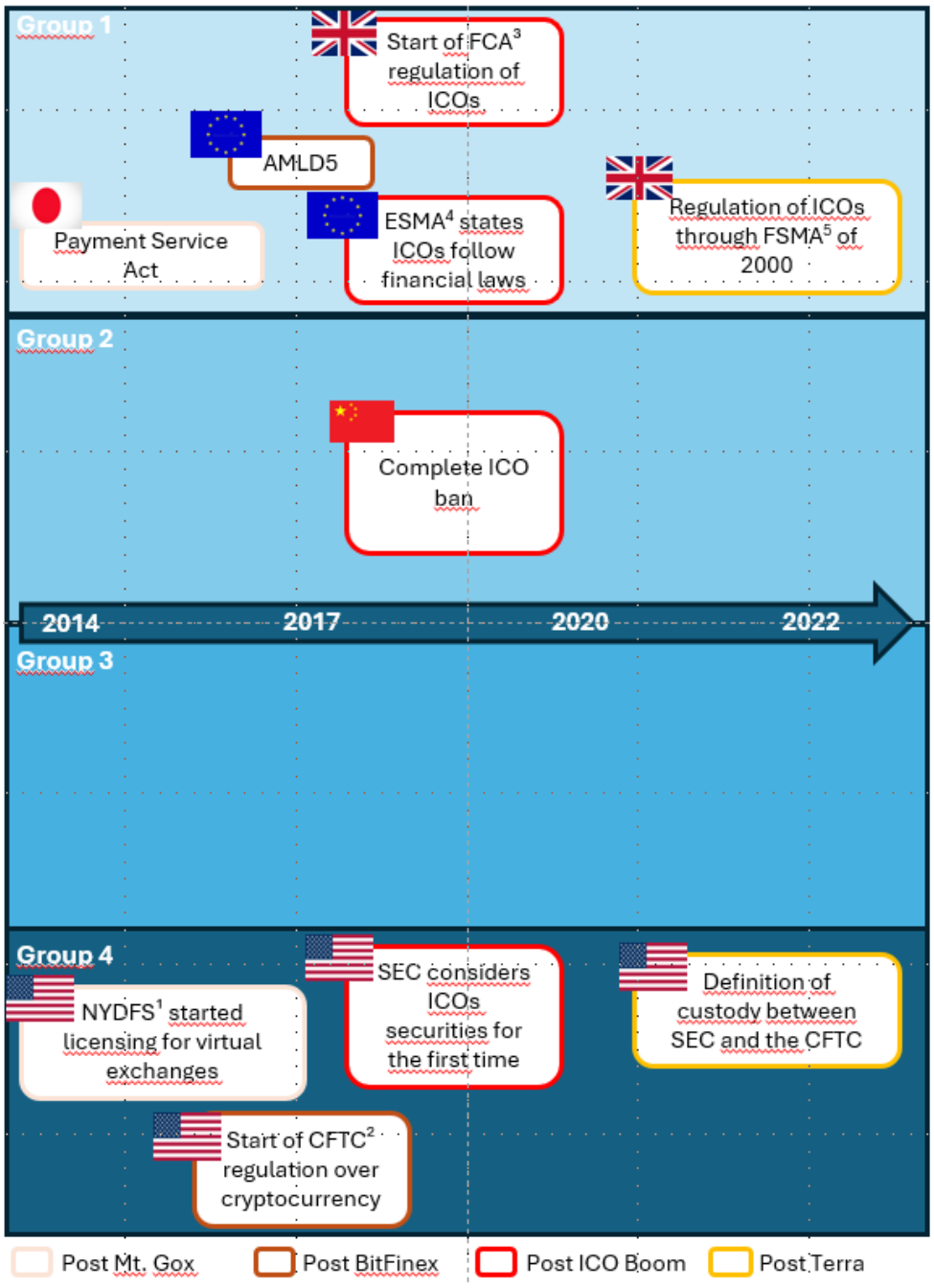

Figure 4: New regulations of cryptocurrencies before FTX collapse

As evident from the timeline, which highlights the main changes in regulations, there is a notable density of new rules and updates in regulations across the most significant economies worldwide. In contrast, the smallest economies stayed aside when adapting themselves to the new reality of cryptocurrencies, reinforcing the theory and the perception of the heterogeneity of regulatory frameworks. Besides that, it is possible to notice the intensity of the reactions after the ICO Boom, the only moment in which all the most substantial economic and, consequently, most regulatory groups had meaningful reactions.

5.3.4. Global Consolidation

The period between 2023 and 2025 represents the culmination of the institutional learning process within the cryptocurrency and ICO ecosystem, marking the transition from fragmented adaptation to global consolidation. After the systemic crises of the preceding years, the ecosystem entered a stage of coordination in which innovation and regulation began to converge. Governments and international institutions moved from reactive policies toward proactive governance, developing comprehensive frameworks aimed at harmonizing market rules, ensuring consumer protection, and fostering sustainable innovation. This phase reflects the maturation of the ecosystem's collective capabilities: the ability to balance technological dynamism with institutional control. The implementation of global frameworks such as the Markets in Crypto-Assets Regulation (MiCA) in the European Union, the Financial Services and Markets Act 2023 in the United Kingdom, the Digital Commodities Consumer Protection Act (DCCPA) in the United States, and the consolidation of national laws in Brazil and Japan demonstrate how regulation evolved into a mechanism of innovation governance. From an innovation-management perspective, this stage represents the point at which experimentation has been transformed into institutionalized practice — where ecosystems learn not only to create but also to regulate innovation collectively, embedding technological change within stable and legitimate structures.

5.3.4.1.Regulatory framework per level of regulation

Building on the temporal reconstruction above, this section compares how different institutional clusters converted regulatory experience into learning and capability building. Each group illustrates a distinct pathway of innovation institutionalization — ranging from proactive integration (Group 1) to reactive adaptation (Group 3) and defensive restriction (Group 2).

Following a significant number of events and transformations in the cryptocurrency industry, it is essential to review the results obtained through the regulatory transformations that have resulted from several frauds and significant developments in this sector.

It is also essential to highlight the limitations of this classification in this context. The classification used at the beginning of this paragraph was developed in an article from 2024, almost 10 years after the start of the history of crypto regulation mentioned in this chapter. Therefore, it is possible to see some inconsistencies between the posture and maturity of the countries inside the groups at this point, before the FTX breakdown.

Nonetheless, based on the classification of the groups made from Arner et al. in 2024., it was understood that, despite these inconsistencies, the most effective way to explain and assess events of such diversity and peculiarity was through this clusterization, which is, above all, deeply connected to the results and the actual understanding of the countries regarding the function and risks of ICOs and cryptocurrencies.

With this foundation in place, the next step is to summarize the results of the changes after these 8 years of regulations changes worldwide, in particular when it comes to group 1 and group 3 of our clusterization, which is composed of diverse countries:

5.4 Regulatory results of the Innovation Process

5.4.4.1. Group 1

During the years studied, Group 1, comprising the European Union, the United Kingdom, Hong Kong, Singapore, Japan, Switzerland, the United Arab Emirates, and Australia, has gradually begun to move towards completely regularizing and regulating the ICOs and cryptocurrency market.

Although this analysis began in a completely unregulated market in 2014, through a series of measures and political actions, this group was able to profoundly change its regulatory framework. The first point to stand out when analyzing this group is the consistent tendency to adopt KYC (Know Your Customer) and AML (Anti-Money Laundering) rules in the more closely analyzed countries. (Japan, the European Union, and the UK). The second point that stands out is an attempt to apply the rules of ICOs and cryptocurrencies to general financial laws. This means that, at some point, all countries mentioned adopted ICOs and cryptocurrency laws that were already in effect for the economic system.

This behavior and the complicated attempt to adapt each day to the existing laws for this new environment suggest a posture concerned with regulating and adapting this new technology to meet the safety standards for both consumers and enterprises, allowing it to be thoroughly integrated with traditional financial systems. This perception and factors confirm the position of writer who first created this classification, who states this group is rapidly applying a similar regulatory approach and sees crypto as a market to be regulated and accepted (Arner et al., 2024).

5.4.4.2. Group 2

Group 2 presents itself as a more manageable group since it comprises only one country with a simple regulation. Group 2 comprises China and presents a clear regulatory framework

resulting from this year's years of regulation. During the years studied, China was on the beginning of crypto, around 2014, issued an advisory about the risks of fraud and several losses connected to crypto, and again in 2017 decided for a complete ban, having in the last years a few updates and also a limited perspective of changes in its posture towards crypto (Arner et al., 2024).

5.4.4.3. Group 3

Group 3 is already a more complicated case. Regarding the countries included in group 3 (Brazil, India, and Indonesia), it was impossible to find mentions in the researched articles that directly connect the most relevant events of the cryptocurrency world to changes in regulation. This fact suggests a lesser relevance to the regulations in those countries and a certain disconnection from these countries with the most relevant trends worldwide. Nonetheless, there are mentions in the literature about a shift in the position of these three countries toward crypto, relating that they started their crypto regulation history with a rougher and prohibitive position and, in the last years, are shifting toward a posture similar to Group 1, each day being more favorable to a regulation and general authorization of trade and functioning of those technologies.

5.4.4.4. Group 4

The following group, which is constituted solely by the United States, is also a complicated case in itself, not because of its large number of conflicting geographies but due to its complex internal division of power. The relatively independent nature of the states, associated with a large number of regulatory institutions, makes it more challenging to establish a clear regulatory framework.

Nonetheless, since the beginning of the cryptocurrency trend, the United States has been one of the precursors of all kinds of regulations and concerns connected to the growth of crypto exchanges and later to ICOs, uses of blockchain technology, and diverse ways of financing entrepreneurial activities through non-conventional forms, as it was expected considering the large volumes of money raised and amount of processes connected to cryptocurrencies since the beginning in the US.

Even so, since the beginning of the assessment made in this study, it was possible to see some inconsistencies in the country, beginning with the series of recommendations and regulations issued by the state of New York, creating an inconsistent framework in the country since the beginning and with the series of recommendations and consequently uncertainty between institutions about who would effectively be responsible for the regulation.

Even though, at the end of the period assessed until this end of the study, regulations and orientations in the USA could create a clear framework for the surveillance of cryptocurrencies, mainly through the division of responsibilities between the SEC and the CFTC, making the institutions responsible for some key factors that emerged in this period, such as the KYC and AML policies.

5.5. Challenges to Institutionalization of innovation

Considering From an innovation-management perspective, the flaws observed in current regulatory frameworks reveal not merely policy gaps, but structural tensions inherent to the institutionalization of a disruptive innovation. The evolution of the ICO and cryptocurrency ecosystem illustrates how governance systems often missed technological creativity, producing asymmetries that, while problematic, also generate valuable learning feedback for future regulation. Each imperfection functions as part of the innovation cycle—a temporary imbalance that drives collective adaptation within the ecosystem.

The first and perhaps most critical challenge concerns the absence of regulatory standardization across jurisdictions. In traditional financial systems, regulatory authority is concentrated within national institutions that enforce consistent norms and accountability mechanisms. By contrast, the decentralized and borderless nature of blockchain-based finance resists this centralized control. The resulting regulatory fragmentation has led countries to pursue divergent strategies, often driven by their innovation ambitions or risk tolerance. This regulatory heterogeneity, though a weakness in terms of coordination, also fuels experimentation and policy learning. For instance, after the 2017–2018 ICO Boom, Singapore's flexible and innovation-friendly approach positioned it as a global hub for ICO activity, attracting investment and serving as a living laboratory for regulatory innovation. Conversely, China's prohibitive stance illustrates defensive adaptation—an attempt to protect domestic systems while indirectly contributing to global learning by delineating the boundaries of acceptable experimentation. Together, these contrasting paths highlight that in the institutionalization of innovation, diversity of approaches acts as a mechanism for discovery and mutual calibration.

A second major challenge lies in the contradiction between the ideal of decentralization and the practical centralization of intermediaries. Despite blockchain's original promise of distributed autonomy, many of the ecosystem's most significant failures Mt. Gox (2014), Bitfinex (2016), Terra-LUNA (2022), and FTX (2022)—stemmed from the vulnerabilities of centralized exchanges. This paradox demonstrates a recurring pattern in innovation processes:

as novel technologies scale; coordination and efficiency pressures often lead to recentralization through new intermediaries. These actors unlike traditional financial institutions operate without established governance routines, generating instability that ultimately provokes new rounds of institutional learning. The concentration of power in exchanges thus becomes a catalyst for governance innovation, forcing the ecosystem to reconsider how decentralization and accountability can coexist.

The third challenge relates to technological interdependence and the search for stability mechanisms, exemplified by the rise of stablecoins. In theory, these assets were designed to anchor the volatile crypto market; in practice, they exposed a conflict between innovation speed and institutional safeguards. Without transparent reserves, independent oversight, or the credibility of a central authority, many stablecoins failed to sustain the trust necessary for systemic balance. This shortfall underscores a broader innovation-management insight: disruptive ecosystems require the gradual construction of trust architectures, institutions, norms, and verification systems that substitute for traditional guarantees. Each crisis involving stablecoins has therefore contributed to refining the collective understanding of how to stabilize value within decentralized innovation systems.

Finally, a fourth and deeply structural flaw concerns the absence of equivalent fiduciary and custody principles in the crypto-financial environment. Traditional financial institutions evolved under rigorous rules designed to separate client assets from institutional operations, ensuring long-term confidence and systemic safety. The absence of such norms in the early phases of the crypto ecosystem particularly among centralized exchanges reflects the immature stage of its institutional evolution. However, this gap has also served as a powerful learning mechanism: it revealed the necessity of translating institutional trust mechanisms from conventional finance into the innovation domain, thereby accelerating the maturation of governance capabilities.

Taken together, these challenges demonstrate that the evolution of ICO regulation represents an iterative learning process within an innovation ecosystem. Each regulatory imperfection, market failure, or crisis functions as a feedback loop, compelling actors to transform ad hoc experimentation into structured capability. The absence of uniform standards fosters exploration; the centralization paradox exposes governance gaps; the fragility of stablecoins highlights the need for credibility mechanisms; and the lack of custody norms forces institutional adaptation. In aggregate, these dynamics reveal that institutionalization in innovation systems is not linear or error-free—it unfolds through cycles of imbalance and correction, through which regulation evolves into a mechanism of innovation governance.

5.6. Summary of the process

The process of institutionalizing innovation within the ICO ecosystem unfolded through a sequence of interconnected phases that collectively illustrate how disruptive technologies evolve into structured and legitimate systems. From early experimentation to regulatory consolidation, the findings demonstrate that each phase generated new learning loops and governance capabilities that progressively stabilized the ecosystem. During the Pioneering Experimentation phase (2013–2016), the absence of regulation enabled creativity and technical exploration but also exposed systemic vulnerabilities. The Reaction and Containment phase (2016–2018) introduced the first regulatory interventions, transforming isolated practices into coordinated responses to risk and fraud. The Systemic Crisis and Reflection phase (2020–2022) represented a critical inflection point, as global crises particularly the FTX collapse triggered collective awareness of the need for institutional alignment and legitimacy. Finally, the Global Consolidation phase (2023–2025) marked the transition from fragmented adaptation to organized governance, reflected in the emergence of comprehensive frameworks such as MiCA, FSMA 2023, and DCCPA.

This phase-based reconstruction follows the process logic proposed by Langley (1999) and Melo et al. (2020), in which organizational or ecosystem evolution is examined through the sequencing of events that reveal learning mechanisms over time. In the case of ICOs, these temporal brackets expose how a decentralized technological innovation gradually built governance capabilities, moving from experimentation to institutionalized practice.

Across these phases, the ICO ecosystem evolved through iterative cycles of experimentation, crisis, and adaptation, transforming spontaneous innovation into institutionalized capability. Each regulatory milestone acted as a feedback mechanism, reinforcing collective learning and embedding innovation within formal structures of trust and accountability. In this way, the institutionalization of ICOs exemplifies the broader dynamics of innovation in ecosystems where technological disruption and governance co-evolve through continuous interaction. This processual understanding provides the foundation for the subsequent discussion chapter, which interprets these empirical findings through the theoretical lenses of innovation management, ecosystem coordination, and institutional learning.

In sum, the institutionalization of ICOs exemplifies how innovation ecosystems evolve through cycles of learning, coordination, and stabilization. The following chapter discusses these empirical phases considering innovation-management and institutional theories,

highlighting how collective capability building transforms disruption into organized governance.

6. DISCUSSION

This chapter interprets the four empirical phases identified in Chapter 5 Pioneering Experimentation, Reaction and Containment, Systemic Crisis and Reflection, and Global Consolidation—through the theoretical lenses of innovation-management and institutional theory. Building on the process-based logic advanced by Langley (1999) and Melo et al. (2020), it examines how the ICO ecosystem evolved from open technological experimentation to a structured and legitimate governance system. Each phase reveals distinct mechanisms of learning, coordination, and capability building that together demonstrate how a decentralized financial innovation became institutionalized within a global ecosystem.

The analysis reframes the trajectory of *Initial Coin Offerings* as a case of innovation-as-process, in which technological, organizational, and regulatory dimensions co-evolve through continuous feedback. Rather than treating regulation as an external constraint, the discussion views it as a mechanism of innovation governance—a collective capability that emerges when diverse actors align around shared goals of legitimacy, transparency, and market stability. The institutionalization of ICOs thus represents the culmination of an innovation-management process in which crises, adaptation, and learning transform disruptive creativity into structured practice.

Following Melo et al. (2020), the development of capabilities in this ecosystem can be interpreted through recursive cycles of experimentation, feedback, and institutionalization. The early exploratory period functioned as a *closed mode* of innovation; the ICO Boom (2017–2018) mirrored an *open-driver* stage of rapid diffusion; the FTX collapse operated as a *vanguard project* that exposed systemic weaknesses and triggered reflexive learning; and the post-FTX environment corresponds to a *project-to-organization* phase, in which innovation becomes embedded within formal governance structures. This sequence also resonates with Lewin's (1947) change model, unfreezing, change, and refreezing, highlighting how destabilizing shocks unfreeze existing routines, allowing new institutional arrangements to emerge and stabilize.

Understanding the ICO lifecycle in these terms clarifies how innovation unfolds at the ecosystem level. Consistent with Adner (2006, 2017) and Jacobides, Cennamo & Gawer (2018), the evolution of the ICO market illustrates that successful innovation depends on the alignment of interdependent actors who perform complementary roles. Each regulatory milestone can therefore be read as an exercise in partner coordination and capability alignment. The next sections interpret each empirical phase within this theoretical framework, connecting the

observed patterns of regulation and crisis response to the broader dynamics of institutional learning and capability building that characterize the institutionalization of innovation.

6.1.Analysis of the four Innovation phases

The institutionalization of innovation in the ICO ecosystem can be understood as a continuous process in which crises, regulatory responses, and technological adaptation interact to generate collective learning. Each phase of the timeline described in Chapter 5 reflects a distinct stage in the development of ecosystem capabilities and coordination routines. By combining theoretical insights from innovation-management and institutional theories with the concrete regulatory dynamics observed across jurisdictions, this section explains how the ICO market evolved from unregulated experimentation to global consolidation.

6.1.1. Pioneering Experimentation (2013-2016)

The first phase marks the emergence of blockchain finance as an open field of experimentation. Between 2013 and 2016, early innovators launched the first ICOs and exchanges without formal oversight. This aligns with Melo et al. (2020)'s closed-mode of innovation—isolated projects exploring technical feasibility before governance routines exist. Start-ups, developers, and early investors co-created a loosely connected network based on trust and shared ideology rather than formal institutions.

Empirically, the period was defined by the creation of the first ICO in 2013 and by the collapse of Mt. Gox in 2014, which revealed the fragility of this unregulated ecosystem. The absence of security norms allowed creativity but also exposed vulnerabilities. Regulators began to observe the phenomenon: the U.S. Financial Crimes Enforcement Network (FinCEN, 2013) and the People's Bank of China (2013) issued the first advisories treating virtual currencies as potential financial assets. Although these were isolated acts, they represent the initial recognition of the technology by formal institutions.

From an innovation-management viewpoint, this stage illustrates Adner (2006, 2017) and Jacobides, Cennamo & Gawer (2018)'s insight that ecosystems rely on alignment among complementary partners. In this early stage, complementarities existed but were uncoordinated. Each actor pursued value independently, producing technical breakthroughs but no shared governance. The failures of Mt. Gox and similar events acted as informal feedback loops, initiating the ecosystem's first collective awareness of the need for coordination—a key precursor to institutional learning.

6.1.2. Reaction and Containment (2016-2018)

The Reaction and Containment phase corresponds to the ecosystem's first attempt to transform learning from crises into regulatory routines. The BitFinex hack (2016), which resulted in the theft of 120,000 BTC, and the ICO Boom (2017–2018), when global funding exceeded USD 4.9 billion, demonstrated both the scale of opportunity and the magnitude of risk. These events catalyzed regulators in major economies to define formal boundaries for participation.

In the United States, the Commodity Futures Trading Commission (CFTC) fined BitFinex 75000 US dollars for failing to register as a futures commission merchant and for offering illegal off-exchange commodity transactions, establishing a precedent that cryptocurrencies could be treated as commodities under the Commodity Exchange Act. This ruling represented the first direct institutional intervention in the crypto-financial market and symbolized the transition from observation to action. In Europe, the EU adopted the Fifth Anti-Money Laundering Directive (AMLD5, 2018), extending KYC and AML obligations to virtual-asset providers. Similarly, the U.K.'s Financial Conduct Authority (FCA) issued guidance and warnings classifying certain tokens as securities under the Regulated Activities Order (2001) and created a multi-agency Crypto-Assets Taskforce (2018). Japan's Payment Services Act (2017) also required registration of exchanges. Together, these initiatives formed the first response to crypto risks.

Conceptually, this period aligns with Adner's (2017) notion of alignment and Jacobides et al. (2018)'s model of role differentiation within ecosystems. Regulation acted as a coordination mechanism, turning fragmented innovation into a managed process. The introduction of KYC/AML rules can be interpreted as the ecosystem's first collective capability: a shared standard for legitimacy and trust. By converting informal learning into formal governance, the ecosystem demonstrated the containment logic that enables scaling while maintaining creative experimentation. This phase thus represents the first institutional codification of innovation in the ICO world.

6.1.3. Systemic Crisis and Reflection (2020-2022)

Between 2020 and 2022, the crypto ecosystem experienced systemic crises that exposed the fragility of its institutional foundations. The Terra/LUNA collapse (2022) revealed the instability of algorithmic stablecoins whose value depended on internal conversion mechanisms. As LUNA's market price fell, the peg with UST broke, erasing USD 40 billion in market value. Soon after, the FTX collapse demonstrated governance failures in centralized

exchanges: opaque asset management, conflicts of interest, and inadequate segregation of client funds.

From an innovation-management standpoint, these crises were not merely failures, they were learning catalysts. They correspond to Melo et al. (2020)'s concept of vanguard projects: critical episodes that expose systemic weaknesses and trigger the reconfiguration of capabilities. They also mirror Lewin's (1947) "unfreeze–change–refreeze" cycle. The shocks "unfroze" existing assumptions about decentralization and forced reflection on the need for transparency, accountability, and institutional safeguards.

Empirically, the crises prompted the first coordinated global regulatory response. In the U.K., the Financial Conduct Authority (FCA) issued Discussion Paper 23/4 (2023) on fiat-backed stablecoins, while the Bank of England and the Prudential Regulation Authority examined their use in payment systems. In the U.S., the Digital Commodities Consumer Protection Act (DCCPA, 2022) clarified the division of authority between the CFTC and SEC, introduced transparency and anti-manipulation obligations, and required registration of crypto intermediaries. For the first time, global regulators converged toward a shared understanding of crypto governance. This convergence signifies the institutional reflexivity of an ecosystem learning from its own crises.

Analytically, this phase demonstrates that crises operate as accelerators of institutionalization. They transform reactive regulation into reflexive governance by converting failure into knowledge. As in organizational learning, ecosystems evolve through feedback: breakdown • reflection • redesign. The Terra and FTX collapses thus represent not the end of innovation but the mechanism through which innovation gains legitimacy.

6.1.4. Global Consolidation (2023-2025)

The final phase represents the maturation and institutional stabilization of the innovation process. After years of fragmented experimentation and crisis-driven reflection, regulators and market actors entered a period of global coordination. Comprehensive frameworks such as the Markets in Crypto-Assets Regulation (MiCA, 2023) in the EU, the Financial Services and Markets Act (2023) in the U.K., Japan's amendments to the Payment Services Act (2023), and Brazil's Virtual Assets Act (2022, implemented 2024) established clear obligations for registration, consumer protection, and asset segregation. These frameworks institutionalized governance standards that integrate cryptocurrencies into mainstream finance.

This phase corresponds to the project-to-organization transition in Melo et al. (2020)'s model, where temporary arrangements solidify into enduring structures. In theoretical terms,

the process exhibits Scott's (2014) regulative pillar of institutionalization—rules, monitoring, and enforcement and DiMaggio & Powell's (1983) isomorphism, as different countries converge on similar solutions through imitation and professionalization. Group 1 economies (EU, U.K., Japan, Singapore, Switzerland, UAE, Australia) now demonstrate proactive integration; Group 3 countries (Brazil, India, Indonesia) are following adaptative paths, while Group 2 (China) maintains defensive restriction. Despite differing motivations, all pathways indicate a collective learning outcome the recognition that sustaining innovation requires institutional trust.

From an innovation-management perspective, regulation has become a governance capability. Rather than opposing creativity, formal institutions now enable it by defining legitimate boundaries for experimentation. This phase shows that institutionalization is not the termination of innovation but its transformation into sustainable practice a stable platform for continued technological and financial creativity.

6.1.5. Synthesis of the phases

Across the four phases, the ICO ecosystem demonstrates that institutionalization and innovation are co-evolutionary. Experimentation created technological novelty; containment introduced coordination; crisis generated reflexivity; and consolidation formalized governance. Each stage built on the previous one, forming recursive loops of learning that transformed spontaneous initiatives into structured systems of capability.

Empirically, the sequence of global regulatory reforms from FinCEN 2013 to MiCA 2023 illustrates a cumulative movement toward legitimacy. Theoretically, it affirms Langley (1999)'s view that process research reveals how events generate order over time and supports Melo et al. (2020)'s proposition that capability building unfolds through cycles of feedback and institutional embedding. The ICO case thus exemplifies how an innovation ecosystem can move from unregulated exploration to coordinated, legitimate governance while preserving its creative potential.

The following section discusses the broader implications for innovation management and corporate finance, outlining how these findings expand our understanding of ecosystem-level capability building and the governance of disruptive financial technologies.

6.2.Implications for Innovation Management and Finance

This reinterpretation of ICO development reframes financial regulation as a form of innovation governance. The findings show that financial ecosystems evolve through mechanisms similar to those in industrial and technological domains: iterative experimentation,

feedback through crisis, and gradual stabilization via institutional design. Regulatory bodies, in this view, assume roles akin to innovation orchestrators—facilitating coordination, codifying learning, and enabling continuity in fast-changing environments.

For practitioners of innovation management, the ICO case underscores the value of adaptive and reflexive models of governance. It demonstrates that effective innovation management requires not rigid control but the capacity to learn from disruption and to translate uncertainty into structured experimentation.

For policymakers and scholars of corporate finance, the study reveals that regulation can function as an enabler of innovation, not merely as a constraint. By institutionalizing transparency, accountability, and shared standards, governance structures provide the trust and predictability necessary for new technologies to mature. The institutionalization of ICOs thus exemplifies how governance design can stabilize disruptive innovations without stifling their creative potential.

6.3.Theoretical Contributions

The analysis of ICOs through a process-based perspective contributes to the literature on innovation and institutionalization by empirically illustrating how innovation unfolds in complex, multi-actor ecosystems.
Unlike traditional models that focus on the firm as the main locus of innovation, this study reinforces the argument, advanced by Adner (2006, 2017), Jacobides, Cennamo, and Gawer (2018), and Melo et al. (2020), that innovation must be understood as a collective and dynamic process.
The findings drawn from the ICO ecosystem bring three central theoretical insights into this conversation.

1. Innovation as an ecosystem process.
The evolution of ICOs demonstrates that innovation cannot be confined to firm-level boundaries. It emerges from the coordination of heterogeneous actors developers, investors, regulators, and intermediaries who co-create and share capabilities across technological, organizational, and institutional domains. This distributed dynamic mirrors what the literature on open and collaborative innovation anticipates: that innovation becomes sustainable when it is supported by shared governance and collective learning routines.

2. Crises as catalysts for institutional learning**.**
Building on Melo et al. (2020) and Lewin’s (1947) models of change, the analysis of the FTX collapse and other crises shows how moments of instability serve as unfreezing points in the

innovation cycle. These episodes transform disruption into reflection and institutional adaptation precisely the process by which ecosystems evolve their governance. Rather than representing failure, crises operate as learning accelerators, compelling distributed actors to codify informal practices into structured regulatory routines.

3. Institutional capability building and the governance of innovation. The gradual harmonization of regulatory frameworks, such as MiCA (EU), FSMA 2023 (UK), and DCCPA (US), exemplifies how innovation ecosystems convert improvisation into institutionalized governance capabilities. This transformation parallels the "project-to-organization" transition proposed by Melo et al. (2020): experimentation becomes embedded in durable structures that stabilize innovation and enable legitimacy. In doing so, regulation ceases to be a barrier to creativity and becomes a capability for innovation management at the ecosystem level.

Together, these contributions connect the empirical trajectory of ICOs with the literature on open innovation and institutionalization. They confirm that innovation and governance are not opposite forces but mutually reinforcing dimensions of systemic learning. By revealing how innovation ecosystems create their own institutional order, this study helps refine the conceptual bridge between innovation management, organizational learning, and regulatory theory.

6.4.Synthesis and transition to conclusion

Revisiting the thesis as a whole, the research demonstrates that the life cycle of ICOs from inception to post-FTX consolidation mirrors the process of institutionalized innovation under uncertainty.
What began as a decentralized technological experiment has matured into a globally coordinated system of learning and governance.
Through successive cycles of experimentation, reaction, crisis, and stabilization, the ICO ecosystem illustrates how innovation becomes structured through the very institutions that emerge to manage it.

By integrating Melo et al.'s (2020) process logic with Lewin's (1947) model of systemic change, the study identifies a recurring pattern across levels of analysis: innovation unfolds through disruption, adaptation, and refreezing or, in institutional terms, through experimentation, reflexivity, and consolidation. In this case, crises such as the FTX collapse acted as vanguard projects, prompting collective learning that reshaped governance frameworks and permanently altered the structure of the ecosystem.

The theoretical significance of this finding lies not in proposing a new model, but in illustrating with empirical clarity how existing theories of innovation, institutionalization, and ecosystem governance intersect. It reinforces that the management of innovation, whether technological or financial, depends on the same underlying processes of learning, coordination, and the conversion of disruption into organized capability.

Ultimately, the ICO ecosystem serves as a living laboratory for innovation management research, showing that innovation does not evolve despite regulation but through it. As digital-financial ecosystems continue to mature, their co-evolution of technology, organization, and governance will remain an open frontier for research, challenging the boundaries of innovation theory and deepening our understanding of how institutions shape and are shaped by innovation itself.

The discussion above consolidates the theoretical and practical insights derived from the four phases of the ICO evolution. It highlights how the institutionalization of innovation under uncertainty transforms decentralized experimentation into collective governance capabilities. Rather than restating the empirical results, this section closes the analytical discussion by reaffirming that innovation and regulation co-evolve as complementary forces. The next chapter concludes the thesis by integrating these insights into a broader reflection on how innovation becomes sustainable when embedded in adaptive institutional frameworks.

7. CONCLUSION

The ICO phenomenon, initially conceived as an open and unregulated alternative to traditional finance, gradually evolved into a structured, globally coordinated ecosystem governed by formal legal and organizational frameworks.

The analysis reconstructed this evolution in four interconnected phases:

1. **Pioneering Experimentation** (2013–2016), when innovation thrived amid technological novelty and institutional voids;
2. **Reaction and Containment** (2016–2018), when early regulation emerged as a coordination mechanism to balance creativity and control;
3. **Systemic Crisis and Reflection** (2020–2022), when market failures such as the Terra–LUNA and FTX collapses acted as catalysts for learning and regulatory transformation; and
4. **Global Consolidation** (2023–2025), when comprehensive frameworks such as MiCA, FSMA 2023, and DCCPA stabilized governance and legitimized ICOs within the broader financial system.

Through this longitudinal reconstruction, the study demonstrated that innovation and institutionalization are not opposing processes but complementary dynamics in the life cycle of emerging technologies. The findings demonstrate that crises, far from representing breakdowns, serve as vanguard projects, what means, critical junctures that trigger reflection, coordination, and capability building. Regulation, in turn, operates as a form of innovation governance, translating distributed learning into structured routines and enabling sustainable development within open systems.

From a theoretical perspective, the thesis contributes to the literature on innovation management and institutional theory by reinforcing three central insights. First, innovation in complex ecosystems depends on multi-actor coordination and the co-creation of capabilities that transcend organizational boundaries, echoing Adner (2006, 2017) and Jacobides et al. (2018). Second, crises function as moments of unfreezing and renewal, confirming Melo et al. (2020) and Lewin's (1947) frameworks of learning and change. Third, regulation can act as a collective capability that transforms improvisation into systemic order, supporting Scott (2014) and DiMaggio & Powell (1983) in showing how institutions emerge as enablers of innovation.

Methodologically, the thesis illustrates the potential of process-based analysis to connect empirical chronology with conceptual understanding. By applying temporal bracketing

and focusing on feedback loops, it captured how distributed actors learn and adapt over time. The approach thus contributes to refining methods for studying innovation in open, multi-actor ecosystems—a setting characterized by interdependence, uncertainty, and continuous transformation.

Practically, the results offer lessons for regulators and managers of digital ecosystems. The institutionalization of ICOs shows that governance mechanisms grounded in transparency, trust, and adaptive learning can foster legitimacy without suppressing innovation. Regulators should therefore view oversight as an iterative process of co-evolution rather than as a final constraint. Similarly, innovators should recognize that compliance and governance are strategic capabilities that enhance stability and investor confidence.

This research also reveals important limitations. The analysis faced the inherent difficulty of studying a distributed innovation system with multiple heterogeneous actors, where causality is diffuse, and data, fragmented. The recent nature of regulatory reforms limits the ability to assess long-term outcomes. These constraints underscore the need for longitudinal and comparative studies that can track how new frameworks influence innovation trajectories across different technologies and jurisdictions.

Ultimately, the study concludes that the institutionalization of ICOs makes clear the organization of innovation itself. What began as a decentralized experiment in financial democratization has evolved into a mature system of governance, learning, and legitimacy. The ICO case demonstrates that innovation does not thrive in the absence of institutions but through their adaptive evolution. In transforming volatility into structure and uncertainty into trust, the ICO ecosystem stands as a model of how innovation becomes sustainable when embedded in institutional frameworks capable of learning and change.

8. CALL FOR NEW STUDIES AND LIMITATIONS

Despite the advances achieved in this study, several limitations must be acknowledged.

First, the research faced the intrinsic challenge of analyzing an open innovation system that involves multiple heterogeneous actors, as entrepreneurs, regulators, investors, developers, and supranational agencies, interacting without a single coordinating authority. In such ecosystems, information is distributed, feedback is asynchronous, and causal relationships between events and outcomes are often nonlinear. This complexity limited the precision with which institutional changes could be linked to specific regulatory or technological decisions. While the process-based approach captured broad patterns of learning and institutionalization, the fragmented nature of available data prevented deeper quantitative validation of each mechanism.

A second limitation derives from the recency and volatility of the phenomenon. Because much of the post-FTX regulatory framework is still under implementation, its long-term effects on innovation performance and ecosystem coordination remain uncertain. Future longitudinal studies could follow these frameworks through successive iterations of adaptation, revealing how institutional routines evolve once the initial regulatory cycle stabilizes.

At least, at a theoretical level, the ICO case illustrates both the difficulty and richness of applying open-innovation theory to multi-actor systems that cross technological, organizational, and legal boundaries. Traditional innovation models often assume a focal firm or governance hub that orchestrates activities; by contrast, crypto-financial ecosystems lack such a central anchor. The study of these distributed arrangements forces scholars to rethink core concepts such as capability, learning, and control, and to integrate insights from institutional theory, governance, and network science. This complexity is precisely what makes the field so fertile for further research: it offers a living laboratory where innovation, regulation, and institutionalization unfold simultaneously across multiple scales.

Future research should therefore expand in three main directions: 1) Comparative ecosystem studies, evaluating other cases; 2) Longitudinal analyses that observe how new regulations transform ecosystem behavior; 3) Cross disciplinary approaches combining more factors and elements to develop integrated frameworks

By embracing these challenges, scholars can deepen understanding of how innovation emerges, diffuses, and stabilizes when no single actor controls the process, a meaningful question for both open-innovation and institutional theory.

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Appendix

Appendix A

Criteria to add or exclude articles in secondary research

Following the process-tracing logic outlined above, the inclusion and exclusion criteria were designed not only to ensure reliability and methodological rigor, but also to capture the diversity of perspectives necessary to interpret regulatory evolution as an innovation-learning process.

In this context, several inclusion criteria were used to ensure the reliability of the study. The inclusion criteria were:

1) Studies published in English

2) Publications between 2015 and 2024

3) Peer-reviewed journal articles, conference papers, books, government reports, and journal articles recognized in their respective topic

4) Studies focused on ICO and cryptocurrency regulations

5) Studies addressing ICO regulation, the FTX breakdown, and the success of ICOs

6) Studies employing empirical, theoretical, or case study methodology

7) Studies from inside the 10 biggest economies or from the European Union

The exclusion criteria were:

1) Studies in languages other than English

2) Publication before 2015

3) Opinion posts and portals without recognition from industry

4) Articles focusing only on technical aspects of blockchain or the financial industry

5) Articles focusing only on comparative law

6) Studies lacking transparent methodology

It is essential to note in this context that this criterion was not applied to the laws and directly related regulatory journal texts used in this research, due to the nature of laws and their purposes, as well as their objective character,

Appendix B

Data profile

To better understand the results and their validity, the data was split into three categories: articles on approaches to regulatory and law texts, scientific articles, and journals.

After doing the research mentioned above, the results were:

- 38 scientific articles
- 56 Newspaper articles
- 28 laws and official publications

At least, through the snowballing technique, 24 texts were also identified that followed precisely the predetermined inclusion and exclusion criteria in this research.

To evaluate the validity of the geographical and temporal clutch of articles selected for the study and to possibly understand this validity for all the geographies and kinds of texts, it is essential to evaluate the presence of the articles specified in each geography, which is shown on the charts below:

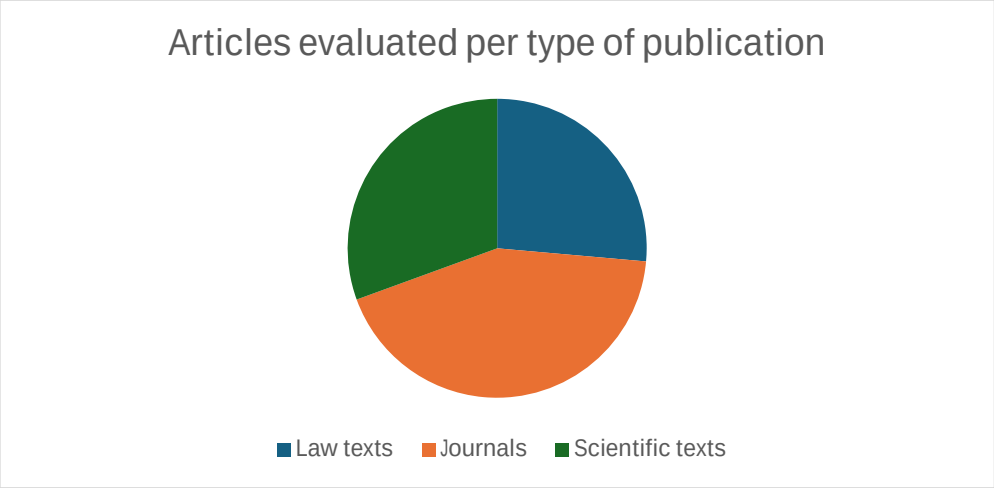

Figure 5: Division of type of text analyzed.

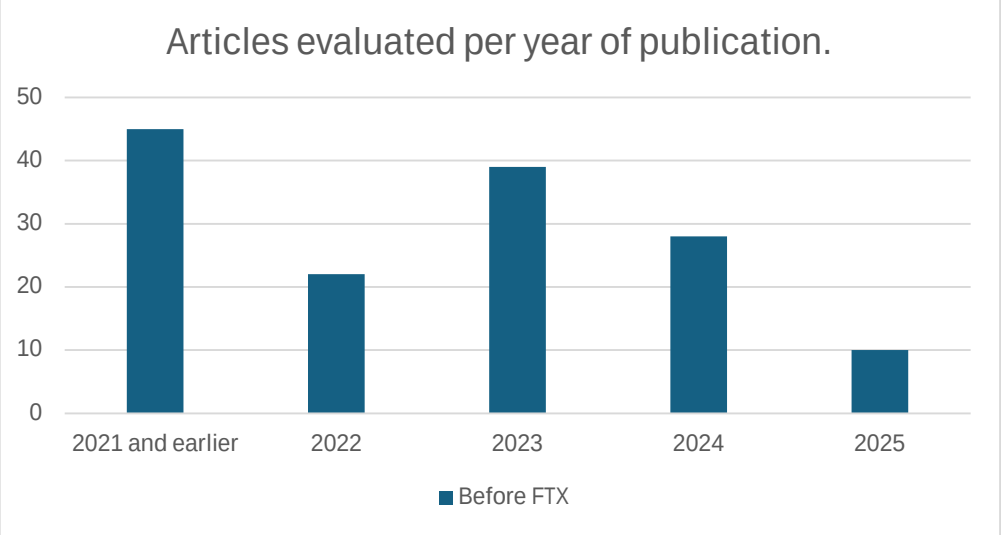

Figure 6: Division of texts analyzed per year of publication.

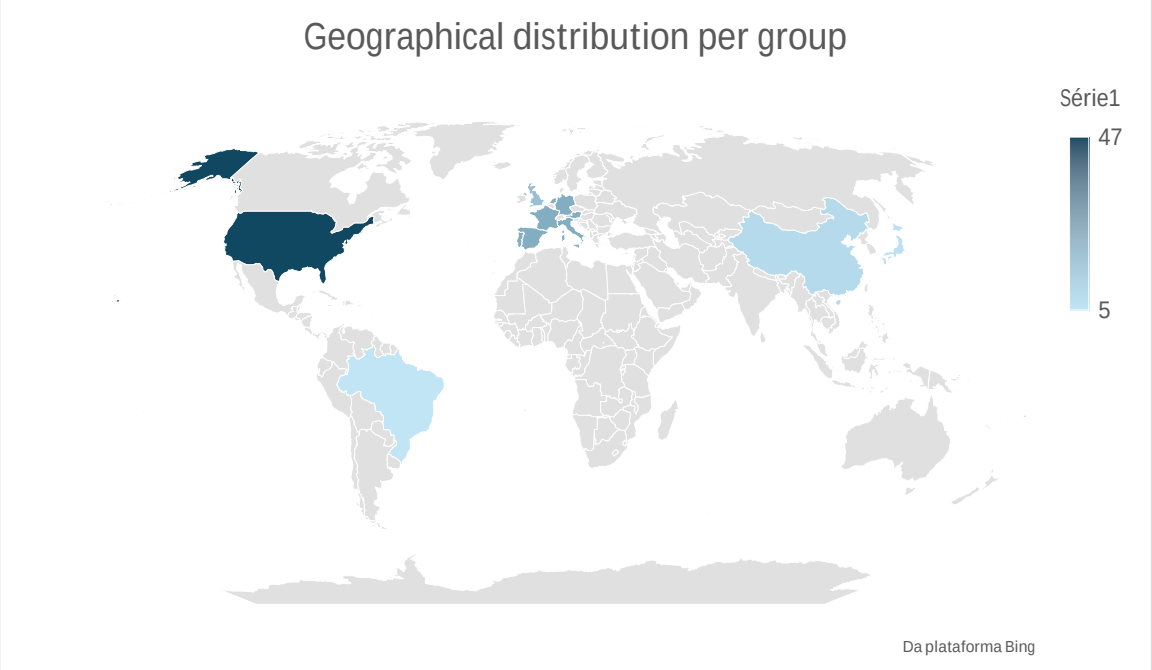

Figure 7: Geographical coverage of the texts analyzed.

When analyzing the distribution above, it is possible to see an almost equally divided coverage between the types of texts proposed, with a slight difference relating to the media and journal reports, which proved to be necessary during the research, considering the amount of information that was available only through this media because of the recency of the updates in law and the reactions to the new regulations.

By analyzing the year of publication of the literature used, there is a dominance of recent articles based on the recency of new regulations concerning crypto.

When it comes to geographical distribution, it is possible to see coverage of the more economically meaningful geographies worldwide, with the US standing out due to its mix of decentralized regulatory nature and economic importance.

The balanced distribution of source types and the predominance of recent publications may reflect the rapid institutional learning curve surrounding ICO regulation.

Appendix C

C.1 Overview

This appendix expands on the juridical dimension of the institutionalization of Initial Coin Offerings (ICOs), complementing the process-based discussion developed in the main text.

While Chapters 5 and 6 emphasized the innovation-management dynamics of regulatory learning, this appendix clarifies the legal infrastructure that translated those learning cycles into enforceable norms.

It highlights the evolution of the regulatory reasoning, the transformation of fiduciary and custody doctrines, and the integration of stable-coin and virtual-asset service providers (VASPs) into traditional financial-law frameworks.

The objective is not to reproduce legislation, but to trace how law itself became a mechanism of innovation governance.

C.2 The Evolution of Legal Reasoning

C.2.1 From technological novelty to legal categorization

The juridical debate surrounding cryptocurrencies initially revolved around classification.

Between 2013 and 2016, regulators struggled to define whether tokens were currencies, securities, commodities, or digital goods.

In the United States, the Commodity Futures Trading Commission (CFTC) declared Bitcoin a “commodity” under the Commodity Exchange Act (2015), while the Securities and Exchange Commission (SEC) applied the Howey Test to determine when tokens constituted securities (SEC v. W.J. Howey Co., 1946).

The European Union, by contrast, treated crypto-assets as “means of exchange” outside the monetary-policy perimeter until the Fifth Anti-Money-Laundering Directive (AMLD5, 2018) introduced their first partial recognition.

This conceptual ambiguity was the initial obstacle to institutionalization: innovation lacked a clear legal subject.

C.2.2 Early jurisprudence and enforcement logic

As markets expanded, enforcement agencies began testing traditional doctrines on digital assets.

The 2016 BitFinex and 2017 DAO cases in the United States demonstrated that existing securities and commodities law could apply to ICOs by analogy.

These rulings initiated what scholars call regulation by enforcement—a reactive strategy that gradually established jurisdictional precedent.
Although criticized for legal uncertainty, this phase proved decisive: it embedded crypto-assets within existing legal taxonomies, paving the way for codified frameworks.

C.3 Custody and Fiduciary Duties

Traditional financial law is built on the principle that intermediaries must protect, not exploit, client assets.
Custody regulation—expressed in provisions such as SEC Rule 15c3-3 (Customer Protection Rule) and Directive 2014/65/EU (MiFID II)—requires asset segregation, reconciliation, and third-party oversight.
Crypto-exchanges, however, operated without equivalent safeguards.
The FTX bankruptcy (2022) exposed the legal vacuum: customer deposits were commingled with proprietary funds, breaching every fiduciary standard applied in securities, banking, or fund-management law.
In response, post-FTX reforms in the EU, U.K., and Japan explicitly imported custody and segregation requirements into digital-asset frameworks.

MiCA (2023), Articles 67–73, obliges issuers and service providers to hold customer assets separately and maintain verifiable reserves.

The Financial Services and Markets Act 2023 in the U.K. incorporated crypto custody into existing trust-law principles.

Japan's Payment Services Act (2023 revision) introduced liability for exchanges failing to protect customer holdings.

These measures represent a direct translation of fiduciary doctrine into innovation law, aligning technological infrastructure with long-standing prudential ethics.

C.4 Stable-Coin Regulation and Systemic Interconnectedness

Stable-coins aimed to replicate the stability of fiat currency within the blockchain ecosystem, but the Terra–LUNA collapse (2022) demonstrated that algorithmic stabilization mechanisms lacked credible backing.
The episode had two major legal implications:
(1) stable-coin issuers perform bank-like functions and must therefore meet equivalent prudential standards;
(2) disclosure and reserve-audit obligations must replace voluntary transparency.

C.4.1 European Union

Under MiCA Titles III–IV, issuers of asset-referenced tokens (ARTs) and e-money tokens (EMTs) must:

obtain authorization from national competent authorities;

publish white papers approved by regulators;

maintain fully backed reserves; and

submit to the supervision of the European Banking Authority (EBA). MiCA thus extends the European consumer-protection model into the digital realm, creating a hybrid between securities regulation and payment-system oversight.

C.4.2 United Kingdom and Commonwealth jurisdictions

The U.K. FCA Discussion Paper 23/4 (2023) and subsequent consultations under the FSMA 2000 (Amended 2023) proposed treating fiat-backed stable-coins as e-money, bringing them under prudential regulation.
Singapore and Australia followed comparable paths, emphasizing risk management and disclosure rather than prohibition—an illustration of regulatory isomorphism through policy diffusion.

C.4.3 United States

In the United States, the DCCPA (2022) and Financial Innovation and Technology for the 21st Century Act (2022) established dual jurisdiction: the CFTC oversees commodities-like tokens, while the SEC handles securities-like instruments.
Both Acts introduce anti-manipulation, anti-fraud, and customer-asset-segregation provisions, effectively importing the fiduciary logic discussed above into federal law.

C.5 Global Convergence after FTX

The FTX collapse transformed fragmented national approaches into a coordinated international agenda.
The Financial Stability Board (2023) issued high-level recommendations on cross-border supervision, echoed by the G20 Roadmap on Crypto-Asset Regulation (2023). Simultaneously, the IMF (2023) and the Bank for International Settlements (2023) emphasized macroprudential oversight and systemic-risk assessment.

National frameworks now converge around four shared pillars:

Licensing and supervision of Virtual-Asset Service Providers (VASPs);

Consumer and investor protection;

Prudential standards for custody, reserve management, and disclosures;

Cross-border cooperation and data-sharing.

The table below summarizes key developments.

Table 3: Regulatory Frameworks

Jurisdiction	Core Legal Frameworks	Primary Objectives
European Union	Markets in Crypto-Assets Regulation (MiCA 2023)	Licensing of issuers and VASPs; reserve and transparency rules
United Kingdom	FSMA 2023 + Crypto-Asset Promotions Regime 2023	Integration of crypto into existing financial law; consumer protection
United States	DCCPA 2022; FIT 21 Act 2022	Define SEC/CFTC roles; transparency; market-manipulation prevention
Japan	Payment Services Act 2023 revision	Custody and transfer limits; AML coordination
Brazil	Virtual Assets Act (2022/2024)	Authorization of VASPs; criminalization of fraud
China	Enforcement of 2017 ban; 2023 cross-border regulations	Capital-control protection; prevention of illegal fundraising

These frameworks exhibit a pattern of institutional convergence: despite different legal traditions, regulators are adopting comparable prudential and governance principles. In institutional-theory terms, this demonstrates coercive (global standards), mimetic (policy learning), and normative (professional consensus) isomorphism (DiMaggio & Powell 1983).

C.6 The Legal Architecture as a Mechanism of Innovation Governance

The trajectory reconstructed above reveals that law is not merely a constraint on innovation but an active component of the innovation process.
By incorporating crypto-assets into pre-existing legal infrastructures—custody, fiduciary duty, prudential regulation, and consumer protection—governments converted market experimentation into institutionalized capability.
Legal codification accomplished three systemic functions:

Legitimation: assigning legal status to digital tokens and exchanges, enabling trust and investment.

Stabilization: establishing predictable boundaries for market operation.

Diffusion: standardizing best practices internationally, facilitating interoperability of financial systems.

In short, the juridical framework described here performs the same role within the legal domain that governance routines perform within innovation management: it transforms collective learning into structured, enforceable knowledge.