



# Next Generation Blockchain-Based Financial Services

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**Abstract.** This paper explores the transition towards a paradigm in which centralization and decentralization systems coexist in the provision of financial services. The blockchain technology application to the financial industry is giving birth to Decentralized Finance (DeFi). The transition is studied through a cross-chain analysis that allows to compare different blockchain ecosystems characterized by diverse evolution courses. The results show a path dependency linked to the first-mover advantage of the Ethereum blockchain. The analysis also highlights the emergence of new players that propose higher scalability opportunities (e.g., Eos, Tezos) and different design choices in terms of governance. This exploratory study also emphasizes the potential complementarity between the standard financial system and DeFi, discussing the main differences among the financial services provided on-chain and off-chain.

**Keywords:** Blockchain · Decentralization · Financial service · Decentralized finance · Cryptocurrency

## 1 Introduction and Underlying Rationale

The modern economic system works through the close interaction among centralized institutions such as governments, Central Banks (CBs), private banks and stock exchanges, not exclusively restricted to national borders. The interdependence of these actors concentrates risks, leading to domino effects whenever a pillar of consolidated economic structures enters a crisis. The blockchain technology was born in response to one of the most severe economic meltdown in recent decades: the 2008 financial crisis. This crisis accentuated some pains of the economic system, such as lack of transparency, traceability and accountability, as well as the need for better wealth distribution and a greater alignment of incentives among the stakeholders of the financial ecosystem. Indeed, the first

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This work was conducted as part of the research activity related to an extensive and ongoing effort to understand and map the innovation potential of Distributed Ledger Technologies (DLTs) carried out by [OverTheBlock](#), a permanent observatory on Blockchain technology powered by LINKS Foundation.

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blockchain infrastructure was implemented in 2009, after the publication by Satoshi Nakamoto [10] of the whitepaper that also gave birth to the first cryptocurrency, the Bitcoin, proposing an innovative system capable of performing peer-to-peer transactions with no need for trusted third party interventions.

After more than ten years, the blockchain ecosystem has considerably evolved, hosting an increasing number of decentralized financial applications built on numerous blockchain infrastructures. The environment composed of all these applications is defined as Decentralized Finance (DeFi). In particular, blockchain technology grants a transparent and trustless framework, departing from the traditional financial system's paradigm, allowing permissionless access to various financial services, provided that an Internet connection is available.

Therefore, the decentralized nature of DeFi provides a unique solution to solve three critical points of the centralized paradigm. Firstly, decentralization eliminates the necessity of trusted third parties, diminishing the intermediaries' market power derived from the information advantage they develop over transacting parties, leveraging their intermediation services [14]. Secondly, transparency is granted since all users have access to transaction data stored on the blockchains while still maintaining privacy (at least for public blockchains) [5]. Thirdly, DeFi can leverage the blockchain technology to foster financial inclusion, providing the possibility to have access at least to essential financial services (e.g., transaction account, savings deposit) [11].

For the DeFi ecosystem to exist, there must be a circulating medium of exchange that we define as *currency* in the traditional system while in the DeFi context, we call *cryptocurrency*. If, on the one hand, fiat money is generally under the monopolistic control of CBs, on the other, cryptocurrencies represent a form of unregulated and programmable digital money that is consensually accepted by the community members of the blockchain [8]. New transactions, in turn, are performed through the implementation of a consensus algorithm. Hence, it is on the community and algorithm that the DeFi bases its functioning.

However, most financial services' implementation needs the execution of *smart contracts*, conceived by Nick Szabo in 1996 [15] and first implemented on the Ethereum blockchain. Therefore, despite the massive innovative contribution brought by Bitcoin's creation, the birth of DeFi dates back to a later time. In particular, smart contracts automatically trigger self-enforcing actions arising from an agreement among two or more parties. Therefore, whenever the terms set in the agreement are fulfilled, the lines of code contained within the smart contract are executed, and the effects of the contract take place.

Since the first implementation of smart contracts, the DeFi ecosystem has experienced relevant improvements, attracting increasing attention and capital levels by users and developers. Indeed, despite the high volatility of cryptocurrencies, looking at the market capitalization of the principal tokens, the ecosystem has achieved significant aggregated volumes, i.e., about 235 billion US dollar<sup>1</sup>.

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<sup>1</sup> The market capitalization is calculated as the product between the number of tokens in circulation and the value of each token. The value aggregates the capitalization of the top ten native blockchain tokens available in the market. Source: <https://coinmarketcap.com/> - accessed 15-05-2020.

In this context, this paper presents an exploratory study of the next generation blockchain-based financial services. In particular, the analysis carried out aims to trace the path outlined by DeFi, showing the present status of this ecosystem, focusing on a cross-chain perspective. Therefore, the study addressed in this work serves as a strategic observation point to comprehend future developments affecting the financial industry and the associated interaction between centralized and decentralized environments. The paper’s main contribution lies in delineating the features of DeFi and highlighting its relevance, outlining, for the best of our knowledge, the first transverse representation of an infrastructures’ ecosystem to identify the DeFi progress and its future trends.

The paper proceeds as follows. Section 2 deals with blockchain technology within the context of tokenomics. Section 3 presents a discussion about the blockchain infrastructures analyzed in this study. The actual DeFi ecosystem is presented within Sect. 4. Finally, Sect. 5 concludes the paper.

## 2 Blockchain Technology and Tokenomics

The blockchain represents a subset of the Distributed Ledger Technologies (DLTs). All DLT platforms allow to record and share data across multiple stores, each containing the same contents. Therefore, the community is responsible for maintaining these records, distributed within a network of computer servers called *nodes*. Three main features of the blockchain technology make its innovative potential disruptive. Firstly, the ledger’s distributed nature eliminates intermediaries by spreading control over the network among users. Secondly, since the network is born distributed, the community needs to find consensus over new data entries. The *consensus protocol* defines the rules that legitimize the entry of new transactions into the ledger. Thirdly, the validation of new data entries takes advantage of cryptographic methods designed by the platform’s developers. Moreover, the consensus mechanism’s peculiarities and the cryptographic algorithm determine many essential aspects of the blockchain infrastructure, such as the degree of efficiency and power consumption [16]. Besides, the consensus protocol creates a system of incentives that, in combination with the absence of intermediaries, allow the platform to settle transfers of property rights that can involve cryptocurrencies, as well as a wide variety of assets.

The cryptographic validation of transactions allows the introduction of the concept of *digital scarcity* since property right transfers do not permit to create copies of the exchanged assets. Indeed, if in the case of the Internet, information abundance is due to high fixed costs and low marginal costs of production considering that information is costly to produce but cheap to reproduce [13], assets traded on top of blockchain platforms cannot be replicated at will. Therefore, blockchain technology has the potential to transform society and economy from multiple perspectives through the development of new market design solutions.

Focusing on the financial services sector, blockchain infrastructures provide lower entry barriers for users and developers. Moreover, the blockchain platforms are characterized by alternative monetary policies for individuals who suffer unstable economic conditions due to untrustworthy institutions.

As stated before, the growth experienced by the DeFi ecosystem since the implementation of smart contracts has attracted the attention of new developers. In recent years, many blockchain platforms have been created with the capability not only to execute smart contracts but also to develop decentralized applications (dApps). One of the most fertile fields in terms of dApps development is DeFi, through the conception of applications able to offer standard financial services, often taking a step forward to propose innovative solutions to old-time needs.









In this context, the functioning rules of the blockchain infrastructures and decentralized applications are set by developers during the platforms' design. Even though in most cases, the community has the power to modify relevant aspects of the framework through internal voting, the laws that regulate on-chain operation are designated in such a way as to achieve predefined objectives (e.g., total token supply, users' incentive system). The main result of this dynamic is the shift from economics towards *tokenomics*. Indeed, while in economics changes are applied in a dynamic fashion by maneuvering key variables to approach the desired objectives through the observation of the reaction of the system, in tokenomics, innovation is put forward by designing the rules governing the playground in a way that the stakeholders' behavior aligns with the goal pursued [7]. As a result, DeFi falls, by definition, within the field of tokenomics, allowing users to have access to financial services through the exploitation of dApps and to interact with the other members of the community to manage the ecosystem.

### 3 Blockchain Infrastructure Analysis

The fields of application of DLT and, in particular, blockchain technology are certainly not limited to cryptocurrencies and DeFi. Nevertheless, remaining within this paper's scope, this section presents the analysis of a series of blockchains upon which the exploratory study on DeFi is based. This analysis aims to present the technical scenarios within which the DeFi ecosystem has proliferated in the last years, paving the way for subsequent research that wants to investigate the conditions that favor and hinder the decentralized financial realm's growth.

Figure 1 shows eight blockchains: Bitcoin, Ethereum, Tron, Stellar, Eos, Tezos, Neo and Cardano. The selection criteria of the blockchains are essentially three. The first one concerns the market capitalization of the blockchain's native tokens, while the second one has to do with the platforms' nature. In particular, the sampling concentrates on permissionless and public permissioned platforms where DeFi has developed the most. Finally, the third one regards the objectives of the blockchains. Indeed, the analysis focuses on platforms that aim at reshaping the financial industry from multiple perspectives. Specifically, the figure provides data about nine variables that aim to delineate the platforms' governance features, outlining the principal factors that make each of them unique. First of all, the figure indicates the accessibility of blockchain platforms since we can primarily distinguish between permissionless and permissioned blockchains. In the first case, users do not need any approval to join or leave the network and have access to an identical copy of the ledger. In the

second case, the nodes have to be pre-selected by a network administrator to join and operate inside the community [8]. Moreover, permissioned blockchains can also be divided into two other categories: public and closed (or private). While in the public case, anyone can access and view the contents of the blockchain even though only the pre-selected nodes can enable transactions, in the closed case, the access is restricted to the components of the community and, in addition, the transactions can be validated only by the blockchain administrator.

								
BLOCKCHAIN	BITCOIN	ETHEREUM	TRON	STELLAR	EOS	TEZOS	NEO	CARDANO
Accessibility	Permissionless	Permissionless	Permissionless	Permissionless	Permissioned (Public)	Permissionless	Permissioned (Public)	Permissionless + Permissioned
Consensus Mechanism	PoW	PoW → PoS	DPoS	SCP	BFT-DPoS	LPoS	DBFT	Ouroboros PoS
Cryptocurrency Issuance Method	Mining	Pre-Mined (72 million) + Mining	Pre-Mined (65 billion)	Pre-Mined (100 billion)	Pre-Mined (700 million)	Pre-Mined (≈763 million)	Pre-Mined (50 million)	Pre-Mined (45 billion)
Cryptocurrency Symbol	BTC	ETH	TRX	XLM	EOS	XTZ	NEO	ADA
Cryptocurrency Total Supply	Limited (21 million)	Unlimited	Limited (100 billion)	Unlimited	Unlimited	Unlimited	Limited (100 million)	Limited (45 billion)
Blockchain Uses	Transaction Platform	Fuel Issuer + Smart Contracts and dApps Deployment	Web Decentralisation + Smart Contracts and dApps Deployment + Entertainment Industry	Transaction Platform + Smart Contracts Deployment	Transaction Platform + Smart Contracts and dApps Deployment	Self-Amending + Smart Contracts and dApps Deployment	Assets Digitalisation + Smart Contracts and dApps Deployment	Fuel Issuer + Smart Contracts and dApps Deployment
Target Audience	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses	Individuals + Businesses
Market Capitalisation	≈ € 178.6 B	≈ € 23.6 B	≈ € 1 B	≈ € 1.4 B	≈ € 2.5 B	≈ € 2 B	≈ € 700 M	≈ € 1.5 B
Creation Year	2008	2014	2017	2014	2018	2018	2014	2017

**Fig. 1.** Blockchain infrastructures analysed with respect to nine qualitative and quantitative variables.

Figure 1 also shows that all the blockchains selected are permissionless or public. Only Cardano represents an exception since it incorporates both a centralized and decentralized governance layer. This criterion of selection follows the logic according to which permissionless and public blockchain infrastructures represent the real innovative contribution to the financial industry by decentralizing the services provided. Indeed, DeFi benefits, with respect to Centralized Finance (CeFi), include transparency, autonomy (i.e., non-custodial management of assets), financial inclusion and tradability (i.e., no requirements to commit to entire high-value investment at once<sup>2</sup>) [1]. Conversely, financial services supplied on permissioned and private blockchains do not significantly differ from the CeFi paradigm except, in most cases, in terms of efficiency deriving from more significant scalability opportunities [12].

The second variable deals with the consensus protocol, indicating the specific validation mechanism of new data entries in every blockchain analyzed.

<sup>2</sup> In most cases, transactions conducted on blockchain platforms can involve purchases and sales of portions of assets. For instance, the smallest unit of Bitcoin tradable on the market is called a *satoshi* and corresponds to the one-hundred-millionth part (100.000.000) of a Bitcoin, i.e., 0.00000001 BTC.

Zhang and Lee (2019) [16], studying the main consensus protocols, distinguish between *probabilistic-finality* and *absolute-finality* mechanisms. Proof-of-Work (PoW), Proof-of-Stake (PoS) and Delegated Proof-of-Stake (DPoS) protocols fall within the first category, while Practical Byzantine Fault Tolerance (PBFT) and Ripple protocols belong to the second one. Moreover, they conclude that PoW, PoS and DPoS are more suitable for public and permissionless blockchains than PBFT and Ripple that, instead, apply better in a permissioned (private) framework. In the context of DeFi, where platforms aim to attract the largest possible number of users, one can expect that the relative blockchain infrastructures are presumably based on probabilistic-finality consensus mechanisms.

Furthermore, as mentioned in Sect. 2, the consensus protocol of a blockchain is also responsible for the platform's efficiency, determining the number of transactions performed per second (TPS). Generally, the more decentralized the blockchain is since the consensus mechanism will be based on few consensus nodes that support the platform's wellness (e.g., Eos blockchain). Bach et al. (2018) [3] carry out a comparative analysis of typical blockchain consensus protocols. They focus the analysis on different algorithmic steps of the consensus mechanisms (e.g., scalability, the system of incentive and security), confirming the indirect proportionality between efficiency and decentralization degree of blockchain platforms by reporting TPS numbers of the *high-profile* blockchain infrastructures (i.e., those with the highest market capitalization of native cryptocurrencies).

The variables between the third and the fifth deal with characteristics directly related to the native cryptocurrencies of the blockchains: the issuance method (which differentiates between *pre-mined* tokens and *mining* activities regardless the consensus protocol applied), the token symbol and the total supply of tokens. In the issuance method, pre-mining activities are typically associated with Initial Coin Offering (ICO) funding mechanisms. In particular, ICOs have emerged in the last years as a novel instrument through which ventures sell tokens to fund initial development, although no commitment is made to their future price [4]. Moreover, ICOs have allowed new blockchain platforms to trigger network effects in relatively short times through the prospect of future positive revenues (e.g., Eos, Tezos and Cardano), instead of waiting for them to develop independently (e.g., Bitcoin, Ethereum). The implementation of ICOs, in turn, also affects design decisions regarding the total supply of tokens.

The variable *blockchain uses* highlights the main on-chain activities that, in most cases, also involve developers' attention (e.g., dApps deployment and smart contracts). In the context of DeFi, as described previously, the development of dApps and the implementation of smart contracts are of primary importance to provide access to financial services, leveraging the blockchain technology's decentralized nature. The variable *target audience*, instead, identifies the main actors who take advantage of the services provided on the blockchains. However, note that, even though only individuals and businesses have been identified,

this does not preclude other actors (e.g., institutional players) from fruitfully exploiting the benefits deriving from the use of these frameworks.

The last two variables show the market capitalization of each blockchain's native cryptocurrency and the platforms' creation year. In particular, concerning the market cap, the values are expressed in US Dollars and are calculated as the product between the number of tokens issued by the platform and the current price per coin<sup>3</sup>. Moreover, the cryptocurrency market cap can also be used to measure the volume of investors' attention drawn by each blockchain. As a result, the data presented within Fig. 1 shows how the Bitcoin blockchain has attracted the largest amount of capital in the DeFi ecosystem (and, by extension, in the blockchain environment), despite the inefficiency of its infrastructure compared to other platforms (e.g., Eos, Stellar). Therefore, network effects still play a more influential role within the blockchain ecosystem than infrastructure features (e.g., efficiency, power consumption) in attracting investors.

## 4 DeFi Ecosystem

In terms of financial services, the transition from the traditional financial industry to DeFi is not straightforward. Moving from a centralized ecosystem to a globally inclusive financial system, not all the features remain constant. Numerous changes happen, creating a network characterized by more or less disruptive elements concerning the standard environment. In this framework, this section aims to present the actual DeFi ecosystem from a cross-chain perspective, highlighting the main differences between the financial services provided within DeFi and those offered in the traditional financial system. The principal financial services taken into consideration in this study are *borrowing and lending*, *exchange*, *deposit/asset management*, *derivatives* and *stablecoin issuance*.

After having selected the platforms to analyze following the criteria described in Sect. 3, the categories of financial services have been designated in such a way as to encompass most of the financial operations carried out both in DeFi and CeFi. The methodology applied results in a comprehensive framework of the actual DeFi ecosystem that can also provide a strategic observation point to observe future developments. For the best of our knowledge, this analysis represents the first cross-chain study of the DeFi ecosystem within a context where other studies generally refer to single-chain frameworks [2].

In the context of the eight blockchains presented in Sect. 3, Fig. 2 shows the DeFi ecosystem in terms of services provided within each blockchain platform. As stated earlier, most of the financial services offered by DeFi require the implementation of smart contracts and specific protocols generally performed by dApps. In this framework, the Bitcoin blockchain is the only one, among the eight platforms analyzed, that does not allow to execute smart contracts and, in turn, to develop dApps. However, as also discussed in the previous section,

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<sup>3</sup> Note that the source of this information is the same as indicated in footnote 1.

given the Bitcoin’s impact in terms of network effects, which caused its considerable appreciation since 2012, it represents one of the DeFi ecosystem’s cornerstone. Moreover, the situation outlined by the figure below shows the monopolist role played by the Ethereum blockchain inside the DeFi environment. Indeed, Ethereum has generated strong network effects as in the Bitcoin case, being the first blockchain to implement smart contracts and develop dApps.

Consequently, despite the relative inefficiencies compared to other platforms, the positive feedback loops generated by the increasing dimension of the blockchain environment in terms of dApps have always attracted more attention by users and developers<sup>4</sup>. Nevertheless, more recent infrastructures (e.g., Eos, Tezos) have started to expand their network in terms of the number of on-chain dApps and financial services offered. Consequently, the effects deriving from the emergence of other blockchains within the DeFi environment are twofold. First of all, emerging platforms can attract on-chain users of other infrastructures, offering higher performances to face increasing scalability requirements. Secondly, a more prosperous DeFi environment composed of many blockchains can bring to an expansion of the decentralized network at the expense of the CeFi ecosystem.





































































	 BITCOIN	 ETHEREUM	 TRON	 STELLAR	 EOS	 TEZOS	 NEO	 CARDANO	
Borrowing & Lending		      			   				
Exchange / Trading		            			   				
Deposit / Asset Management		          			 	 			
Derivatives		   							
Stablecoin issuance		      							

Fig. 2. DeFi ecosystem survey across eight blockchain infrastructures.

Within the set of categories of financial services selected, payment gateways were not mentioned since they can be considered as a standard integration of deposit service granted by traditional financial institutions like private banks. However, in the case of DeFi that principally makes use of cryptocurrencies,

<sup>4</sup> However, it has to be considered that the Ethereum blockchain is planning to make a change in the consensus mechanism from PoW to PoS to increase the efficiency of the platform, as shown in Fig. 1 above.



conditions may change. Indeed, since their price tends to fluctuate, it is not easy to think of these tools as widespread means of payment. Instead, they should be conceived as assets and, therefore, as *digital assets* utilized by users to take advantage of the financial services made available by dApps. In this context, the introduction of stablecoins has marked the DeFi ecosystem, since they grant access to digital assets with minimal fluctuation rates and peg either to fiat currencies (e.g., US Dollars) or to digital assets (e.g., USDC, TUSD). Consequently, the launch of this type of tool has created an essential incentive in moving simple payment transactions on the DeFi ecosystem.

In this framework, DAI represents the first stablecoin issued through the borrowing and lending platform of MakerDAO, developed on top of the Ethereum blockchain. Examples of fiat-backed stablecoins are SDUSD, provided by the Neo blockchain through the dApp Alchemint, and ANCT, issued by AnchorUSD and built upon the Stellar blockchain. On the other hand, instances of crypto-backed stablecoins are EOSDT issued by the Eos blockchain and USDx provided by dForce developed on top of the Ethereum blockchain.

Concerning borrowing and lending services, in DeFi, differently from CeFi, the money deposited in platforms is used to finance borrowers without substantial restrictions. Therefore, deposit activity collapses into borrowing and lending category, since lenders can earn interests just depositing fiat money or digital assets in the framework's wallet (i.e., generating passive income). In particular, dApps grant access to P2P lending platforms that use the money deposited by users to finance borrowers provided that borrowers can over-collateralize their loan (generally at 150%) with digital assets. Besides, these on-chain projects allow potential borrowers also to become margin traders by virtue of the collateral that they have to provide in order to apply for a loan.

The ease with which users have access to margin trading activities highlights another important point of divergence between decentralized and centralized ecosystems. Within CeFi, margin trading is characterized by elitist access, since a potential trader usually needs a specific margin account and a minimum investment threshold. Moreover, to receive funds from brokerage firms, the trader must be recognized as a trusted investor. Within the CeFi context, in addition, margin calls take place whenever the trader's margin account falls below the *maintenance margin level* due to a consistent decrease in the value of the collateral (i.e., the securities purchased spending the borrowed money). In DeFi, instead, the collateral is represented by a certain amount of digital assets pre-deposited by the borrowers. The margin call automatically occurs when these assets' value falls below a predefined threshold, via smart contracts, without the necessity of trusted third party interventions. For this reason, within DeFi, we can talk about *permissionless initiation of margin calls* and *permissionless provision of margin call liquidity* [9]. Regarding the DeFi ecosystem, Fulcrum and Nuo represent two examples of borrowing and lending dApps developed on top of the Ethereum blockchain, which also offer margin trading services.

When it comes to exchanging activities, they can be considered the *alter ego* of trading in the CeFi framework. Indeed, thinking of cryptocurrencies as digital

assets, the exchange among native tokens of different blockchains represents an investment choice to take advantage of rising and decreasing trends in the various digital asset markets. Moreover, as also seen before, many dApps provide more than one financial services. For instance, the dApp Nuo mentioned above grants also access to exchange activities. Another interesting example is Tokenlon, an exchange platform built on top of the Ethereum blockchain, which also issues the token *imBTC* that is a derivative pegged to the value of BTC.

The dApps that deal with deposit and asset management are applications that allow managing funds and digital assets. Indeed, in the DeFi ecosystem, dApps are generally non-custodial, which means no specialized institution is entitled to make financial and commercial decisions regarding assets belonging to customers. Moreover, since asset management activities also include the possibility of transferring tokens from an account to another, payment activities can be considered part of this category. In this context, Instadapp is an interesting dApp, developed upon the Ethereum blockchain, that grants access to asset management activities and connects many DeFi protocols allowing users to interface with a series of financial services. MakerDAO, Compound and Uniswap are three examples of interconnections made available by Instadapp.

DeFi derivatives represent another exciting field of this growing financial ecosystem. In the CeFi framework, derivatives are contracts among two or more parts whose value depends on the underlying financial assets upon which the parts have an agreement. As such, derivatives can be viewed as secondary securities, since they have no intrinsic value. Instead, in the DeFi environment, derivatives represent synthetic tokens able to reproduce the underlying assets' fluctuations. In particular, DeFi derivatives are obtained through a set of practices that fall within the *asset tokenization* field. One of the main applications of asset tokenization is the *wrapping process*. This procedure allows to obtain wrapped tokens, starting from an original token (e.g., ETH, BTC) through a transformation process carried out by smart contracts. The wrapping procedure also provides additional functionalities to the transformed tokens. A prominent example of this type of activity is present on the Ethereum blockchain, and in particular, it is applied in the ecosystem of tokens based on the ERC20 (Ethereum Request for Comment-20) standard. Indeed, the ERC20 standardized format makes possible the interaction between users who own ERC20 tokens.

Moreover, it is also worth noting that user interaction also occurs across different DeFi platforms (even though always developed upon the Ethereum blockchain) that recognized the same standardized format. An example of asset tokenization dApp is Chintai, built on top of the Eos blockchain, allowing businesses to issue, manage and trade tokenized assets. Another example of this category is Digix, a dApp based on the Ethereum blockchain that issues tokens pegged to the value of gold (i.e., 1 DGX = 1 g of real gold). Besides, also the Tezos blockchain is entering the world of digital derivatives through the issuance of wrapped BTC tokens, named *tzBTC* [6].

Finally, Fig. 3 summarizes the information collected within the study, showing how, just a few years after the first execution of smart contracts in 2014,

the DeFi ecosystem is expanding across the blockchain environment. Therefore, whenever a box that connects a financial service with a blockchain is colored, at least one dApp provides that specific service upon the related infrastructure.

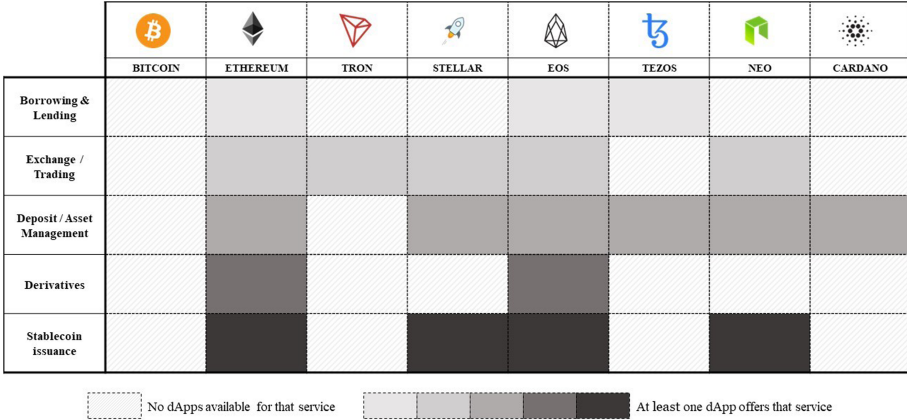


Fig. 3. DeFi ecosystem map across eight blockchain platforms.

## 5 Conclusion and Next Steps

The exploratory study about next generation blockchain-based financial services presented in this work allows understanding how and towards which way the financial industry is evolving. The blockchain technology application in this sector has brought to the creation of an ecosystem composed of dApps able to reproduce standard financial services and go a step further, proposing innovative solutions for this industry’s evolution. The results presented describe a rapidly changing ecosystem, actually driven by the Ethereum blockchain and followed by prominent projects with broad potential in terms of efficiency and ecosystem prosperity. Therefore, the study addressed in this work provides a strategic observation point to better comprehend the future developments affecting the financial industry. This exploratory study also represents an initial step within the research field that treats the transition from centralized to decentralized systems. Further analysis will focus on a multiple perspectives’ study with the aim to define which degree of complementarity among centralization and decentralization can maximize their respective strengths and minimize the weaknesses. Therefore, subsequent work will broaden the research horizon to in-between realities that present combinations of decentralized and centralized governance layers while preserving the blockchain’s principles. This type of analysis will enhance comprehension about the future perspectives of DeFi, delineating the profile of potential future successful actors in the next-generation financial industry.

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