Application of Block Chain Technology in Higher Education

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The block chain is an ICT innovation; it facilitates new types of economic organization, governance and transparency. Organizations, especially in India, have yet many challenges to overcome in synchronizing and aligning their digital transformation efforts to enable the network effects to take hold. In this investigation, the application of block chain technology, in higher education in India - involving academic institutions, students and verifiers, especially in the wake of the current racket of fake degrees being issued at a large scale from universities across the country at the graduate and post-graduate levels - is being explored.

Keywords: Block Chain Technology, Higher Education, India

1. Introduction

Block chain-based solutions have the potential to make government operations more efficient and improve the delivery of services in the public and private sectors. Identity verification and authentication technologies, as one of the applications of block chain based solutions – and the focus of our own efforts at Secure Key Technologies – have been critical components in service delivery in both sectors due to their power to increase trust between citizens and the services they access. To transformthe trust into a compact value-added; identities must be validated through highly-reliable technologies, such as block chain, that have the capacity to reduce cost and fraud and to simplify the experience for customers while also keeping out the bad actors. With identities migrating to digital platforms, organizations and citizens need to be able to transact with reduced friction even as more counter-bound services move to online delivery. The block chain technology has caught the attention of several Indian banks. Recently, ICICI Bank announced that it successfully executed transactions in international trade finance and remittances using block chain technology. All over the world Block chain technology in used to improve the education system, India has taken a cue from these countries but is starting off at a small scale to test the viability and success of this technology at a large scale.

Identity verification and authentication have long been a critical component in service delivery for both the private and public sectors, but changing citizen demands in the digital age have stressed the need for new approaches to verify that an individual is whom they say they are – with surety. At the same time, as more of our lives migrate online, "bad actors" such as hackers and fraudsters are always finding new ways to exploit our sensitive information for their own personal gain at the expense of legitimate users and online service organizations. Governments, banks, telecommunications companies, healthcare providers, and businesses of all sizes are vocal in their commitment to becoming more digital – and that commitment hinges on digital identity. Digital identity is a critical, but underserved, a layer of the digital era for the safety of citizens as they continue to do more online both domestically and globally.

Block chain technology has fueled a revolution in the economy. The blockchain is a digital distributive ledger that continuously and collectively maintains records of any kind of transaction that holds value via a network of computers (nodes). This ensures all parties have equal access and one person cannot manipulate data without permission from all other parties in that network. There is no central administrator who controls the interaction between two people; this technology will completely change the way of doing business, destroy some businesses and make some redundant in the future. It was invented under the alias of Satoshi Nakamo to following the 2008 financial crisis to provide a financial ecosystem that is secure, decentralized and trustworthy. The first application of Block chain was the Bitcoin and crypto currency (Patel, 2008).

"Block chain will potentially lower the cost of trust and eliminate the middleman across industries."

While the block chain revolution is a recent phenomenon, the Internet bubble exploded more than a decade ago, completely changing and connecting the ecosystem of business, politics, social interaction and every other dimension allowing for greater communication, cooperation and in some cases competition. However, block chain provides a conducive and safe environment for the recording and validation of all information that holds value without a central or single point of authority. This vital information that is currently stored and exchanged is dependent on a third party (intermediary) to prevent tampering of information and validation of the identity of the two parties. This has powered the shared economy that includes companies such as Uber and Airbnb and given governments; banks, universities and other intermediaries' unchecked power to handle these transactions and maintain trust between the two parties. However, this level of trust comes at a cost, these intermediaries charge a hefty price for their services, use our data for commercial purposes and undermine our privacy, their centralized databases and ledgers can be easily hacked and this system excludes over 2 billion who don't have equal access to such institutions (Tapscott and Tapscott, 2016). The Block chain is the solution to all these problems, it promises to reduce transaction costs and explicit costs of administration and commission, and it is quick and secure. It allows you to transfer value/information/ data anywhere in the world at almost no cost and within minutes. (D'Aliessi, 2016). The irony of block

chain is that it is a transparent system that still maintains the privacy of every user and every transaction on the block chain is verified in no time. However, like every technology, block chain comes with its set of problems and challenges.

Each transaction recorded on the block chain is digitally signed based on cryptography, this includes using a public and private key that are mathematically linked ("Definition from Whatis.Com"). The digital signatures protect the integrity of the message, ensures that no one can tamper with the message or content during the exchange process. A hash is a mathematically computed algorithm assigned to each input to ensure the authenticity of the data without revealing its contents. Every chain begins with a genesis block (first block in the chain); all succeeding blocks are linked via a hash connecting every block to the previous one to verify the transaction.

Hashing simply accelerates the process of verifying the integrity of the message and validates the identity of the individual sending the message. The hash uses the data as the input and generates an output based on mathematical algorithms, in other words, it works as a digital fingerprint (Rabbani, 2017). The hash encrypted in the message is sent only once the message has been sent to check if the receiver received the intended message. If the hash is different, then the two parties are alerted that the message is tampered with, and ,this happens rarely.

Blockchain technology provides many more benefits over regular digital certificates as the hash ensures greater security and privacy while safeguarding digital signatures. It doesn't require any third party intervention or authorization, overcoming the issue of centralization that leads to a single point of failure. The ownership of a document or asset in a paper certificate belongs to the entity that signed it. An electronic signature is either a scanned handwritten signature or a digital image of a signature that fulfils the exact same purpose as a handwritten signature. A digital signature is an electronic signature that is encrypted as a digital code generated by public encryption within an electronic document itself. This ensures the document isn't tampered with while being transferred from one digital space to the next and validates the person from whom it came from. A major advantage of digital signatures is they don't reveal the identity of the signatory but has encrypted the public and private keys of the receiver (Thompson, 2017).

Blockchain enters this domain to provide greater security and privacy by replacing direct signing by both the parties with a hash. The hash function consists of an algorithm that indicates that the digital signatures have taken place. It is a one-way procedure whereby the sender creates a hashthat has all the input data stored on it such as degree certificates for example but is immutable once created. This same document can be used in the future (Thompson, 2017). Public Key Infrastructures (PKIs) is primarily used for encryption and signing data based on digital certificates (verification of all kinds of identities from people to software and computers). PKI provides users or parties with a pair of authorized keys (public or private) that are based on a mathematical algorithm to ensure safe exchange and communication of data and money. Each user has a public and private key; only the user has the private key while the public key can be given to anyone freely. The user would encrypt the file using their private key, but only a public key can be used to decrypt it and not encrypt anything. PKI's will soon run on blockchain technology where instead of running the certificate authority (CA) software on one particular system it would run on multiple computers (Nexus Group, 2017). The block chain will store the hash values for as long as the block chain exists, verifying both the block data and transaction data. However, a traditional PKI will only authenticate the digital certificate (Thompson, 2017).

Most governments across the world are investing indigitization of documents, especially of those records such as land and education certificates which are available only in physical formats. However, the main question is what determines the ideal format for such certificates. The recent intervention of replacing paper certificates with digital certificates is due to the problems of storage, unable to verify them if they are lost, easy to forge and inconvenient for all the stakeholders involved (Grechand Camilleri, 2017). Digital certificates have been in existence for the last couple of years and have proven to overcome challenges faced by paper certificates but still have many disadvantages. They still require the involvement of a third party; this becomes the single point of failure and centralization. These certificates are easy to destroy and forge without the use of digital signatures or hashes and many times these certificates are prone to data-leaks.

Digital certificates produced using blockchains is the most secure and efficient method being adopted by many countries across the globe (Grech and Camilleri, 2017). Tamper-proof blockchain records consist of 3 components or layers; the first contains the signed hash of the content, the second contains all the data and images and the third is the presentation and styling of the data. The verification process is fairly simple, the hash of the recipient is compared to the hash stored on the blockchain if they match the document is verified "Tamper-Proof Digital Records" (Patel, 2018).

Block chain technology can be applied to a number of fields and can be used to develop multiple solutions. Its most popular and frequently used application was seen in Bitcoin and crypto currency. Block chain will solve problems of Digital ID management while applying for gas connections, mobile numbers and bank accounts. It will ensure the benefits of various government distribution systems reach the eligible citizens, P2P sharing of medical records and green power-sharing are a few such examples. One of the greatest advantages of information stored on block chain is it can be made public or private depending on the case and its cause (Anand, 2018).

As the Technology is also evolving, thought leaders are finding the ways to use Block chain technology as an engine in Supply Chain domain to enhance the customer experience with real-time visibility and authenticity of the product lifecycle from origin to end. Smart contracting are another important element of Block chain technology which will help the industries to fasten the payment processing without any multiple certifications of invoices. The separate blocks will get created based on the work progress, resulting in real-time monitoring by all stakeholders for disbursement of milestone payments in a short span of time. Block chain technology works on the principle of peer to peer and distributed ledger methodology. OEM, Tier-1 and Tier-2 will have the shared eco-system for faster communication and visibility in terms of optimization of inventory

level, rejection and demand planning. By putting an additional layer of the Internet on Things on Block chain technology, the industry will have real-time visibility of Import shipments. Based on the movement of shipment, new blocks will get created thereby stage-wise tracking of deliveries from thepoint of origin. With this companies can strengthen the demand planning for maintaining the lean inventory levels. Additionally, it will help companies to timely trigger the payment disbursement in case of shipments through Letter of Credit.

2. Block Chain Technology in India

India has a population of 1.3 billion people of which 22percent of its population is below the poverty line, which means 1 in every 5 Indians is poor; around 80percentof the poor lives in rural areas (World Bank, 2016). India's rural areas are plagued with corruption, bureaucracy and low levels of policy implementation in every area from education, health to financial services and just sheer neglect of the underdeveloped regions. Hence India's poor in particular have been conditioned to fear the worst and have dismal levels of trust in the government (Sandner, 2017). The low levels of social trust have translated into low levels of economic development, as the poor are hesitant to invest without getting caught in a vicious cycle because there is simply no record of any transaction made, devoid of identity proof and financial and legal support. These issues drive the cause of rural-urban migration however the problem isn't omitted but continues to exist, if not worse.

Block chain technology with the existing Adhaar card scheme will solve the first problem of identification following which government schemes can reach the targeted groups. The biggest advantage of block chain is it will do away with the unnecessary amounts of paperwork and heightened levels of bureaucracy. Through this technology the masses can gain access to credit in villages and in cities, completely getting rid of the middleman (ex: money lenders and traders). Block chain will mitigate India's middleman problem; you no longer need an individual, platform or institution to ensure trust between strangers but a simple digital ledger technology (Shin, 2018). The initial research, design and implementation of Blockchain technology are expensive;nevertheless, it promises lower costs, greater security and transparency in the future than a conventional database. This further delves into the question of how a database is different from block chain technology. At the most basic level of differentiation, a database is centralized and controlled by an individual, but a block chain is a decentralized system not managed by anyone. This shift in basic technology will completely destroy the existing shared economy that supports companies like Uber and Airbnb among many others. Platforms such as these are simply intermediaries or middleman that can be replaced by simple peer-to-peer transactions, transforming businesses, corporations and entire economies (Shin, 2018). Block chain technology has converted trust into service without a middleman.

While there are many applications of the blockchain, we chose to research the application of block chain technology in issuing university degrees to beat the current racket of fake degrees being issued at a large scale from universities across the country at the graduate and post-graduate levels. Every year India produces more than 50 lakh student graduates. Fake certificates cost companies between Rs500-1000 per applicant for education qualification checks and companies hiring in thousands spend a minimum of 50 lakhs to 1 crore every year (Singh, 2018). In addition, students have no ownership over their own academic assets and records, often these physical copies get lost, and there is no record of them.

Annually the University Grants Commission (UGC) issues a list of fake universities across India, in 2017 alone 23 universities were identified to be fake. There is a legal procedure that needs to be followed to set up a university in India and the subsequent issuance of degrees through laws passed by the central or state government. A number of universities have been set up and award degrees without being approved by the UGC or adhering to the existing guidelines. In India, Uttar Pradesh tops the list with 9 fake universities, followed by New Delhi with 6, Orissa and West Bengal with 2 respectively, and followed by Bihar, Karnataka, Kerala and Maharashtra with 1 each. In 2009, the UGC listed The Indian Institute of Alternative Medicine as a bogus university along with many others however many of these universities have still not been closed. Delhi, the national capital, tops the chart with 66 fake colleges. Across India, there are 279 technical institutes that haven't been approved by the UGC or the AICTE and regulated yet they are granting degrees. In such cases, these physical certificated hold no value (Pandey, 2017).
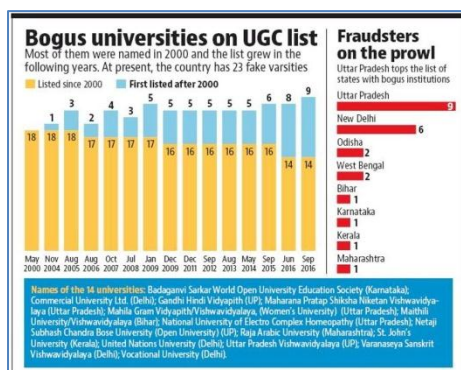
Source: Hindustan Times, 2017

The government of India has been aware of this problem for many years and has taken the initiative towards finding a solution to this problem. In 2016 the Ministry of Human Resource Development set up the National Academic Depository

(NAD) as a part of its digital India Campaign to hold records of certificates from class 10 onwards. NAD has two digital depositories, CDSL Ventures Limited and NSDL Database Management Limited (NDML) that will ensure safe and easy access to its documents and digital assets. This project would involve three main stakeholders, academic institutions, students and verifiers. It would provide 24X7 access to its online website that houses all academic awards, mark-sheets, degrees and diplomas. As of March 2018, 401 educational institutions (including universities and IIM's etc.) have signed up, 44, 920 students have registered, 1, 01, 75,224 awards have been issued, and 119 verifiers have been accounted for NAD.

While the NAD has made tremendous efforts towards digitizing the authorization and verification of degree certificates, there are certain loopholes and problems in this model. The first being the number of stakeholders involved other than the parties involved in the transaction. As per this programme, nearly 2, 50,000 academic records have been digitized, and five universities have signed up every week since 9ᵗʰ July 2017. However, universities feared losing revenues from a fee charged to authenticate certificates. This was introduced prior to the introduction of Block chain technology. However, the method of the NAD may prove to be costlier and complicated in the future as more students and universities sign up (Gupta, 2017). In addition, there is no standard format or software used by all universities to print and store these degrees. This causes multiple issues, as converters have to be created to reformat the data that will be used in the future. Most government universities lack the funds to digitize their records; this cost would simply be transferred to the students. The NAD still remains a database hence it is still controlled by a single body that is the UGC, making it vulnerable to a single point of failure. While the NAD issues certificates by school boards, approved institutions and test conducting bodies, many credentials or badges that are earned through on the job training or experiences cannot be accounted for. This also highlights the issue of privacy of the students and vital information that can be publicly accessed without permission due to the direct linkage with the Aadhar card.

Estimates suggest that the racket of fake degrees will increase in thousands if this Block chain technology is not implemented. In the 2018 Union budget, the finance minister further allocated Rs 3,073 crores to Digital India programme putting a major emphasis on the use of Block chain technology and AI (Gupta, 2017). This problem of fake degrees isn't special to India but has also been witnessed in the United Kingdom. In the United Kingdom, 1 in 4 CV's contains lies about educational qualifications. Employers spend £12 per applicant, and the process takes several days, as they need multiple universities to verify and authenticate the degrees. Block chain would remove the cost and time involved and would help resolve the issue of international transfer of degrees. The hiring process will be smoothened; as employers would be able to filter candidates based on the desired qualifications, they're looking for given many candidates put their qualifications on the block chain. The removal of the middleman – Universities have already begun with the introduction of online courses and degrees on websites such as Coursera. However, block chain will implement trust in the entire system where multiple parties can cross-check the authenticity of the degree with the simple click of a button.

The crisis of fake degrees isn't a recent phenomenon but has been a problem since the very existence of academic degrees. Ezell and Bear (2012) extensively researched this concept in their book, Degree Mills: The Billion Dollar Industry That Has Sold over a Million Fake Diplomas. Degree Mills have become an issue across the world. Currently, there are over 3,300 unrecognized universities of which many are not legitimate and are providing all kinds of degrees (MBA to a medical degree) at a price. Exact, a Pakistani software company based in Karachi ran 370 websites issuing fake degrees and accreditations of fake universities from countries across the world including the US (Ameen, 2015). In the USA alone, diploma mills sold over 50,000 PhD's compared to 40,000- 50,000 earned PhD degrees annually, which means more than 50% of the PhD degrees are fake. An international diploma mill's revenues surpassed US$ 450,000,000 by selling over 450,000 degrees (masters, bachelors, medicine and law) internationally (Ezell and Bear, 2012).

According to the European Commission's Joint Research Centre, the introduction of the block chain will disrupt the education and training industry that is estimated to be worth $4.6-$6 trillion. The areas block chain technology will target licensing and accreditation, awarding education qualifications, management and organization of student records, tuition payments and intellectual property management. Many universities across the world have begun testing block chain-based solutions. This technology will end the system of physical degrees certified by educational and learning institutions, records of achievements and transfer of credits ("Block chain Upending Multi-Trillion Education Industry, EC Report says - Cryptovest").

While there are many advancements being made in block chain technology in the west, Dubai has recently (February 2018) announced the largest pilot project of the world's largest application of Block chain technology in education. Education, a block chain technology company claims this will be the largest private-public partnership of schooling. Their project will create an Academic Passport that will enable students to receive, view and manage their academic portfolios ("World's Largest Pilot of Block chain Technology in Education Launched Affecting over 400,000 Students"). India has taken a cue from these countries but is starting off at a small scale to test the viability and success of this technology at a large scale.

3. Block Chain Usage in Education

The creation of a block chain model in education that is adaptable to the Indian context is the need of the hour. In particular, the usage of this technology to issue secure, immutable and verifiable digital degree certificates, not just by traditional universities but also by online educational platforms such as Coursera. This will give students and any party that needs to verify these records (employers, government, institutions) control and access to the academic and educational records and achievements of an individual (Block chain in the EU PDF). Learning will be centred on the student and so will their transcripts, where the validation of credentials won't require the evaluating party to go back to every single source. The

application of Block chain in Education extends beyond digital degrees, to create new modes of pedagogy, funding higher education, rewarding students and the creation of Meta universities (Tapscott and Tapscott, 2017).

Massive Open Online Courses (MOOCs) and Universities are taking precedence over traditional 3-4-year degree courses as they are financially draining and students can simultaneously pursue other interests or occupations. Today, age is no bar in education and individuals pursue degrees, corporate training and informal education at any age. For many professional courses, each component of the programme is delivered by a different organization. Hence it would make the coordination of physical degrees impossible. The usage of block chain would smoothen the process of collaboration and communication between universities. The main challenge is to integrate the internal systems of universities where the exchange of information between the two parties will facilitate the authenticity of a certificate. Hence employers can directly access the block chain rather than contact the University or student. The ultimate aim is that students anywhere in the world can claim their degree is verified and legitimate without having to contact their respective universities (Block chain in the EU PDF).

Learning Machine is an American company that focuses on providing Block chain infrastructure to create digital assets that can hold social value. The company considers Bitcoin block chain to be the most secure, widely tested and adopted block chain "Tamper-Proof Digital Records" (Patel, 2018). In 2017, MIT and Learning Machine collaborated to issue digital certificates on Blockcerts to undergraduate, masters and PhD students. There were many elements involved in creating a standardized, authorized and accepted the certificate. First, the template of the certificate was created with all the necessary images, signatures and text that were then later filled in with data based on the specific degree. After which the content layer containing all the data of the diploma and the public key of the recipient was added. This digital asset is hashed with MIT's private unique key and then registered on the block chain permanently. All records are then available to each graduate via a public key.

According to Ambarish Datta, MD&CEO, BSE Institute, traditional learning has expanded beyond boundaries, where individuals are able to acquire skills and knowledge from multiple platforms and institutions. This could be from universities, online courses or peer-to-peer interaction (2018). Also, every credential or achievement of an individual may not be available in the form of a formal physical certificate and may be acquired over a long period. Degree certificates alone don't hold too much value in terms of employability but on the job training, today plays an important role in the overall learning process. Hence academic and non-academic credentials (on the job training performance) and experiences can easily be recorded and validated via Block chain Technology ("Block chain: Is It the Future to Education?"). The Apprenticeship Act 1961 has supported the Skill India initiative to train more individuals and boost on the job training (TRA, 2017).

India faces multiple hurdles in the field of higher education, that of increased bureaucracy and hierarchical structures and organizations. A single umbrella council or agency that is focused on higher education (including all specializations and disciplines needs to be initiated. The higher education space has been regulated by two bodies, the University Grants Commission (UGC) and the All India Council for Technical Education (AICTE).

Similarly, accreditation agencies in India have further been divided based on general, agricultural and technical education (Sindhi, 2015). There is a need for a single regulatory body that will reduce the time involved in making efficient decisions and also reduces administration costs and inefficiencies. The proposal for a single apex and autonomous institution – National Higher Education Authority has already been recommended by the UGC. The organizational structure of government educational bodies and commissions provides more obstacles to implement standardized procedures for issuing digital degrees using block chain technology. Niti Aayog has also been pushing for technical and non-technical universities under one umbrella (Centre's Plan to Replace UGC, 2017).

The landscape of the Indian higher education includes private and public universities that are supported by the state and central governments and private bodies. The UGC is the main body that recognizes universities, this includes Central, States and Private Universities, plus a separate set of 16 councils (under the UGC) is in charge of accreditation. Degree certificates are issued and verified by the UGC for all universities excluding autonomous bodies/ central institutions such as IIT's, IIM's, NLU's, AIIMS, and NLU's. These are examples of groups of educational institutions; some of them are funded by the government while others by a private-public partnership. The colleges that are autonomous have the authority to issue their own degrees (from a BA to a PhD) while the others are affiliated to a particular university. The application of block chain is very useful and viable to not just single institutions but mainly group institutions (IIT's and IIM's). (https://www.linkedin.com/pulse/blockchain-edtech-introduction-sudeep-kumar)

The impact of any new technology can have its pros and cons; block chain currently presents a number of strengths, weaknesses, challenges and opportunities to existing educational institutions and models. The major strength of this technology lies in its adoption by Universities, which will reduce administration costs significantly through a new system of smart scanning of CV's (Block chain in the EU PDF). The aim of this paper is to identify the existing gaps, technical challenges and the critical points of resistance to the adoption of Block chain technology in India. Block chain can be applied to different settings, individual institutions, groups of institutions, and national and international organizations (Clark, 2016).

4. Smart Contracts Legal Provisions & Smart Contracts

For any technology to be implemented there needs to be measured in place that safeguards the interests of all the stakeholders and people affected indirectly. When subject matter includes Block chain, Bit coin and crypto currency and other cutting-edgetechnology, there is sheer ignorance and lack of awareness by many professionals, especially lawyers. It is claimed that less than 1 per cent of all attorneys understand the working of Block chain technology and their impact. Hence there have been no regulations implemented by the government or the Reserve Bank of India (RBI) in this domain. Since this technology

is completely transforming and revamping the economy, countries have a special responsibility to safeguard the interests of their people from issues arising out of such technologies (Solution, 2018).In January 2018, the RBI and the National Stock Exchange have made efforts towards testing block chain technology in trade applications and for KYC- data respectively (Merchant).

The evolution of contracts has gone through a significant time period and has drastically changed from the social contract proposed by Lock, Hobbes and Rousseau to the establishment of contract laws. Block chain technology will further alter the nature of contracts and introduce the concept of "Smart contracts". Nick Szabo first introduced smart contracts in 1994;however significant research reveals that implementation of such contracts will take a while, as India's existing regulatory framework isn't supportive of such contracts on a large scale. Smart refers to the digitization of contracts where terms and conditions are encoded onto the block chain such that every transaction is recorded onto the block creating an unalterable and non-erasable trail. Hence this makes it incredibly difficult for any party to alter the terms.

The contract is self-enforcing, as both parties have to fulfil all the criteria of the contract until the end. Since it is computer coded, smart contracts are easily adapted to if-then situations such as insurance and financial services sector, leaving no space for ambiguity and uncertainty. The contract itself is self-executory, and any modifications to the contract would mean re-drafting the entire contract from scratch. The means of the contract must not override the actual content of the contract, be it traditional or smart contracts the basic ingredients remain the same. Smart contracts pose a number of problems such as the authentication of contracts with a single electronic signature or the validity of such contracts to solve legal disputes.

Most of India's laws are reactionary; they are formulated post an event or an accident taking place rather than being precautionary. In India, the Information Technology Act, 2000 (IT Act) has placed restrictions regarding how a digital signature can be obtained, and from whom, currently, only the government has the authority to issue such signatures. This, however, works against the principle on which block chain is built where the hash and cryptographic keys are generated mathematically through the block chain itself. This would pose a huge number of challenges to apply block chain at such a large scale. There are always ambiguities when it comes to bridging the gap between law and technology, The Indian Evidence Act, 1872 states that the admissibility of a digital signature generated via the block chain may not be valid as it wouldn't be attained under the IT Act. Hence this would serve as a disadvantage of implementing smart contracts currently. A similar case was seen when e-mails were first introduced in mainstream communication, but now emails are legally accepted as per cyberlaw. The law takes time to comprehend such technologies and create appropriate regulatory frameworks (Rishi, 2017).

5. Conclusion

Private and public sector organizations have many challenges to overcome in synchronizing and aligning their digital transformation efforts to enable the network effects to take hold. India's policymakers, civil society leaders, senior business leaders, and entrepreneurs are building strong clusters to help the country be the leader of the next era of the Internet as a platform that helps transform human affairs for the benefit of the citizens. Executives can contribute to the digital ecosystem by creating open and collaborative cultures where knowledge and innovation are shared with the industry for the benefit of the masses and, more so, to establish quality and communication standards. They also can contribute by staying open to change, embracing digital adoption and transformation within their management models and infrastructure.

It is time for institutions to rethink their processes and governance structures to become more agile and innovative players. The success of a harmonious digital identity ecosystem relies on staying ahead of the organization's digital curve. As a first step to provide better quality in the provision of public services, Secure Key Technologies' blockchain-based ecosystem (securekey.com) allows multiple partners to strengthen authentication and provide identity attribute validation, as a fabric of trust and as a solid foundation to embrace a new digital era. Secure Key Technologies' vision for the future of digital identities redefines the ways both consumers and businesses approach identity verification and the sharing of key personal information.

The challenges identified in the education system be it the difficulty in authenticating Certifications and Documents, tracking Intellectual Property and in Accessibility can be better managed through block chain implementation.

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