

Digital Economy and the Role of Information Technology

Meenu Gupta

Company Secretary, Noida, Uttar Pradesh, India.
Email: guptameenu90@gmail.com

Abstract: As mankind has progressed from the Stone Age to Metal Age to the Information Age that we are living in today, there has been continuous progress, making our lives simpler day by day. However, the newest revolution to hit anthropological progression is digitization. This phenomenon has transformed all over lives and catapulted it into the Digital Age. To realize the objective of making India a 'Digital India', the PM Narendra Modi announced a demonetization drive to clean the system and weed out corruption and black money effecting a strong growth in digital payments and transactions and resulting in emergence of digital currencies and digital payment mechanism. However, insights into users' personal information including debit, credit card details, passwords and its illegal use by hackers with a surge in digital transactions are most critical risks necessitating adequate internet security measures to control cybercrimes. The paper aims to analyse the role of information technology in this digital era.

Keywords: Bitcoins, Cybercrime, Digitization.

I. INTRODUCTION

Digital Technologies, as can be evident from the experience of leading countries, is beneficial for businesses, people and governments in creating economic and social benefits and generating opportunities for sustainable growth and development of economy as a whole. In this fast developing technological environment, internet affordability and availability, mobile communication, is what people are dependent on to share information, dealing in transactions with governments and businesses, delivering goods and services, doing businesses. Reports are evident of generating increased opportunities, enhanced quality of service delivered, and thereby the boost in overall growth. The best practices have shown that the more efficient usage of digital technology will drive the economy, growth and jobs. It is therefore important for countries to undertake structured efforts to create and harness the benefits of digital economy in order to realize greater job creation, increasing country competitiveness, allow for greater diversification and catalyse innovations in service delivery to improve the levels of their citizens.

II. CONCEPT OF DIGITAL ECONOMY AND ITS CONTRIBUTION TO INDIAN ECONOMY

The concept of digital economy can be traced to its multifaceted, dynamic nature and the transformational power of digital technology. According to OECD, 'Digital economy is an umbrella term used to describe markets that focus on digital technology'. It enables and executes the trade of goods and services through electronic commerce on the internet. It is not only about e-commerce and e-business but involves conducting businesses, providing services across multiple sectors, be it transport, education, agriculture, healthcare, entertainment, media, retail through digital technology. It is a key driver to ensuring enhanced productivity of industries, facilitating in emergence of new markets and industries, achieving sustainable growth, and accelerating the development of global economy.

The global digital economy is experiencing high growth, rapid innovation and broad application to other economic sectors. An Accenture study estimates that digital transformation of top 10 economies of world is a \$1.36 trillion opportunities waiting to be unlocked by governments and business leaders. According to BSG, it will reach \$4.2 trillion in G-20 economies by 2016 and 'already contributes upto 8% of GDP, powering growth and creating jobs. In addition, other 75% of value added created by internet is in traditional industries, due to higher productivity gains.

Digitisation has provided the solution for storage requirement of articles like books, music, film and newspaper. Libraries filled with archives of newspapers, books and music cassettes would occupy vast amounts of space and labour for maintenance and recovery. However, digital libraries have been a godsend in such situations. With prints of old film and newspapers being digitized, they can be stored in compact forms. In addition to savings in terms of storage space, there is also the advantage of having ease in recovery of such items as they can be looked up on a central database and obtained within seconds. Also, resources which would otherwise have been used in maintaining these records can now be employed elsewhere.

The financial sectors will experience the new competitive entrants into the market while also facilitating emergence

of new revenue models for intangibles, with the sudden and tremendous shift to digital money and also facilitating in the development of new products and services. McKinsey in a report on how digital finances boost growth in emerging economies released in September, 2016 details 'benefits' and states that the rise of digital payments, by minimizing the informal and black economy, will enhance the government revenue; and over the longer term, can develop e-commerce and on-demand services, but digital payments can unleash more rapid growth, given their greater convenience, in turn, e-commerce can unlock consumers spending.

As technologies continue to develop rapidly, so does their user-friendliness. Gadgets these days are easy to handle and use superior technology and software at lower costs. Thus, a digital economy is efficient, cost effective as well as convenient.

III. EVOLUTION OF DIGITAL ECONOMY

The term 'Digital Economy' was coined by Don Tapscott in his best-seller 'The Digital Economy: Promise and Peril in the Age of Networked Intelligence (1995). The book was one of the first which described how Internet based information technology will change the way we perform the business, a form of economy that is functioning on digital computing technology. It is firmly realized that the developed economies are already embracing digital technology due to its visible impact on world economy. These economies are also aware that we are at the dawn of fourth industrial revolution, which will string up digital, biological and physical technologies in innovative and strong communications.

Three components for digital economy as per Thomas Mesenbourg (2001) are as follows:

- E-Business Infrastructure: Economic infrastructure to facilitate e-business processes and conduct e-commerce that includes hardware, software, telecommunications networks, human capital for use in e-business.
- E-Business: A process conducted over computer-mediated networks by a business org.
- E-Commerce: It is transferring goods and services between the buyer and seller online.

To analyse and measure the digital depth of various countries, the World Economic Forum has prepared a Networked Readiness Index, a crucial barometer for determining how countries are performing in digital world. It quantifies how well an economy is using information and communication technology to enhance competitiveness and well-being. As per the ranking conducted by World Economic Forum, 2016, Singapore has been at the top ranking and is deriving best benefits of information technology and is making exemplary usage of digital technology in delivering basic and government services also ensures that its institutions are smoothly connected. The other nine countries including Finland, Sweden, Norway, US, Netherlands, Switzerland, UK, Luxembourg, Japan also have fine access to

advance technology making their venture capital and business network highly connected. These countries have an extremely favourable business and innovative atmosphere which has created one of most buoyant and digitized economic centers in world.

IV. INDIAN SCENARIO FOR DIGITAL ECONOMY

India is now on the cusp of a massive digital revolution and to realize the objective of making India 'Digital Society' and a 'Knowledge Economy', PM Modi envisioned the scheme of 'Digital India' so as to transform the entire concept of governance by making it more transparent and accessible to the citizens. The Digital India initiative is being implemented by Department of Electronics and Information Technology (DeitY), along with other ministries such as Ministry of Communications and Information Technology, Ministry of Rural Development, Ministry of Health, etc. Further, on 8th November, 2016, the government announced demonetization of high currency notes followed by extensive campaign on digital payments and less-cash economy.

India has launched its ambitious project 'Digital India' with a mission 'Digital infrastructure as a utility to every citizen, governance and services on demand and empowerment of citizen'. Precisely, the Govt of India has launched the Digital India programme as a flagship programme to transform India into a digitally empowered society and knowledge economy with key objectives of providing e-learning, health and e-governance services. The Digital India aims on providing e-learning, health, e-governance services as its fundamental objectives. Detailed roadmap portrays "public internet in 2.5 lakh villages by March, 2017 and broadband to all by March, 2017". In a nutshell, Digital India is to empower common people using broadband by delivering e-governance, education and health facilities to them even in remote areas. It aims to bridge the gap between haves and have-nots and also between rural and urban areas commonly known as 'urban and rural digital divide'.

At the time of publication of Networked Readiness Index 2016, India did not make any remarkable progress. The World Economic Forum observed that India slipped down two positions to an overall rank of 91 due to the fact that other countries are moving at higher speeds compared to India. Adding to this is the inadequate infrastructure and the lack of skills among the population that remained a key obstacle to ICT adoption, i.e., illiteracy rate has been a third of population, internet access has been a privilege to only 15 out of 10 households and only 5.5 mobile broadband subscriptions for every 100 people can be seen. This picture is in spite of the fact that affordability has long been one of the strengths of Indian ICT ecosystem, with the country ranking 8th in the year 2016 in that area. A deep divide persists between well-connected metropolitan hubs and remote areas, where even the most basic infrastructure is insufficient. The Digital India programme launched in 2015 aims to close this gap through fostering investment in digital infrastructure,

improving digital literacy, and increasingly providing online services to citizens. India's performance in terms of providing online services and allowing e-participation has so far been in line with that of peer countries, but far from global best.

However, the above comment of World Economic Forum was made in the year 2016 and after which India had witnessed two revolutionary turning points first was launch of Jio Telecom services and second was demonetization. Demonetisation led cash crunch in economy and common people started making digital transactions and thus involved themselves in the digital economy on massive scale but subsequent remonetisation again reduced the quantum of digital transactions. During the period of demonetization, the value of AEPS digital transactions, as per NPCI, has shot up from Rs. 1.9 billion to Rs. 12 billion by May, 2017 (a growth of 532%).

According to a Report, of India's 1.2 billion population, an estimated 485 million in urban and 180 million in rural areas, as of June, 2017, are using the Internet and further among them, it has 410-420 million mobile internet users with 245-250 million

in urban and 165-170 million in rural areas. This was due to demonetization drive announced on 8th November, 2016 that led to cash crunch in the economy and common people started making digital transactions and this involved themselves in digital economy on massive scale but subsequent remonetization again reduced the quantum of digital transactions. Digital payments rose 55% in 2016-17 against a 28% growth during a five-year period ending the year 2016. According to RBI data, debit card usage at point of sale more than doubled to 400 million-plus transactions at the height of cash crunch in December from 140 million in October, reduced in February to 250 million and has stabilized around 268 million in April. RuPay card transactions have grown 316% at 16 lakh from 3.85 lakh on 8th November, while the value has been up 503% at Rs. 236 cr from Rs. 39 cr in November. Similarly, with more than 10 billion subscribers of Jio Telecom Services and competitive measures of other Telecom Service operators now a large part of Indian Population is using internet enabled services like digital payments, e-commerce, e-learning, tele-medicine and e-governance, etc.

TABLE I: GROWTH IN DIGITAL TRANSACTIONS POST DEMONETISATION

	2017			2016		
	January	February	March	January	February	March
<i>Volume of Transactions (in Rs. Million)</i>						
Debit Cards	1040.97	944.32	981.28	817.51	796.69	844.59
IMPS	62.42	59.75	67.41	22.48	23.86	25.98
PPIs	295.8	280.02	342.09	65.25	65.37	72
<i>Value of Transactions (in Rs. Billion)</i>						
Debit Cards	2006.48	2286.82	2616.46	2327.99	2259.57	2342.82
IMPS	491.25	482.21	564.68	165.59	169.67	198.73
PPIs	110.01	96.28	106.77	49.09	49.98	59.72

Source: RBI

As of 31st March, 2017, only 17,000 village panchayats could be provided with broadband connectivity as against a target of 2.5 lakh village panchayats. It obviously proves that there is still lack of broadband connectivity in rural areas. However, the data clearly shows that India has made progress in digital inclusion.

V. ADVENT OF DIGITAL CURRENCIES AND PAYMENT WALLETS

Digital economy is much more about conducting online transactions, from economic innovations to transforming how the business is done to allowing entry of new digital currencies and payment processes.

Blockchain Technology: Blockchain is a protocol for exchanging value over the internet without an intermediary, such as a central bank. It is the technology that allows for secure management of a public ledger or database (also referred to as a 'dis-

tributed ledger'), where transactions are verified and securely stored on a network without a physical governing central authority. Blockchain technology is the backbone that supports crypto currencies such as Bitcoins.

In a marked difference from the prevailing systems of exchange of value, where two or more parties need to agree on the value and other commercial considerations for a transaction to happen, Blockchain allows for transactions within a closed group underpinned by a crypto currency. Blockchain offers the storage of records of transaction data through distributed networks. It retains the full history of transactions, which makes them verifiable and independently auditable. It also enables peer-to-peer transfer of value, potentially eliminating the need for intermediaries. In addition, event triggered programmable contracts, also known as smart contracts, can be stored and executed on Blockchain.

There are several intrinsic features of a Blockchain that lend it its power and allows it to record and transfer value over the internet in a peer-to-peer manner:

- *Settlement of Transactions:* It ensures reduced risk through real time settlement of recorded transactions.
- *No Intermediary:* It enables two parties to directly deal with each other, denying any involvement of third party, as blockchain is based on cryptographic proof.
- *Distributed Ledger:* The peer-to-peer distributed network records a public history of transactions, making Blockchain distributed and highly available.
- *Irreversibility:* It ensures that overspending, manipulation and fraud in deal transactions can be avoided with the fixed recording of every transaction that cannot be changed unless the entire chain is altered.
- *Censorship Resistant:* Crypto economics ensures that Blockchain continues pumping out new blocks and that blocks are not being reverted or altered.

The Gartner hype cycle puts Blockchain technology just below the peak of expectations, which means that experts still see another 18-24 months before this technology becomes main stream. Most industry experts and pundits concur, but would rather see it moving quickly beyond Proof Of Concepts (POCs) into production sooner rather than later. While significant investments have already been made into the Blockchain ecosystem, a lot still needs to be seen. Several companies have done POCs globally, with financial services industry leading the way. The leading global banks have been actively working together in the Global Blockchain consortium R3, which is a consortium partnership of over 80 of leading financial institutions and regulators led by R3, a distributed ledger technology firm. There are several use cases around global money movements (payments and remittances), trade finance, digital identity, smart contracts, and several others that have been established and leading firms are investigating into.

VI. BITCOIN

Bitcoin is classified as one of the first digital currencies, or cryptocurrencies. They are manufactured using software, by solving complex mathematical problems and cryptology having market values. By solving one such problem nearly 12-and-a-half bitcoins are generated. Its origin can be traced back to 2009 when an unknown group of codes (under the pseudonym of 'Satoshi Nakamoto') introduced Bitcoin to the world as a peer-to-peer ('P2P') open source software that operates to create and maintain a distributed public ledger. Bitcoin is based on underlying 'blockchain technology' which is analogous to a database that maintains the record of all changes made to it since its creation through mutual consensus of its users. This blockchain keeps growing as newly completed blocks, i.e. transactions are added. The blocks are linked to each other like a chain, in a proper linear, chronological order with every block containing a hash of previous block. The blockchain is decentralized and is maintained by a network of computers referred to as "miners" who solve complex computationally intensive exercises for financial reward as part of verifying

amendments to ledger and maintaining the network. The main characteristics of bitcoin are:

- *Decentralisation:* Unlike traditional currency, there is no central authority to regulate its supply or manipulate its value. The value of Bitcoin fluctuates primarily due to its fiat market value.
- *Cryptographic Architecture:* Bitcoin transactions are validated on a P2P basis in a decentralized manner.
- *No Third Party:* Unlike earlier version of digital currencies, Bitcoin do not need the trusted third party to validate transactions.

Dealing in bitcoin is so secure that sender's and receiver's identity is not disclosed while only exchange of money is visible, hence minimizing the scope of hacking the system. This type of anonymity with its strong cryptological security is ensured by those dealing with bitcoins.

Bitcoin has become much popular only after the Prime Minister Narendra Modi launched the demonetization and that its price reached \$102018 sometime after the demonetization announcement on 8th November, 2016 which was \$757, and between \$866 and \$896 in the early days of demonetization. The bitcoin was valued at around \$770 in US the same day. On 27th May, 2017, the market price of bitcoin in India reached \$2096.68. There has been a clear surge in bitcoin transactions after demonetization. The digital economy was well be the future. Transactions through bitcoins have been legalized in US, EU, Japan and Singapore, but there is enough effort being made to control the bitcoin economy. In this context, there is no law yet in India.

VII. DIGITAL WALLET

A digital wallet refers to an electronic device that allows an individual to make electronic transactions. For instance, using computer to buy items online or purchasing products or receiving services using a smartphone. The buyers' information can be passed to a merchant's terminal via Near Field Communication (NFC). It has a unique feature of not only performing basic financial transactions but also to authenticate holder's credentials, that is to say, it also verifies the buyer's age while he purchases alcohol. The system has already gained popularity in Japan, where digital wallets are known as "wallet mobiles".

VIII. OPPORTUNITIES FOR INDIA IN DIGITAL ECONOMY

Digital Revolution, regarded as the third industrial revolution, also known as the 'The Internet Economy' or Internet of Everything (IoE), is expected to generate new market growth opportunities, jobs and become the biggest business opportunity of mankind in the next 30-40 years. Goldman Sachs predicts that India comprising 15% of world population, with a growth rate of 7 to 8%, could be the second largest economy by 2030.

Cisco estimates that all IoE pillars-Internet of Things, Internet of people, Internet of data, and Internet of Process for India have a Value at Stake (VAS) of Rs. 31.880 trillion (about half a trillion U.S. dollars) for the next ten years. From that Rs. 7.263 trillion is in the public sector and Rs. 24.616 trillion is in private sector during the next decade. Prime benefits of India's public sector are increased revenue; reduced costs; higher employee productivity; improved safety and security; improved environment; enhanced citizen experience, and better health and well-being.

Digital economy's potential has also been acknowledged by India and have witnessed substantial investment in public and private sectors for digitalization. It has also gained value in view of commitment of Indian government to spend Rs. 1.13T (US\$19 billion) within the next five years. Nearly 40% of global value at stake will have new winners and vendors in the next decade. This major opportunity of digital economy could prove to be a key driver changing the lives of millions of Indian people and provide the opportunity for India to dramatically expand its role and influence in global economy and become a powerhouse of digital innovation.

Although it has been sufficiently stated that digital economy is a well established concept in our minds and world, it is also a phenomenon of the future. In other words, there is still a lot of scope for digital technologies to evolve and break their own records. Although some parts of the world are heavily ensconced in their digital lives, there are still others who are struggling to see the light as far as digital technologies are concerned. The ascent of this digital economy has not been evenly spread across the globe. Such large dissensions in the outreach of a digital economy need to be addressed. Efforts are being made to make digital technologies and gadgets more accessible to the multitudes still unaware of this technological revolution. For instance, India recently developed the world's cheapest tablet computer which was sold to students at subsidized rates of \$35.

India seems ready for transition to digital economy and McKinsey identified three conditions, i.e. widespread mobile connectivity and ownership; a national digital-payment infrastructure and a well-disseminated personal ID system with chips or biometric identification for India to ensure a smooth digital transition. The neo-liberal economic policies since the last decade have already fulfilled all these measures, with the latest addition of Aadhar Card. Now the stage is well set for the next step-digitisation of economy.

Embracing Digital technologies will have the potential to ensuring benefits in areas of broadband expansion, electronics manufacturing and e-governance. Digital India programme, as envisaged by govt, will assist the India in overcoming challenges, seizing opportunities and providing citizens with access to better infrastructure and quality of life. India has the tremendous opportunity to align with the govt's Digital India initiative that can transform the life experiences of 1.2 billion Indians.

IX. BARRIERS / CHALLENGES IN ACHIEVING DIGITAL ECONOMY

There are four major barriers in achieving digital economy viz, technical illiteracy, security threats, non-confidence of users and infrastructure. These barriers are hampering the adoption of digital economy individually and supporting to each other also. Digital economy is prone to breach of security system. In the month of September, 2016, India has experienced 3.2 million debit cards compromised. The probe by NPCI (National Payments Corporation of India) found a malware-induced security breach in the systems of Hitachi Payment Services, which provide ATMs, point of sale and other services in India. The investigation alleged that the security breach occurred in ATMs of a particular private bank. This incidence has lost faith of common people in Digital Economy and refrained them from adopting digital economy. Although security breach is not frequent and often happens due to subscriber's negligent behavior traceable to technical illiteracy, security threats, non-confidence of users and infrastructure which are supportive to each other.

Technological illiteracy leads to omission and non-observance of cautionary measures which renders security system vulnerable. Breach of Security system always erodes the faith of users on digital environment. Then new devices and software will be invented to ensure security and to gain the faith of common people on digital system. These new inventions make existing infrastructure obsolete and creates the infrastructure inadequacies. Also new infrastructure requires know-how to operate and thus leads to technological illiteracy.

The risks creating barriers to digital economy are enumerated below:

- *Cyber Security:* The increasing economy digitization has led to growing cyber security risks. Cyber security aspects being too sensitive to be handled by private sector, had to be considered across the digital economy spectrum to have a secure and trusted environment to attracting investors and conducive to growing businesses. Cyber risk insurance can assist in the context where there exist opportunities for PPPs in reinsurance of cyber risks.
- *Disruptions in Labor Markets:* While Digital Economy has the potential to raise new employment opportunities through its ability to connect and deliver quickly, poses threats to traditional types of employment and job security we are experiencing today. WDR2016 on digital dividends enumerates the risks associated with the rapid labor market reforms and destruction of traditional jobs; changes in nature of work with the internet enabled jobs such as micro work or jobs in on-demand economy; and the risk of widening income inequality. There is a need to rethink strategies by governments to address the widespread technology risks.

- *Social and Economic Inequities:* Though the benefits of digital economy cannot be denied, it is equally exacerbating existing social and economic inequities. If we review the McKinsey report, digital access is a privilege to only 40% of the globe. The disproportionately rural, low income, illiterate, elderly and female are those in 75% of offline population concentrated in 20 countries. There are only 25 in every 100 households having access to internet and only 5.5 mobile broadband connections for every 100 people. The digital economy benefits can be fully unveiled only when universal access will be provided to all.

Embracing digital technology should not only be limited to accessibility but should also ensure degree and quality of participation for those having privilege to internet. Among users of internet, women consist of 29% of population while the remaining 71% is men as per Boston Consulting Group. Further, if we should to address issue of underrepresentation of women in political conversations, universal and affordable access of internet to all is the need. Though the private sector will be able to provide backhaul infrastructure for digital connectivity, Government has the compulsory role to promoting structural solutions including dismantling the monopoly control over international gateways, liberalising domestic markets for building and operating physical infrastructure networks, and creating robust regulatory frameworks that check for policy capture by private sector monopolies. Commercial solutions such as Facebook's Internet.Org can provide affordable access, but with a high cost to net neutrality; whether Google's Project Loon that uses Wi-Fi balloons will impose the same kind of restrictions is yet to be seen. Further, privacy and security issues should also be taken care of while ensuring digital accessibility.

X. CONCLUSION

Digital Economy is characterized by digitization of many products and services and by the use of internet and other

networks to support economic activities. Such computerization changes the manner in which business is done and considerably improves economic activities and competition. India's status as a digital economy is at a nascent stage and will involve and innovate drastically in the coming years, especially with the increase in convergence of sectors such as financial services, telecom, information technology, etc and will call for technology to reach the bottom of the pyramid.

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