

The Future of Blockchain Tech in Transactional Business

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Abstract

This paper represents an attempt at a thorough analysis of the complexity of blockchain technology & cryptocurrencies while reviewing the core aspects of the development stages that this growing market has undergone and where it may lead. Additionally, we provide a review of current obstacles and advantages for wider adoption of such disruptive tech in banking & fintech industries for its potential for fast, cheap and secure transactions and mass utilization prospective. Considering such benefits and advantages, we have to ask the question of whether there is a need for the middleman transaction participants in the future digital economy. In order for this innovative and disruptive tech to become truly global, we need to go through four phases of development presented in the development matrix. Using various examples, our analysis puts the blockchain tech & crypto at the current second development phase. The main obstacle to move from the second to the third, and subsequently, the fourth and final phase remains the absence of unified legal framework and regulations in key global economies such as the United States and the European Union. Once the legal foundation is established by the G20 economies, regulating cryptocurrency use, trading and taxation, the transition to this final phase should be rapid, and will be followed by mass adoption, with more than a quarter global population fully utilizing and enjoying the benefits of blockchain tech innovation and cryptocurrencies.

Keywords: *blockchain; cryptocurrency; regulation; banking; transactions.*

JEL Classification: *D53; E17; F63; O31.*

Introduction

Since the early development stages of blockchain tech and the introduction of Bitcoin as the first digital currency, this technology has proven itself to be more disruptive and beneficial to a wide variety of economic and financial sectors. Currently, we live in the second developmental phase – the continuation of the cryptocurrency and blockchain tech progress – where we are witnessing and testing the many benefits it promises humanity. In order for this disruptive tech to move to the third phase, several criteria need to be met in terms of regulation, number of users and total market capitalization.

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Blockchains have progressed from the early stages of proof of work, energy intensive, isolated digital spaces with its sole dedicated user base, to more multifunctional, dynamic and interoperable blockchains, allowing them to communicate and transmit fast and secure transactions at a fraction of current cost and time. Blockchain trilemma challenges are being addressed by the new cryptocurrency projects, which aim to achieve maximum performance in all three functional properties: decentralization, security and scalability through innovative technical and programming solutions.

There is growing potential for a new market within the individual payment systems, cross border remittances and cashless transactions that the new disruptive blockchain tech and cryptocurrencies offer. Legacy financial institutions with their complicated transactions currently face a number of challenges such as bureaucratic hurdles, number of middlemen actors with their applicable transaction fees and costs, transaction speeds, closing during holidays and non-banking hours, and final settlement dates; thus, creating further barriers with the overall time it takes to finalize a transaction from start to finish, as well as mounting costs and other security issues. In addition, there is a growing number of people around the globe who don't have access to banks and credit services, and who will never qualify for a simple loan.

Therefore, blockchain technology, with its growing cryptocurrency projects, should be able to solve the aforementioned challenges and present a viable universal solution for these issues by providing the fastest, most secure and cheapest transactional speeds, without the bureaucratic paperwork and barriers of the traditional legacy payment systems. In this space, the unbanked population has the same privileges as everyone else — they can complete transactions at any non-banking hour or holiday within seconds. This is exactly the potential of this disruptive tech within the digital economy of the future. Furthermore, this technology is progressing and constantly evolving. Currently, the technology is moving from the energy-intensive proof-of-work consensus mechanism to the proof-of-stake and other eco-friendlier consensus mechanism concepts, which are much less energy-intensive and greener processes. These developments will further move blockchain tech and cryptocurrencies to the next phase of progress.

The third stage of the blockchain tech is greater mass adoption, where there will be over 500 million users with cryptocurrency market cap crossing the \$5 trillion market cap threshold. At that stage, we will have more visible, proven and practical benefits that will be part of the everyday financial / economic activities. For this to occur, the governments around the globe need to devise smart and practical regulations and legal frameworks to allow this innovative tech to develop and cryptocurrencies to exist next to the fiat alternatives simultaneously.

Within the article, we further analyze blockchain tech and cryptocurrency adoption and progress in four different developmental stages. We analyze each stage in Table 1 and the challenges they individually face, as well as prerequisites to move to the next phase of progress.

Table 1. Blockchain development matrix

Indicators	Phase 1	Phase 2	Phase 3	Phase 4
Development Years	2010-2019	2020-2024	2025-2029	> 2030+
Total Market Cap	under < \$1 Trillion USD	\$1-\$5 Trillion USD	\$5-\$10 Trillion USD	> \$10+ Trillion USD
Mass Adoption - % of Population Globally	Low <5%	>5% Low <10%	>10% Medium <25%	High >25%
Number of Wallet Users	Under 200 mil	Under <1 Billion	>1 Billion	>2 Billion+

Source: Developed by the © authors, 2022.

Within this research, we start with the history and data over the previous decade, presenting the main challenges blockchain tech has faced, how it has evolved and the solutions utilized to solve the obstacles and facilitate its future growth. In addition, historical facts and examples are presented regarding the manner in which this tech benefits consumers. Current obstacles such as the absence of sound regulatory environment and legal frameworks governing blockchain tech and cryptocurrencies are also discussed to outline the main existing challenges to future growth and mass adoption. We also present some statistical facts that show rapid growth and adoption worldwide over the past few years. The paper further takes into consideration the main criticism and concerns raised by crypto sceptics, and provides detailed counterarguments. Furthermore, various country examples are also analyzed to better portray the diverse legal environments that exist today in the European Union and the United States. Additionally, there have been proven crypto benefits for the Ukrainian people at the start of the Russian invasion and Putin's war in 2022.

The Four Phases of the Blockchain Development – From Infancy to Mass Adoption: Methodology and Criteria

Over the past decade, blockchain tech and cryptocurrencies have been rapidly evolving and progressing, just as their prices and values have risen over time. From the early days of blockchains, when we had minimal number of users, uncertainty about its future and minimum practical utilization, this technology has been growing progressively, attracting more individual investors, retail investors and more recently, corporate-organizational players.

We have subdivided its progress into four phases from start to mass adoption / final phase, assuring that our methodology and analysis assign vital parameters and criteria for it to move from one to the next phase of progress.

These parameters are very important in terms of the tech value-growth, popularity, use-case and adoption. The most important criteria to measure the blockchain development progress are the following: total market capitalization value in \$USD, mass adoption and penetration rate, as well as the number of active wallet users.

As cryptocurrency popularity grew, so did the number of companies and shops that started accepting cryptocurrencies as in-store payment method or have an in-store cryptocurrency ATMs. Per Table 2, according to *Statista's* March 2021 research, there were close to 22,000 such stores and ATMs in the 147 countries of the world.

Table 2. Countries globally with 10+ merchants, in-store cryptocurrency ATM as of March 2021

Country	Merchant/ATM	Country	Merchant/ATM
United States	5,968	Denmark	83
Italy	1,366	New Zealand	75
Slovenia	1,133	Lithuania	74
Brazil	1,019	Iran	67
Germany	713	Hungary	63
Spain	708	Norway	57
Canada	661	Sweden	55
Colombia	645	Azad Jammu and Kashmir	55
Czechia	569	Antigua and Barbuda	54
Russia	552	Singapore	51
Argentina	508	Costa Rica	49
Netherlands	507	Latvia	47

Table 2 (cont.)

United Kingdom	495	Estonia	47
Venezuela	418	Philippines	43
Switzerland	412	Panama	41
Australia	393	Belarus	41
Austria	377	Malaysia	39
Croatia	361	Ecuador	33
Japan	355	Cuba	32
Mexico	279	Ireland	24
France	277	Uruguay	22
Poland	258	Montenegro	21
Greece	233	Vietnam	21
Thailand	223	Cyprus	21
South Korea	191	Serbia	20
Slovakia	188	Paraguay	20
Belgium	159	Malta	19
Taiwan	153	Luxembourg	18
Turkey	139	United Arab Emirates	16
Ukraine	127	Guatemala	14
Portugal	108	Bosnia and Herzegovina	13
Chile	99	Nicaragua	13
Indonesia	96	Cambodia	12
Bulgaria	95	Honduras	11
China	93	Kazakhstan	11
Israel	89	Kenya	10
South Africa	86	Jamaica	10
India	85	Georgia	10
Romania	84	Egypt	10
Peru	84	Belize	10
Finland	83		

Source: © Statista, 2021.

What is Blockchain & Why Does It Matter?

The story of blockchains and cryptocurrencies has been dominating the news media and expert opinion editorials, with critics calling it a fad and supporters calling it a revolutionary technology with the ability to alter our economy, banking and financial activities, as well as our daily lives. These are a few reasons why this topic is of societal importance and worth examining in depth. In this paper, we analyze all the pros and cons of blockchain technology with its origins, current state, progress and its future path within the four previously mentioned phases of development. We will base our analysis on hard facts, data, and qualitative and quantitative research methodologies to answer the following questions: Will blockchain technology become an inseparable part of the future digital economy? If so, how? What phases of progress are we looking at? When shall we see the mainstream adoption of the technology by governmental and non-governmental institutions?

Blockchain: evolution and development phases

Ever since Bitcoin was introduced a decade ago, something new and revolutionary started to develop – the first working blockchain was born. In the beginning, Bitcoin, as a digital currency, was viewed as an alternative to physical cash currency. The Bitcoin’s blockchain was a public ledger that was maintained by its dedicated community. Thus, an ecosystem came to life and opened doors to new possibilities and other digital ecosystems, such as Ethereum, to follow and develop.

Ethereum was viewed as “the internet of the blockchain” world, encompassing smart contracts and decentralizing application creation, delivery and operation – all in one ecosystem. The Ethereum project opened the door to something unique: An innovative digital platform that had the ability and potential to incorporate all of our economic and financial activities within its transactional ecosystem. More blockchains followed the Ethereum project.

The newer blockchain ecosystems promised to deliver more than just a simple electronic currency and transaction. They promised faster speeds with more enhanced security, decentralization and scalability, thus solving the “blockchain trilemma” issue, which stated that each blockchain could only have two of the three properties, and basically had to sacrifice one, because technically it was impossible to have all three — decentralization, security, and scalability — simultaneously. Thus, newer projects like PolkaDot (DOT), Near Protocol (NEAR), MultiversX (EGLD), among others, emerged with the promise to solve the “blockchain trilemma” challenge through new technical programming means and processes, such as sharding, cross-sharding, operating multiple inter-connected interoperable parachains, etc. This created the technical foundation for the blockchain tech to move towards a more advanced *Phase 2* stage of development.

Throughout the early decade of the blockchain era, continued innovation, technological development and constant improvements allowed us to move into a more advanced phase of this technology — *Phase 2* of the blockchain era. This is where we are today, with over 20,000 cryptocurrencies and numerous accompanying blockchains, according to *Coinmarketcap*, that are the core engines powering the entire blockchain universes and the overall still-growing crypto ecosystem. Blockchain technology and cryptocurrencies will continue to develop and progress in the future. According to *Coinmarketcap*, the total cryptocurrency market cap has grown from approximately \$1.5 Billion USD in May 2013 to \$2.9 trillion USD in November 2021 at its all-time high per Figure 1.

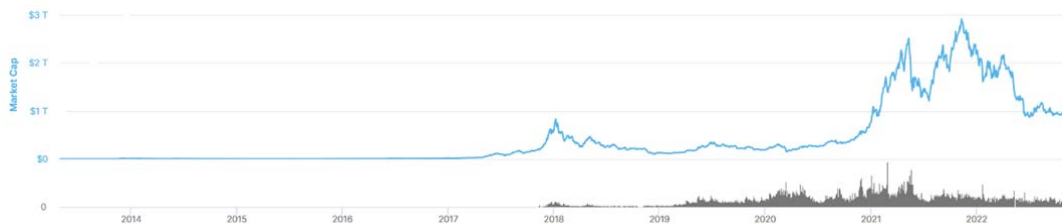


Fig. 1. Total Cryptocurrency Market Capitalization 2013-2022

Source: © Coinmarketcap.com, 2022.

According to *Time Magazine*, 2021 saw many new crypto investors, and according to a study by Grayscale Investments, over fifty percent of Bitcoin investors started a year ago or even more recently. The new activity caused the crypto market to reach both all-time highs and lows, which resulted in significant gains and losses for investors (Alex Gailey, Kendall Little, 2022).

With the new phase of blockchain progression and development, solving the “blockchain trilemma” and blockchain interoperability issues has become the main strategic objective to

solve for most blockchain programming engineers. Thus, decentralized, secure and scalable blockchains that are truly interoperable –with the technical resources and capability to communicate data, transactions and smart contracts across different blockchains – are becoming a reality, with new tech advancements offering faster, cheaper, scalable and more secure informational and transactional transfers between different blockchains.

The concept of interoperability further means that different blockchains can coexist and have the technical ability to transfer and share data, transactions, communicate smart contracts and dApps (decentralized applications) between these blockchains. Interoperability has the potential to make blockchain tech more attractive to the corporate financial world, which is fundamental in moving the blockchain tech development and progress into *Phase 3* — the stage in which we will start seeing larger institutional organizations test and take the first adoption steps, as well as becoming more comfortable with the possibility of utilizing this innovative tech for their strategic-organizational needs. As this shift occurs, we will have moved from the era of independent blockchains that cannot communicate data and transactions to each other, to a new age of information exchange, as well as informational and transactional interoperability, with benefits that are both visible and practical. This is a vital feature of blockchain technology that will further facilitate its advancement into *Phase 3* of growth.

Currently, within the *Phase 2* of development, there are multiple new projects being launched; innovation and technical development are ongoing in efforts to solve the challenges blockchains and cryptocurrencies faced in *Phase 1* in terms of interoperability, decentralization, security and scalability.

There are a few more criteria to be met for this tech to progress further towards *Phase 3* and, ultimately, to the final *Phase 4* of mass adoption and global utilization. In parallel to the technical and programming challenges being addressed and solved by programmers and IT developers, various advanced global economies and governments need to take steps to develop and establish sound crypto-friendly regulations and legal frameworks regarding cryptocurrencies. Without this vital step, we will not be able to move fully into *Phase 3* and the final *Phase 4*.

Additionally, there are further criteria to measure the development and progress stages of the blockchain tech that include the following parameters: growth in the number of active users and wallets around the globe and growth in the total overall market capitalization of cryptocurrencies. According to *Statista* (Figure 2) below, we are currently under 500 million active users with around \$1 Trillion market cap — close to \$3 trillion during the bull market high (per Figure 1.) Therefore, we currently remain within *Phase 2* of the development matrix. The starting stage of the final *Phase 4* is estimated to be close to the total market cap of gold, valued at \$12.6 Trillion today, according to *Companiesmarketcap* (companiesmarketcap.com). This is the approximate economic value threshold, where *Phase 4* will begin and surpass the precious metal, as the mass adoption cycle sets into this phase.

Considering the speed of development and the overall evolution of the blockchain tech and cryptocurrencies, we forecast that this tech will move into *Phase 3* before 2030 and transition into the *Phase 4* post-2030, when we will have fully integrated blockchain systems within the future digital global economy — web 4.0 and beyond — powered by smart contracts, dApps, and AI, in combination with blockchain tech and cryptocurrencies.

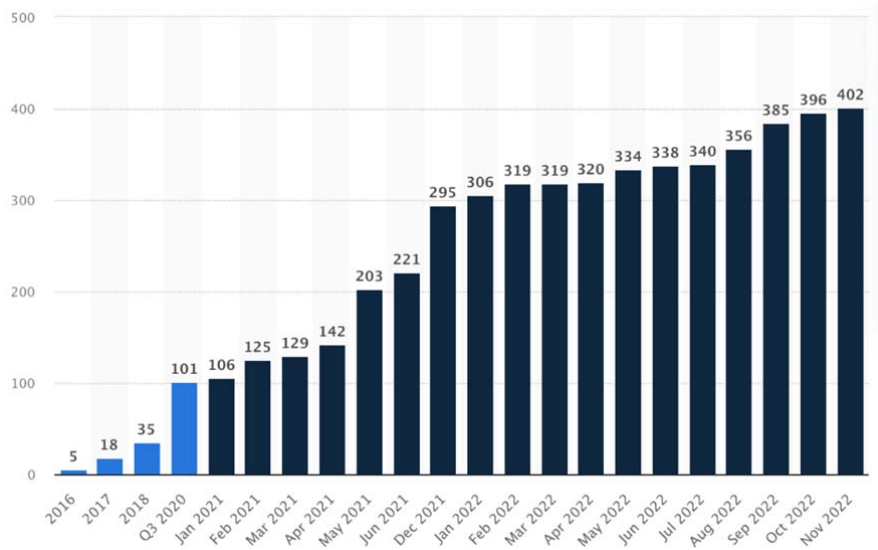


Fig. 2. Number of identity-verified cryptoasset users from 2016 to November 2022 (in Millions)

Source: © Statista.com, 2022.

According to the International Telecommunication Union (ITU) in 2022, about 5.3 billion people in the world, which represented roughly 66% of the total global population, was using the Internet — a 24% increase from 2019 statistics (ITU, 2022). If we also factor in the data that 2.8 billion credit cards were in use worldwide in 2021 (Shift, 2021) and there were 7.26 billion mobile phone users worldwide in 2022 (Statista, 2022), we can have more vision and forecast about *Phase 3* and the final *Phase 4* adoption rates and probability of the overall participation. Within the final *Phase 4* transition to mass adoption of cryptocurrencies, this threshold should begin with the 25% of population participating in the blockchain-crypto sphere by utilization, trade and transactions. Furthermore, even the unbanked population, who is unable to open bank accounts or apply for a loan, can utilize cryptocurrencies as long as they have access to internet or a mobile device, helping blockchain tech use and mass adoption surpass the overall credit card utilization rate of 24% in the beginning of *Phase 4*. This step will ultimately fuel the overall mass-growth potential opportunities ahead of 2030 and beyond. Considering how rapidly the cryptocurrencies became adopted in the following top ten countries listed in Table 3, we can predict that, with this rate of growth and popularity, within a decade, we should expect more than a quarter of the global population to be utilizing this technology and innovation. Average growth these countries had over the prior two years was 59% (excluding negative growth data as outliers), with some individual countries having well over 100% growth rate over this time. With well-defined cryptocurrency legal and regulatory frameworks worldwide, we can expect faster annual growth and adoption rates ahead into *Phase 3* and *Phase 4*.

Table 3. Cryptocurrency adoption worldwide 2019-2021, Share of respondents who indicated they either owned or used cryptocurrencies in 56 countries and territories worldwide from 2019 to 2021 (Top 35 listed)

Country	Years			in %	% Growth vs 2019
	2019	2020	2021		
Nigeria	28	32	42	in %	50%
Thailand	23	18	31	in %	35%
Philippines	15	20	28	in %	87%
Vietnam	22	21	27	in %	23%
Turkey	20	16	25	in %	25%

Table 3 (cont.)

Argentina	16	14	21	in %	31%
South Africa	16	18	21	in %	31%
Switzerland	10	11	16	in %	60%
Kenya	10	11	16	in %	60%
Malaysia	6	12	16	in %	167%
Brazil	16	11	16	in %	0%
Netherlands	9	10	15	in %	67%
Colombia	18	15	15	in %	-17%
Czechia	10	9	15	in %	50%
India	7	9	15	in %	114%
Portugal	9	8	14	in %	56%
Spain	10	9	14	in %	40%
Chile	11	12	14	in %	27%
Pakistan	6	6	14	in %	133%
Ireland	8	10	13	in %	63%
United Arab Emirates	20	10	13	in %	-35%
United States	6	6	13	in %	117%
Peru	15	16	13	in %	-13%
Hong Kong	11	11	13	in %	18%
Greece	11	11	13	in %	18%
South Korea	8	8	13	in %	63%
Egypt	10	8	12	in %	20%
Indonesia	11	13	12	in %	9%
Saudi Arabia	14	11	12	in %	-14%
Australia	7	8	12	in %	71%
Lithuania	6	9	11	in %	83%
New Zealand	6	5	11	in %	83%
Canada	5	5	11	in %	120%
Denmark	8	4	11	in %	38%
Dominican Republic	10	10	11	in %	10%

Source: © Statista, 2021.

Benefits of the blockchain tech's impact in banking and finance – phase 4

The first sector of the financial services/banking industries that blockchain technology can impact is international remittances such as Western Union, MoneyGram and other similar services. According to the World Bank, in the 4th quarter of 2020, the average transaction fee for cross-border P2P payments averaged at 6.51%. This number is even higher for banks averaging at 11%, with payments taking 2-3 days to complete. With Blockchain, banks can offer secure transaction recording, rather than relying on traditional payment processes via distributed public ledger and without the involvement of third-party intermediaries. Blockchain has also been shown to decrease potential fraud risks by creating easier compliance with consumer data privacy guidelines and by storing transaction information within a distributed public ledger network, thus making it virtually impossible to alter without all network members' consent.

Due to these benefits, many new players are entering blockchain-powered cross-border P2P payments systems, which offer faster transactions at much lower fees vs. the high network fees and “the sluggish pace of the SWIFT system and lack of transparency” that encompass legacy cross-border payment processes and transactions (Sam Klebanov, 2021).

In 2019 PNC bank joined the Ripple network (XRP) to offer cross-border remittance services to their corporate customers. Others also followed suit and joined the Ripple network: Santander, MasterCard, and American Express. With the launching of Payburner, P2P payments can be made instantly using XRP cryptocurrency. Other big corporations had been testing their own blockchains, such as IBM with IBM World Wire, which allows its corporate clients to transfer payments using Stellar (XLM) cryptocurrency. When it went live, they claimed the network had supported payments in 50 currencies in 70 different countries. However, the greatest obstacle to the mass adoption remains – no clear, fully established regulatory and legal environment by governments (Sam Klebanov, 2021). According to *Forbes*, there are three ways Banks could adopt the blockchain tech: Payments, Security & Infrastructure (Frank Sorrentino, 2021).

Payments & Financial Transactions

Utilizing blockchain technology for fast and cheap payment transactions, these are made possible by using stablecoins – digital coins pegged one to one to a US Dollar or any other fiat currency such as the Euro, Pound, etc. With stablecoins financial institutions have developed new processes to send and receive payments at any time with very low costs. Collaboration between financial institutions and cryptocurrency projects, and players via banking services, exchange platforms and wallets are rising daily. In addition, by offering crypto cards to their customers, financial institutions allow businesses to accept crypto-payments without the cryptocurrency-market volatility risks, hedged by the same banking-financial institutions. Therefore, crypto-market volatility risks do not present transactional challengers to the payment acceptors. These circumstances present wider opportunities to customers who want to transact and pay with cryptocurrencies vs. fiat. Crypto cards are currently being issued in partnership with reputable global players, such as Visa, Mastercard, Amex, etc., (crypto.com Visa debit card, Nexo Card, Coinbase Card, Binance card, Gemini Credit Card, Venmo Credit Card, etc.).

Considering the fact that cross-border payments become very expensive for both small banks and their customers, therefore blockchain-based payment solutions benefit both parties - banks and clients (Frank Sorrentino, 2021).

Financial institutions are currently hypothesizing on how the benefits of cryptocurrencies will shift the behavior of consumers in terms of how they shop and transact with money. Banks like Bank of America are filing tech-related patents indicating the level of seriousness some banks and financial institutions are placing on digital currencies. It also demonstrates blockchain technology's effect on local and global economies.

By utilizing the blockchain tech, the financial market players could potentially offer some exceptional benefits to the customers in terms of speed of transaction, the low cost of transaction, and security and visibility via cost optimization of the third-party players or the transactional “middlemen.” These benefits would arise through execution and implementation of smart contracts (contracts written in highly arithmetic coded languages ensuring its stability and inability to alter them once they go live) and smart-contract tokenization.

When considering the benefits of the overall blockchain tech, we have to mention the smart contracts in more detail. These are revolutionary contracts that do not require notary services or lawyers to complete. They are written in programming languages by using highly arithmetical models and provide benefits whose full potential we have not yet realized. Therefore, the smart contracts open the door to revolutionize the financial services industry by automatization of their services, which will be the major benefit of the digital banking sphere.

Smart contracts offer transparency, allowing all parties to see use of funds, and read the contracts with the ability to see the details of contract terms without any uncertainty, which decreases overall risks and brings peace of mind especially to smaller retail investors, who could suffer the most financially. Although the average consumer may not understand the

contract code's technical language, they are able to access an open-source platform and feel less vulnerable. Thus, DeFi offers advantages that traditional finance institutions and organizations do not have (C. R. Harvey, A. Ramachandran, J. Santoro, 2021).

In general, there is a growing interest by the banking institutions to consider migrating their prospective transactions to the blockchain platforms for its speed, accuracy, security and lower costs benefits. Their appetite had been gradually growing to participate and capture the market share in the blockchain space in the cross-border transactional payments and remittances services. Today the cross-border payment systems and processes are riddled with transactional third-party players, with their own respective burdens in fees and costs, timeframes and business days it takes to complete and finalize the transaction, which further adds on costs and increases the overall price of the cross-border payment transactions.

By utilizing the blockchain technology, which is geographically neutral in its design and structure, cross-border payments could potentially take a second or more to complete, depending on the blockchain specific speed of the transaction. These types of transactions can occur at any time, including non-banking times, non-business days and national holidays without hesitation or issues. These types of transactions are simple, fast, cheap and secure. In addition, these types of individual blockchain transactions contain hashes that guarantee accuracy, security, visibility and tokenization. It further eliminates the need of the legacy banking system requirements to have corresponding settlement accounts, need for the third-party transactional middlemen, without any added-on costs for the commission fees or other miscellaneous transactional fees; and all it takes is literally seconds (or minutes, depending on the specific blockchain in use) to finalize and complete.

Having banking and fin-tech industries enter and adopt this technology will open the doors for *Phase 4* progression of blockchain tech. This will follow soon after the regulatory frameworks set clear rules & regulations on how banking, financial and other large industries can interact and utilize blockchain tech & cryptocurrency adoption. Let's consider the following example: An individual in Georgia wants to transfer \$1,000 USD to another individual in Indonesia. Today, there are only three major services available for such transaction:

- A. International wire transfer services via traditional banking institutions.
- B. Quick payment & remittance services via the Western Union, MoneyGram, etc.
- C. VISA Direct /MoneySend.

In the first instance, option A, in order to serve the individual to wire transfer the \$1,000 to an individual in Indonesia, a banking institution in Georgia is required to have a corresponding account with a bank that is part of the global network with authorization(s) to make US Dollar transfers (via the US Fed Reserve). In addition, the bank in Georgia also has to have a corresponding relationship with middlemen banking services that have access and relationship with the final destination – the wire transfer transaction landing the Indonesian bank. The overall timeframe such a wire transfer transaction could take is approximately three business days. In this instance, we have excluded non-banking days, non-banking times and holidays. However, considering the fact that every nation has its own national holidays, which differ from country to country, such a transaction could potentially take even more time, up to five business days or more to complete. Such a transaction additionally will need a minimum of two corresponding banking participants and transaction clearing, and would reach the final destination with the added on minimum \$30 USD services fees & costs. However, these costs could be even higher considering the landing bank or sending banking institution's individual services fees.

In the second instance, the individual sending the funds to Indonesia would pay about \$60 USD in transfer & transaction fees, and finalizing these types of transactions could take about 10 minutes or less. Therefore, this option is more popular amongst the immigrant populations, who

need fast transfer services without the need to open any banks accounts anywhere. However, the final add-on fees could be more expensive in general.

The third option has many restrictions for cross-border usage in transaction amount, receiver and receiver's country code due to Anti-money laundering (AML) and compliance issues.

Blockchain tech also offers benefits beyond simple cross-border payments and transactions. There are a number of additional benefits to e-commerce players by utilizing the blockchain tech not only in terms of payments by using certain stablecoins or cryptocurrencies, but also implementing and migrating logistics, and supply-chain data and processes within this innovative space, offering the same type of simplicity, accuracy and security as in the cross-border transactional processes. These types of logistical and supply-chain processes will be facilitated via the smart contracts and technological advancements that this space is undergoing.

Security

The ability to couple payments and smart contracts together creates new ways for banks to easily manage complex transactions in more simple and efficient manner. Blockchain can be used for a variety of processes — loan closing procedures, invoicing, supply chain financing — allowing more secure transactions (Frank Sorrentino, 2021). The blockchain is an open, visible public ledger; the transactions are not anonymous and those records are being kept there permanently. This sort of visibility and openness is another key benefit offering the banking, non-banking and e-commerce industries more resources to keep their transactional data stored cheaply and securely on chain, together with logistical, payment, supply-chain or other smart-contract services. As a whole, the existence and constant development of such ecosystems will bring more organizational players and guarantee its future success, adaptation in the new era of web 4.0 and beyond.

Infrastructure

In addition to payments and transactions, blockchain technology also provides banks the opportunity to update and modernize their complex processes and systems, and improve other internal processes, since most of the legacy systems and processes are still based on older systems requiring manual work processes. Thus, the use of blockchain technology helps eliminate the manual procedures in the exchange of huge amounts of data (Frank Sorrentino, 2021).

According to Gautam Jain, global head of digitization at the Standard Chartered Bank, blockchain is a “revolutionary technology” that has a lot to offer to communities on a global scale. Furthermore, Jain notes that, as the original role of banks was to facilitate commerce and trade within communities, they should spearhead the blockchain tech revolution, making trading much more efficient and completely decentralized (BBC, 2022).

Since the blockchain is a public ledger with accounting entries, any bank could utilize it to move its accounts on blockchains, therefore making them more secure, widely accessible and much cheaper to operate and maintain. It could even help lessen the risk of bank runs (Adam Hayes, 2022).

In April 2021, the European Central Bank issued for the first time two-year digital bond for 100 Million Euros (\$121M USD) on the Ethereum blockchain. This was done in partnership with Goldman Sachs, Banco Santander SA and Société Générale AG, who oversaw and managed the process. The belief is that digitalizing capital markets may benefit all participants in the near future by reducing the fixed costs, creating market transparency and much faster settlement speeds. (David Yormesor, 2021).

Overall, the banking and financial industry is starting to test waters with the blockchain technology and cryptocurrencies. They are slow and cautious; however, they do see the

potential benefits and opportunities for its further use and adoption. These institutions will continue to enter the blockchain digital space vigilantly, considering all vitality and absence of clear legal frameworks and regulations.

The Main Disadvantages & Arguments by the Skeptics

Currently, several adverse factors, challenges and obstacles remain to be solved, in order for the blockchain tech & cryptocurrencies to move into *Phase 3* and later, into the final *Phase 4* –mass adoption and global utilization stage:

1. Volatility.
2. Absence of regulations and legal frameworks.
3. Reversal – inability to reverse the transaction.
4. Psychological skepticism and overall consumer attitude.

Let's consider these factors in greater detail: In the absence of well-established legal and regulatory frameworks by the most advanced and developing economies of the G20, this innovative technology is facing a major hurdle to progress further to *Phase 3* and *4*. Having such economic conditions and circumstances create further uncertainty could result in sudden cryptocurrency market shocks, rapid price drops and contribute to the overall crypto marketspace price volatility today. Currently numerous governments around the globe are working on their crypto policies and regulations. Once the new rules of the game are established, the major obstacle towards further development, progress and innovation will have been removed.

Skepticism & psychological barrier – challenges to moving into phases 3 and 4

New tech adoption: skeptics

Generally, when we are discussing new disruptive technologies and their potential impacts, benefits and other associated effects, the general public tends to listen more to the skeptics and pessimists. These disruptive technologies need to break through psychological barriers in current *Phase 2*, in order for them to become more widely accepted and adopted by the society. At those phases of adoption, these technologies tend to get tuned to the detailed economic needs and wants of society in general or a specific market segment. However, it is quite a challenging task to convince the general public to use and adopt the new technology, to try it and break from the past – legacy systems and processes they had been used to utilizing.

For example, in 2009, the United States public was still heavily reliant on magnetic stripe credit/debit cards. However, the more cautiously conservative European Union was already accepting the fact that a card microchip is more secure and reliable tech. In the same time period, within the CEMEA (Central East, Middle Europe and Asia) region, there was the first revolutionary use and adoption of the contactless payments via the Visa PayWave card in Georgia, that had specific new tech incorporated – chip and antenna. These contactless cards used the RFID tech - Radio-frequency identification technology, which allowed it to communicate with the card reader when it was held within the near distance of the card reader during a transaction (Agenda News, 2015).

At the time, the local as well as global markets in general seemed quite skeptical of the security and reliability of the contactless cards. However, the first use cases in Georgia, followed by a rapid adoption of this tech, paved the way for it to become more popular and available, with its benefits more visible, practical and smart vs. the traditional legacy magnetic stripe cards (Andy Williams, 2009). This became the best, most practical and comfortable alternative to its users, transforming Georgia into the global leader in adoption, market penetration and the use of contactless cards. According to VISA spokesperson in 2015, interest in the Visa payWave

services has grown exponentially in Georgia since 2010, as users can complete payments for goods and services in seconds. Georgia is one among over 12 nations in the Commonwealth of Independent States (CIS) and the South-East Europe (SSE) region to adopt the contactless payment service, and was the leader of 17 states in the CIS/SSE region, where the Visa cards were issued (Agenda News, 2015).

Crypto vs. Dot Com bubble comparison by skeptics

Skeptics frequently compare the blockchain and cryptocurrency “bubble” to the Dot com bubble of the late 1990s. Looking back at the Dot-com bubble and accompanying market crash of 2001-2002, we can see some stark differences. The Dot-com bubble developed throughout the 1995-2000 when the Nasdaq Composite stock market index rose 400%, and then fell 78% from its all-time high by the end of 2002 (Adam Hayes, 2019). Multiple online companies and retailers failed, but some, such as Amazon, was able to survive and thrive. However, the main question to see the differences between the two events is: Who were the primary victims of the Dot-com bubble and crash? These mainly were the middle-aged (mostly white) Wall Street hawks and investors of sorts, who sought to jump in on the new the Dot-com wave to get rich quick. They were the primary participants in the Dot-com bubble economics and the main victims of the accompanying crash.

Who are the primary participants in the blockchain and cryptocurrency ecosystems today? These are small-scale shop owners in Nigeria, or a student in Indonesia, or a small-scale farmer in Zimbabwe, or tech developers in Georgia or Ukraine, or high-school artists trying to create new digital art NFTs, programmers, tech enthusiasts, other newcomers, anyone... the whole universe! The blockchain tech and cryptocurrency ecosystems belongs to the entire community who participates in it; this is not the playground for the rich investors or the 1%, as was the case with the Dot-com bubble crash. This is what makes the blockchain tech and cryptocurrencies so strong and attractive: participation by many and democratic governance of these projects by its community members.

Questions, fears, doubts and skepticism is normal emotional and psychological early phase of any tech development. This is not a new development, as it takes years for people to observe, be assured, believe and trust, and then accept the change or new development.

Illicit use by criminal organizations

Some of the main arguments against using cryptocurrencies in the financial services sector entail illicit uses, uses by terrorist or other criminal organizations, money laundering and other miscellaneous illegal use. However, these activities can be regulated and government agencies can oversee and disrupt such operations. Overall, these potential perceived illegal uses do not amount to considerable risk to the blockchain and cryptocurrency space.

Considered not eco-friendly

There are arguments against the blockchain and cryptocurrencies portraying them as not so eco-friendly and being very energy extensive, energy hungry systems, that consume lots of megawatts of power. This criticism has not gone unnoticed, as the new blockchains and cryptocurrencies are starting to adopt Proof of Stake or other more innovative validation and consensus processes that consume much less power and are very eco-friendly vs. the Proof of Work concept, which has been the legacy mining process of the older blockchains such as Bitcoin.

Proof of work and proof of stake are both consensus mechanisms, but they work in different ways. In a proof-of-work environment, miners are verifying cryptocurrency transactions, which requires a lot of computing power and energy. In proof of stake, validators are selected based on some rules in combination with the stake they have in the transaction; that is, how much of them

own tokens they have locked in to commit to be selected as a validator. Both are decentralized environments with pros and cons. Some of the cons are that verifying transactions requires considerable energy resources making it less environmentally sound. In addition, as cryptocurrency becomes more popular, small group of top earning miners constantly competing for rewards and control of the blockchain, centralization also becomes an issue to consider.

However, Proof of Stake consensus mechanism requires quite a large initial investment to hold a stake in a particular network. To qualify as a validator, you need to purchase enough of the native cryptocurrency token, which leads to “an exclusively rich blockchain” with a few and very wealthy validators (Mike Antolin, 2022).

Proof of Stake seems to be the eco-friendly answer to the legacy energy-consuming mining systems. Proof of stake can be beneficial because it is not as costly run mining operations, which Ethereum estimates could decrease energy use by up to 99%. Proof of authority has a similar effect, but the main difference between proof of authority and proof of stake consensus mechanisms is that any potential validators must be pre-approved based on their market reputation rather than the total token value holdings and they do not have the authority to verify consecutive blocks (Nitish Pahwa, 2022).

Irreversible transactions

Another argument against blockchain tech and cryptocurrencies is the irreversibility of transactions, meaning once a transaction is done and complete, it cannot be reversed by any means whatsoever.

Regulations, Taxation & Laws

The single most important current issue remains the absence of sound, transparent and well-established legal environments by the major economies, such as G20 countries. Without this important step, the transition to *Phase 3* and the final *Phase 4* will be impossible. However, the regulations are heading towards crypto & blockchain space, as governments and their finance-revenue departments cannot ignore the \$1+ trillion market cap industry and the potential tax revenues deriving from it. Furthermore, the recent FTX/Alameda fraud scandals and multiple bankruptcies by the cryptocurrency trading centralized exchanges, due to which customers lost billions, reinforced the further need to have sound regulations and laws in the near future to protect all consumers, set up the main regulatory frameworks for cryptocurrency trading, DeFi transactions, eliminate the “Gray area laws” that exist within the United States, as well as allowing this tech to progress and facilitate its transition to the *Phase 3* and ultimately *Phase 4*.

Today, within the *Phase 2*, each regulatory environment and legal framework differs from country to country. Just to explain how differently these regulatory environments define and view cryptocurrencies today, let's explain the following countries as examples:

The United States of America

The United States has quite a complicated relationship with blockchain tech and applicable cryptocurrencies, where a centralized legal framework simply does not exist. In the US, different federal government agencies view crypto very differently from one another. The Internal Revenue Service (IRS) considers cryptocurrencies as “property”, therefore taxing them in the same way it taxes other assets like gold and stocks (A. Gailey, K. Little, 2022). The Securities and Exchange Commission (SEC) on the other hand, considers most of the cryptocurrencies as securities and some, such as Bitcoin, as assets. According to the former SEC Chief Lisa Bragança the agency “considers just about all cryptocurrencies to be securities...”

The only cryptocurrencies that are not considered as securities and are regarded as assets are Bitcoin and Ethereum (Megan Dematteo, 2022).

In order for the SEC to determine if a cryptocurrency is a digital asset or a commodity, the SEC looks closely whether the asset constitutes an "investment contract." For those assets to be considered an "investment contract," they must meet the following three criteria of the Howey Test (case SEC v. W.J. Howey Co., 328 U.S. 293 (1946)): (1) the investment of capital (2) in a common enterprise (3) with a reasonable anticipation of gains and profits to be earned from the efforts of others (R. E. Barton, C. J. Mcnamara, M. C. Ward, 2022).

There is a different approach by the U.S. Department of Treasury's Financial Crimes Enforcement Network (FinCEN). The FinCEN has been providing guidelines on Bitcoin since 2013, designating Bitcoin as a "convertible currency with an equivalent value in real currency, or one that can act as a substitute for real currency." In addition, any organization that manages Bitcoin exchanges or exchanges Bitcoin for cash or payments, falls under "moneys services business" (MSB) designation, thus dependent on the U.S. Bank Secrecy Act law, and is mandated to register with the U.S. Treasury and record and document all cryptocurrency transactions over \$10,000 USD. The FinCEN is also creating regulatory actions for all enterprises to establish cryptocurrency tracking and reporting processes and requiring them to report detailed transactions and all suspicious activities. These tracking and reporting procedures make it easier to investigate potential financial crimes and criminal activities with cryptocurrencies (Prableen Bajpai, 2021).

Beyond the cryptocurrency assets and its creators and owners, the SEC has also started to pay more attention and enforce action against the crypto lenders and crypto exchanges (R. E. Barton, C. J. Mcnamara, M. C. Ward, 2022). Therefore, regulation and more defined legal framework is coming to influence the overall blockchain and crypto ecosystems, which will also provide positive development if these regulations are crypto-friendly in terms of opening up to more institutional players and move into a new era of fast growth and adoption. However, these types of obstacles –when different government agencies have different legal definitions and approaches towards cryptocurrencies– remain the core obstacle for the further development and facilitation of blockchain tech.

The European Union

The EU considers the cryptocurrencies as crypto assets. Therefore, it is not illegal to use any cryptocurrency within the EU jurisdiction. However, the EU Banking Authority has also noted that crypto-asset activities are outside its control and the public needs to be warned about the associated risks of cryptocurrencies. Therefore, in 2020, the European Commission proposed regulatory legislation for cryptocurrency assets, now endorsed by multiple EU agencies. Its intent was to bridge the gaps within the EU financial regulation and enforcement framework and level the financial, legal and regulatory playing field within the EU borders, while ensuring that access to cryptocurrency for the EU citizens is safe. In addition, EU countries such as France, Germany, Spain and Iceland legally already allow Bitcoin and other crypto transactions (Prableen Bajpai, 2021).

On October 5, 2022 the European Council approved the comprehensive Markets in Crypto-Assets (MiCA) regulation. With this vital step forward, the European Union is advancing towards a common EU-wide cryptocurrency set of regulations and governance for all the member countries. Its main aim is to bring the asset class under the supervision of the European Securities and Markets Authority (ESMA) and the European Banking Authority (EBA) (Rahul Nambampurath, 2022).

Germany

Germany has clearly defined crypto tax regulations, whereby individuals can sell and buy Bitcoin or Ethereum tax-free after a year. Germany's Federal Finance Ministry also regulates such crypto activities as cryptocurrency mining, staking, borrowing and lending, crypto airdrops and hard forks. In January 2022, the German government passed a law to encourage financial organizations to offer cryptocurrency services. The law defined that any businesses offering cryptocurrency services in Germany must at first acquire an authorization license from the BaFin - Germany's Federal Financial Supervisory Authority. Since that announcement, financial institutions that provide crypto services in Germany have experienced noticeable growth. The same year (2022), Germany's Commerzbank (CBK) had applied for a cryptocurrency license, making it the first major banking institution in Germany to adopt cryptocurrency (Pratik Gauri, 2022).

To further facilitate crypto adoption, in 2021, the German parliament adopted very crypto-friendly law, allowing some institutional funds to invest billions USD in crypto assets. Policymakers throughout the world have been slow to accept cryptocurrency assets, but a shift is taking place towards the mainstream (Stephan Kahl, 2021).

Ukraine

Ukraine's young leader Volodymyr Zelensky has also been supporting the adoption of crypto-friendly laws. After the Russian Federation invaded Ukraine in February 2022, the national currency –Hryvnia– started to crumble. The transfers were slow, taking more time to reach the end users, and cross-border payment providers such as Wise lowered its transfer maximum from \$14,000 USD to \$200. But as the need was growing for fast funds, the Ukrainian government has turned to crypto.

Immediately after the war began, the Ukrainian government posted its Bitcoin #BTC, Ethereum #ETH and Tether #USDT wallet addresses via social media. The Ministry of Digital Transformation of Ukraine as of May 2022 accepts 14 cryptocurrencies for the donation purposes. The government of Ukraine has been able to raise \$100 Million USD by now. According to Alex Bornyakov – Deputy Minister of Digital Transformation of Ukraine, cryptocurrencies truly helped the country during the first few days of war because, even though donations in crypto were much smaller than traditional fiat currencies, the crypto donations had some benefits such as instant transfers, easy and simpler process for individuals to donate cryptocurrencies, which are from governments or business control. By the beginning of March 2022, half of the crypto donations raised had already been spent by the Ukrainian government on military equipment including medical supplies, ballistic plates for bulletproof vests, handheld transceivers, meals for soldiers, thermal imaging equipment and ballistic helmets (The Economist, 2022).

From the crypto payments received, more than \$14 Million USD was spent as of March 1, 2022, which highlights the simplicity of fund distribution. Some of these funds were utilized to pay for vital medical supplies, gasoline, food, and civilian evacuations by the Crypto Fund of Ukraine and the remainder was distributed to fund the Ukrainian armed forces' needs. This war is revealing how crypto and its community is able to generate support for causes outside the cryptocurrency universe, contrary to what the crypto critics have pointed out as it being prone to speculation (Lawrence Wintermeyer, 2022).

Considering the previous examples, we can argue that we are in phase 2 / development stage, where some leading nations and economic blocks, such as EU and Eastern Europe –Ukraine– have already adopted blockchain and crypto-friendly regulation and legal framework; but leading economies such as the United States still remain in a complicated legal relationship with this technological innovation. There is a need for the United States and other leading nations to create meaningful crypto and blockchain friendly regulations that will allow this tech to further

evolve and move to the more advanced stage three of development, which will open the doors for mass adoption, more banking, financial and other industry participation and growth.

Crypto & Developing Countries

Cryptocurrencies in general have had much faster adoption and success in developing countries. Bitcoin transactions have become more available due to wider use of internet and availability of mobile phones. Several important economic and non-economic factors pushed the rapid adoption of Bitcoin in these countries. These factors include high inflation rates and limited or no access to financial services. In addition, there is low trust in government, coupled with deep-seeded corruption that obstructs further economic development in those nations. Therefore, cryptocurrencies in general can provide significant benefits to the poor by enabling them to enjoy greater access to financial services protected from fiat currency inflation, bad government and untrustworthy fiscal policies. In these scenarios, people put more trust in electronic digital coins vs. their traditional currencies. Therefore, cryptocurrencies offer those communities an opportunity to trade globally in a rapid and cheap manner with digital currencies that they trust.

Today, we have almost two billion people on the planet who do not have the ability to receive traditional financial services. These people do not have bank accounts or cannot get a bank issued card, cannot get a credit loan, have nowhere to deposit savings, etc. Furthermore, these people are not able to participate in their local economies, the majority of which are in developing nations. The population, however, is young and, for the most part, tech-savvy. For example, in some parts of Africa, mobile phone use is more widespread than access to electricity. Therefore, mobile phones are being used as a main tool for day-to-day life tasks and currently for cryptocurrency transactions well. In addition, about 200 million people are 15 to 24 years old across the African continent, who are knowledgeable in technology, and willing to adopt cryptocurrency. The same is happening in other developing countries like Indonesia, Turkey and India. A tech-savvy population with a high mobile phone usage rate and in need of financial services is the best environment for the adoption of cryptocurrencies. (Jay Hao, 2020).

In countries like Nigeria, many people rely on cryptocurrencies to manage their day-to-day financial challenges. Even though the Nigerian government banned crypto in 2021, it did not stop its adoption, especially in financially unstable areas. High Bitcoin adoption rates in Africa have led the United Nations to call the continent “the next frontier for cryptocurrency.” Similarly, individuals and businesses can now pay for international suppliers in Bitcoin instead of the US Dollar currency, generating more profits for businesses and protecting users against currency devaluation risks (CoinTelegraph, 2022). Therefore, global cryptocurrency adoption rates listed in **Table 4**, justify the overall use cases, trends, and benefits of cryptocurrency transactions throughout the developing world today.

Table 4. The 2022 global crypto adoption index top 20

Country	Overall index ranking	Centralized service value received ranking	Retail centralized service value received ranking	P2P exchange trade volume ranking	DeFi value received ranking	Retail DeFi value received ranking
Vietnam	1	5	5	2	7	6
Philippines	2	4	4	66	13	5
Ukraine	3	6	6	39	10	14
India	4	1	1	82	1	1
United States	5	3	3	111	3	2
Pakistan	6	10	10	50	22	16
Brazil	7	7	7	113	8	7
Thailand	8	12	12	61	5	3
Russia	9	8	8	109	11	12
China	10	2	2	144	6	4
Nigeria	11	18	18	17	20	17

Table 4 (cont.)

Turkey	12	9	9	121	19	15
Argentina	13	13	13	26	21	25
Morocco	14	19	19	21	33	18
Colombia	15	23	23	10	27	29
Nepal	16	17	17	19	34	41
United Kingdom	17	14	14	71	12	11
Ecuador	18	37	37	6	45	56
Kenya	19	43	43	5	9	34
Indonesia	20	16	16	129	18	13

Source: © Chainalysis, 2022.

Bitcoin and other cryptocurrencies, has facilitated economic development in many countries. Despite prevalent poverty across the developing countries, Bitcoin is commonly used as digital currency for online transactions due to internet access and use. After purchasing Bitcoin, for example, the users in developing countries can trade with Bitcoin or trade Bitcoin for profit or hold it as an investment. This is possible due to Bitcoin being decentralized, it is easily accessible, since a user would only need a wallet, phone/pc and internet connection to start using the crypto for payments or other means (CoinTelegraph, 2022).

In developed nations, the views towards Bitcoin and overall cryptocurrencies were generally more negative and pessimistic. These digital assets were viewed suspiciously in the financial world, where Bitcoin is still considered risky and volatile. For example, JP Morgan CEO Jamie Dimon has been a famous critic of Bitcoin cryptocurrency, labeling it as “fraud” in 2017. His company however moved to the opposite direction as crypto values went higher (CoinTelegraph, 2022).

Conclusion

Overall, blockchain technology and cryptocurrencies are going to continue to progress and further develop. Furthermore, available statistical data on the current adoption three-year trends worldwide (2019-2021) show average 59% of adoption rates over that short period of time in *Phase 2*. In addition, if we consider the fact that the number of verified cryptocurrency owners grew from 5 million in 2016 to 402 million as of November 2022, we can only forecast that such significant and rapid growth rates highlight and demonstrate the overall potential and importance of blockchain tech.

The limitations of this research are evident on the quantitative side; thus, a more qualitative approach was devised and adopted. The main challenge within blockchain tech and cryptocurrencies is the need for historical data beyond the past decade. Even within the past decade, since the first Bitcoin project launched, the crypto universe has rapidly developed, progressed, and grown to more than 20,000+ cryptocurrencies today, with ongoing and continuous growth and development each day. For this reason alone, comparing today’s data vs. ten years or even six years ago does not produce sufficient quantitative-analytical data necessary for detailed research analysis and formulation. Therefore, the only viable data to consider and analyze is within the past 3-to-5-year timeframe, when we entered a more active cryptocurrency and blockchain development phase. However, even this data is limited to a degree, and there is a need to have at least seven to ten years of consistent data for a more detailed quantitative design and analysis.

The arguments and facts in this paper make it clear that blockchain technology will definitely be an integral part of our future digital economy and our daily lives. The paper analyzes the current development phase and provides further evidence for its future growth, potential, and utility. This research contributes to the field of study by examining all vital features, challenges, and

opportunities of blockchain tech for its further growth, progress, and mass adoption. Furthermore, the readers in this field of study will be able to expand their knowledge base about blockchain technology's characteristics, life cycle, value, and overall potential. In addition, they will also be able to use this research as a roadmap for more detailed further study, research, and analysis.

This evolution will guide the entire blockchain & crypto industry from the current *Phase 2* to the fourth phase of mass utilization. As such, mass adoption and moving to the more advanced phases of blockchain tech and crypto projects is only a matter of time, since they have proved and demonstrated a wide number of benefits to society, corporations and various other organizations. In order to progress further to *Phase 3* and *Phase 4* of wider adoption and higher crypto market caps, we need to solve one main challenge facing the blockchain & crypto industry: The absence of clearly set-out rules.

Within the absence of a regulatory environment and a legal framework, this tech still generates some distrust in the public and feeds skeptics and pessimists that this might only be a fad that will disappear at some point in the near future. However, strong proven projects like Ethereum, as well as the new ones like Solana, Polygon, Cosmos, Chainlink, Near and PolkaDot will bring new features, innovative tech and add to the ever-changing progress of the blockchain space moving it to dynamic interoperability. Considering the fact that various governments have already adopted reasonable regulations and laws governing the cryptocurrencies, the move to *Phase 2* of the blockchain & crypto tech development has already started. However, the current global economy needs its biggest players, like the United States and China, to take the lead in adopting crypto-friendly legal frameworks to help this technology to progress to *Phase 3* and *4* and integrate faster into our financial, banking and other sectors, thus becoming an inseparable part of our future digital global economy.

In order to further facilitate mass adoption and bring this knowledge to the wider population, the blockchain & crypto project teams should also consider investing more in educational e-courses and knowledge lessons so that any user can easily learn, understand and ask any related questions. This will help raise public awareness and generate more trust in this revolutionary tech. The general population does not know much about it other than what they see on TV or read. The mainstream needs to learn and understand that blockchain can make our lives easier, and more cost efficient; that crypto projects offer wide array of solutions to different problems; that this technology is useful and beneficial to us all and it will benefit humanity in general.

Considering the fact that, in many developing nations, people have already been using cryptocurrencies for international trade, vendor payments, and as hedge against local fiat currency volatility and inflation, the overall adoption will only keep growing in the future. Furthermore, the Central Banks around the globe are actively developing and launching own Central Bank Digital Currency (CBDC) projects and its use case further invalidates cryptocurrency and blockchain critics, as this technology is rapidly progressing to the *Phase 4* of maturity and adoption worldwide.

References

1. Agenda News, 2015. *Georgia embraces Visa payWave technology*. Available at: <https://agenda.ge/en/news/2015/1529> (Accessed: 13th October 2022).
2. Antolin, M., 2022. *Proof-of-Work vs. Proof-of-Stake: What Is the Difference?* Coin Desk. Available at: <https://www.coindesk.com/learn/proof-of-work-vs-proof-of-stake-what-is-the-difference/#:~:text=Proof%2Dof%2DStake%3A%20Which,them%20in%20return%20with%20crypto> (Accessed: 25th May 2022).
3. Bajpai, P., 2021. *Countries Where Bitcoin Is Legal and Illegal*. Investopedia. Available at: <https://www.investopedia.com/articles/forex/041515/countries-where-bitcoin-legal-illegal.asp> (Accessed: 10th September 2022).

4. Barton, R.E., McNamara, Christopher J. and Ward, Michael C., 2022. *Are cryptocurrencies securities? The SEC is answering the question*. Reuters. Available at: <https://www.reuters.com/legal/transactional/are-cryptocurrencies-securities-sec-is-answering-question-2022-03-21/> (Accessed: 22nd March 2022).
5. BBC British Broadcast Network., 2022. *Banking on innovation*. BBC editorial team. Available at: <https://www.bbc.com/storyworks/banking-on-innovation/blockchain> (Accessed: 14th October 2022).
6. Chainalysis Team, 2022, *The 2022 Global Crypto Adoption Index: Emerging Markets Lead in Grassroots Adoption, China Remains Active Despite Ban, and Crypto Fundamentals Appear Healthy*, Chainalysis, <https://blog.chainalysis.com/reports/2022-global-crypto-adoption-index/> (Accessed: 16th December 2022).
7. Coin Telegraph Digital Media., 2022. *How can third-world countries counter inflation using Bitcoin?* <https://cointelegraph.com/bitcoin-for-beginners/how-can-third-world-countries-counter-inflation-using-bitcoin> (Accessed: 23rd May 2022).
8. CoinMarketCap., 2022. Available at: <https://coinmarketcap.com/charts/> (Accessed: 22nd May 2022).
9. DeMatteo, M., 2022. *Are Crypto Assets Securities?* CoinDesk Publishing & Media. Available at: <https://www.coindesk.com/markets/2022/02/03/are-crypto-assets-securities/> (Accessed: 3rd February 2022).
10. Gailey, A. and Little, K., 2022. *Yes, Your Crypto Is Taxable. Here's How to Report Cryptocurrency to the IRS in 2022*. The Time Magazine. Available at: <https://time.com/nextadvisor/investing/cryptocurrency/cryptocurrency-tax-guide/> (Accessed 3rd May 2022).
11. Gauri, P., 2022. *Crypto week at a glance: Bitcoin slips below \$30,000; Germany issues crypto tax guidelines*. The Economic Times. Available at: <https://economictimes.indiatimes.com/markets/cryptocurrency/crypto-week-at-a-glance-bitcoin-slips-below-30000-germany-issues-crypto-tax-guides/articleshow/91722224.cms> (Accessed 22nd May 2022).
12. Hao, J., 2020. *Financial Inclusion, Cryptocurrency and the Developing World*. Coin Telegraph Digital Media. Available at: <https://cointelegraph.com/news/financial-inclusion-cryptocurrency-and-the-developing-world> (Accessed: 25th June 2022).
13. Harvey, C.R. (Duke University), Ramachandran, A. (Dragonfly Capital) and Santoro, J. (Fei Protocol), 2021. *DeFi and the Future of Finance*. National Bureau of Economic Research, Duke University.
14. Hayes, A., 2019. *Dotcom Bubble*. Investopedia. Available at: <https://www.investopedia.com/terms/d/dotcom-bubble.asp> (Accessed: 16th October 2022).
15. Hayes, A., 2022. *Blockchain Technology Could Revolutionize Traditional Banking*. Investopedia. Available at: <https://www.investopedia.com/articles/investing/083115/blockchain-technology-revolutionize-traditional-banking.asp> (Accessed: 7th September 2022).
16. International Telecommunication Union (ITU) - Statistical Datasets Individuals Using Internet, July 29, 2022, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (Accessed: 17th December 2022).
17. Kahl, S., 2021. *Germany to Allow Institutional Funds to Hold up to 20% in Crypto*. The Bloomberg Publishing. Available at: <https://www.bloomberg.com/news/articles/2021-07-30/germany-to-allow-institutional-funds-to-hold-up-to-20-in-crypto> (Accessed: 14th September 2022).
18. Klebanov, S., 2021. *A Look at Blockchain in Cross-Border Payments*. Payments Journal. Available at: <https://www.paymentsjournal.com/a-look-at-blockchain-in-cross-border-payments> (Accessed: 5 July 2022).
19. Nambiapurath, R., 2022. *European Council Approves Crypto Regulation Bill*. Investopedia. Available at: <https://www.investopedia.com/eu-on-crypto-regulations-6747785> (Accessed: 6th October 2022).
20. Newbery, E., 2022. *Here's Why I'm Putting My Crypto Investments on Hold*. The Ascent. Available at: https://www.fool.com/the-ascent/cryptocurrency/articles/heres-why-im-putting-my-crypto-investments-onhold/?source=eptyholnk0000202&utm_source=yahoo-host&utm_medium=feed&utm_campaign=article (Accessed: 9 August 2022).
21. Pahwa, Nitish., 2022. *There Is a Greener Way to Mine Crypto: But Bitcoiners don't want it*. Slate. Available at: <https://slate.com/technology/2022/03/how-green-is-green-crypto.html> (Accessed: 17th August 2022).
22. Shift Processing, Statistical Data, Credit Card Statistics, <https://shiftprocessing.com/credit-card/>, August 2021, (Accessed: 10th December 2022).

23. Sorrentino, F., 2021. *Banking On Blockchain*. Forbes magazine. Available at: <https://www.forbes.com/sites/franksorrentino/2021/11/29/banking-on-blockchain/?sh=680ac6a370ed> (Accessed: 29th August 2022).
24. Statista, 2021. Cryptocurrency adoption in 56 different countries worldwide 2019-2021, October 2021, Statista.com (Accessed: 17th December 2022).
25. Statista, 2022. Forecast number of mobile users worldwide from 2020 to 2025, Statista.com Statistical Datasets, <https://www.statista.com/statistics/218984/number-of-global-mobile-users-since-2010> , (Accessed: 17th December 2022).
26. Statista Team, 2022. *December 2022 Statistical Data - Number of identity-verified cryptoasset users from 2016 to November 2022 (in millions)*, <https://www.statista.com/statistics/1202503/global-cryptocurrency-user-base/> (Accessed: 16th December 2022).
27. The Economist., 2022. *How is Ukraine using crypto to fund the war?* Available at: <https://www.economist.com/the-economist-explains/2022/04/05/how-is-ukraine-using-crypto-to-fund-the-war> (Accessed: 2nd April 2022).
28. Williams, A., 2009. *Oberthur, Tbilisi bank to launch payWave cards throughout Central Europe*. SecureIDNews. Available at: <https://www.secureidnews.com/news-item/oberthur-tbilisi-bank-to-launch-paywave-cards-throughout-central-europe/> (Accessed: 3rd June 2022).
29. Wintermeyer, L., 2022. *Ukraine Demonstrates That Cryptocurrency Is A Potent Tool For Marshaling Grassroots Support*. Forbes Magazine. Available at: <https://www.forbes.com/sites/lawrencewintermeyer/2022/03/21/ukraine-demonstrates-that-cryptocurrency-is-a-potent-tool-for-marshaling-grassroots-support/?sh=4001aee62d41> (Accessed: 10 June 2022).
30. Yormesor, D., 2021. *EIB issues its first ever digital bond on a public blockchain*. EIB European Investment Bank. Available at: <https://www.eib.org/en/press/all/2021-141-european-investment-bank-eib-issues-its-first-ever-digital-bond-on-a-public-blockchain> (Accessed: 28 September 2022).