Digital Super Divide: Humanity on the Crossroad

K. K. Minocha, FIETE

Anusandhan Apartment, Plot 22, Sector 6, Dwarka, New Delhi 110075 India

kkminocha@gmail.com

Abstract -- **In fast expanding digital era accelerated by frontier technologies like AI, Block chain, AR/VR, Robotics etc raise high hopes and hype. Perhaps only connected half the world populations can benefit and other unconnected half is denied. Proponents of digital ICTs and broadband tirelessly continue to speak and focus only on socio economic benefits for nations, nudging the governments to drive forward digital agenda. It is time to pause and reflect. The use of smart technology is a critical part of our evolution, but it needs to achieve mass relevance, as 30 years of global internet experience reveals. Nations find themselves on the cross roads of digital highways. Various kinds of divides always existed ever since humanity.**

But super divide - DIGITAL DIVIDE is much more frightening as it is increasing everyday very fast at exponential rate due to fast expanding technologies with rate of growth being far too greater than rate of technological diffusion and adoption amongst masses. Damaging power of digital divide is becoming too forceful to ignore. Simultaneously, owing to excessive digital consumption several damaging unintended consequences have arisen. Digital era has created new complexities/ dimensions for both heavy consumers and non consumers which merit serious attention and holistic look.

Article proposes two urgent studies to focus on damaging effects and assessment of digital era while proponents can continue focus on benefits of ICTs.

Keywords: Digital divide, ICT, World wide web, Digital transformation, Teledensity, Sustainable development goals, Urban-rural divide, PURA, E-Indexes, Digital Evolution index, Digital taxation, Usage asymmetry, Digital citizen, Digital wisdom

I. INTRODUCTION

TODAY most aspects of our lives are technology-oriented. In the digital age, information is always at our finger tips. Every day we communicate with mobile devices, use GPS to get directions, and socially interact on Face book and Twitter. The way we make decisions is getting more sophisticated because of digital technologies. Truth is about half the world's people access and use the Internet. The other half do not.

Plethora of digital jargons-Offshoots of digital era
One often hears a plethora of jargons in world of Digital technologies *viz.* digital life, digital communication, digital cities, digital government, digital divide, digital identity, digital signatures, digital libraries, digital money, digital companies, digital marketing, digital space, digital detox, digital death, digital erosion, digital fasting, digital habits, digital law, digital privacy, digital culture, digital skills, digital fluency digital foot prints, digital university, digital education, digital citizenship, digital games, digital fakes, digital natives, digital immigrants, digital citizens, digital Etiquette or Netiquette, digital Rights and Responsibilities, digital transformation, digital empowerment, digital Health and Wellness, digital Security and Protection digital planet, digital wisdom, etc. constitute various aspects of digital ecosystem and each jargon carries deep message issues for society.

The list seems ever growing as new technologies frequently evolve in digital space creating a expanding digital universe.

This digital ecosystem impacts individuals citizens, public, institutions, business and governments as users as well as non users as stakeholders.

Frontier technologies like AI, Block chain, AR/VR, Robotics etc raise high hopes and hype which perhaps only connected half the world populations can benefit and other unconnected half is denied. Digital universe is uneven.

The article discusses some of above aspects of Digital era along with contradictions digital phenomena brings in with Good, Bad & Ugly aspects and its unintended consequences.

The Digital Era: 30 years after the invention of the internet, only half of the world is connected. Internet is open conduit, it is capable of transmitting anything that can be put into digital form. It matters because of its three important characteristics *viz*. Its Global span or reach, its ability to converge everything & ability to drive innovation. By the end of 2018, half of the world's population was connected to the internet - roughly 30 years after the invention of the World Wide Web, other half often struggling to secure access.

Is this a cause for celebration or introspection? Thought contradiction of Digital modernity! Half the planet largely at bottom of pyramid who struggle with basic needs for survival (Maslow's need Hierarchy: Food, clothes and shelter) are unconnected. The use of smart technology is a critical part of our evolution, but it needs to achieve mass relevance.

Above asymmetry is cause for concern. The quotes in following paragraphs capture the essence of concern:

Observations of WWW inventor on March 12, 2019 when Internet turned 30 years old . To mark 30 years of Internet World Wide Web (www) service, its inventor Tim Berners Lee, delivered a key note speech at an event "Web@30"at the CERN said "The web is not the web we wanted in every respect."

He observed: "Web opened the way to a technological revolution that has transformed the way people buy goods, share ideas, get information and much more. It's also become a place where tech titans scoop up personal data, rival governments spy and seek to scuttle elections, and hate speech and vitriol have thrived -- taking the Web far from its roots as a space for progress-oriented minds to collaborate".

Other authors and countries based on experience too have amplified these concerns as below during early stages of internet growth:

"The empowerment of global citizenry through Information and Communication Technologies (ICTs) has drawn ample attention among development planners since the 1990s. Proponents of rural and community empowerment are encouraging governments in the developing world to take ICT initiatives, suggesting that the investment in ICTs will enable those countries to bypass more gradual development processes in order to engage their citizens on par with the developed world (Dey *et al*, 2010; Harris, 2016; Takio, 2013). But this notion is flawed for three key reasons. Firstly, it over emphasises the role of technology through simplifying the social, political and economic parameters of development. Secondly, it overlooks the needs, abilities and cultural context within which those technologies were originally introduced and interrelated; third: the importance of the political, social and economic context within which those technologies are now being applied (Mansell, 2014; Thomas, 2012)."

Besides global concerns on empowerment of citizens by ICTs similar concerns have arisen about small business as is clear from experience of OECD countries: "Information and communication technology (ICT) connectivity (PCs and Internet) is very widespread in businesses of all sizes. As is the case with all technologies, small businesses are slower than large ones to adopt new ICTs. Potential small business benefits and firm and sector-specific strategies drive the adoption and use of ICTs. Furthermore, sectors are increasingly global and dominated by large firms and the structure of their values chains and operations shape opportunities for small and medium size enterprises (SMEs). Principal reasons for non-adoption are lack of applicability and little incentive to change business models when returns are unclear.

SMEs also face generic barriers to adoption including trust and transaction security and IPR concerns, and challenges in areas of management skills, technological capabilities, productivity and competitiveness. The issues for governments are to foster appropriate business environments for e-business and ICT uptake (*e.g.* to diffuse broadband, enhance competition), and target programmes to overcome market failures to the extent that they are needed in particular areas (*e.g.* skill formation, specialised information). Governments have a range of SME e-business and Internet use programmes. However commercial considerations and potential returns are the principal drivers of small business adoption and profitable use." (OECD Report ICT, E-Business and Small and Medium Enterprises 2004). Above clearly shows thought Contradiction of Digital Modernity.

The Digital Transformation is a Double-edge sword-Good and bad Impacts. Digital transformation impacts society at several levels. On the production side of the economy, digital transformation enables the automation of business operations, yielding operational efficiencies, such as reduction of transaction costs, with an impact on productivity.

Similarly, digital transformation provides new business opportunities, impacting employment and entrepreneurship. Regarding the delivery of public services, digital transformation enhances the provision of health and education, while improving the way citizens interact with their governments. Finally, digital transformation has an impact on human relationships and individual behaviour, facilitating social inclusion and communication. It may also be noted, however, that digital transformation could also result in potential negative effects, such as workforce disruption, the disappearance of companies, cybercrime and social anomie.

For proponents of digital technologies it is worth taking note that in order to reap benefits of digital era society has to prepare and nurture all the stake holders to create balanced digital ecosystem otherwise half baked efforts are fraught with danger.

II. THREE WAVES

Digitisation refers to the transformations triggered by the massive adoption of digital technologies that generate, process, share and transfer information. Digital transformation is not a one-time event but proceeds in waves driven by technological progress and diffusion of innovations in same way as earlier waves of technological change, such as the steam engine, railroads, telegraph and automobiles that transformed society.

The first wave: (Adoption of Telecommunications and automated data processing): It comprised of introduction and adoption of what today are considered "mature" technologies. Examples include: Management information systems aimed

at automating data processing and applied to monitoring and reporting of business performance, Telecommunications technologies such as broadband (fixed and mobile) and voice telecommunications (fixed and mobile) which enable the remote access of information.

The Second wave (Diffusion of internet): It entailed the diffusion of the Internet and its corresponding platforms (search engines, marketplaces),which enable the networking of enterprises to consumers and enterprises among themselves for purchasing of supplies, and distribution of output.

The Third wave -Advance ICTs (*Rides on first and second wave*): It comprises of adoption of wide range of advanced technologies, such as big data/analytics, Internet of Things, robotics, sensors, and artificial intelligence, and is aimed at enhancing information processing and the quality of decision making, while further automating routine tasks within business enterprises and governments. These technologies are not typically adopted in a stand-alone fashion but are integrated with the mature technologies characteristic of the first and second waves. Diagram below captures these waves.
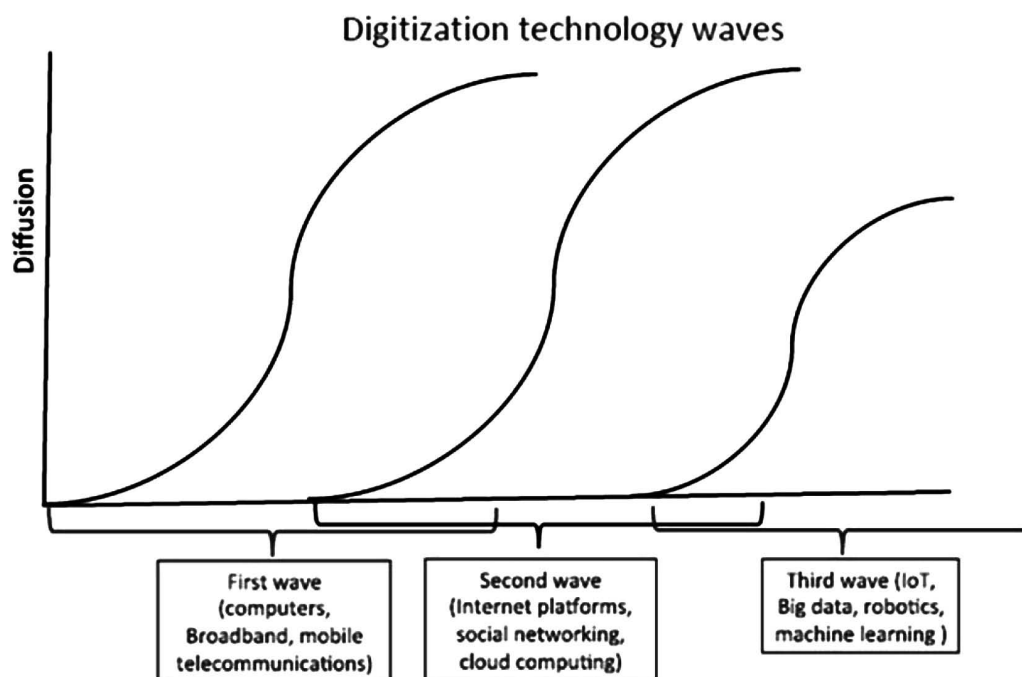
Today AI holds biggest potential to benefit society and simultaneously multiply (fast forward) prevailing digital divide.

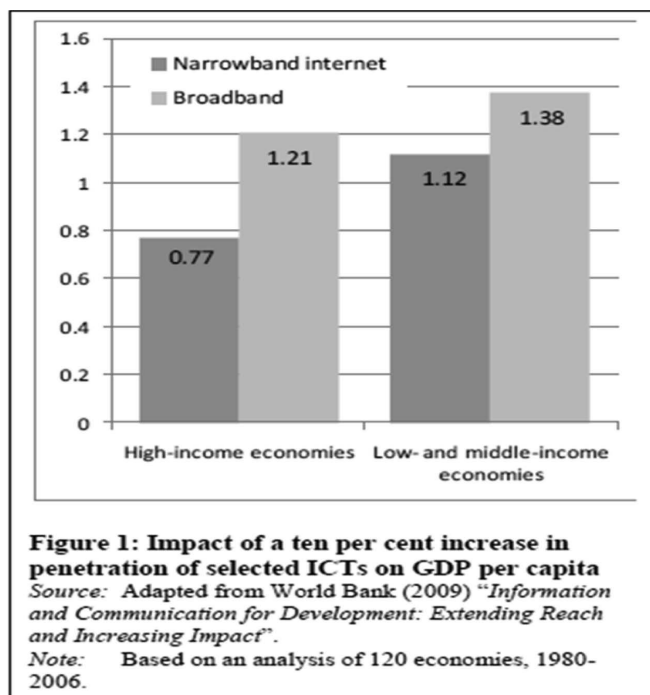## III. RELEVANCE OF BROADBAND PENETRATION TO ECONOMIC GROWTH

Broadband is a key driver of economic growth and the competitiveness of nations. Broadband is a General Purpose Technology having a major impact on the way in which we live and work. As per often quoted World Bank research, *viz.* the '*Information and Communication for Development 2009*' suggests that the impact of broadband to economic growth is indeed substantial, much more profound than comparable narrowband or voice-based ICTs, providing a boost of 1.38 % points on GDP growth in developing countries for every 10% points increase in broadband penetration.

*Global importance attributed to power of ICTs and Digital technologies in achieving MDGs and SDGs:*In the year 2000 serious use of ICTs has been emphasised by United Nations to meet Eight MDGs (Millennium Development Goals) to be achieved by 2015. MDGs, approved by UN represent the first global development effort to provide a better future for the millions of poor citizens, with clear goals and a time frame. Four of the MDG goals pertain to health and nutrition; they are: eradication of extreme poverty and hunger; reducing child mortality, improving maternal health, and combating HIV/ AIDS, malaria and tuberculosis. Use of ICTs are part of MDG and have an impact on other MDGs.

Target 18 of MDG goal 8 mentions the following: In cooperation with the private sector, make available the benefits of new

Source: SOCIAL AND ECONOMIC IMPACT of digital transformation on the Economy - ITU

Figure 1: Impact of a ten per cent increase in penetration of selected ICTs on GDP per capita
Source: Adapted from World Bank (2009) *"Information and Communication for Development: Extending Reach and Increasing Impact".*
Note: Based on an analysis of 120 economies, 1980-2006.

Source: World Bank

technologies, especially information and communications technologies.

Table 1 below shows some examples as to how ICT can assist in achieving other MDGs.

TABLE 1 -- HOW ICTs CAN HELP ACHIEVE THE MDGs

Goal/Target	Role of ICTs
1. Eradicate extreme poverty and hunger	Increase access to market information and reduce transaction costs for poor farmers and traders
2. Achieve universal primary education	Increase supply of trained teachers through ICT- enhanced distance training
3. Promote gender equality and empower women	Deliver educational and literacy programmes specifically targeted to poor girls and women using appropriate technologies
4.Reduce child mortality 5. Improve maternal health 6. Combat HIV/AIDS, malaria and other diseases.	Increase access of rural care-givers to specialist support and remote diagnosis. Enhance delivery of basic and in-service training for health workers. Increase monitoring and information sharing on disease and famine
7. Ensure environmental sustainability	Remote sensing technologies and communications networks permit more effective monitoring, resource management, mitigation of environmen-tal risks.

Source: TRAI National Broadband plan 2010

To quote from Millennium Development Goals report, 2010 (UN MDG website) "a challenge in bringing more people online in developing countries is the limited availability of broadband networks. Many of the most effective development applications of ICT, such as telemedicine, e-commerce, e-banking and e-government, are only available through a high-speed Internet connection. But a significant divide exists between those who enjoy fast access to an online world increasingly rich in multimedia content and those still struggling with slow, shared dial-up links."

In India we have achieved mixed success in meeting MDGs coupled with lack of broadband.

UN's Sustainable Development Goals (SDGs)
Encouraged by the progress with MDGs, UN General Assembly approved the more ambitious SDGs to be achieved by 2030. The progress under the MDGs, the way forward and prospects of achieving SDGs, globally and in India is reviewed by UN.

Under SDG no.9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" and

SDG target 9.c states "Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020".

To achieve SDGs nations must ensure availability of advanced ICTs backed by reliable BB connectivity to every citizen with sense of urgency given fast advances in ICTs.

Various kinds of Divides- Digital divide is not a cause but it is a symptom of other divides. Divides always existed for long ever since existence of humanity. Now it has got conditioned to various types of divides/discriminations *viz*. Gender divide, Racial divide, Economic divide, Geographic divide, Rural urban divide, Information divide, Knowledge divide, Accessibility divide etc means there are significant gaps between 'Haves' and 'Have nots'. In the Digital age latest avatar of divides has been called DIGITAL DIVIDE.

The "digital divide"(DD) refers to the fact that certain parts of the population have substantially *better opportunities to benefit from the new DIGITAL economy* through intensive use of ICTs than other parts of the population which do not have access to ICTs putting them to position of disadvantage and inequality.

DD is any uneven distribution in the access to, use of, or impact of information and communication technologies (ICT) between any number of distinct groups; these groups may be defined based on social, geographical, or geopolitical criteria, or otherwise.

The *divide within* countries may refer to inequalities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels or other demographic categories. The divide between differing countries or regions of the world is referred to as the global digital divide, examining this technological gap between developing and developed countries on an international scale.

DD is *not a cause* but it is a *symptom* of other divides. It is kind of SUPER DIVIDE or Divide of all Divides much more powerful divide than other divides.

III. TRAI INDICATORS AND URBAN-RURAL DIGITAL DIVIDE

Latest statistics on Teledensity Rural and urban and Broadband (BB) speeds 512 Kbps or higher subscriptions released by TRAI are shown in Figures below:
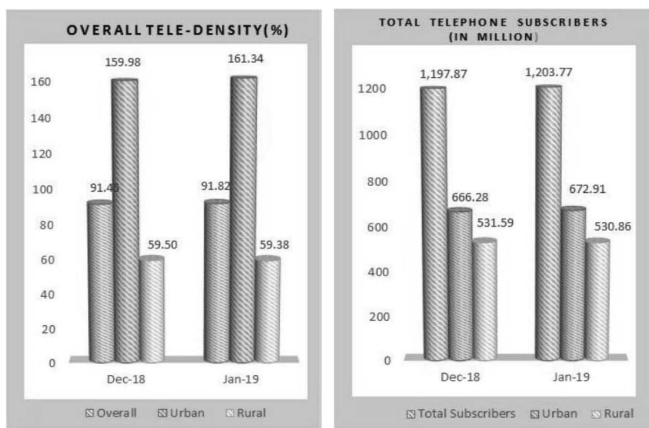
Source TRAI Teledensity indicator Press Release No. 22/2019 dt 20 March 2019

Source: TRAI Broadband (connections down load speed >=512 Kbps

Percentage Teledensity growth during past decade is shown in table below. The urban areas enjoy more than 100% density *i.e.* more than one phone per person for since long time.

Year	Urban teledensity %	Rural teledensity%	Overall teledensity %
2010	122	25	53
2018	161	59	92

Overall Internet penetration due to growing no. of connections may be rising, but the urban-rural digital divide remains a reality in India. Today 512 Kbps is snail speed and no longer eligible to be called BB.

India lives in villages -Digital Divide or Urban rural divide *An unfinished agenda* Though 69 % of Indian population lives in rural areas; reliable high speed broadband facility is limited to metro and major cities. The country's overall teledensity has crossed 90%, however, its irony – more than 40,000 villages still do not have access to basic mobile services *viz.* 2G mobile coverage even today. This remains unfinished agenda for even universal mobile coverage of villages leave aside broadband coverage. Availability of broadband is critical for development of rural areas.

Rural India always takes a backseat. To date, most development theory and practice have focused on either "urban" "rural" issue with little consideration of the fact that needs context, and Ecosystem for rural are different with some areas of intersection between the two.

IV. PURA - *ASPIRATIONS!*

Provision of Urban Amenities to Rural Areas (PURA) is a strategy for rural development in India. This concept was given by former president Dr. A.P.J. Abdul Kalam. To make villages self-sufficient. PURA proposes that urban like infrastructure and services be provided in rural hubs to create economic opportunities outside cities. Physical connectivity by providing roads, electronic connectivity by providing communication networks, and knowledge connectivity by establishing professional and technical institutions will have to be done in an integrated way so that economic connectivity will emanate. PURA programs in several states since 2004, largely remains work in progress leaves much to be desired.

Description of Urban scene - Scene of Digital Abundance-Hyper connected -Over served-Over consumption (Multiple screens-Multiple SIMS per user). Many of us living urban areas enjoy variety of digital services through Broadband internet connectivity so many ways and choices. These include both Wired OFC (FTTH),Cable TV (Fixed) and Wireless 2G, 3G and 4G (Mobility) along with free Wi Fi connectivity at airports, railway stations, smart cities using variety of devices smart phones, smart watches, tablets, lap tops, TV etc and take it for granted. Though we have a choice of multiple connectivity providers TELCOs and Digital Service providers(SPs) called Over The Top services(OTTs).

Despite fierce competition amongst TELCOs some deficiencies in QoS (*e.g.* call drops, poor coverage) prevail in urban areas too. To compensate for such deficiencies we are able to avail services of more than One TELCO because of highly competitive low tariffs using 2 to 3 phones per individual (dual SIM phones) at very prices cheaper than food. Many a times we are also pampered with free services packages for months together.

Frontier technologies like Artificial intelligence, Block chain, cloud technologies etc puts urban always first in advantageous

position. Further we eagerly await much talked about 5G which will provide internet of things (IoT) such as sensors and machines on large scale etc (Industrial Revolution 4.0).

One may also say urban is land of "Haves in abundance". Even brief spells of Digital services implies Pain for digitally conditioned urban (Of course Long outages too). This online abundance is available round the clock (24x7). Many of us heavily consume digital services so much that we feel suffocated due to temporary lack/outage of it even for few minutes be it due to No coverage (Not spots) in running train or basements etc. or when Internet slows down in heavily crowded areas such as malls, cinemas etc.

Pain of long outages of Facebook FB and Instagram felt by users world over: On 13 March 2019 a hash tag started trending on Twitter: #Facebook down. FB a very popular social media site and its sister, Instagram, suffered a serious outage and restored after about 2 days time. Some users weren't able to log into their accounts at all while others were experiencing limited functionality. Impact was wide scale global in nature.

It was the worst disruption to the platform since 2008 when FB user numbers were 150 million - compared to 2.3 billion current users on the social network. Outages for large internet platforms like FB, You Tube are not unusual, but in the past they have typically restored service within an hour or two. During and after the outage, speculation was rife that FB experienced a cyber-attack *viz*. A distributed denial of service (DDoS) attack, where a website is taken offline because an attacker is flooding it with traffic. However FB in response denied this.

FB also earned bad name in year 2018 that has seen it be a victim of several successful hacks and data leaks. Because of heavy dependence Internet outages like this and also Internet shutdowns due to law and order reasons are frowned upon seriously by both individual users and business user community who have impact on their revenues and including FB platform which earns through advertisement.

Several initiatives in action are Digital India, Make in India, Start up India, Skill India, coupled with Aadhar, JAM Trinity, UPI payment platforms also the *Policy incentives* from several State Governments for ICTs urban digital consumption is rising very fast with their daily life depending on internet 24x7 including while on the move. But it has largely remained urban phenomena with little of Rural as BharatNet (Pillar no.1 of Digital India programme) is still work in progress and facing its own operational challenges on rural turf.

Description of Rural scene: Under connected, or poorly connected underserved and some Unconnected, On the contrary these areas lack above facilities because of sparsely located population or remote and difficult geographical areas or poor

affordability of rural areas resulting provision of services uneconomical leading to lack of business case for TSPs. This leads to migration of people to urban areas.

Statistics capture the divide w.r.t. to number of telephone connections and for BB connections position is much worse.

Three Aspects of digital inclusion and digital divide - Digital divide is increasing rampantly everyday-estimating its damaging power-Need for reverse study-Two studies proposed here.

Divide is most researched topic amongst Economists scholars etc. There are 3 aspects of digital inclusion: (1) Access: Availability and Affordability (2) Adoption: Digital literacy (3) Application: Workforce development, Education, Healthcare, Civic engagement.

If above are not addressed they lead to Digital exclusion called divide in society. There are 3 types divides *viz*. (1) Economic Divide (2) Usability Divide (3) Empowerment divide are discussed below:

Economic divide: It is obvious and simplest form of DD is manifested in the fact that some people can't afford to buy a computer or user devices and connectivity. Although world over politicians always talk about this point and use it as tool to attract votes. In developed countries, it is reducing fast but underdeveloped countries will continue to face a challenge including our own for some more time to come. Many commentators view this simplistic way in purely economic terms *i.e.* the first aspect. As per them give people free connectivity and laptops/phones and rest will fall in line. This is wrong assumption. Ensuring technology adoption is an essential condition to achieve outcomes.

However remaining two other types of divide will have much greater impact in the years to come.

Usability Divide: Matter does not end by merely providing connectivity and user devices. Far worse than the economic divide is the fact that even today technology remains so complicated for many people are not able to use a computers and smart devices even when given free. Many others can use computers, but don't achieve the modern world's full benefits because most of the available services are too difficult for them to understand. Cyber security frauds concerns and experiences deter them to use critical online services like banking payment systems etc. Usability divide exists both in developed and underdeveloped countries.

Almost 40% of the population has lower literacy skills, and yet few websites follow the guidelines for writing for low-literacy users. Even government sites that target poorer citizens

are usually written at a level that requires a college degree to comprehend. Lower literacy is the Web's biggest accessibility problem, but hardly any attention is paid to this massive user group. Senior citizens face the second-biggest accessibility problem, but again there is little interest in the guidelines for making websites easier for old users.

V. USAGE ASYMMETRY

Though the economic divide is closing in many parts, perhaps there is little progress on the usability divide. Usability is improving for high-end users. For such user segment, websites and applications like e-commerce, social platforms, payment platforms, Taxi hailing get easier every year, generating vast profits for website owners and OTT providers. That's all great news for high-end users, but the less-skilled 70% or more of users have seen little in the way of usability improvement. We know how to help these users -- but simply not doing it.

Empowerment Divide: Society has knowledge needed to bridge the usability divide, and one hopes in due course that this aspect is closed. The empowerment divide, however, is the hard one: even if computers and the Internet were extraordinarily easy to use, not everybody would make full use of the opportunities that such technology affords.

Participation inequality is one aspect of the empowerment divide that has held constant throughout all the 30 years of Internet growth: in social networks and community systems, about 90% of users don't contribute, 9% contribute sporadically, and a tiny minority of 1% accounts for most active contributions.

Example below illustrate Empowerment divide -Many users don't know even how to use internet search engines.

Research shows that many users don't know how to use search to truly master the Web. People don't understand advanced search features, they rarely employ query reformulation, and many uncritically select the first search results.

Similarly many people are not aware large number of features available in smart phones which could enhance their productivity.

 Relative position of progress amongst above said 3-Divides: In short ultimately, one can be hopeful about the 'economic divide', which is closing rapidly in many countries. However the 'usability divide' will take longer to close, but at least we know how to handle it -- it's simply a matter of will to do so. But about the 'empowerment divide', one gets pessimistic may expect that it will only grow more severe in the future.

Today In developed world the economic divide is a non-issue, but the usability and empowerment divides alienate huge population groups who miss out on the Internet's potential, but in developing world all the three pose a serious challenge.

VI. REASONS WHY DIGITAL DIVIDE EXISTS?

While there is no fixed answer to the question "Why digital divide exits?" answer of why digital divide exists is complex, as it depends on several factors, and many of which cuts across the globe. On the other hand, some issues are very specific to individual country, region or state. Major factors that cause digital divide includes:

Fast changing Technologies: The internet is expanding very quickly, and not all countries--especially developing countries- are able to keep up with the constant changes. Most of the developing countries including India have low Internet penetration, leading to denial of access to many web based information and latest technology.

*Slow diffusion of new technologies:*Another reason of digital divide is economic inequality. The digital divide comes from slow diffusion of new technologies to selective sections in society or countries. Primarily, wealthier peoples and countries carry out these experiments with new technologies because they have disposable income. But over time, these divides closes considerably as the technology becomes less expensive and more tested.

Socio-Economic reasons: Even if there is enough diffusion of technology and access to information and knowledge, not all people can afford to reach the knowledge hub. For example, not all kids are getting as much technical education as others because lower socio-economic areas cannot afford to provide schools with bundles of computers. For this reason, kids are being separated and not receiving the same chance as others to be as successful.

In Multilingual India unique case Language divide challenge: One of the important criteria of digital divide is language barrier. Most of the contents in the web is either written in English or other foreign language, which Indian are not well versed. As a result getting benefit out of these contents are not possible. Diverse country like India with large number of regional languages faces challenge this divide no other country has such intense challenge.

Advanced ICTs widen the divide. Recent phenomena of Big data, Cloud computing, IoT Industry 4.0, Block chain AI (Artificial Intelligence) technologies etc constitute advanced ICTs . AI is increasingly becoming the veiled decision-maker of our times.

Investments in infrastructure for advance ICTs: Harnessing the benefits of advanced ICTs requires appropriate infrastructures, services and skills. Networks will have to support diverse

quality-of-service demands from applications and users while delivering robust and ubiquitous connectivity. This requires the roll-out of wireless Internet of Things platforms, and relying on network virtualization and improved fiber connectivity. Moreover, it will require the development of advanced ICT skills among users.

Advanced ICTs raise important concerns over next-generation digital divides. Network operators and users will have to adapt their business models to take advantage of the opportunities of the digital transformation. Thus, policy makers and regulators are called upon to create conditions facilitating entrepreneurial experiments and innovation.

Thus Digital divide is double edge sword - a Complex and dynamic Phenomenon. To close the divide, society must respond at very fast rates with matching preparations and local solutions as preparedness for fire fighting is needed.

VII. TWO URGENT STUDIES PROPOSED TO ADDRESS IMBALANCE IN DIGITAL ECOSYSTEM

Proponents of Digital ICTs and Broadband always speak and focus on socio economic benefits for nations and nudge the governments to drive forward digital agenda. Now with 30 years of global experience with internet nations find themselves on the cross roads of digital highways. Now time has come to reflect and introspect.

Today in era of fast expanding technologies where rate of technological growth is far too greater than rate of technological diffusion and adoption Digital divide is increasing everyday very fast exponentially. Damaging power of divide is becoming too forceful to ignore. Digital divide is increasing rampantly everyday due to fast proliferation of advanced ICTs in uneven pockets causing immense damage to have nots and also to have access who are not able to harness it fully (suboptimal use) estimating its damaging power-Need for studying the unintended consequences that arise from this.

Therefore it is proposed that there is now a urgent need to carry out a reverse study to assess extent of socioeconomic damage caused by rampantly growing divide by reputed agencies like World Bank, ITU and each of affected nations themselves to localise context similar to world bank's previous study of assessing economic benefit resulting from increase in broad penetration often quoted by experts in seminars (See above Relevance of Broadband penetration to Economic growth source world bank).

Proposed Reverse study should exclusively focus on socio economic damaging impact of digital divide which could read something like this to rhyme with prevailing one : A 10 percent increase in the digital divide rate in developing countries is associated with a X percent damage in GDP per capita and damage is far too higher than the equivalent relationship for developed countries at Y %.

It's no brainer that damage value X will be far greater than it's equivalent Y .The intent is to estimate values of X and Y and then quote and sing this song in every seminar to lay emphasis on damage side so that resultant damage caused by digital divide is brought under check, duly contained and in control of instead of continuing with rampant accumulation similar to irreversible damage caused to earth by plastic, fertilizers, nuclear technologies etc.

Henceforth it will also help in calibration and keep in check induction of digital ICTs by champions and proponents is backed with simultaneous adequate preparation proactively for end to end net positive impact on the lives of users and nations and not reckless growth and reactive response.

It will go a long way in awakening consciousness of proponents of digital technologies, governments and nations who have started buying the idea that digital technologies are panacea. There is also need for commissioning second study to examine and measure the damaging effect caused by excessive digital consumption bordering abuse or addiction in all walks of life. Objectives and parameters of study can be suitably framed for meaningful outcomes. The idea of these two proposed studies to bring balance to digital ecosystem for intended welfare and avoid unintended consequences for nations and the planet.

VIII. DIGITAL NATIVES, DIGITAL IMMIGRANT, DIGITAL FLUENCY TO DIGITAL WISDOM

As Digital era evolves globally some interesting insights such as Digital Natives, Digital Immigrant, Digital Fluency to Digital wisdom have cropped up. Digital native is a term coined by an Educationist Mark Prensky in 2001. It was used to describe an individual who was born after the widespread adoption of digital technology and grew up in the digital age. Digital natives are comfortable with technology and computers at an early age and consider technology to be an integral and necessary part of their lives. For North America, most people born prior to 1980 are considered digital immigrants. This cut off year 1980 is arbitrary without any rationale.

Teenagers and children today are generally considered to be digital natives as they mainly communicate and learn via Internet, computers and mobile devices computers, mobiles, texting. This exposure to technology in the early years is believed to give digital natives a greater familiarity with and understanding of technology than people who were born before it was widespread.

A digital immigrant is an individual who was born before the widespread adoption of digital technology. The term digital immigrant may also apply to individuals who were born after

the spread of digital technology and who were not exposed to it at an early age. Not all children born today are digital natives by default.

Digital immigrants are the opposite of digital natives, who have been interacting with technology since childhood. Digital immigrants are believed to be less quick to pick up new technologies than digital natives. However, this classification of people into Natives and immigrants is controversial.

IX. MEASURING THE INFORMATION SOCIETY IN DIGITAL ERA

It is often said what ever gets measured gets done. Measuring the Information society presents its own challenges in ever evolving fast paced Digital world. e-readiness (electronic readiness) index is a measure of the degree to which a country, nation or economy may be ready, willing or prepared to obtain benefits which arise from information and communication technologies (ICTs).

An index is comprised of multiple relevant indicators/ variables that can be concluded into a single value to evaluate effectiveness on a certain subject. For this purpose, composite e-indexes have been developed to measure the levels of ICT Adoption in different countries all over the world by many globally recognized organizations and institutes have introduced a number of indices related to telecommunications & ICT sector (See list below).

e-readiness is considered one of the main faces of development for any country and represents the transformation of society including the movement from traditional methods to more modern ways of thinking or dealing with health, education and production.

The ICT Development Index (IDI), published annually is a composite index that combines 11 indicators into one benchmark measure. It is used to monitor and compare developments in information and communication technology (ICT) between countries and over time. Every year ITU conducts country wise global study of development of ICTs in world and ranks them. From 2018 onwards index has been refined to contain 14 indicators instead of 11 to add further insights into the performance of individual countries and the relative performance of countries at different development levels. The IDI is a standard tool that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries.

India's IDI & Digital communication Policy aspirations: Government is seized of poor status in world ranking. Therefore it has included IDI improvement as one of policy objectives in Telecom policy *i.e.* to improve its IDI ranking to Top 50 nations by 2022 from ranking of 134 in 2017.Digital communications policy 2018 states in its objectives -"Propelling India to the Top 50 Nations in the ICT Development Index of ITU from 134 in 2017".

Network Readiness Index (NRI) framework of WEF: The World Economic Forum developed Networked Readiness Index (NRI), also called Technology Readiness, developed in 2002. It measures the propensity for countries to exploit the opportunities offered by information and communications technology (ICT). NRI enables evaluation of a country's level of readiness to obtain and participate in the benefits of ICT. Objective of NRI is to assess the impact of ICT on the competitiveness of nations.

TABLE 2 -- LIST OF MOST WIDELY USED E-INDEXES

Short name	Full name	Author	First publication	Number of countries
ISI	Information Society Index	IDC	1997	53
ERI	E-Readiness Index	EIU	2000	70
KEI	Knowledge Economy Index	WEF	2005	140
EGDI	E-Government Development Index	UNPAP	2002	182
IDI	ICT Development Index	ITU	2002	154
DAI	Digital Access Index	ITU	2003	178
TAI	Technology Achievement Index	UNDP	2001	72
NRI	Networked Readiness Index	WEF	2002	148
DOI	Digital Opportunity Index	ITU	2005	181
ICT-OI	ICT Opportunity Index	ITU	2005	183
ICT-DI	ICT Diffusion Index	UNCTAD	2006	180
GII	Global Innovation Index	INSEAD	2007	143
GCI	The Global Competitiveness Index	WEF	2004	144
IS	Infostates	ORBICOM	2003	183

Source: Some Aspects of ICT Measurement: Comparative Analysis of E-Indexes, Kateryna Kononova
National University, Kharkov, Ukraine

Digital Evolution Index Map- (Speed of Change in Digital world)-Mapping momentum around the world instead of tabular ranking: Digital Evolution Index captures Speed of Change in Digital world as in the digital age, speed is the new scale. An interesting framework to track digital evolution in a fast changing Digital landscape called Digital Evolution Index developed by HBR in collaboration with Fletcher School at Tufts University and Master card in 2015 to trace the emergence of a "digital planet," and to map Digital Momentum around the World. By measuring each country's current state of digital evolution and its pace of digital evolution over time (2008-2015, HBR Fletcher-Master cardteam created a chart or a map of our digital planet (see chart below).

Charts Horizontal axis represents Rate of change of in digital evolution and Vertical axis How countries scored on the Digital evolution index (Out of 100).Countries on this chart fall into four zones: Stand Out, Stall Out, Break Out, Watch Out. Some countries are at the border of multiple zones.

Stand Out countries are highly digitally advanced and *exhibit high momentum*. They are leaders in driving innovation, building on their existing advantages in efficient and effective ways. To stay ahead, these countries need investments to keep their innovation engines in top gear and generate new demand, failing which they risk stalling out. Stall Out countries enjoy a high state of digital advancement while *exhibiting slowing momentum*. The five top scoring countries in Stall Out zone in the DEI 2017 ranking — Norway, Sweden, Switzerland,

Denmark, and Finland, reflecting the challenges of sustaining growth. Stall Out countries may look to Stand Out countries for lessons in sustaining innovation-led growth. Countries in the Stall Out zone can put their maturity, scale, and network effects to use to reinvent themselves and grow.

Break Out countries are low-scoring in their current states of digitalization but are *evolving rapidly*. The *high momentum of Break Out countries* and their significant headroom for growth would make them highly attractive to investors. Break Out countries are often held back by relatively weak infrastructure and poor institutional quality. India occupies in this zone. Break Out countries have the potential to become the Stand Out countries of the future, with China, Malaysia, Bolivia, Kenya, and Russia leading the pack.

Watch Out countries face significant challenges with their low state of digitalization and low momentum; in some cases, these countries are moving backward in their pace of digitalization.

Inferences from DEI 2017: Clearly two of the world's most significant economies, the U.S. and Germany, are at the border of Stand Out and Stall Out, with a third, Japan, in the neighbourhood. Digitally speaking Clearly and notably, the most exciting region in the world, is Asia, with China and Malaysia as exemplars. We can expect to see plenty of investor and entrepreneurial interest in this region; it is critical that the political institutions are stable and supportive. India, with many policy-led pushes for digitalization, including a Digital India

Plotting the Digital Evolution Index, 2017
Where the digital economy is moving the fastest, and where it's in trouble.

HOW COUNTRIES SCORED ACROSS FOUR DRIVERS ON THE DIGITAL EVOLUTION INDEX (OUT OF 100)
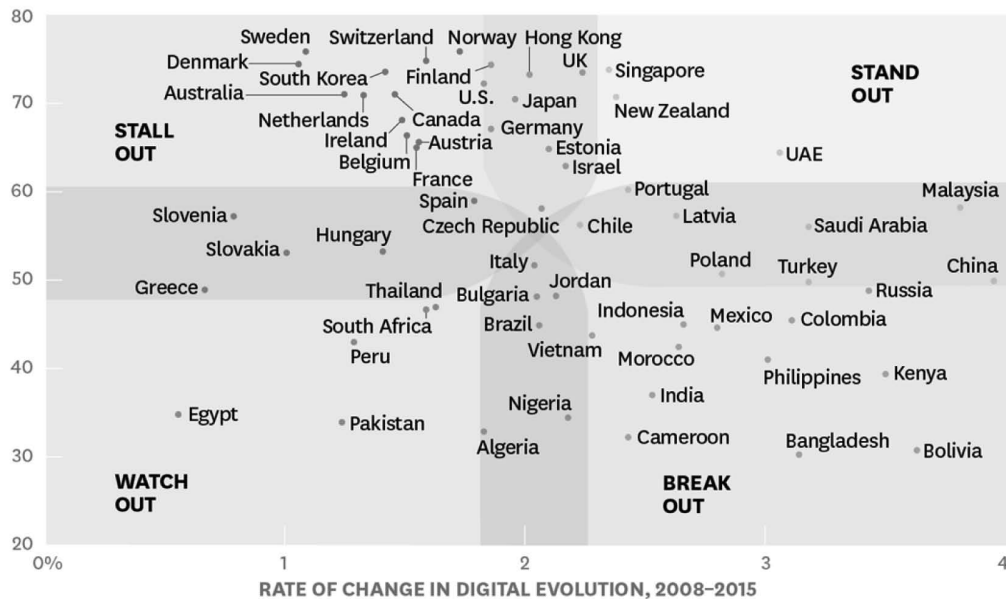
campaign and initiatives to give a boost to digital payments, ought to pay attention to the overall low level of evolution in the country. This can act as a drag on any initiative. Broader and more systemic changes are needed to boost digital evolution in this type of environment.

IX. DIGITAL TAXATION CHALLENGE

Digital companies in digital era manifest contradictions on taxation making it challenging - They Exploit Tax loop holes- France is first country to show the way to world. This a contradiction that while on one hand new digital companies world over themselves disrupt every sector of economy, every walk of life with their new innovations and business models resulting in death of some old companies but when it comes to their own lawful taxation in accordance with new taxation models they avoid, resist and want to stick to taxation laws meant for traditional brick and mortar business models by exploiting loop holes in existing laws and continue to fight prolonged legal battles against tax authorities in courts for years together.

Traditionally, brick & mortar companies have been taxed on their profits. Calculating profit is a complex affair, affording much scope for creative accounting in digital economy dealing with digital companies. Traditional taxation is globally disrupted in digital era.

Some experts have for long suggested taxing companies on their sales, not profits, to end tax avoidance through creative accounting. However, other experts opine this will be unfair to struggling companies that lose money despite having large sales. That is why taxes are almost everywhere levied on profits, not sales. France on 11 July 2019 enacted legislation to tax digital giant companies called 'GAFA' (Acronym for digital biggies- Google, Apple, Facebook and Amazon) at rate of 3% on their revenue, not profits. Legislation has been dubbed as- 'GAFA tax'.

India in 2016 made mild beginning which levies a 6% equalisation tax instead of a straight tax on digital online advertising platforms like Google, FB etc, limited to tax on the fees that advertisers pay to these platforms. Eventually India and many other countries too need to go France way *i.e.* tax revenues though not immediately in a calibrated way.

This is essential to tackle the completely new phenomenon of digital companies that can show massive sales, but no profits, in many countries they serve.

The rationale behind devising a separate framework to tax online service providers is this: That existing system has been disrupted by the new business models of digital giants. Unlike traditional companies, they face no import duties or non-tariff barriers when they enter foreign countries: it is

impractical to levy an import tax or sales tax on data. Hence, digital activities have escaped tax. This is because the digital economy is characterized by a unique system of value creation resulting from a combination of factors such as sales functions, algorithms and personal information of users.

What distinguishes technology companies from traditional businesses is user participation in creating value, which, in turn, translates into revenue. Though using consumer data to improve businesses is not exclusive to the digital economy, the unique ability of digital businesses lies in their power to analyse big data collected via constant user interaction and data mining.

Further Digital giants can show virtually no profits in the countries they serve, and show virtually all their profits in their headquarters in a low-tax countries like Ireland or Luxembourg. This can be done by vesting intellectual property rights (IPR) with the company in the tax haven, and arranging to have all other subsidiaries pay high licensing fees for this IPR, thus transferring the bulk of profits to the tax havens. This is a problem for the US too. Trump administration is livid that US companies are salting away their profits abroad and not bringing them back to the own country.

But this is also a problem for all countries finding that digital companies have massive activities in their territory that would be taxed substantially if they were traditional sales, but escape altogether because they are digital.

Matter also came up at meeting of finance ministers G 20 nations in June 2019 where they agreed to find new ways to push ahead on compiling common rules that will close loopholes used by global technology giants like GAFA to reduce their corporate tax burden. Ideally, an international agreement should have been reached on this issue long ago. But the interests of all countries are not aligned. Hence, there is pressure for unilateral action.

X. DIGITAL CITIZENS

Digital Citizenship is a concept which helps us understand what all technology users should know to use technology appropriately and responsibly. Digital citizenship can be defined as engaging in appropriate and responsible behaviour when using technology. It encompasses digital literacy, ethics, etiquette, online safety, norms, rights, culture and more. As in any society, it is expected that digital citizens act in a certain way according to accepted norms, rules, and laws. All the online users leave a trail of their digital footprints whenever you use technology online. This includes digital cameras, smart phones, iPods, tablets, laptops and computers. A Digital Footprint is the record of digital users interaction with the digital world.

A Digital Footprint is like an invisible report card that accumulates over the years and is a general reflection of our

online activity. It also reflects personality traits of online user and is visible to anyone on social platforms may affect future employment of youngsters who should be very careful in their online activity.

XI. DIGITAL WISDOM AND TRADITIONAL WISDOM

For today's young people, using technology is as fundamental as reading was for their parents and grandparents. Technology underlies and supports everything they do. Today we all face the need to adapt quickly to a very different world, one that is growing increasingly complex and changing at an ever-accelerating pace. Technology can be used for great things, but it can also be a massive distraction. Being digitally wise involves allowing machines to do what people want them to do. It may mean being careful what we do online and inculcate digital habits which enhance and empower us. Wisdom comes from different sources: individual wisdom, collective or organizational wisdom (wisdom of crowd) and machine wisdom (artificial intelligence).

Today there is need to redefining traditional Wisdom. Our "Traditional" thinking is undergoing profound change--so much so that finding the best combination of mind and technology requires new wisdom termed as "digital wisdom." Old kinds of wisdom, like memorizing a great deal of information when young that will work for the rest of your life, or seeking a job or employer you can remain with for an entire career, no longer make sense in our contemporary world. Today information goes out of date far too rapidly. Today skills must come from multiple disciplines and sources.

Not that our "old" wisdom never counts or applies—much still does. But we need to figure out where and when the traditional wisdom does and does not work, and when it doesn't, we need to put something new in its place. *Certain things* viz. *human passion, empathy, or yearning can never be outsourced to technology.* Some of our digital enhancements may bring ethical dilemmas. With our eyes wide open to the potential benefits and harms of digital technologies, let us pursue digital wisdom in order to succeed in the twenty-first century and endeavour to become a good digital citizen.

Finally quoting from book Wisdom 2.0- The New Movement Toward Purposeful Engagement in Business and in Life "Technology is not the answer. It is also not the problem. What matters instead? Awareness, Engagement, and Wisdom.

Wisdom 2.0 addresses the challenge of our age: to not only live connected to one another through technology, but to do so in ways that are beneficial, effective, and useful.

XII. CONCLUSION

Only a half-century after 30 years the invention of the internet, and half of the world is unconnected.   This creates huge divide.

The digital revolution is here to stay. Digital technologies can make us live efficiently provided we use them with care and caution. Our need of digital wisdom is important and urgent. It will help us behave properly in the digital world where there are no secrets and everything is open.

Digital world era has its inherent contradictions: Good Bad and Ugly aspects. All these come together as a package. While enthusiasts can be Gung ho about turning everything and humanity into DIGITAL avatar but we have to tread digital path with caution and care. Unintended consequences of Digital era have to be guarded as in past other technological revolutions *viz*. Nuclear, Plastics, Processed Foods, Fertilizers, and their reckless abuse of these have caused vast irreversible damage to humanity and environment given us enough experience and learning to deal with digital revolution. Two studies have been proposed in article with an intent to bring balance to digital ecosystem for intended welfare and avoid unintended consequences for nations and the planet.

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K.K. Minocha FIETE graduated from Delhi College of Engineering in the year 1976 and MBA (Finance) from IGNOU. Professionally qualified Telecom engineer with 41 years of rich, diverse experience in various fields of telecommunications.

Belongs to 1978 batch of Indian Telecom Service. Served in Department of Telecom in variety of areas of Policy, USOF, Project installation, Maintenance, planning and management of both modern long distance telecom network and local network providing various kinds of services.

During the career visited 12 countries abroad on different assignments including training. Worked as APT Expert on Digital International Satellite system to DPR Korea at Pyongyang for digitalization of their international satellite network in the year 1999.