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Study of Blockchain Technology Applied to International Marketing and Potential Business Disruptions

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ABSTRACT:

Technology has played a significant role in the continuous revolution in the internationalization of products. Most relevantly the transmission and communication tools. Starting from the invention of Print Media, Radios, Telephone, Fax and Internet.

The Internet with emails, social media and e-commerce platforms made the world a smaller place where every small, medium business or individuals can easily market their product or service in any foreign country. While its possibility today, International marketing has many challenges yet to be addressed.

On the other hand, like the Internet, the advent of Blockchain technology is likely to disrupt international marketing forte with its capabilities of distributed ledger technology, Smart Contracts and bringing Authenticity in untrusted environments.

Objective of this paper is to draft the applications of blockchain in the future of international marketing. How Blockchain can help the global business environment to cope with diverse parameters. To evaluate if the said technology has potential to disrupt the current marketing methodologies by bringing trust in untrusted global business ecosystems.

In this study we will explore the literature concerning the research done across the international business cut with blockchain technology and try to accomplish the objective with explorative study.

Introduction:

American Marketing Association (AMA) defines International marketing as the multinational process of planning and executing the conception, pricing, promotion and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives.

Although there is a lot more to do in international marketing at a high level we will stick to this definition through this paper. As said, we divide the study in four processes as conception, pricing, promotion,and distribution and define the challenges that persist even after so much evolution in the business processes at present.

Majority of business process evolutions have traditionally been driven by technologies. Specifically talking about the marketing arena. Marketing in all dimensions has seen the era of analog processes. This domain has precisely adapted to the changing environment and technologies. Openness to changing needs and continuously diversifying scope has been key for businesses to survive and be competitive to in time disruption. Foreseeing the trend, the challenges ahead are more aggressive as the pace of technological evolutions and market behavior is growing faster than expected business transformations.

One of these technological disruptions is Blockchain. Blockchain gained limelight with Bitcoin first followed by similar other cryptocurrency. It has become popular in the past few years due to its unique characteristics and relevant use cases in the International business environment. Despite strong potential across a wide range of business domains , most of the research and development with Blockchain through this time has been focused on cryptocurrencies , finance and banking. Now that awareness and understanding of the blockchain as technology beyond cryptocurrencies is crude, many researchers and technologists claim that blockchain will significantly disrupt the way businesses function today. This gap in mapping blockchain with international marketing encourages serious efforts towards evaluating the Blockchain as a tool for International marketing and its application.

Contribution of the Survey

What is Blockchain?

IBM, Blockchain Technology evangelist and promoter define Blockchain as "It is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved."

Timeline of Blockchain

2018 • Blockchains potential got revamped by more investments in wide range of use cases

2017 • Seven European banks, announced their program to develop a blockchain-based trade finance platform in collaboration with IBM

2016 • Ethereum DAO code was compromised and hacked , Emergence of permissioned blockchain solutions

2015 • Blockchain trial was initiated by NASDAQ , Hyperledger project was started

2014 • With crowdfunding the Ethereum Project was started , Ethereum genesis block was created

2013 • Ethereum, a blockchain-based distributed computing platform was

2012 • Coinbase, started as brokerage for Bitcoin

2011 • Silk Road launched with Bitcoin as payment method ,BitPay first Blockchain-based wallet, Emergence of other cryptocurrencies like Swiftcoin, Litecoin

2010 • First Bitcoin cryptocurrency exchange Mt. Gox started working

2009 • First Bitcoin block was created

2008 • Bitcoin's whitepaper was published by Satoshi

Blockchain was first brought to the public by a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency bitcoin. Transparency , Immutability and Security are major . It is seen as researcher industries and While there are now researcher and its unique. At a high level the service or products are classified in terms of its scope of reception. Some of these are made for local, domestic purposes while most of the services or products can be promoted globally.

Blockchain is challenging the status quo of the central trust infrastructure currently prevalent in the Internet towards a design principle that is underscored by decentralization, transparency, and trusted auditability. In ideal terms, blockchain advocates a decentralized, transparent, and more democratic version of the Internet. Essentially being a trusted and decentralized database, blockchain finds its applications in fields as varied as the energy sector, forestry, fisheries, mining, material recycling, air pollution monitoring, supply chain management, and their associated operations. [1].

In this paper we provide a broad ranging survey of the implications of blockchain on the future of the Internet with a comprehensive take on their legal and regulatory ramifications as well. we cover a wide range of use cases and try to observe the common patterns, differences, and technical limitations so that a more informed decision can be made by someone interested in deploying a use case from ground up or translating one's use case to a blockchain-based solution. We provide a comparison of our paper with other recent blockchain-based survey. most of the issues covered by recent survey literature, a clear distinguishing feature of this paper is that we also discuss a few of the most important legal and regulatory challenges and ramifications of deploying a blockchain-based solution. This is particularly important given the development of new data protection regulations.

Papers/Books (Author)	Year	Blockchain Fundamentals	Challenges	Smart Contracts	Blockchain Applications	Future Trends	IoT	Block chain Types	Blockchain Characteristics	Consensus Algorithms	Regulatory Issues
Zheng et al. [10]	2016	✓				✓			✓	✓	(
Ye et al. [11]	2016	(		(		(	(	✓	(	(	✓
Yli-Huumo et al. [12]	2016	(				✓	(	(	(	(	(
Pilkington [13]	2016					(	(	(	(	✓	(
Nofer et al. [14]	2017						(	(	(	(	(
Zheng et al. [15]	2017			(	(		(	✓			(
Lin et al. [16]	2017			✓		(	(	(			(
Miraz et al. [17]	2018		(	(		✓	✓	✓	(	(	(
Yuan et al. [18]	2018		(	(		(	(	(	(	(	(
Ali et al. [8]	2018		(		(	✓				✓	(
Wust et al. [19]	2018	(	(			(				(	(
Salah et al. [20]	2019	(					(			✓	(
Xie et al. [21]	2019						✓	(	(	(	✓
Wang et al. [22]	2019		(	(		(	(	(	(		(
Yang et al. [23]	2019			✓		✓	(	(	(		(
Yang et al. [24]	2019			(		(		(	✓	(	(
Belotti et al. [25]	2019	(		✓		(		(	(		(
Dai et al. [26]	2019			(		✓		(			(

Wu et al. [27]	2019			(		(		(		(	(
Viriyasitavat et al. [28]	2019	(		(		(		(	(	(	(
Mollah et al. [29]	2020			(			(	(		✓	✓
Liu. [30]	2020			✓	(		(	(		(	(
Neudecker et al. [31]	2019			(	(		(	(	(	(	(
Lao et al. [32]	2020			(		(	✓	(			(
Kolb et al. [33]	2020			✓		(	(	(			(
Monrat et al. [34]	2019			(		✓	(	(			✓
Zhang et al. [35]	2019			✓	(	(	(	✓			(
Xiao et al. [36]	2020	(		(	(	(	(	(			(
Bodkhe et al. [37]	2020	✓		(			✓	(	(		(
Al-Jaroodi et al. [38]	2019	(					(	(	(	(	
Our Survey	2020	✓					✓	✓	✓	✓	(distinguishing feature)

BACKGROUND

The original premise of blockchain is to establish trust in a peer-to-peer (P2P) network circumventing the need for any sort of third managing parties. As an example, Bitcoin introduced a P2P monetary value transfer system where no bank or any other financial institution is required to make a value-transfer transaction with anyone else on Bitcoin's blockchain network. The provision of this trust mechanism allows peers of a P2P network to transact with each other without necessarily trusting one another. Sometimes this is referred to as the trustless property of blockchain. This trustlessness further implies that a party interested in transacting with another entity on blockchain does not necessarily have to know the

real identity of it.Further, a record of transactions among the peers are stored in a chain of a series of a data structure called blocks, hence the name blockchain. Each peer of a blockchain network maintains a copy of this record. Additionally, a consensus, taking into consideration the majority of the network peers, is also established on the state of the blockchain that all the peers of the network store. That is why, at times, blockchain is also referred to as the distributed ledger technology (DLT). Each instance of such a DLT, stored at each peer of the network, gets updated at the same time with no provision for retroactive mutations in the records.

Use of Hashing

We now take a closer look at how hashing is used to chain the blocks containing transaction records together and how such records are rendered immutable. A hash is defined as a unidirectional cryptographic function. A hash function usually takes an arbitrary input of an arbitrary length and outputs a seemingly random but fixed-length string of characters. Each such output is unique to the input given to this function and can be considered as the footprint for the input. If the input is even so slightly changed then the output of the hash function almost always changes completely and seemingly in a random fashion (there are, however, rare occasions where a collision occurs when two distinct inputs to a hash function map to the same output) [15]. This way hash of a piece of data can be used to verify the integrity of it. As an example, Secure Hash Algorithm 256 (SHA256) is a member of the family of SHA2 hash functions which is currently being deployed by many blockchain-based systems such as Bitcoin [16].

Transaction chain

A transaction chain is observed here that there is a difference between a transaction chain and a blockchain. Each block in a blockchain can contain multiple transaction chains. Each transaction chain in turn shows the value transferred from one peer of the network to another. Each such transaction chain is also sometimes referred to as a digital coin or more generally as a token A transaction chain makes use of digital signatures, in addition to hashing like the way it is described above, to track the provenance of digital funds.

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Smart contracts

One important aspect of blockchains is its use in enabling smart contracts [17]. Smart contracts can simply be viewed as algorithmic enforcement of an agreement among, often, mutually non-trusting entities. More technically, a smart contract is a program that executes on blockchain in a distributed manner and possesses unique identification. It contains functions and state variables. These functions receive input parameters of the contract and get invoked when relevant transactions are made. The values of state variables are dependent on the logic contained in the functions [18].

Public and private blockchains

The underlying blockchains of Bitcoin, Ethereum and, in general, of most cryptocurrencies are open and public. This implies that anyone can join the blockchain network and transact with any other peer of the network. Moreover, such networks also encourage peers to stay anonymous. As an example in Bitcoin's network, peers are assigned addresses based on the hash of their public keys instead of based on their actual identities. On the other hand, there are permissioned and private variants of blockchains as well. This concept was particularly popularized by Linux Foundation's Hyperledger Fabric (HLF) platform. This platform is proposed for business use cases where, in addition to data immutability and P2P consensus, transaction confidentiality is also required. Permissioned and private blockchain platforms such as HLF usually deploy a cryptographic membership service on top of their blockchain's immutable record keeping. Each peer in such a network can be uniquely identified based on its real-world identity. Proof-of-Authority functions on the same principle of permissioned and private blockchains.

Internet of value

The value addition in businesses by blockchain technology is expected to grow to $176 billion by 2025, according to Gartner [17] Inc. Based on this technology, innovative payment channels are being introduced. One such example is Ripplenet [18] that facilitates quick and lower-cost payments globally through its network of more than 300 financial institutions located in different geographical parts of the world.

Digital assets

A digital asset can be considered as the digital representation of a tradeable valuable that can be owned and used in a digital-value transfer system such as blockchain-based cryptocurrency networks. The use of digital assets is rising and evolving wave in the blockchain space. The potency to represent assets within a digitized system and carry out transactions via an open source blockchain technology is inspiring the creation of a whole new marketplace. The aim is to reduce the cost, risk, constrainsts, and fraud associated with the traditional trading systems. Digital asset tokens and the associated set of smart contracts can exemplify an arbitrary agreement among parties interested in a trade related to a digital asset.

BLOCKCHAIN-BASED NETWORK APPLICATIONS

Other than cryptocurrencies, blockchain finds its applications in various other fields, particularly those that require more transparency and trust in their record-keeping.

Software-Defined Networks

Software-Defined Networking (SDN) is an evolving networking technology that detaches data plane from control traffic. In such a technology, networking resources are managed by a centralized controller acting as the networking operating system (NOS) [19]. However, scalability is a major constraint in the single SDN-enabled networking environments, and thus the adoption of blockchain technology with SDN can help with facilitation of multi-domain SDNs interconnection and based upon integration of SDN-enabled edge computing and blackchain technology, where the fog nodes are placed at the network edge. The architecture is distributed as three layers, cloud, device, and fog. Blockchain in this solution is mainly used to record the QoS, service pool, and payments, while the proof-of-service plays the role of a consensus mechanism to control the service usage. However, this solution has not been implemented yet and security of fog nodes enabling communication across IoT entities remains an open research problem.

The Decentralized Internet

The Internet has enabled the evolution of a number of applications such as mobile health, education, e-commerce, online social systems, and digital financial services. However many parts of the world are still deprived of the Internet's boons due to the existence of a digital divide [21],[22]. Moreover, the existing Internet infrastructure is predominantly centralized creating monopolies in the provision of services to its users [23], [24].

Decentralized Email

Today, electronic mail (email) is a common form of communication among many that usually consists of a mail client and an associated server. There are various protocols such as SMTP, ESMTP, POP, and IMAP for formatting, processing, delivering, and displaying email messages by ensuring interoperability among different mail clients and servers. These email messages, without appropriate security safeguards, can potentially be read, modified, and copied at any point along their path [25]. Melissa, Sasser worm and other embedded hyperlinks and viruses have damaged millions of computers and their data [26]. Email solutions (such as Yahoo) have suffered from data breaches in the past and have resultantly urged their users to change their password keys [27].

Blockchain for the Internet-of-Things (IoT)

The Internet of Things (IoT) broadly speaking is a network of everyday objects in which the IoT devices capture or generate enormous amounts of data and send it over the network [28]. This interconnection of a large number of IoT devices is known to cause many privacy and security issues [29] [30], including, but not limited to, authentication, privacy preserving, and data tampering/false data injection. In such systems, blockchainbased solutions can help in addressing the issues related to security and privacy. Besides the by-design existence of some implementation constraints of energy, delay, and computation overhead in IoT devices, businesses have started initiatives to use blockchain into their various domains such as in production and supply chain management [31], [32].

Blockchain-based Content Distribution

Content distribution networks (CDNs) are an effective approach to improve Internet service quality by replicating the content at different strategic geographic locations in the form of data centers. Users can request and access data from the closest replica server instead of always fetching it from the data-originating server. Generally, large companies such as Netflix and Google's YouTube service, have their own dedicated CDNs, while smaller organizations can rent CDN space from other companies like Akamai. BitTorrent is a P2P content distribution protocol that enables the propagation of data using networks of computers for downloading and uploading simultaneously without a central server [33].

Distributed Cloud Storage

Today, consumers and enterprises face the storage and management problems caused by an ever-increasing volume of data on non-volatile data storage systems. Despite the popularity of cloud storage solutions (such as Dropbox and Google Drive), the control, security, and privacy of data remain major concerns [34]. It is largely due to the current model being adopted by the cloud storage systems that often puts them under a centralized institutional authority. In this model, data is transferred over TCP/IP from a client to the host servers in the legacy client-server model [35].

Applications in Online Social Networks

The engagement of people with online social networks (OSNs) has increased greatly in recent years [36]. Users often put trust in these OSNs and share their personal details with their online social community. Privacy and security concerns however still remain an issue with many OSNs. Any breach of trust has the potential to detriment a user's virtual and, often in turn, real-world identities [37].

Cybersecurity

A study on cybercrime [38] conducted on some organizations, says that information loss remained the major cost component and increased from 35% in 2015 to 43% in 2017. Blockchains in particular can be a costly target for cyberattacks [39], [40]. As an example, DDoS attacks on a blockchain system can take the form of flooding the network with small transactions. Still such transactions must be paid for (in the units of gas) in order for them to be confirmed by the network [39]. Public Key Infrastructure (PKI): Certificate Authority (CA) Public Key Infrastructure (PKI) establishes a link between identities like domain names to a cryptographic public key with help of certificates [41], [42]. Among traditional approaches to PKIs, the most common choice is the use of Certificate Authority (CA) that serves as a trusted third party and manages the distribution digital certificates over the network. This creates a single point of failure in such PKIs in practice [43]. There have been many incidents when these centralized CA's have been compromised—e.g., the DigiNotar attack: 531 fraudulent certificates issued [44] [45].

Other Applications

Using the blockchain technology, a company named Factom has started a land registration project with the Government of Honduras to ensure integrity and correctness of the information. Using the same technology, they have engaged in projects related to smart cities, document verification, and the finance industry [46]. In another application, a blockchain-based startupEverledger is working on bringing transparency to the supply chain of diamonds, which was previously perceived as complex, risky and prone to carrying false and incomplete information. Everledger has been designed to reduce fraudulent modifications in the records to help financial institutions, businesses, and insurance companies with actual details of information [47].

A bitcoin-based startupAbra for transferring money to anyone with minimal charges of transaction. No intermediate party gets involved in this transaction [47]. Blockchain is being considered as a novel software connector, which can provide a decentralized alternative to existing centralized systems resulting in quality attributes. For example, Xu et al. [48] found that blockchain can improve information transparency and traceability as a software connector.

TABLE: Examples of blockchain-based applications

Scope	Example(s)	Description
Cryptocurrency	Bitcoin, Bcash, Iota, OmiseGO, Litecoin, Ripple, Dash, Zcash, Monero	Decentralized peer-to-peer electronic cash system for online payments.
Smart Contract	Ripple [46]	Occurrence of certain events triggers transfers of different things, i.e., security deposit payment, saving wallets, decentralized gambling, wills etc.
Cloud Services	Abuse Prevention [56]	Defence to stop attacks and service abuses in cloud computing applications.
Message Exchange	Bitmessage[57]	Secure system to send and receive messages.
Identity and Privacy	ChainAnchor[58]	Trusted, privacy-preserving, identity management system.
Digital Content	Content Distribution [59]	Decentralized and peer-to-peer digital content management system with rights management mechanism.
Voting System	Electronic Vote [56]	Electronic vote transaction system for a voter to spend the vote in favor of one or more candidate recipients.
Health	Patient Data [57]	Patient data sharing system based on blockchain technology.
Transportation	Vehicle Communication [60]	Secure vehicle to vehicle communication system.
Agriculture	ICT E-Agriculture [61]	Distributed ledger system to safeguarded transparent data management.
Software	Software Connector [61]	Software components states sharing system without trusting a central integration point.
Micro Finance	Stellar [62]	Creates services and financial products using blockchain architecture.
E-Commerce	OpenBazaar[63]	Provides trading platform for users where they can make free transactions among themselves.
Mobile Banking	Atlas [64]	Atlas provides platform for mobile banking and connects world communities through it.
Storage	Sia [51]	A cloud storage platforms, enables anyone to make money.
Document Management	Blockcerts[65]	Issue and verify certificates for academic, professional, workforce and civic records.
Storage	BigchainDB, MaidSafe, Filecoin[52]	Scalable storage which supports diverse applications, platforms, industries and use cases.
Business and Economy	IBM Blockchain Platform [66]	Integrated platform designed for creation and acceleration of blockchain based businesses.
Internet of Things (IoT)	IBM Watson IoT [67]	Accountability and security in blockchain-based internet of things.

TABLE: Examples of blockchain-based startups

Scope	Startups	Description
IoT and Economics	Chronicled [68]	Provides trusted data, ensures data provenence of IoT devices and helps in business process automation
Security and Intelligence	Elliptic [69]	Necessary intelligence information to security agencies and financial departments.
Data Security	LuxTrust[70]	Provides security to customer's electronic data and digital identity.

Regulatory Compliance	GuardTime[71]	Data protection regulatory compliance software.
Financial	Augur [72]	A market forecasting tool to increase profitability.
Transportation	Lazooz[73]	Real-time ridesharing services.
Property Records	Ubiquity [74]	Provide service for secure ownership record of property.
Process Compliance	Startumn[75]	Ensures process integrity and improves regulatory compliance.
Music	Mycelia [76]	Music industry online services.
Asset Management	Gem [77]	Secure identification of assets.
Data Security	Tieriom[78]	Data protection service.
Music	Ujo Music [79]	An online music store.
Smart Contracts	SkuChain[80]	Offers services like: Smart contracts, provenance of things, Inventory Management.
Storage	Storj[81]	A distributed storage platform.
E-commerce	Gyft[82]	An online gift transfer platform.
Health and Environment	BitGive[83]	By using blockchain technology it works for the improvement of public health and environment worldwide.

TABLE: Examples of blockchain platforms for distributed cloud storage

Platform	Description
Swarm [49]	An open Infrastructure for Digital Securities
InterPlanetary File System (IPFS) [84]	A protocol and peer-to-peer network for storing and sharing data in a distributed file system
Sia [51]	A platform for securing storage transactions with smart contracts
MaidSafe [52]	A decentralized platform for application development via a proof-of-resources protocol
Storj [53]	A decentralized file storage solution over P2P network using blockchain hash table
Filecoin [54]	A digital payment system and blockchain-based cooperative digital storage
BlockScores/NextCloud [55]	An application for blockchain and smart contract interacting via secure leaderboards

CHALLENGES

The blockchain is expected to drive economic changes on a global scale by revolutionizing industry and commerce by redefining how digital trust mechanisms through distributed consensus mechanisms and transparent tamper-evident recordkeeping. The disruption of blockchain is evident, and people are beginning to adopt this distributed ledger technology. There are, however, various hurdles that are slowing down the rate of blockchain's adoption. Some of these challenges are listed below and with pointers to how these challenges might find a solution in the future.

Governance, Operational & Regulatory Issues

Blockchain has great potential to enable efficient and secure real-time transactions across a large number of industries by providing financial services visibility along a supply chain and streamlining government authorities and consumers. Blockchain technology is still far from being adopted en masse due to some unsolved challenges of standards and regulation. Although it's hard to regulate the development of

the blockchain technology itself, blockchain-based activities (such as financial services, smart contract, etc.) should be Regulated. To support its emergence and commercial implementation, the development of standards and regulations are required to establish market confidence and trust. These regulations can also be used for law enforcement to monitor fraudulent activities e.g., money laundering.

Scalability Issues

Scalability is one of the major concerns in the way of wide spread adoption of blockchain-based technological solutions. We discuss this concern with following three different perspectives.

Security and Privacy Concerns

Besides security being in the system by design of the blockchain-based transactions, privacy remains a concern in applications and platforms [264]. The blockchain technology has been considered as privacy-preserver and rated well in this context [266].

Sustainability Issues

Blockchain has attained an extraordinary amount of interest and attention and a large number of industries are adopting this virtual digital ledger. However, it is still unclear that any particular solution of blockchain can attain a certain level of adoption for their sustainability.

Anonymity

In a blockchain system, the users utilize generated addresses, which are mostly in the form of public keys, for their unique identification over the blockchain network. The blockchain users can generate their multiple addresses in order to avoid the revelation of their real identities. These addresses are generated in the form of cryptographic keys. The said keys are then used to send and receive blockchain based transactions.

Use of Artificial Intelligence and Machine Learning

Recent advancements in blockchain technology are making new ways for the involvement of AI and machine learning (ML) that can help to solve many challenges of blockchain with several important future applications.

Usability and Key Management

One of the primary challenges that any new technology faces is the usability. This issue is more acute in blockchain because of new architecture and high stakes. The transaction flow should be visible to users to analyze the whole transaction flows.

CONCLUSION

In this paper, we provide a study on blockchain-based network applications, discuss their applicability, sustainability and scalability challenges. We also discuss some of the most prevalent and important legal ramifications of working with blockchain-based solutions. Additionally, this paper suggests some future directions that will be helpful to support sustainable blockchain-based solutions. blockchain is still in its infancy implying there will be sometime spent before it gets ubiquitous and widely adopted. However, the aim of this study is to provide a guiding reference manual in a generic form to both the researches and practitioners of the filed so that a more informed decision can be made either for conducting similar research or designing a blockchain-based solution.

Reimagining the future

Although It's still early days in blockchain's development, the transformative potential is clear. Blockchain could be adopted for a host of other uses, including enabling refugees to own their digital identity, voting, and even orchestrating a universal basic income, not to mention a plethora of applications in industries such as automotive and healthcare.

The world is still some way from a 'blockchain transformation'. However, if the predicted growth of the global blockchain market is anything to go by, then it's not a question of if, but when.

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