SAMPLE PATENT LANDSCAPE STUDY - BLOCKCHAIN

Jan, 2017

Contents

1. WHAT IS BLOCKCHAIN?

At a very high level, BlockChain is a decentralized ledger or list of all transactions across a peer-to-peer network. Blockchain is a technology underlying "Bitcoin" and other popular cryptocurrencies. As per industry experts, BlockChain technology has the potential to disrupt a wide variety of business processes, wherein buyer and seller can interact directly without existing need of verification of currency by a trusted third-party intermediary, such as a bank [Source].

BlockChain essentially is a distributed database of records or public ledger of all transactions or digital events that have been executed and shared among participating parties. Each transaction in public ledger is verified by consensus of a majority of participants in the system, and once entered, information can never be erased/deleted. BlockChain contains a certain and verifiable record of every single transaction ever made. To use a basic analogy, it is easy to steal a cookie from a cookie jar kept in a secluded place than stealing the cookie from a cookie jar kept in a market place that is being observed/watched by thousands of people. Bitcoin is the most popular example that is intrinsically tied to BlockChain technology. It is also the most controversial one since it enables a multibillion-dollar global market of anonymous transactions without control of any government body. Hence, it has to deal with a number of regulatory issues involving national governments and financial institutions. However, BlockChain technology itself is non-controversial and has worked flawlessly over the years and is being successfully applied to both financial and non-financial world applications[Source].

Blockchain for financial institutions.

From a business perspective, it's helpful to think of blockchain technology as a type of next-generation business process improvement software. Financial institutions are realizing that, after several decades of internally focused business process software investments, it's time to look for efficiencies outside their own four walls.

Collaborative technology, such as blockchain, promises the ability to improve the business processes that occur between companies, radically lowering the "cost of trust." For this reason, it may offer significantly higher returns for each investment dollar spent than traditional internal investments.

So what's the catch? You cannot get the return by yourself; you must be willing and able to collaborate with customers, suppliers, and competitors in ways that you have never done before.

[Source]

Further, BlockChain is a technology that enables existence of cryptocurrencies. Bitcoin, for instance, is the name of the best-known cryptocurrency, and is known as the introducer of BlockChain technology to the world. For consumers, cryptocurrencies offer cheaper and faster peer-to-peer payment options than those offered by traditional financial services businesses. While cryptocurrencies continue to gain some acceptance as a payment option, price volatility and the opportunity for speculative investments encourage consumers not to use cryptocurrency to purchase goods and services, rather to use it for trading/stock exchange. However, cryptocurrencies carry groundbreaking potential and allow consumers to have access to global payment system- anywhere, anytime.

In the financial services industry, BlockChain technology is already being implemented in innovative ways. For example, New York-based exchange and clearinghouse Nasdaq recently unveiled a blockchain-based system for its Nasdaq Private Market, which connects institutional investors with companies that are not yet listed on a public exchange. The new system offers electronic services to facilitate the issuance, transfer, and management of private company securities. The firm has even named one of its vice presidents as "BlockChain TechnologyEvangelist". Numerous other exchanges and banks around the world, including the London Stock Exchange, CME Group, Societe Generale, and UBS, have formed the "Post Trade Distributed Ledger Working Group" to investigate how BlockChain technology can be used to enhance clearing, settlement, and reporting of trades. Citigroup, Barclays, and Deutsche Bank are among the leading banks investigating and incorporating BlockChain into their payments system[Source].

Disruptive potential of BlockChain Technology.

The technology that underlies cryptocurrency has the potential to disrupt a wide variety of transactions beyond the traditional payments system. Financial services organizations could use the blockchain anywhere, records are stored digitally and can be used in any type of transaction that currently needs to be verified by a trusted third party (see figure). These transactions include but are not limited to transferring digital or physical assets, protecting intellectual property, and verifying chain of custody. In an era of cybercrime and stringent regulatory requirements, a highly fraudresistant system for protecting and authenticating almost any kind of transaction would have a revolutionary impact on the financial industry

[Source]

BlockChain Applications in Internet of Things (IoT)

The Bitcoin Blockchain ecosystem

As a primer on bitcoin, it may help to review the original whitepaper by Satoshi Nakamoto titled Bitcoin: A Peer-to-Peer Electronic Cash System.

The Bitcoin Blockchain ecosystem is actually quite a complex system due to its dual aims: that anyone should be able to write to The Bitcoin Blockchain; and that there shouldn't be any centralised power or control. Relax these, and you don't need many of the convoluted mechanisms of Bitcoin.

Replicated databases. The Bitcoin Blockchain ecosystem acts like a network of replicated databases, each containing the same list of past bitcoin transactions. Important members of the network are called validators or nodes which pass around transaction data (payments) and block data (additions to the ledger). Each validator independently checks the payment and block data being passed around. There are rules in place to make the network operate as intended. Bitcoin's complexity comes from its aims. The aim of bitcoin was to be decentralised, i.e. not have a point of control, and to be relatively anonymous. This has influenced how bitcoin has developed. Not all blockchain ecosystems need to have the same mechanisms, especially if participants can be identified and trusted to behave[Source].

As blockchains and sidechains proliferate, there are several important implications for the Internet of Things and the development of Smart Systems. For instance, BlockChain technology could provide a way to track the unique history of individual devices by recording a ledger of data exchanges ever happened with other devicesor over web.

Blockchains could also enable smart devices to become independent agents, autonomously conducting a variety of transactions. Imagine a vending machine that can not only monitor and report its own stock, but can solicit bids from distributors and pay for the delivery of new items automatically A suite of smart home appliances that can bid with one another for priority so that laundry machine, dishwasher and robo-vacuum etc. all can run at an appropriate time while minimizing the cost of electricity against current grid prices.

At a more abstract level, BlockChain networks themselves have the potential to become independent agents, also referred to as "Distributed Autonomous Corporations." These would supplant systems like banking and arbitration, which have traditionally relied on trusted and centralized human authorities, with trustless and decentralized networks[Source].

2. OBJECTIVES

- To perform detailed analysis of granted patents and published applications pertaining to BlockChain, and publicly available information to understand underlying technologies.

- In depth analysis of granted patents/published applications in order to categorize them and to understand focussing areas of applicants.

- Graphical representation of trends (Filing, Publication, etc.) from mined data of relevant patents/applications.

Image Courtesy

Image Courtesy

3. SEARCH METHODOLOGY

The first step is to create and define a patent set that serves as the basis of analysis. Using renowned patent databases- Thomson Innovation (TI) and Questel Orbit as our data sources, we execute search queries to retrieve patent dataset which is to be analysed.

Search is carried out in Abstract, Title, and Claims fields of a patent, by using relevant keywords and International Patent Classes.

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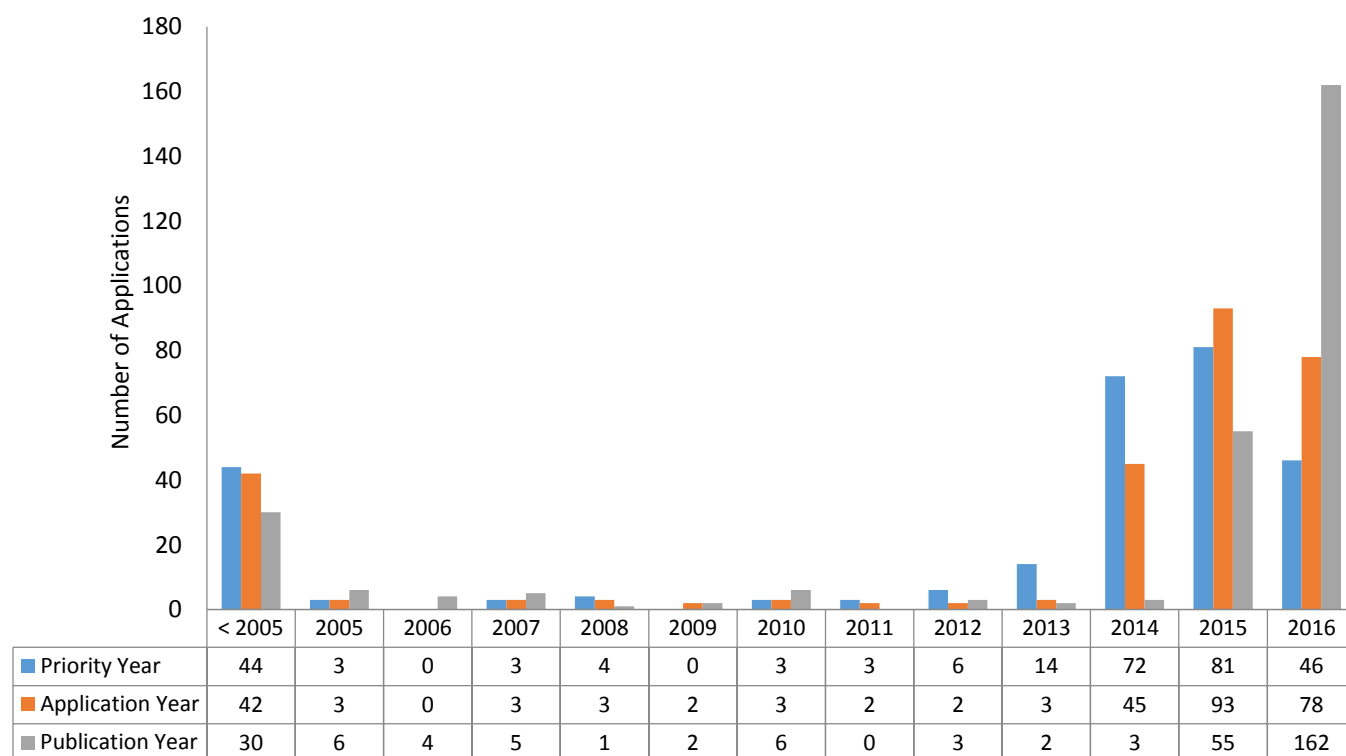
4. EXECUTIVE SUMMARY

- Close to 1500 INPADOC patent families were analysed, which yeilded 279 relevant patent families.

- These 279 relevant patent families (INPADOC) were expanded on Thomson Innovation and a total of 647 individual patents/applications were retrieved as family members of these 279 patent families.

- In the last three years (2013-2016), there has been a rise in patent filing activities for BlockChain Technology. Year 2015 has witnessed maximum patent application filings.

- Bank of America (10 patent families) is the world leader among patent applicants, followed by Bubi (9 patent families). Other applicants having significant number of patent application filings are IBM, Coinplug Lnc, Hewlett Packard, Asap Software Express, Hangzhou Fuzamei Tech. and Intelamong others.

- Inventors from America-Castinado Joseph, Dolan Heather and Ronca James G, followed by Durbin Thomas are leading innovators in BlockChain technology. Jiang Haiof Bubi Network too had contributed significantly in the domain.

- United States (US) registers itself as the country of origin for leading innovations in BlockChain technology. Over 153 patent families were first filed in US or claimed priority from corresponding US applications. United States also leads as the country with highest number (208 patent familes) of individual/foreign patent application filings i.e. US is the country of interest for innovators.

- Various platforms developed that utilize BlockChain as an underlying technology are currency/trading applications (132 patent families).

- Patents/applications pertaining to consensus methods in BlockChain Technology majorly have focus on"proof of work" (106 patent families).

- Patents/applications in BlockChain Technology and pertaining toledger types majorly focus on Public ledger (65 patent families). Distributed Ledger (45 patent families) is the second most widely used ledger.

- Patents/applications pertaining to aunthentication/validation in BlockChain Technology focus majorly on public Keys and private keys based authentication (132 patent families).

- Patents/applications pertaining to algorithms/coding techniques in BlockChain Technology, mainly focuson Cryptography/Encryption/DES Algorithm (105patent families) and and Hash Algorithm (101 patent families).

- Patents/ applications pertaining to types of miner/node incorporated in BlockChain Technology mainly utilize Leaf Nodes (13 patent families).

- Patents/applications pertaining to blockchain having application in a specific business area belong to Financial/Trading sector (58 percent), and Non-Finance sector(14 percent).

5. NON-TECHNICAL TREND ANALYSIS

5.1 PRIORITY, FILING, PUBLICATION YEAR BASED TREND ANALYSIS

5.1.1 ANALYSIS BASED ON REPRESENTATIVE MEMBER PER INPADOC FAMILY[1]

Below graph represents trend of priority year, application year, and publication year of a representative family member taken from its global patent family, pertaining to BlockChain Technology.

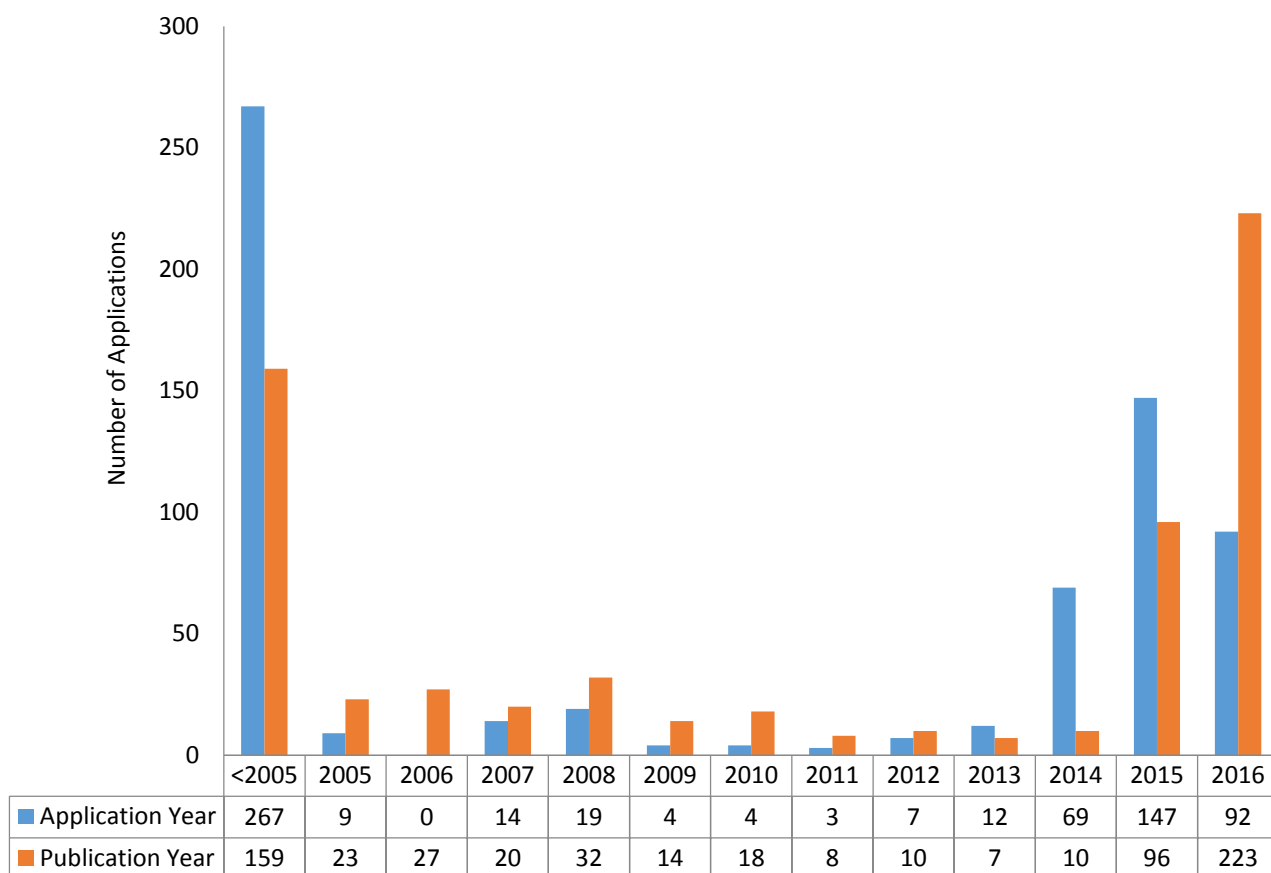|	< 2005	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Priority Year	44	3	0	3	4	0	3	3	6	14	72	81	46
Application Year	42	3	0	3	3	2	3	2	2	3	45	93	78
Publication Year	30	6	4	5	1	2	6	0	3	2	3	55	162

INSIGHT:
- Trend analysis based on filing of priority application indicates a gradual increase in number of applications being filed. Maximum number of patent applications (**199**) taking/having priority were filed during **2014-2016**.
- Filing trend (based on analysis of application year) indicates a gradual rise in filing activity over the years with maximum number of patent applications (**216**) being filed during **2014-2016**. A sudden rise in patent filing activity in the domain of blockchain during years 2014-16 indicates resurgent interest in the given technology domain with number of applications filed towards incremental inventions.
- Publication trend indicates a gradual rise in publication over the years with maximum number of patent applications (**217**) being published during **2015-2016**.

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[1] Please note that the number of patent applications filed during 2015-16 may be higher than that reflected in the graph, attributed to unpublished patent applications.

5.1.2 FILING AND PUBLICATION TREND ANALYSIS BASED ON EXPANDED FAMILY DATA (ALL MEMBERS)[2]

Below graph represents trend for application year and publication year of all family members of a global patent family, pertaining to BlockChain Technology.

	<2005	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Application Year	267	9	0	14	19	4	4	3	7	12	69	147	92
Publication Year	159	23	27	20	32	14	18	8	10	7	10	96	223

INSIGHT:

As evident from trend, there is a continuous rise in the number of patent applications/publications over the period of time. Maximum number of applications **(147)** was filed in **2015**. Accordingly, highest number of applications **(223)** was published in **2016**.

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[2] Please note that the number of patent applications filed during 2015-16 may be higher than that reflected in the graph, attributed to unpublished patent applications.

5.2 ASSIGNEE BASED TREND ANALYSIS

Below graph represents major assignee trend pertaining to BlockChain Technology and based on representative member per patent family.
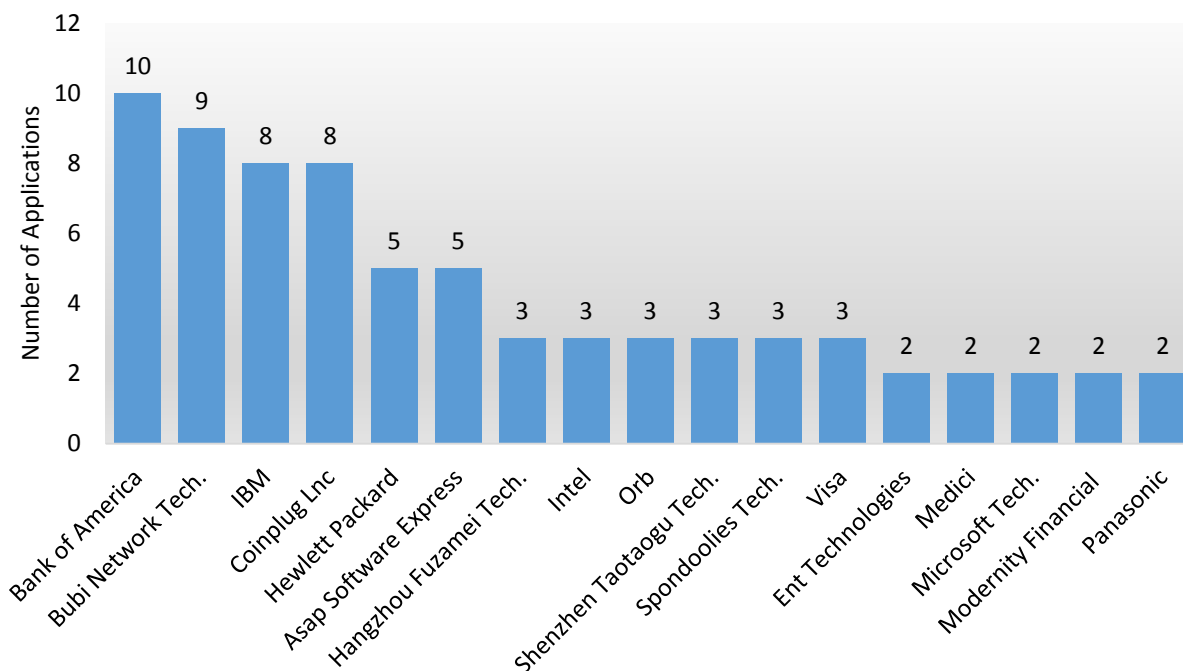
INSIGHT:

As evident from the chart herein above, "Bank of America" (10 patent families), "Bubi Network Tech." (9 patent families)", "IBM" (8 patent families) and "Coinplug" (8 patent families) are key assignees with significant filing activity worldwide.

THE TOP ASSIGNEES ARE:

- ❖ **Bank of America**
- ❖ **Bubi Network Tech.**
- ❖ **IBM**
- ❖ **CoinplugLnc**
- ❖ **Hewlett Packard**
- ❖ **Asap Software Express**
- ❖ **Hangzhou Fuzamei Tech.**
- ❖ **Intel**
- ❖ **Hitachi**

- ❖ **Orb**
- ❖ **Shenzhen Taotagu Tech.**
- ❖ **Visa**
- ❖ **Ent Tech.**
- ❖ **Medici**
- ❖ **Microsoft Tech.**
- ❖ **Modernity Financial**
- ❖ **Panasonic**
- ❖ **ZTE**

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5.3 KEY INVENTORS

Below graph represents top inventors trend, pertaining to BlockChain Technology and based on representative member per patent family.
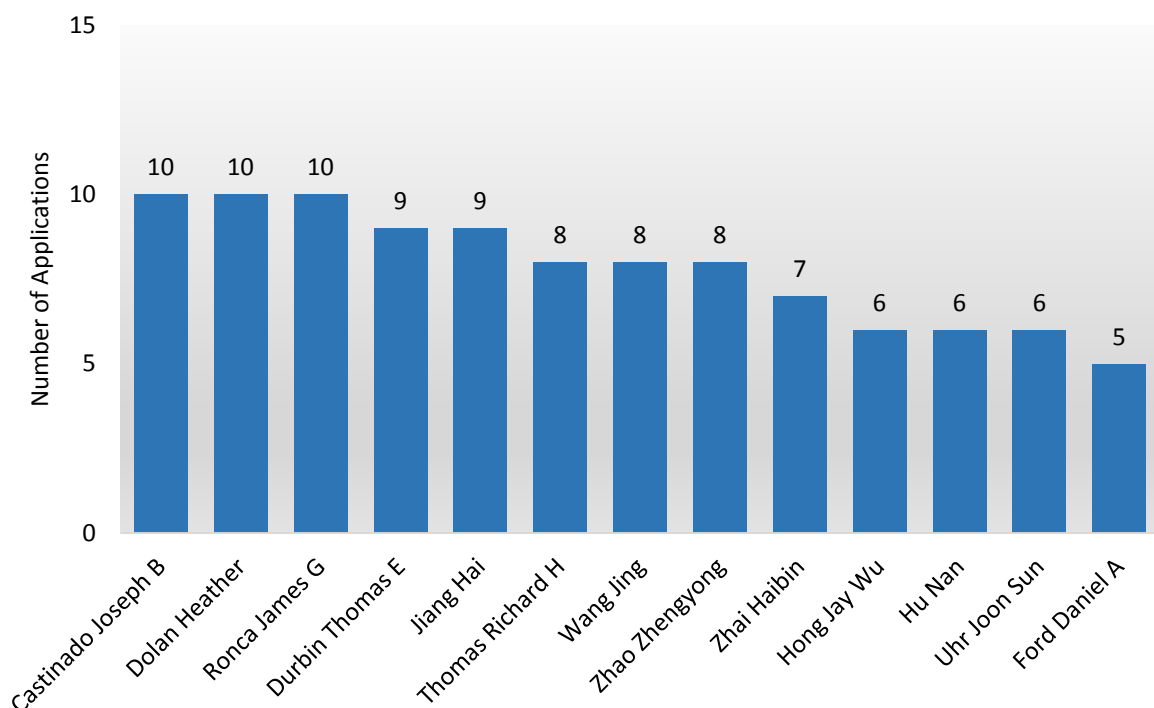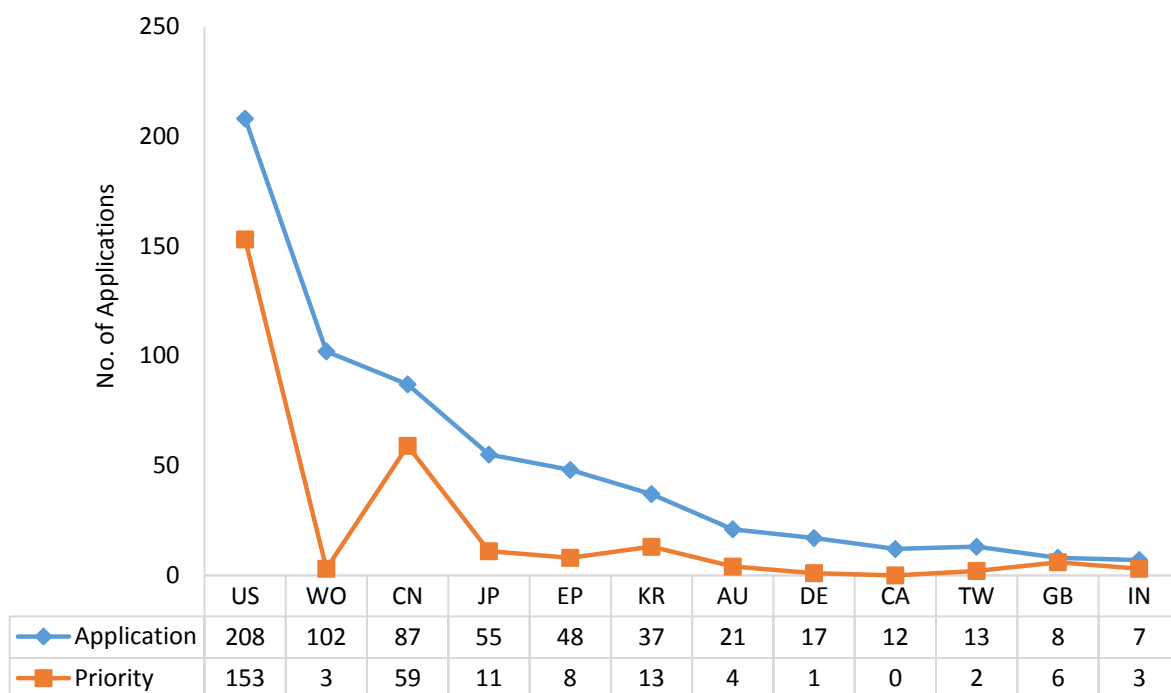

INSIGHT:

Castinado Joseph B **(Bank of America),** Dolan Heather **(Bank of America)** and Ronca James G **(Bank of America)** are the leading inventors with **10** patent families filed in their name, followed by Durbin Thomas E **(Bank of America)** and Jiang Hai **(Bubi Network)** with **9** patent families filed in their name.

5.4 GEOGRAPHICAL ORIGIN OF INNOVATIONS VIS-À-VIS FILING TREND

Below graph represents the trend for priority countries v/s filing countries (Based on expanded patent family).

|	US	WO	CN	JP	EP	KR	AU	DE	CA	TW	GB	IN
Application	208	102	87	55	48	37	21	17	12	13	8	7
Priority	153	3	59	11	8	13	4	1	0	2	6	3

INSIGHT:

Maximum number of innovations originated from US (Priority **153**) followed by China (Priority **59**). Maximum number of applications were filed in US (**208**) followed by PCT applications (**102**) and China (**87**).

Patent Searching | Research and Analytics | Patent Filing | Prosecution | Litigation and E-Discovery | IP Valuation | Landscape

5.5 INTERNATIONAL PATENT CLASSIFICATION BASED TREND

Below graph represents top international patent classes pertaining to BlockChain based on analysis of representative member per patent family.
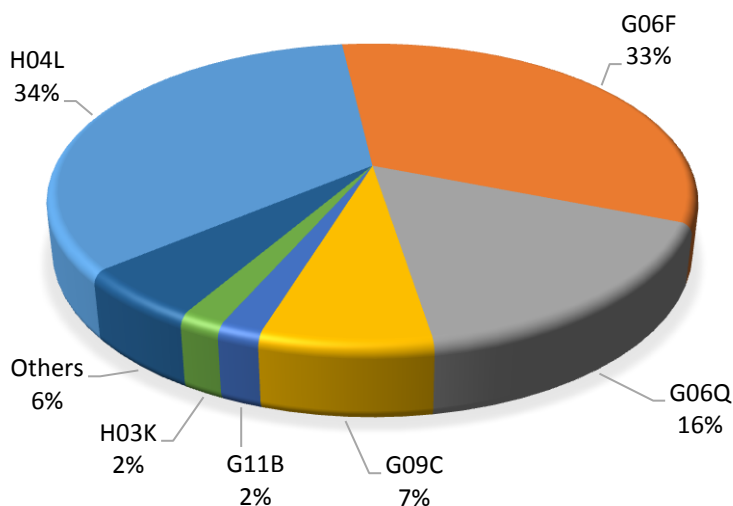
INSIGHT:

Majority of patent applications were assigned with IPC "H04L" followed by "G06F".
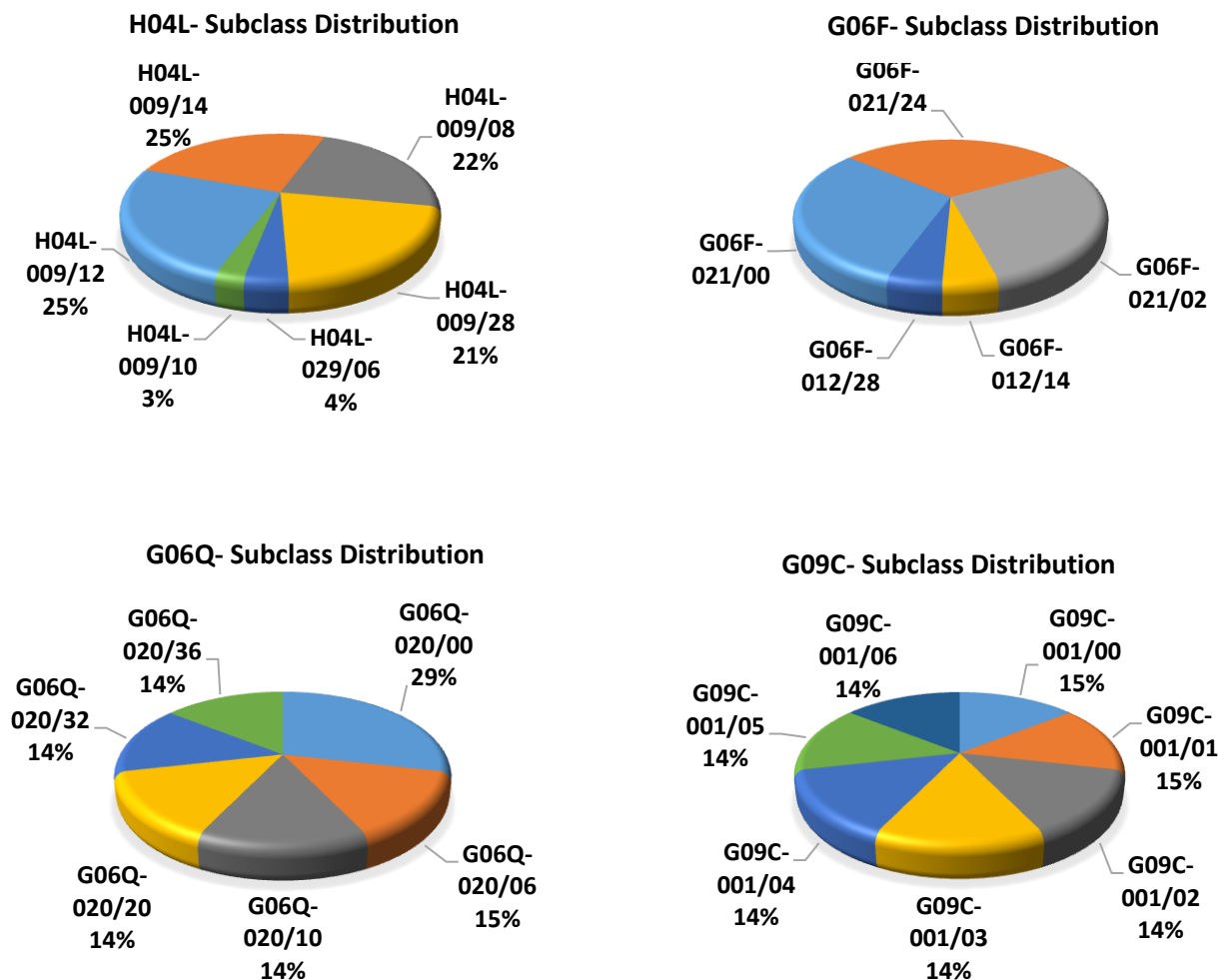
IPC DEFINITIONS:

IPC Subclass	Definition
HO4L	Transmission Of Digital Information
G06F	Electric Digital Data Processing
G06Q	Data processing systems or methods, specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes; systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes, not otherwise provided for
G09C	Ciphering or deciphering apparatus for cryptographic or other purposes involving the need for secrecy
G11B	Information storage based on relative movement between record carrier and transducer
H03K	Pulse technique

5.6 INTERNATIONAL PATENT SUB-CLASSIFICATION BASED TREND

Below graph represents top international patent sub-classes pertaining to Blockchain and based on representative member per patent family.
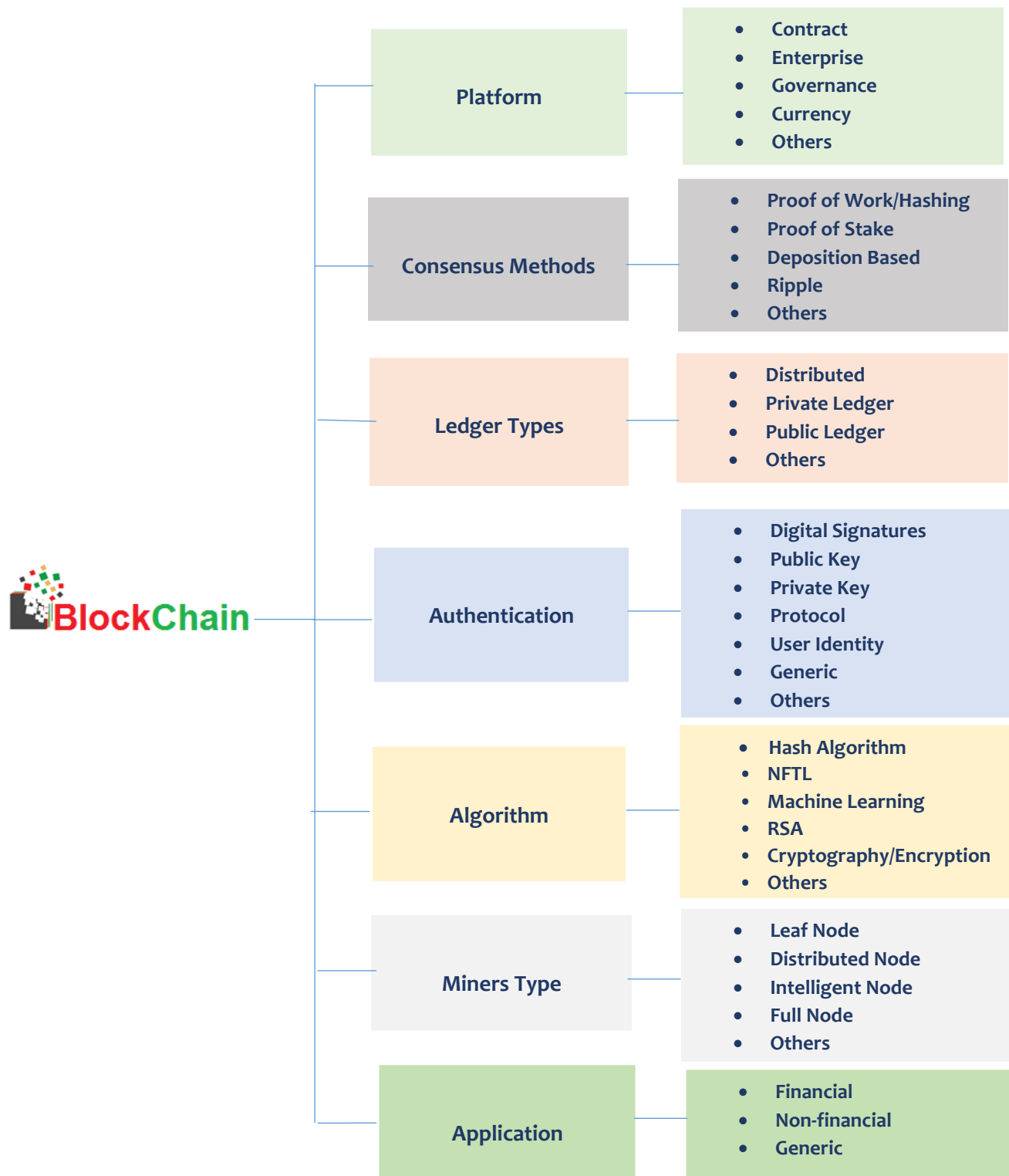
H04L- Subclass Distribution

- H04L-009/14 25%
- H04L-009/08 22%
- H04L-009/12 25%
- H04L-009/10 3%
- H04L-029/06 4%
- H04L-009/28 21%

G06F- Subclass Distribution

- G06F-021/24
- G06F-021/00
- G06F-021/02
- G06F-012/28
- G06F-012/14

G06Q- Subclass Distribution

- G06Q-020/36 14%
- G06Q-020/00 29%
- G06Q-020/32 14%
- G06Q-020/20 14%
- G06Q-020/10 14%
- G06Q-020/06 15%

G09C- Subclass Distribution

- G09C-001/06 14%
- G09C-001/00 15%
- G09C-001/05 14%
- G09C-001/01 15%
- G09C-001/04 14%
- G09C-001/02 14%
- G09C-001/03 14%

IPC SUBCLASS DEFINITIONS:

IPC Subclass	Definition
H04L-009/08	Transmission of digital information, e.g. telegraphic communication;arrangements for secret or secure communication; Key distribution
H04L-009/10	Transmission of digital information, e.g. telegraphic communication; arrangements for secret or secure communication; with particular housing, physical features or manual controls
H04L-009/12	Transmission of digital information, e.g. telegraphic communication; arrangements for secret or secure communication; Transmitting and receiving encryption devices synchronised or initially set up in a particular manner
H04L-009/14	Transmission of digital information, e.g. telegraphic communication;arrangements for secret or secure communication;using a plurality of keys or algorithms

| H04L-009/28 | Transmission of digital information, e.g. telegraphic communication; arrangements for secret or secure communication; using particular encryption algorithm |
H04L-29/06	Transmission of digital information, e.g. telegraphic communication;arrangements, apparatus, circuits or systems, not covered by a single one of groups; characterised by a protocol
G06F-21/00	Electric digital data processing; security arrangements for protecting computers, components thereof, programs or data against unauthorised activity
G06F-12/14	Security arrangements for protecting computers, components thereof, programs or data against unauthorised activity; accessing, addressing or allocating within memory systems or architectures; Protection against unauthorised use of memory
G06Q 20/00	Payment architectures, schemes or protocols; payment architectures, schemes or protocols
G06Q 20/06	Payment architectures, schemes or protocols; private payment circuits, e.g. involving electronic currency used only among participants of a common payment scheme
G06Q 20/10	Payment architectures, schemes or protocols; specially adapted for electronic funds transfer [EFT] systems; specially adapted for home banking systems
G06Q 20/20	Payment architectures, schemes or protocols; point-of-sale [POS] network systems
G06Q 20/32	Payment architectures, schemes or protocols; using wireless devices
G06Q 20/36	Payment architectures, schemes or protocols; using electronic wallets or electronic money safes
G09C 001/00	Ciphering or deciphering apparatus for cryptographic or other purposes involving the need for secrecy; apparatus or methods whereby a given sequence of signs, e.g. an intelligible text, is transformed into an unintelligible sequence of signs by transposing the signs or groups of signs or by replacing them by others according to a predetermined system
G09C 001/02	Apparatus or methods whereby a given sequence of signs, e.g. an intelligible text, is transformed into an unintelligible sequence of signs by transposing the signs or groups of signs or by replacing them by others according to a predetermined system; by using a ciphering code in chart form
G09C 001/04	Apparatus or methods whereby a given sequence of signs, e.g. an intelligible text, is transformed into an unintelligible sequence of signs by transposing the signs or groups of signs or by replacing them by others according to a predetermined system; with sign carriers or indicators moved relative to one another to positions determined by a permutation code or key, so as to indicate the appropriate corresponding clear or ciphered text
G09C 001/06	Apparatus or methods whereby a given sequence of signs, e.g. an intelligible text, is transformed into an unintelligible sequence of signs by transposing the signs or groups of signs or by replacing them by others according to a predetermined system; wherein elements corresponding to the signs making up the clear text are operatively connected with elements corresponding to the signs making up the ciphered text, the connections, during operation of the apparatus, being automatically and continuously permuted by a coding or key member

6. TAXONOMY DEVELOPED FOR BUCKETING OF RELEVANT PATENT DOCUMENTS

Platform
- Contract
- Enterprise
- Governance
- Currency
- Others

Consensus Methods
- Proof of Work/Hashing
- Proof of Stake
- Deposition Based
- Ripple
- Others

Ledger Types
- Distributed
- Private Ledger
- Public Ledger
- Others

Authentication
- Digital Signatures
- Public Key
- Private Key
- Protocol
- User Identity
- Generic
- Others

Algorithm
- Hash Algorithm
- NFTL
- Machine Learning
- RSA
- Cryptography/Encryption
- Others

Miners Type
- Leaf Node
- Distributed Node
- Intelligent Node
- Full Node
- Others

Application
- Financial
- Non-financial
- Generic

7. TECHNICAL TREND ANALYSIS

7.1 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON PLATFORM

This category deals with patents/applications that provide various working platforms utilizing BlockChain as an underlining technology. Below representation shows sub-categories such as, currency/trading, smart contract, and Enterprise among others.
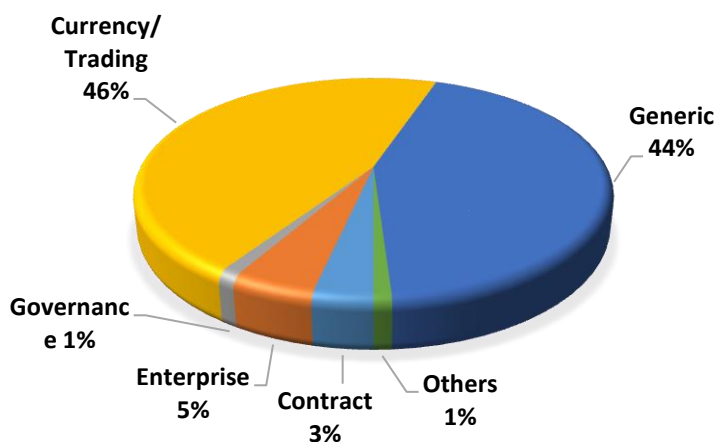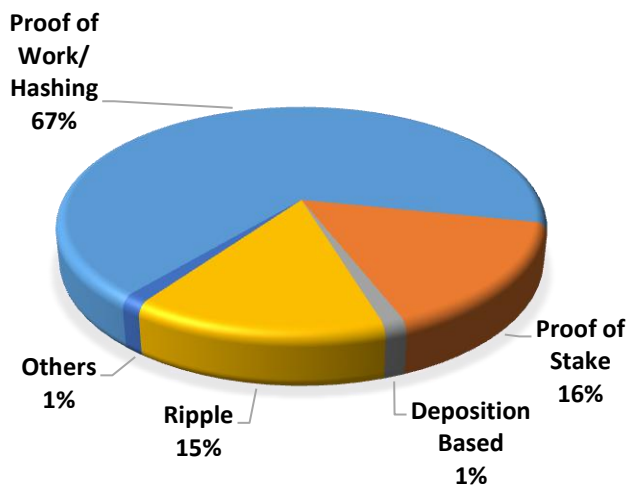

INSIGHT:

As evident, maximum number of patents/applications are falling under currency/trading **(46%)** followed by enterprise **(5%)**.

7.2 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON CONSENSUS METHODS

This category deals with patents/applications that pertain to consensus methods for BlockChain Technology. The Sub-categories include proof of work, proof of stake, and ripple among others.
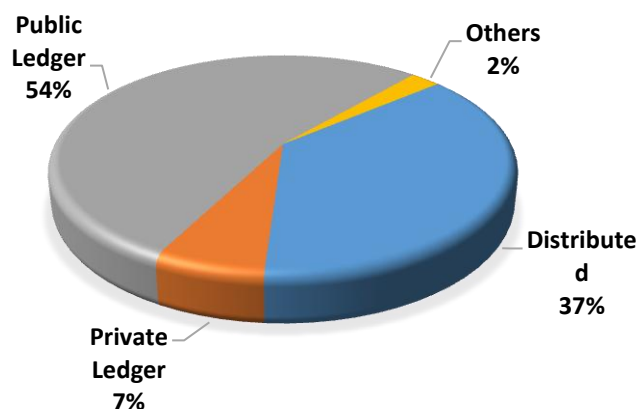
INSIGHT:

As evident, maximum number of patents are falling under Proof of work **(67%)** followed by Proof of stake **(16%)**.

7.3 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON LEDGER TYPES

This category deals with patents/applications pertaining to the types of ledger used in BlockChain Technology. Below representation shows sub-categories such as Public, Private and Distributed Ledgers etc.
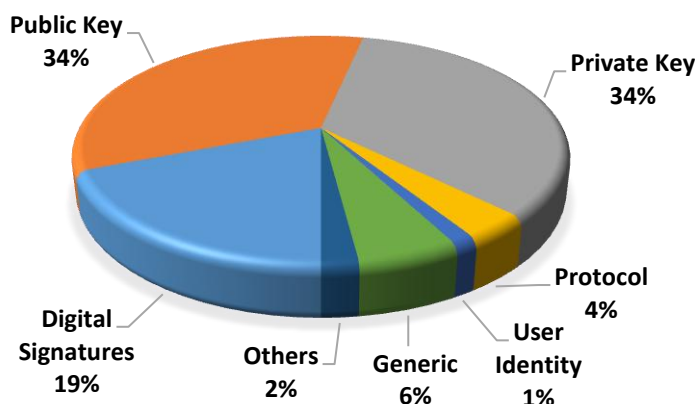

INSIGHT:
As evident, maximum number of patents are falling under Public Ledger (**54**%) followed by Distributed Ledger (**37**%).

7.4 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON AUNTHENTICATION/VALIDATION

This category deals with patents/applications that provide various modes of authentication employed in BlockChain Technology. Below representation shows sub-categories such as Public Keys, Private Keys, Digital Signature and User Identity Validation among others.

INSIGHT:
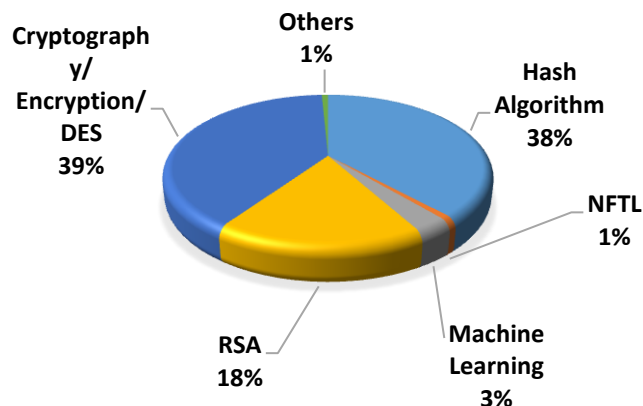As evident, maximum number of patents are falling under Public and Private Key (**34**% **each**) followed by Digital Signatures (**19**%).

7.5 DISTRIBUTION OF PATENTS BASED ON BLOCKCHAIN CODING

This category deals with patents/applications that provide various algorithms/coding techniques employed in BlockChain Technology. Below representation shows sub-categories such as Hash Algorithm, Cryptography/Encryption/DES Algorithm,RSA (Rivest-Shamir-Adleman) Algorithm, andNFTL (Nand flash translation layer) Algorithm among others.

INSIGHT:

As evident, maximum number of patents are falling under Cryptography/Encryption/DES Algorithm **(39%)** followed by Hash Algorithm **(38%)**.

7.6 DISTRIBUTION OF PATENTS BASED ON MINERS

This category deals with patents/applications pertaining to various miner/node types forming part of decentralized arrangement/BlockChain Technology. Below representation shows sub-categories such as Leaf Nodes, Full Nodes, and Distributed Nodes among others.
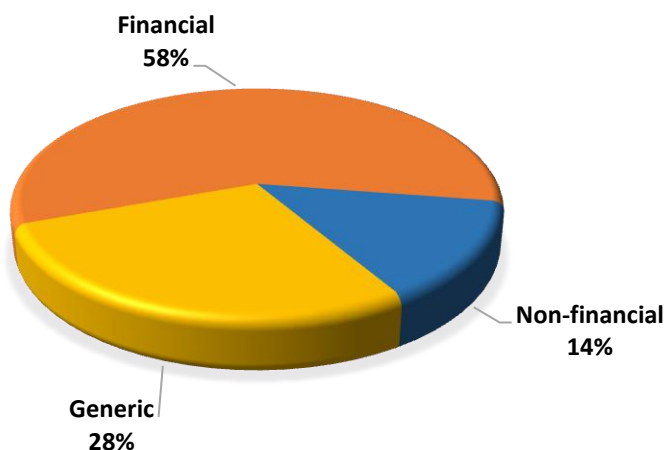
INSIGHT:

As evident, maximum number of patents are falling under Leaf Nodes **(41%)** followed by Full Nodes **(23%)**.

Others 9%

Full Node 28%

Leaf Node 41%

Intelligent Node 3%

Distributed Node 19%
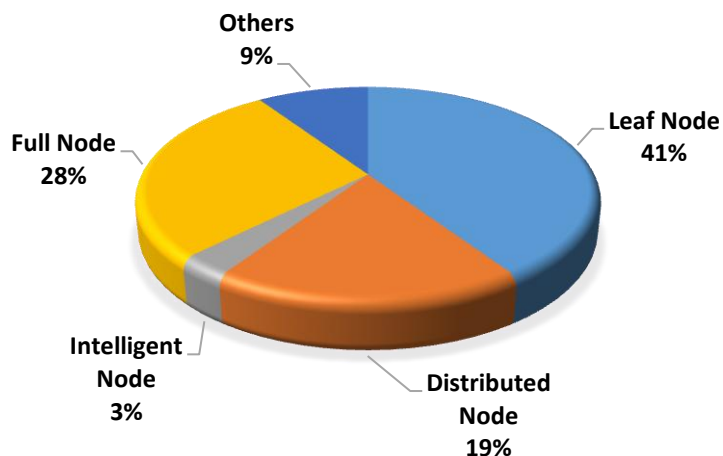
7.7 DISTRIBUTION OF PATENTS BASED ON APPLICATIONS

BlockChain has drawn attention majorly from financial sector but recent patent filing trend indicates accelerated growth in filing of applications in non-financial sector as well, such as healthcare, power &energy etc.

Financial 58%

INSIGHT:

As evident, BlockChain Technology is used majorly for Financial Application **(58%)**.

Non-financial 14%

Generic 28%

8. PATENT PORTFOLIO ANALYSIS- CORPORATES IN BLOCKCHAIN TECHNOLOGY

Based on analysis of recent developments in BlockChain Technology, exemplary corporates contributing majorly towards development and usage of BlockChains have been identified.

8.1 BANK OF AMERICA

Bank of America is an American multinational banking and financial services corporation headquartered in Charlotte, North Carolina. As per recent filing trend analysis and [news feeds](#), Bank of America will work directly with Microsoft Treasury (a group responsible for managing transactions related to its corporate treasury activity and strategic business investments and acquisitions) to establish a BlockChain system that can facilitate transactions between the companies[Source].

In December 2015, United States Patent and Trademark Office (USPTO) published 10 of Bank of America's applications. But the latest information shows that the number of patents Bank of America has filed for and is looking to apply for, is much higher[Source].

EXEMPLARY PATENTS/PUBLISHED APPLICATIONS

Patent No.	Claim
US20150363782	A cryptocurrency validation system, comprising: a memory operable to store a customer profile associated with a customer; one or more processors communicatively coupled to the memory and operable to: receive a request from the customer to perform a cryptocurrency transaction with a third party; calculate a risk score for the cryptocurrency transaction; determine a number of required validations to confirm the cryptocurrency transaction based at least in part upon the risk score; receive a number of validations from a plurality of miners; compare the number of received validations to the number of required validations; and determine whether the number of received validations complies with the number of required validations.
US2015365283	A system comprising: a memory operable to store a customer account associated with a customer; and a processor communicatively coupled to the memory, the memory including executable instructions that upon execution cause the system to: receive a request to deposit a quantity of cryptocurrency into the customer account; associate the quantity of cryptocurrency with the customer account; deposit the quantity of cryptocurrency into a vault connected to a network; determine a total quantity of cryptocurrency deposited into the vault; and in response to determining the total quantity of cryptocurrency deposited into the vault exceeds a threshold, facilitate the disconnection of the vault from the network.
US2015363777	A cryptocurrency security system, comprising: a memory operable to store a plurality of user profiles associated with a plurality of users of an enterprise; and a processor communicatively coupled to the memory and the interface and operable to: receive a request from a user to perform a cryptocurrency transaction with a third party; retrieve BlockChain information associated with the cryptocurrency transaction; determine whether one of the plurality of user profiles is associated with the user based at least in part upon the retrieved BlockChain information and at least one stored cryptoidentifier

	associated with one of the plurality of user profiles; determine whether one of the plurality of user profiles is associated with the third party based at least in part upon the retrieved BlockChain information and the at least one stored cryptoidentifier associated with one of the plurality of user profiles; determine whether the cryptocurrency transaction is suspicious based at least in part upon the associated user profile; and communicate an alert to the enterprise regarding whether the cryptocurrency transaction is suspicious.
US2015363769	A system comprising: a memory operable to: store a set of conversion rules; and a processor communicatively coupled to the memory, the memory including executable instructions that upon execution by the processor cause the system to: receive an electronic request for a cryptocurrency conversion, the electronic request requesting a conversion of a first currency into a second currency, wherein the second currency is a cryptocurrency; retrieve price data associated with the first and second currencies, the price data indicating at least a value of the first currency and a value of the second currency; determine, based at least in part upon the price data and the set of conversion rules, whether the conversion is optimal; and in response to determining the **conversion** is optimal: determine a plurality of exchange rates associated with converting the first currency into the second currency; determine, based at least in part upon the data and the set of conversion rules, an optimal exchange rate of the plurality of exchange rates; and initiate, essentially simultaneously as the determination that the conversion is optimal, converting the first currency into the second currency.

8.2 BUBI NETWORK

Bubi (Beijing) Network Technologies Co., Ltd and Feitian have recently reached a strategic cooperation in the field of BlockChain technology. The two companies will focus on "core technology and products" and "authentication and private key protection" to extensive cooperate in the future.

Bubi has been focused on BlockChain technology and products innovation since 2012. It has tens of patented core technologies that are widely used in many industries [Source].

EXEMPLARY PATENTS/PUBLISHED APPLICATIONS

Patent No.	Claim
CN105790954	A method for constructing an electronic evidence, includes the following steps:Generate a unique electronic data of the applicants, the fixed length digital digest, and to configure the electronic evidence merkel tree BlockChain system; An electronic system with a time stamp structure BlockChain of evidence; The index is set up to block electronic proof BlockChain system, and the index number, and a time stamp are returned to the applicant a digital digest is generated.
CN105719172	An information distribution method, characterized in, including the steps of:3rd to the one or more information distribution mechanism is transmitted by the information distribution request side facility, the information distribution request includes an information delivery record; Receive the at least one 3rd party mechanism of the signed information delivery record; Recording into the signature BlockChain information after issuing, by the authentication process is carried out in the whole network BlockChain consensus; to be authenticated through a rear, a participant approval information distribution and recording the obtained recording BlockChain.
CN105701372	A method for establishing and verifying the identity, comprising the steps of: An identity authentication request submitted by a user in accordance with the authentication mechanism, for building a user identity BlockChain; A certificate authority by means of the user's identity by the identity authentication process BlockChain.
CN105573828	A method of operating processing method, characterized in, comprises the steps of:Receiving a user's operation request; operation request including a plurality of operation information; A plurality of operating according to a plurality of operations in accordance with operation information generated in the order the number of operation of the transaction; Searching for the basis of the presto associated with the operation data recording of the data access objects; access to the recording data stored in a block in the BlockChain; A multi-operation is performed in the operation of the transaction, the execution result according to the updated data objects in the data.
CN105488431	BlockChain A method of rights management system, characterized in, including:After the user successfully logs in BlockChain system, according to the user registration information to the user as a root node tree to generate an authority, the authority tree to the user's roles, and permissions for each sub BlockChain node; and And when the user is to be operated BlockChaining target area, the corresponding rights tree traverses the user system, determining whether the user has performed the operation authority of the calling of a target BlockChaining, if the path nodes permitted to operate, if no prohibited from performing the operation.

8.3 INTERNATIONAL BUSINESS MACHINES CORPORATION (IBM)

International Business Machines Corporation (commonly referred to as IBM) is an American multinational technology company headquartered in Armonk, New York, United States, with operations in over 170 countries. IBM is a premier member of the Linux Foundation's Hyperledger Project, which advances BlockChain technology as an open source standard for distributed ledgers.

Interestingly, IBM's official webpage lists major achievements in BlockChain technology such as IBM tests BlockChain for trading with the Japan Exchange Group, Mizhuo tests trade settlement with IBM Blockchain, among others [Source].

The IBM® BlockChain service on Bluemix® provides a choice between two four-node development and test BlockChain networks, at the click of a button. Rather than creating a BlockChain network from scratch, developers can immediately start writing applications and deploying chaincode. The IBM BlockChain on Bluemix service is a peer-to-peer permissioned network, built on top of Hyperledger Fabric v0.6.1 code from the Linux Foundation's Hyperledger Project[Source].

EXEMPLARY PATENTS/PUBLISHED APPLICATIONS

Patent No.	Claim
DE102016104478	The method for securing data in a computerized system operations, the set being interconnected by respective node, are configured, to transmit data, receive and store, the method comprising: performing computerized cryptographic method for implementing two or more Work have (proof of Work), wherein the computer-based cryptographic method have, from each of the at least a subset of nodes by means of a corresponding Crawler searches nodes connected to each other subset of data is determined to be detected, the nodes of the system are stored, and at each node of the subset data in the subset of data to be detected can be detected.
CN105844505	Through one of digital money transaction method carried out by that BlockChain, characterized in, which method comprises: a centralized personal and business users caused by the digital currency transaction is performed by BlockChain, to generate the electronic book information and the transaction for a transaction document, all of the data record is stored in the node of the BlockChain, a corporate enterprise, or any one of the public authority from the legal authority to invoke the flow conditions for authorizing the condition information on the node tracing survey, and is permanently stored information.
EP1573958	A method for generating a conditional electronic signature, performed in response to one or more conditions being specified for an electronic signature of a data item, the method comprising the steps of: encrypting the data item, encrypting the one or more conditions separately from the data item, combining the encrypted data item and the encrypted one or more conditions, and encrypting the combination to generate a digital signature block that inherently represents the data item and the one or more conditions and enables cryptographic verification of both the data item and the one or more conditions.
	In a cryptographic system having a cryptographic facility providing cryptographic functions for transforming blocks of data, said cryptographic functions including (a) an encryption function for encrypting an input block under a key in accordance with a predetermined encryption procedure to produce an output block comprising said input block encrypted under said key, said encryption procedure being a symmetric encryption procedure having a corresponding decryption procedure for decrypting said output block using said key to regenerate said input block, and (b) a reencryption function for reencrypting under a second key in accordance with said procedure an input block comprising an original

US6333983	plaintext block that has been encrypted under a first key in accordance with said procedure to produce an output block comprising said original plaintext block encrypted under said second key, said procedure having at least one key pair with the property that successive encryption of a block under the keys of said pair in accordance with said procedure regenerates said block in clear form, a method for decrypting a ciphertext block comprising an original plaintext block that has been encrypted under a predetermined key in accordance with said procedure, comprising the steps of: invoking said reencryption function with said ciphertext block supplied as an input block, said predetermined key supplied as a first key, and one of said key pair supplied as a second key to produce a first output block comprising said original plaintext block encrypted under said one of said key pair; and invoking said encryption function with said first output block supplied as an input block and the other of said key pair supplied as a key to produce a second output block comprising said original plaintext block successively encrypted under the keys of said key pair, thereby to regenerate said original plaintext block in clear form.

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