Space Dynamics and Rise of Digital Geographies: A Study in Spatialities of Emergent Technologies, Communications Patterns andDigital-Population Interface

Abstract

The digital technologies have had an unprecedented influence on people's interconnectivity, spatial interactions and kind of spatial differences occur in the world. A technology-dependenturban life has developed further and is seen as a placeless phenomenon. The mass consumption of emergent technologies is a newer reality of the emerging urban class and the new aspiration peoples in the global urban south.In studying geographical implications of this digital reality and technologies is crucial. Attempts have been made earlier, however, less engagement has been on how such a transition and digital-population interface occurs from non-digital to digital environments. Thus, digital media does help in build and reinforce a physical sense of place and the factors associated within.The production of *new* place which is different from the one conventionally understood and perceived is a newer realty. Within this context, a critical assessment of smart city development practices,in India and in the global urban south is quintessential. The present study is an attempt in this direction and addresses are following objectives: i) to explain the ontology and epistemology of (digital)technology(ies)and the underlying process; ii) to discuss embeddedness of urban transitions,the emergence of digital environments and the production of new place; and iii) to interpret the role of smart city development in the making and re-making of place and its experience.

Key Words: digital geographies, digital-population interface, emergent technologies, place, process, urban transition

1. Introduction

Economic development and the technological advances directly play a major part in process of urbanization and growth patterns and expansion of urban centres. Urban agglomerations- "large cities", "urban economic zones", and "integrated groups of cities that share a common interest and fate"- emerge as the concentrations of urban population and drive the economy and socio-cultural progress. Rise of *urban society* takes place in urban agglomerations. Perpillou noted that "they hold commercial jobs, manage mining or industrial businesses, and occupy they highly qualified professions" (1977: 412). In the developed West, urban societyis characterised by its highly advanced socio-economic conditions and the cultural fabric is very distinct from the conventional and those of developing world.This is associated with, as Hubbard argued, "the rapid urbanization of the nineteenth century (sometimes termed as second 'urban revolution') changed [this], first taking roots in the economically dominant states of the European heartland" (2006:12).Since then onwards, number and share of urban places has grown at unprecedented pace in the world. Lefebvre used "the term "urban society" to refer to the society that result from industrialization, which is a process of domination that absorbs agricultural production" (2003: 2).This stage indicates sings of complete urbanization of

UNDER PEER REVIEW

the society which can reflect in the form of *postindustrial society*.The process of urbanization and rise of postindustrial society is strongly related as much of the world's urban society lives in the developed and advanced countries. The United Nation's data reveals that "the world urban population is expected to increase by 72 percent by 2050, from 3.6 billion in 2011 to 6.3 billion in 2050. By mid-century the world urban population will likely be the same size as the world's total population was in 2002" (UN WUP, 2011:3).

The size and growth of urban centres has not been uniform and homogenous throughout the world. Some regions did urbanize faster than rest of others.Some historical periods have been turning point in influencing nature and culture of urbanization.It is observed in the above report that "certainly, since the Age of Discovery, the world's economic development has steadily favoured the growth of towns and the strengthening of urban functions" (UN WUP,Ibid.: 482). This hada huge impact on the socio-spatial variations in process and patterns of urbanization in the world: developed and developing countries.This pattern continues still in the world pattern of urbanization. The world's level of urbanization is expected to rise from 52 percent in 2011 to 67 percent in 2050. The interesting fact is that rise in level of urbanization in the more developed regions will occur from 78 to 86 percent and however a significant transition expected in less developed world from 47 percent in 2011 to 64 percent in 2050 (UN WUP, Ibid.: 4).The urbanization led by large urban agglomerations or metropolitan cities has always played a dominant role in the regional and national economic development. Such urban spaces made up of a complex of industrial, manufacturing, commercial, and tertiary activities and foster the growth, urban expansion and interlinkages in the hinterlands. Studieshave brought to our understanding that "the presence of a metropolitan city has a 0.011 percentage point impact on the growth of tertiary sector. Transport, storage, communication, hotel, restaurants, banking, insurance, real estate, dwellings, business services, public administration, and other services components grow faster in and around metropolitan cities" (Planning Commission, 2007: 144).

Though the developing countries witness urbanizationof peripheries in relation to the central urbanization of countries comprising the advanced region, the scenario has changed drastically since the middle of twentieth century. Carr argued that "as developing countries progress along the path of modernization, urbanization will gather momentum until its peak is reached" (1987: 28). The process of globalization has accelerated the process of urbanization in developing countries termed as the Global Urban South and the major cities there in– urban agglomerations or conurbations- emerge as the welcome centres of newer economic investments, business functions and technological progress.Blanke and Smith argued that "marketing and management strategies, internationally recognized and competitive economic and service structures, as well as the optimization of transport and telecommunications links provide an important starting point for the promotion of a conurbation's international profile" (1999:2).The mass

UNDER PEER REVIEW

consumption of emergent technologies is a newer reality of the emerging urban middle class and the aspiring peoples in the *global urban south*. This transition is very much embedded in the process and forms of urbanization unfolding in this region and the kind of social and cultural changes emerge. There has been a marked transition in the development and lifestyles and "Today, society is rooted in the Internet of things, as an increasing amount of everyday life is connected to algorithms, applications, digital media, and the cloud" (Fekete, 2023:293).Initially, the information and communication technologies (ICTs)were believed to play *unifying* role while adding to transformations, updation of economy and increasing social connectivity among the people, places and regions.Thus, "With increasing technological innovations and diffusion, the world is experiencing a digital revolution that significantly impacts the global economy and livelihoods" (Zhao, et al., 2023:1).The way we view, interact, and connect to one another in the world, the digital communications technologies contribute meaningfully in the rise of *new*(digital) geographies. The modern geography that dealt with the real world of pre-internet era was largely confined to the study of*variable character* of the earth surface. Hartshorne argued that "although geography has its roots in its Classical Antiquity, its development as a modern discipline crystallized in Europe, and primarily in Germany, during the 1750 to 1900" (1939: vii).

Geography as emerged was discipline concerned to the study of earth surface and the world of mankind.With human responses and progress the character of surface has changed much in the post-second World War and the way people to people information flow and communication that takes place now stands in high contrast to the earlier periods.The internet and internet of things has brought unprecedented changes and revolutions in the direction of information flow, storage, analysis and its outcomes. This is very different from the world of conventional radios, televisions and non-android cellphones. Rubenstein noted that "the diffusion of internet service follows the pattern established by television a generation earlier, but at a more rapid pace" (2015:89). The internet is driven by the advancements and innovations in the Information and Communication Technologies (ICTs) in the last quarter of the twentieth century. The consumption of internet and internet-based devices and gadgets has growth in various regions of the world.The data reveals that "between 1995 and 2000, the internet usage increased rapidly in the United States, from 9 percent to 44 percent of the population. But the increased was much greater in the rest of the world, from 40 million internet users in 1995 to 400 million in 2000" (Rubenstein, Ibid.: 89).Noteworthy,"the power of place" has always determined the fortune and living conditions of human population on the earth surface. In the present global "flattening", the places and people are not uniformly benefited from the kind of advances taking place in the world of information and communication technology and the digital penetration in the society. In this context, Harm De Blij had pointed out to this reality that "in India, the much-publicized employment opportunities in the burgeoning high-tech industries of Bengaluru (Bangalore), Gurgaon

UNDER PEER REVIEW

(outside Delhi), and even Kolkata (Calcutta), may attract hundreds of thousands of qualified workers but remain essentially irrelevant to tens of millions of landless peasants in the remote reaches of the lower Ganges Basin" (2009:4).

Noteworthy is that the ICTs and a complex of accessibility to it has been highly uneven and they are seen as contributing to a growing divide both between urban areas and within them. Thus, "these new digital geographies (both social and economic) are by no means technologically determined. Rather, the way in which places and people become "wired" (or remain "unwired") still depends upon historically layered patterns of financial constraints and cultural and social variation" (Zook, et al., 2004: 156).Before the infusion of ICTs in connecting people and places, it would have been utopian imagination that the world be "digital and spaceless society". Technologically empowered cities which have explicit access to and use of ICTs in varied sectors emerge as the nodes. City-states become dominant examples of such a scenario producing digital geographies. Thus, "some countries, particularly relatively small ones such as Singapore or Finland, emerged as so-called "cyberstates", while others such as Estonia, Qatar, and Slovenia are making considerable progress to this same goal although often with radically different forms" (Zook, et al. Ibid: 157).Whole process has spatial and social outcome since it caused digital divide- a dualism of 'haves' vs. 'have nots' that related to technology access; be it devices like PCs or services like Internet connectivity. The digital spread is now being pushed ahead by the private domains and the states in enabling easy access to it and curbing the actually existing digital divide and its socio-spatial variations. Bastion and Mukku's study noted that "each additional 10 percentage points of internet penetration, meaning more people with access to computers or phones connected to the internet, add 0.77 percentage points to per capita gross domestic product (GDP) in developed countries and 1.12 percentage points in emerging countries" (2020: 7). In this wider context, the present study, applying a mixed method and constructive approach, addresses the following objectives: i) to study nature of nexus of technology-economic development-urbanization and its geographic consequences; ii) to explain the ontology and epistemology of technologies and the underlying processes; iii) to discuss embeddedness of urban transitions, the emergence of digital environments and the production of new place; iii) to interpret the role of smart city development in the making and re-making of place and its experience.

2. Material and Methods

Present study offers a critical assessment of contemporary interplay between digital and society and its spatial ramifications and outcomes. The phenomenon of digital geographies is not in separate silos, it is very much historically and technologically produced interplay. Though it has its origin in the post-industrial process of modernization, its geographical coverage and utility is driven by the economic changes, technical advancements and global connectivity. It requires a perspective of spatial outcome of digital connectivity based social

UNDER PEER REVIEW

consumption and place making. Study is based on a mixed method framework that combines of qualitative and quantitative perspectivesto comprehend phenomenon in terms of technological context, use of digital media and its numbers, networks, flows and simply a *mode ofthought*. Perspective is enriched while adopting the framework whereby digital and digitalization is such as a process shaped by the social, cultural, economic and power relations. The sources of data and information applied in study largely drawn from the secondary sourceswhich include grey literature, books, research articles, documents and national and global reports.

3. Results

3.1 Digital: Ontological and EpistemologicalDomain

The ontology in general refers to the nature of being or as reality as it exists. Smith and Mark argued that "ontology is distinguished from all the special sciences, and from all the branches of folk theory, in that it seeks to study in a rational, neutral way all of the various types of entities and to establish how they hang together to form a single whole ('reality')" (2001:592). In geographical science, one of the important queriesrelates to the ontology of *space*.That leads to "ask whether space is to be regarded as being or as Being" (Martins, 2021:2) and the nature of space arrived at understanding offers an insight about its part that it plays in the composition of reality. Martins argued that "if space is Being, we must inquire as to which being has 'space' as its Being, which would then consist of Being-space" (Ibid: 2). This basically unfolds kind of relations that set-in between the matter and space and further as objectivity and materiality.Dealing with such a conception offers an understanding of "space comes to be regarded as a being identifiable with transformed or un-transformed Nature" (Ibid: 2). However, the matter, body and nature do not mean the same thing rather different dimensions of reality. Here space has its own place to be termed as a *category*. Thus, Martins suggested that "by identifying space we are not referring to being in-themselves, but instead to the existence of those being" (Ibid: 2). This may be termed as *existence precedes essence*.So, in Martins' words, "space is the category pertaining to the order of relationships between beings that exist" (Ibid: 3). If we make an attempt to understand whether *digital* exists, this question doespertain to space and time of what constitutes digital. This "enabled by successive innovations in data storage, transmission and processing" (Hubbard, Op. Cit.: 137). It is a phenomenon that has its origin in the *information age*-the idea that access to and control of information is the defining characteristics of this current era in civilization. It is context of a historic period in the twenty first century as characterised by the rapid shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information technology. The ICT revolution contributed to the digitalization process. In social and spatial transition framework, the digital associated with information age is the third stage of this process. First it was a rapid shift in settlement from the countryside to the city caused by the industrial revolution. Second was advancement of this stage and the

UNDER PEER REVIEW

perpetual transformation wherein “in industrial societies, the power of merchants, craftsman, and guilds was supplemented by the power of industrial capitalists making the commodities of an industrial age” (Hubbard, Ibid.:12). Third is the technological progress and socio-cultural transition leading to advanced urban society where information and communication infrastructure and the internet of things shape the lives and economies world over. Thus, Lallana noted that “The ICT refers to a broad field encompassing computers, communications equipments and the services associated with them. It includes the telephone, cellular network, satellite communication, broad-casting media and other forms of communication” (2003:7).

In fact the digital is the outside world of wired network, softwares, and the platforms. It is can be seen as an objective world created by the interplay of technologies of information and communication.With digital revolution and its socio-spatial access, “one task of geographical ontology [will be] to study the mesoscopic world of geographical partitioning in order to enable the construction of mappings between these mesoscopic partitions and the partitions of associated scientific domains…” (Smith and Mark, Op. Cit.:596).This perspective would help in producing qualitative understanding of the digital phenomenon.The digital phenomenon exists as long as it has objective reality- wired network (further developments as Wi-Fi), softwares, platforms, information systems, database specifications, devices, gadgetsand also the social reach and its consumption. These may be coined as the *geographic elements*. It is a reality that exists in the world only in a different form. In remote sensing technique, as applied in geographical analysis, “the task of digital classification is to assign or label each pixel of the remote sensing image to one of the several possible objects on earth- water, forest, snow- to a specific class” (Joseph and Jeganathan,2018: 365).Similarly, the world of digital can be understood as an environment which people inhabit by using it, socially consuming it and simultaneously contributing to its contents and flow across space.This way, the production of digital is a social construction as is the technology. Its meaning lies in the context how it is being produced, used and reproduced by the people inhabiting a region, place and location.

The epistemological concern ishow to understandit and its operation as a reality. This refers to interpretation and analysis of the things which exist or about nature of such a reality.Epistemology offers a perspective through which the reality is explained, understood and studied and its inherent nature is systematically unraveled. The same may be extended to the *virtual* world as well.However, another epistemology is *realism,* according to which reality cannot be understood and studied in its totality. In other words, positivism is the philosophical theory that claims that whatever exists can be verified through observation, experiments and logical evidence, whereas realism is the philosophical view that claims that the external world exists independent of our conceptual scheme or perceptions. Further, there is what is called postmodernism wherein the *Digital Era* can be seen “as momentum of the Postmodern Era because this period and their

UNDER PEER REVIEW

manifestations comprise scientific, a technological and social aspects which never could be developed in Modernity" (Fernando, 2007: 16).Alongside, the emergent technologies- more advanced, innovation centred and superfast- are significant aspects of the information and communication environment. This is being experienced in the large metropolis and urban agglomerations of the Global Urban South.More argued that "contemporary cities are the emerging nodal centres of communication that convey a distinct civilizational experience through urban living, forms, patterns, and the built environment" (2020). The kind of transitions- rural to urban and traditional economy to more advance form of economy is associated with changing form of capitalism. This can be explained in terms as "it superimposes an economic scorecard on our social graph and psychological constructs, mapping out all our commercial activity and interactions. Companies gather, store, analyze, share and market this data through a few lines of code" (Canderle, 2021). Thus, the other side digital-led society is that it introduces "a type of techno-feudalism of data extraction" (Grimshaw, 2017: 1).

Looking through the political economy perspective of digital development unfolds that this very much lies in the process and practice of capitalism. Its contribution significantly has grown to the tertiary sector of economies and is largely confined to urban agglomerations and their hinterlands world over. Yesilbaghas suggested that "the remarkable rise of the digital economy is increasingly recognized as a key feature of contemporary capitalism. It is indeed impossible to ignore the encompassing dominance over the global economy by digital platforms" (2022: 1).Basically, capital is understood as a process which occurs through the exploitation of labour and set a relation between capital and labour.Das elaborates that "thus a society dominated by relations of capital produces not only commodities and capital but also space, and the production of space is shown here to be an irrational and an ideological process that acts as a veil for capitalism" (2009: 375). Rise of digital geographies is associated with "digital economy".In simple terms, digital geographies can understood as deals with some crucial aspects of such a phenomenon: the how a digital economy (of a region and nation) is spatially structured and nature of its organization across the space of that region; in what form and ways digital economies are linked (or lacking in such a link) to one another across the globe; and how society of such economies and of geographical settings use and consume the digital technologies in terms of access to information, in its communication and the flow between them and others.

The digital and information is interwoven. However, the nature of information reveals that it turns out to be spatial when questions are raised in the discourse on who createsit? Where is information created?The environment of power is significantly important dealing with such kind of questions. Some people and regions have more control over it that others. This may be termed as *digital divid*e.Heeks argued that "digital systems are significantly associated with inequality in the global South. That associations has traditionally been understood in terms of the digital divide or related terminologies whose core

UNDER PEER REVIEW

conceptualization is the exclusion of some groups from the benefit of digital systems" (2022:688).The digital system is intrinsically associated with the post-industrial city which means a *centreless* urban form. Hubbard argued that "this decentering appears to be connected to important changes in the economy of cities, with the economiesof scale which were important in the context of 'Fordist' mass production giving way to 'post-Fordist' economies of scope" (Op. Cit.:47).The increasing digitalization in the peripheral parts of the world has shown expansion of digital technology and its wider public utilization. Though digitalization brought development benefits, the inequalities and disparities have widened world over but also within the Global South.

3.2Digital Geographic Environment

The current revolution of information and communication technology has spread across the world but at varying scales. The scenario depicts that "The diffusion of television from the United States to the rest of the world took a half-century, whereas the diffusion of the internet has taken only a decade" (Rubenstein, Op. Cit.: 89).Information and communication are intertwined and further advancements in this leads to economic, social, cultural, and public sphere. Among the emergent technologies, digital infrastructure plays a key part in an interconnected and instrumented world which is termed as the *Internet of Things*. This means "a phenomenon where physical objects such as devices are both smart and connected, with the ability to collect and share data" (KPMG and CII, 2014: 7).Digital development including its infrastructure is highly uneven across the world and among the countries of developed and developing regions. Now digital technologies are at forefront in realization of sustainable development and enhancement of quality of work and life.Digital infrastructure has become a concern for the leaders and trickling down in the public policy. From a disciplinary discourse, "No other technological innovation in human history has affected the practice of geography in such a profound way as the computer. It has drastically transformed both geography as an academic discipline and the geography of the world" (Sui and Morrill, 2004: 82). Information technology plays a critical part in our modern lifestyles. It reached each and every facet of human experience. It can be used to solve problems, make decision, and even create new ones. It is also used to improve our lives. Digital geography is a field that deals with the study of geographic features and their relationships to other geographical features. It is emerging as a sub-branch of human geography that deals with interrelationships between the humans, physical and virtual worlds they made.

Geographers have been experimenting with digital technologies since the early days of computing. Initially, this took the form of employing computers to accomplish new forms of quantitative geography and modeling, utilizing computation capacity to perform computations. (Garrison, 1956; Haggett, 1966; Hagerstrand, 1967) From the mid-1960s, this was accompanied by the first digital mapping initiatives(Tobler, 1959; and Balchin)

UNDER PEER REVIEW

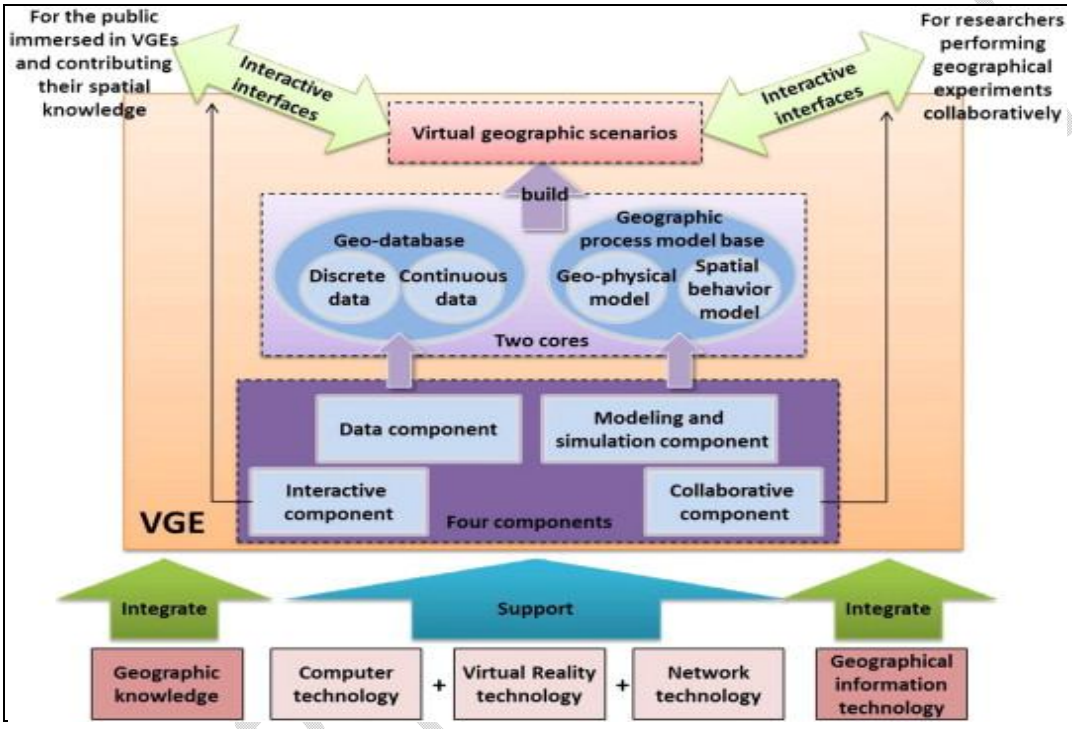
and the creation of newly formed Geographic Information Systems (Foresman, 1998).“Even while early computers were extremely sluggish by today's standards, they were thousands of times faster and less susceptible to error when processing big data sets and sophisticated statistical calculations than was previously conceivable, and hence were immediately adopted as an essential research tool (Sui and Morrill, Op. Cit.). Since then, digital technologies (such as computers, satellites, GPS, digital cameras, audio and video recorders, smartphones, data infrastructures) and software packages (such as statistics programs, spreadsheets, databases, GIS, and qualitative analysis packages) have become indispensable to geographic practice: generating, processing, storing, analyzing, and sharing data (the majority of which is born digital); creating and disseminating visualizations, maps, and ideas” (Fraser, 2007; Kitchin et al., 2013).

Geographers have used the digital in two ways since the early 1990s. First, they aimed to define and map the digital geographies, employing geographical ideas and methodology to make sense of the spatialities of digital technologies and associated socio-technical assemblages, as well as the geographies supporting their creation. This has included mapping cyberspace and virtual worlds(Kitchin and Dodge, 2014), charting the spatialities of social media and games(Ash, 2009), modeling the material geographies of ubiquitous computing (Kitchin and Dodge, 2014),and detailing the economic geographies of component resources, technologies, and infrastructures(Malecki, 2002).“Second, they have investigated the geographies produced by digital technologies, namely how ICTs are mediating and augmenting the production of space and reshaping the geographies of everyday life.Geographers also looked at how the internet is transforming economic and urban geographies, as well as how businesses and cities are spatially constituted” (Castells, 1996).

The digital revolution is opening up new and exciting ways to explore the planet. Recent advancements in the field of geospatial technologies (GSTs) are based on computer technology, the Internet, and Global Positioning Systems (GPS), Geographical Information Systems (GIS), Remote Sensing (RS), and digital globes are examples of geospatial technology (GST) tools used in visualization, measurement, and study of earth's properties (Cimons 2011; Baker et al. 2014). It is fair to say that geography has taken a 'digital turn' over the last two decades. The manner in which the digital is transforming the production of space, place, nature, landscape, mobility, environment, and soon have been recognized across all sub-disciplines.This is where marketplace plays a significant role in the digital consumption rather than the workplace. Canderle further noted that “in today’s dual financial-cum-digital system, profits and capital are no longer primarily produced in the workplace, but rather in the marketplace — through consumption, credit, investments, and savings — and in cyberspace, through internet and mobile usage, social networking, and gaming” (Op. Cit.).In a nutshell, digital geographic environment is emerging an approach of analysis of the digital-human created world. Enough is illustrated by Lin et al. “by merging

UNDER PEER REVIEW

geographic knowledge, computer technology, virtual reality technology, network technology, and geographic information technology, [virtual geographic environments] are built with the objective of providing open, digital windows into geographic environments in the physical world, to allow users to 'feel it in person' by a means for augmenting the senses and to 'know it beyond reality' through geographic phenomenon simulation and collaborative geographic experiments" (2013:75). The model of Lin et al. is depicted by the below given Figure 1.



Source: Lin et al. 2013.

Figure 1 Structure of the Digital Geographic Environment

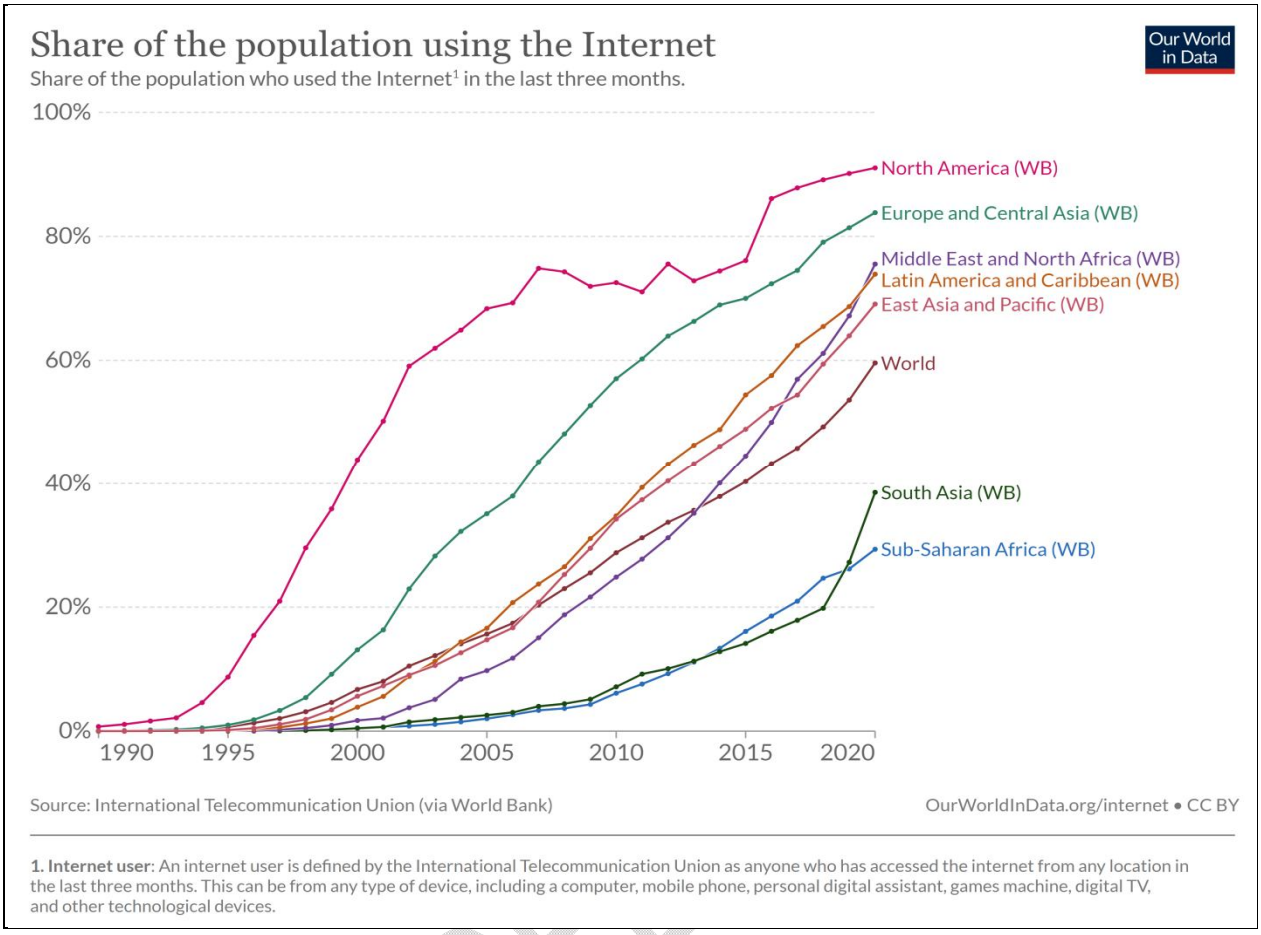
3.3Population and the Digital Technologies: Emerging Spatialities

"As our connections to one another, our governments, and the services we buy, develop, share, or consume move online, communities around the world are discovering that internet access is a must for full participation in society. These patterns were reinforced once the global COVID-19 pandemic took hold and communities around the world struggled to access basic services like as crucial public health information, remote education, and telecommuting options that had migrated entirely online. Perhaps the most important lesson from the COVID-19 pandemic is that access to internet connectivity is no longer a luxury but rather a necessity for societal resilience"(UN Habitat,2021: 15-17). This *access* to network of internet is now a socially variable phenomenon even in the developing world.

“Big data analysis shows that there exist unequal access to information and communications technology in the world, some regions and their people have better connectivity compared of others. The digital divide refers to the disparity between individuals (and society) who have the resources to engage in the information age and those who do not. Although there is no reliable data on the size of the global online population, estimates suggest that the number of Internet users has increased from 4.4 million in 1991 to 10 million in 1993, 40 million in 1995, 117 million in 1997, 277 million in 1999, 502 million in 2001, and more than 600 million in 2002.Thus, the global Internet penetration rate has climbed from less than 0.1 percent in 1991 to 2 percent in 1997, 7 percent in 2000, and more than 10% of the total world population in 2002”(Chen and Wellman, 2004:19). Despite the Internet's fast global adoption, a disproportionate number of users are centered in more developed countries: the USA, the UK, European Union and other advanced countries. In the United States in 2001, 169 million Americans were online, accounting for almost 60% of the entire population of the country and 29% of the global Internet population. There were 172 million users in Europe (28 percent dissemination), 182 million in Southeast and East Asia, including 145 million in China, Japan, and Korea (23 percent), and 145 million in China, Japan, and Korea (23 percent). South America had 29 million users (5 percent), Oceania had 11 million (2 percent), and Africa had 10 million (slightly over 1.5 percent)(Chen and Wellman, Ibid: 19).

The social and spatial polarization inherent in the digital divide, according to Castells (1996), is marked by a division between the space of flows' (well-connected, mobile, with more opportunities) and the space of places' (poorly linked, immobile, and isolated). This digital divide manifests itself in a variety of ways, including disparities between persons of different classes or living in different parts of a city, as well as disparities between urban and rural areas and between nations (Dodge and Kitchin, 2002).Internet access is commonly regarded as the cornerstone for digital society involvement and a pillar of digital human rights. The benefits of digital technology, participation in digital society, and access to digital service offers remain structurally exclusionary without robust, inexpensive, sustainable, and inclusive internet connectivity.The digital divide has been a worldwide occurrence. Researchesunraveled that “populations in industrial countries have been digitally connected since the 1990’s, yet people in low-income countries arrived relatively late to the digital world” (Bastion and Mukku, 2020: 7). The given Figure 2 shows the regional pattern of internet users in the world which is self-explanatory that developed regions are far better than rest of the world.

UNDER PEER REVIEW



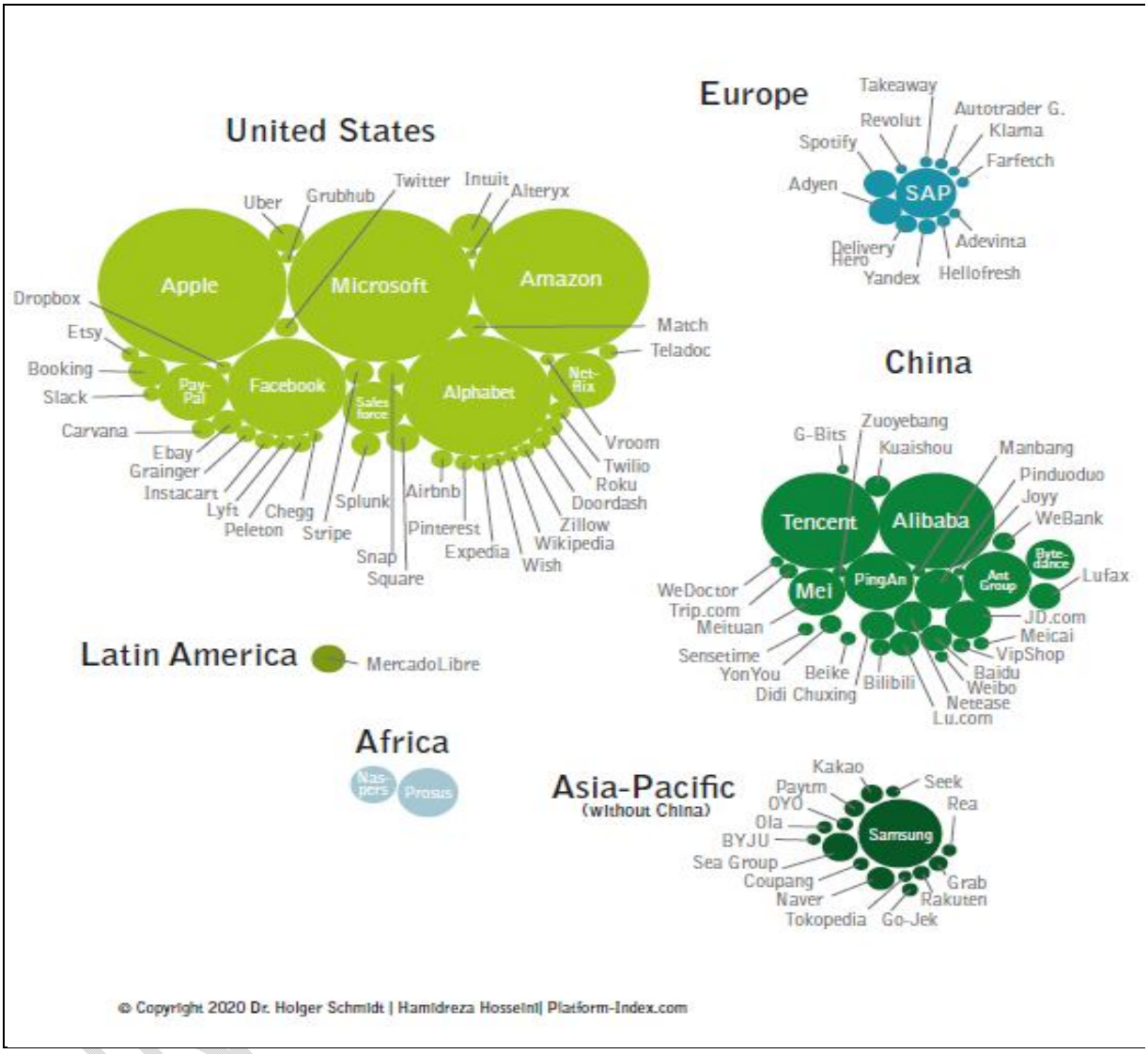
Source: Hannah Ritchie, Edouard Mathieu, Max Roser and Esteban Ortiz-Ospina (2023) - "Internet". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/internet' [Online Resource]

Figure 2 Regional Share of the Population Using the Internet in the World

Recent data reveal that during the last five years, almost 1 billion new internet users have been added worldwide. However, over 3.7 billion people remained offline in 2019. Meanwhile, 5G subscribers are expected to reach 3.5 billion by 2026, accounting for around 54% of global mobile data. Several trends concerning the digital divide are rising globally.Africa and the Commonwealth of Independent States (CIS) regions face the largest gaps.In developed nations, 87% of individuals use the internet, compared to 44% in developing ones.Africa has the greatest connection gap, with 23 percent of the population lacking access to a mobile-broadband network. The second-largest gaps are in Eastern Europe and the Commonwealth of Independent States (CIS), where 11% of the population lacks access. In 2020, affordability remained a major obstacle to internet adoption in low develop countries.Globally, 28% of urban families do not have internet access, while 37% do not have access to a computer.In wealthy countries, 13% of urban families still lack home internet access, compared to 19% of rural households.Connectivity in informal communities around the world is poor or non-existent.In 2019, globally, 55% of the male population is using the internet, compared to 48% of females. Studies have shown up to 27% of the urban older population lack internet connectivity. Older people who are most

UNDER

vulnerable in terms of poor health and low economic status are least likely to be using computers. In 40% of countries reporting data, less than 40% of individuals reported being able to carry out a digital activity considered as a "basic" information communication technology (ICT) skill(UN Habitat, Op. Cit.: 15-17).



Source: After Bastion and Sreekanth, 2020

Figure 3 Showing Locational Pattern of Worldwide Top One Hundred Platform Companies

Though most of developing countries have gone ahead in establishing ICTs system, they lack the resources and infrastructure necessary for the digital development. The more powers players in the tech domain influence and direct their digital ecosystems. Bastion and Mukku's study showed that "overall, the interests and values of the two powerful players- the United States and China- shape the global tech ecosystem, with the European Union attempting to become a third, balancing force" (Op. Cit.: 9). These tech-rich nations

play a pivotal role in the Global South in various directions- from access to digital financial services, governance, skill training, and job creation. They operate more in terms the *platform economy*. It does bring new job opportunities in the countries of the Global South, and at the same time affecting the conventional national revenue streams. There are huge spatial and regional variations in the way platform companies function worldwide. Figure 3 shows the dominant part played by the platform companies. The US big tech firms, particularly the top five companies- Alphabet, Amazon, Facebook, Microsoft, and Apple- are amongst the most valuable companies in the world.

3.4 The Communication Network and the Production of Social Space

Everything becoming "digital" renders the term a meaningless signifier and renders it unfit for labeling. Given this, it makes more sense to consider how the digital reshapes much geography, mediates the production of geographic knowledge, and has much geography than to categorise all of those geographies as belonging to digital geography, even though we do believe that there is a need to think critically about the relationship between geography and the digital. For instance, it is best to examine how the internet of things is reshaping urban management within the context of urban geography; to investigate how mobile phones are being used to deliver aid in certain regions of the Global South, it is best to do so within the context of development geography; and to examine how telemedicine is altering the spatialities of health care, it is best to do so within the context of health geography (Ash et al., 2015).

The spatialities of video games and social media have been studied by geographers. The concern for theorizing the relationship between body and screen, and how engaging and communicating through screens modifies users' spatial understandings, embodied knowledge, political awareness, and social relationships, unites various areas of inquiry. In the instance of video games, Ash (2009, 2010, 2012) claims that playing them fosters new modes of spatial awareness, based around etiologies of action that direct players without thinking in order to capture and maintain their attention (also see Lammes, 2008). As Shaw and Warf (2009) argue, these digital settings can also shape how users imagine other people and places throughout the world, so establishing unfavorable stereotypes.

The Internet vastly improves our collective ability to archive information, search through enormous amounts of it quickly, and retrieve it quickly. It is claimed that the Internet will increase access to education, good jobs, and improved health, as well as establish new deliberative venues for political debate and give citizens direct access to government. Insofar as such assertions are credible, Internet access is a valuable resource, and inequality in Internet access is a major public policy concern.(DiMaggio &Hargittai, 2001). Further, Mustafa and Hamzah (2011) noted that internet use is rising and some people now consider it essential. In addition to serving as a vehicle for information, the medium is also

UNDER PEER REVIEW

a powerful tool for interpersonal communication. Research noted that “Communication modes are changing and have now crossed such distances with the help of computerization and digital technology especially the emergence of Internet and its various new applications…Internet is the place to meet and interact and form relationships. In fact, this form of social interaction or communication has become increasingly common in our daily lives” (Mustafa &Hamzah, 2011).

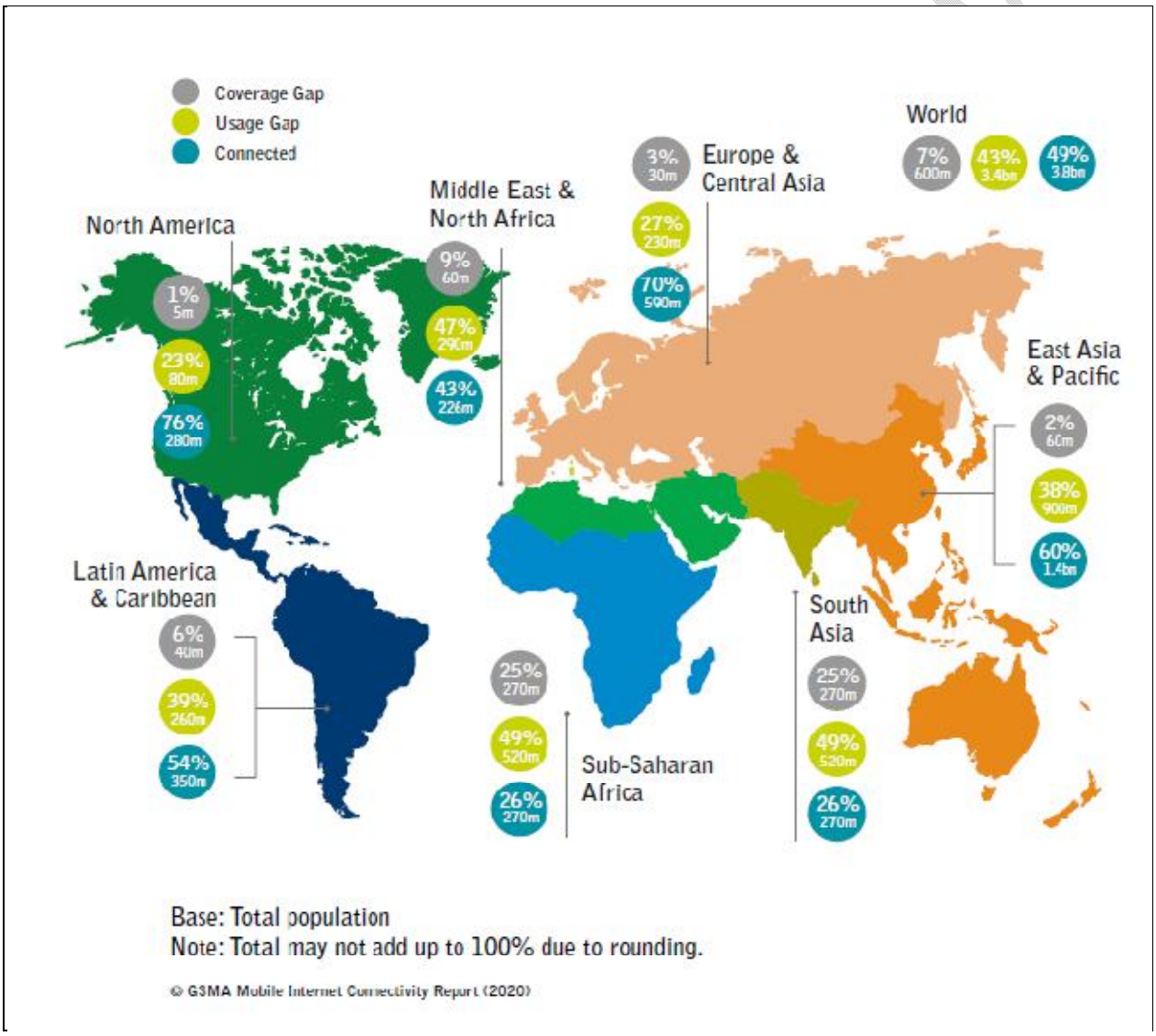
In terms of communication, the characteristics of behaviors can be associated to changes in behavior in the immediate environment of an online setting. According to Beebe, Beebe, and Redmond (2005), the emergence of the personal computer and computer-mediated communication (CMC) has profoundly transformed interactions among friends and family members. There are so many social sites like Facebook,Instagram, Twitter, YouTube and so on. These social media platforms creates new social spaces where individual, groups or society meets together and share feelings. For example Burrus (2010) concurs that FB and Twitter-like social networking sites are causing a rise in dependence among users. It is to stay in touch with friends and family and to learn the most recent information about them. It has demonstrated how, in terms of time spent on FB, individuals nowadays are becoming more and more dependent on it. They use Facebook frequently due to knowledge, happiness and grief, social life, and a desire for unity.

These social media platforms bring the whole world on Facebook twitter like social media apps.According to Little's (2011) online study, the Internet is paving the way for new forms of social cohesion in modern society. 70% of participants in his research survey strongly agreed that the Internet serves as a foundation for new types of social cohesion. Using Egypt as an example, the use of Facebook during the democratic demonstrations there is a promising sign. Facebook has made it possible for Egyptians to express themselves socially and in real time in favor of the activists. On the other side, social media may be regarded as weakening racial cohesion while enhancing small group cohesion.These social media platforms also rebuild relation between family members and friends.According to Mustaffa et al. (2011), Facebook is only used to communicate with friends and help them get in touch with old friends. Facebook in some way influences young people not just personally, but also in their connections with family members and across generations. Facebook fosters better family communication by giving Malaysians a forum to discuss topics they would otherwise never discuss in person.

These sites also help older people to reduce their loneliness. For example Telegraph (2012) has also reported that getting pensioners online could solve elderly loneliness crisis .According to Baym et al. (2007), online interactions are of lower quality than offline ones, although closeness and intimacy are important in interpersonal communication research.Closeness is defined by Kelly et al. (1983) as strong, frequent, varied, and lasting relationships that have been modified and are found in online environments. There is an

UNDER PEER REVIEW

unknowable fragrance of the future striving and confronting both human communication and relationships in the presence of digital culture while seeing the conflict in an inventive interaction between traditional community communication and social media. Research shows that "lack of affordability and limited mobile coverage are major causes for the digital divide. However, other factors such as lack of literacy, digital skills, or content in local languages play an important role in explaining the lack of internet access" (Bastion and Mukku, Op. Cit.: 19). Figure 4shows that there coverage is high around the world, but usage lags behind.



Source: After Bastion and Mukku, 2020

Figure 4 Showing State of Mobile Internet Connectivity by Regions

The marked difference is noticeable between the more developed and the less developed world. In fact, the technology and digital access is influenced by the economic, social and

political factors but these can be overcome as efforts roped in to expand digital infrastructure. For example, almost half of the Least Developed Countries have reached a high level of coverage to 2G mobile signal. Most Asian and South American countries have already completed the trials for adopting 5G technology. Seven African countries are expected to adopt 5G communication technology by 205 and they include Kenya, Nigeria, and South Africa. There has been focused effort by the nation in bringing a digital transformation in the country coincided with policy of liberalization and globalization. Thus, the country has gone through an unprecedented growth in Internet users, digital systems and information and communication gadgets and devices during the post-economic reforms. Parsheera's study noted that "at the central level, India's digital transformation strategy is built on the foundational blocks of strengthening access, the adoption of e-governance initiatives, and the empowerment of citizens" (2022:2).

The Telecom Regulatory Authority of India's reports reveal that internet access density- the number of internet subscribers per 100 people- ranges widely, from the highest figure of 186% in Delhi to the lowest figure of 36% in the Bihar service area (TRAI, 2023). The rural-urban divide is a prime negative aspect of digital access and internet density in the country. Geographies of development and socio-economic well-being found to be associated with wider accessibility of internet and digital systems on one hand and the population which remains out of its circumference in the country. Parsheera's study is worth quoting here that "it has also been found that the ability of different user groups to benefit from e-governance solutions is highly dependent on their level of digital skills. The only 38% of households in India are digitally literate - 61% in urban areas and 25% in rural areas" (Op. Cit.:5). Data on digital access in states of the country reveals that in regions such as Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Bihar and parts of Jammu and Kashmir- the rural digital literacy rates are less than 20%. The highest level of digital literacy (more than 70%), both in rural and urban areas, is reported in states of Goa and Kerala.

4. Discussions

4.1 The Confrontational Space: The Emergent Technology and the Urban Condition

The Internet of Things (IoT) has been regarded as an innovation that seeks to create a smarter world by connecting the physical and digital worlds. Despite the fact that the IoT concept has received a lot of attention in recent years, true execution of a large scale IoT network is still in the works. Globalization has linked cities on opposite sides of the globe in previously unknown sorts of competition - for capital, assets, and the creative class. These prompt people to experiment with new ways of dealing with the organization, planning, accounting, development, administration, and activity of metropolitan foundations and administrations, which are collectively known as Smart Cities, and which also play an important role in the future sustainability of built environments.(Ahmad,2021). Regional dimension of urbanization plays a significant part in the economic changes taking place and the societal transformation set in the vivid motion. The emerging economies are where

UNDER PEER REVIEW

urbanization and urban growth is rampant and cities, towns and urban agglomerations show unprecedented marks of growth and expansion. This is related to a transition- urban. The National Institution for Transforming India (NITI) reported that "India is transitioning from a mostly rural to a quasi-urban country. This poses challenges for sustainable development and at the same time presents a great opportunity for leveraging the benefits of urbanization with robust systems in place" (2021: 2).

These advanced technologies are being used in *smart cities* for a variety of objectives, including energy consumption, pollution reduction, traffic management, lighting, and traffic control. This major goal of smart cities has the potential to alter our present conceptions of the world. We can predict that the Internet of Things will have an impact on many aspects of life, from mundane daily tasks to deep human emotions. Citizens frequently benefit from smart city applications and the surrounding environment(Rajab and Cinkelr, 2018).In India, the total cost of the Smart Cities Mission (SCM) projects comes to Rs 1,79,228.99 crore, while the initial total estimate was Rs 2.05 lakh crore, of which less than a half would be funded by the governments, and the balance to be mobilized from internal or external sources, and other central government schemes. As per the data presented by the Ministry of Housing and Urban Affairs (MoHUA) to the Lok Sabha, as of 7 July 2023, work orders have been issued by 100 Smart Cities in 7,978 projects, of which 5,909 projects (74 per cent) have been completed. The government has released Rs 73,454 crore for 100 Smart Cities of which Rs 66,023 crore (90 per cent) has been utilised. The Ministry of Urban Development released the "City Mission Statement and Mission Guidelines" in 2015 which outlined the vision and strategic components. The primary objective of the smart cities mission is *to integrate economic growth with enhancing people's quality of life by fostering local development and leveraging technology to achieve tangible outcomes*. The major strategic components of the mission include: i) retrofitting- this involves upgrading and revitalizing existing areas to make them smarter and more efficient; ii) redevelopment- here the focus is on transforming existing areas, including comprehensive slum development, to improve living conditions and the overall quality of life cities; iii) green field development- these are new areas to be planned and developed around cities to accommodate the increasing urban population. These areas will serve as hubs for technology innovation, information highways, and the creation of data, enabling the application of smart solutions for residents and communities; and iv) pan city development- this means to expand the implementation of smart infrastructure and services across the entire city, ensuring that smart solutions benefit all residents and promote inclusive growth.The *Budget Briefs* of Centre for Policy Research (CPR) noted that "as per the Annual Report of Ministry of Housing and Urban Affairs, for FY 2021-22, area-based development was to contribute 1,66,065 crore (or 81 per cent), while pan-city solutions were to account for 38,953 crore (19 per cent) of total costs" (2023).

UNDER PEER REVIEW

Rapid developments in the implementation of Smart Cities, signals how data storage and innovative technologies plays a key role in shaping urban populations. Looking through the Urban Systems Collaborative critical hypothesis states that the expanding openness of data can enable us to create Urban Systems models which are capable of assisting residents, business visionaries, city associations, and governments in seeing all the more profoundly into how their urban areas work, how individuals utilize the city, how they feel about it, where the city faces issues, and what sorts of remediation can be applied (Ahmad, et al. 2021). The new advancement in the field of embedded devices, such as sensors, actuators, and smart-phones, among others, is providing an incredible business potential for the new era of smart urban planning, in which all fine gadgets (electronic gadgets) are equipped for interconnecting and communicating with one another over the Internet(Ahmad.et al,2016). As a result, the concept of a Smart Cyber Society emerges which drives the concept of the smart home. In recent past, the concept of sharp economic urban zones has risen to prominence. Furthermore, as a promising response to the test of metropolitan maintainability, it is rapidly gaining energy and general consideration(Capeluto,2016; Bibri,2017; Xie.et.al,2020; Wang.et.al,2021; Ye.et.al,2021).

Residents of these smart cities are to be connected via smartphones and high-tech equipment with Internet of Things integration, which improves lives. It also raises worries about information security, privacy, and unauthorized data access. Significant developments in information and communication technologies have resulted in modern smart cities. Smartphones and other high-tech devices with Internet of Things integration connect citizens of smart cities, improving their quality of life and giving incalculable benefits. Deep learning and related technologies efficiently address these security challenges in Big Data and IoT applications (Amanullah et.al,2020).When developing a smart city ecosystem, several new challenges must be considered. User security and privacy have become key issues as a result of the Internet of Things devices' involvement in numerous applications. The use of machine learning techniques to generate accurate outputs from large, complex databases enables the prediction and detection of vulnerabilities in IoT-based systems (Waheed etal.: 2020). Focus on E-governance in a smart city intends to use ICT to automate the governance and management process and development good practices. However, the equally important concerns emerge in terms of which locations and areas of a city are provided with such digital infrastructures and systems. Whether whole population of the city has access to it and benefit from such interventions in urban space are crucial queries.

4.2Case of Agra City: The *Digital*in Practice

Agra city is one of the largest urban agglomerations (UAs) of the State of Uttar Pradesh.City is located on the western bank of river Yamuna 206 km south of the national capital New Delhi. The city is the headquarters of Agra district in the western Uttar Pradesh.Agra is located in Uttar Pradesh, a Northern state of India. Agra city is administered by the Agra

UNDER PEER REVIEW

Municipal Corporation. According to provisional reports of Census of India 2011, the population of Agra was 1,585,704, with 845,902 males and 739,802 females. The population of Agra Metropolitan Region which includes the Municipal Corporation is 1,760,285 of which 939,875 are males and 820,410 are females.City is a popular national and international travel destination, receiving more than a million tourists every year. Prasad and Gavsker in their research highlighted that "heritage tourism of Taj has also ushered in a new set of environmental regulations (clean and green), being put in place to protect the monument and its surrounding area" (2016: 44).According to Agra Smart City project details, the city hosts 17 percent of the total international tourists visiting India ever year. The Taj Mahal alone receives seven-eight million domestic and foreign tourists every year, the highest in the country. The vision statement of the Agra Smart City states *City of Taj – where history is preserved, environment is pristine, infrastructure is world- class, and opportunity is plenty – a safe place to live, a great place to tour*.

The city was selected to be turned into a smart city in 2017 in the second round of selection of cities. The total project cost of each city under the Smart Cities Mission (SCM) is ₹1,000 crore. A special purpose vehicle (SPV), Agra Smart City Limited, was set up under the Companies Act 2013 to implement the development work at the city level. A Commissioner heads the SPV and this will plan, approve, implement, manage, monitor, and evaluate smart city-related projects. The smart city proposal for Agra includes INR 2,133 core makeover plans. The project will cover two thousand two hundred fifty acres of the area around the Taj Mahal, Agra Fort, and other parts of the city. The Agra Smart City initiatives encompass the major focused areas of: economic development; safety and security; health and education; energy management; area development; information technology connectivity and digitalization; water supply and solid waste management; environmental conservation etc.as per the *Agra Smart City Ltd*, city had adopted an AI-enabled system capable of detecting various issues such as stray cattle, clogged manholes, traffic rule violations, and even instances of sexual harassment. The Integrated Command and Control Centre (ICCC) monitors the city 24×7 and provides live updates on various aspects, including waste collection, parking violations, adaptive street lighting, environment pollution and overflowing manholes. Chakrabarty's report mentioned that "from detecting stray cattle and clogged manholes to monitoring solid-waste disposal, the Agra Smart City is managed through a central command and control system that works with artificial intelligence" (2023).Further it noted that potholes, traffic rule violations, even sexual harassment — all this can be detected by the system employed by the Agra Smart City, spread over an area of 2,250 acres.Manholes have been fitted with censors that can detect whether they are overflowing and need cleaning, and 3,50,000 houses have been geo-tagged.In Agra, the 19 projects under SCM include a *vacuum-based sewerage system* integrated with ICCC, Information and Communication Technologies (ICT)-based solid waste management collection monitoring through GPS tracking of vehicles and RFID

tags, Smart Health Centres catering to the local population, automated self-cleaning toilets and round the clock water supply with metered connections. Table 1 shows the major projects being implemented under the area development and pan city works (as per the Agra Smart City Limited). The area based development has major works under three themes: a) reconnecting Taj Mahal with Agra Fort; b) Integrated Development of Taj Ganj Area; and c) enhancing connectivity to Taj Mahal via Fatehabad Road.Again, most of urban development works, improvements and initiatives are dominated by the historic-global importance of the monuments and thus whole process of urban planning remained centred on them for long in case of Agra city.Localities of equal historic importance remained on periphery of urban planning. Taj Ganj is 400 year old market district sharing the peripheral skyline of the Taj Mahal. It includes clusters of *bastis*(neighbourhoods) which originally started with the four 'katras' or quadrants down towards the southern gate of the Taj Mahal. This zone remained off the track of urban development in the city. This place is full of contrasts. Routes to the Taj Mahal are the boundary of this place beyond which slum like conditions prevail and infrastructure and amenities are minimal.Close to the historic monuments, a market meeting the requirements and needs of the domestic and foreign tourists with digital connectivity and modern hospitality. Beyond the Tajganj, place is dominated by highly organized tourism and global standards meeting hotels and villas.How far smart city interventions have penetrated in this place remains is a matter of future research.

Anyways, another noteworthy feature of Agra Smart City initiatives includes the smart classes. Smart classes are a way to teach students by using upcoming technology. This will enhance the teaching and learning experience for both teachers and students. Up-gradation of two municipal schools was implemented under the Smart City Project - Agra Nagar Nigam Inter College & Girls High School, in Tajganj, a zone close to the Taj Mahal complex. Under the area based development works in these educational centres, the smart classes projects has focused on and implemented following components: i) interactive multimedia content, ii) projection equipment, iii) online support for students and teachers, and iv) capacity building of teachers.

Table 1 Smart Cities Mission: Agra Smart City Projects and Costs

Sl. No.	Major Head	Project Details	Costs (INR in Cr)
1	AREA BASED DEVELOPMENT	Development of Street Vending Zone	3.45
2		E-Toilet	4.07
3		Improvement of vicinity of lesser known heritage monuments	3.56
4		Junctions Improvement Ph-1 (Civil) & Ph-2 (Signage)	7.68
5		Beautification and Streetscaping of Fatehabad Road	105.93
6		Intensive Beautification of heritage walk with 25km radius around Taj Mahal	9.70
7		Façade improvement of traditional houses	0.99
8		Rehabilitation of major roads	85.43

UNDER PEER REVIEW

9		Rehabilitation of minor roads	171.77
10		Solar installation	26.53
11		Micro skill development centre	2.02
12		Provision of Municipal Health Centre	5.29
13		Upgradation of Municipal Schools (Smart Classes)	1.30
14		Provision of quick response centre, Smart Police Kiosks, Digital Literacy Centre	8.68
15		Waste Management	3.83
16		Water supply and Fire Hydrant	134.07
17		Taj East Drain Improvement Plan	26.10
18		Sewerage network	145.42
19	PAN CITY PROJECTS	Integrated Command and Control Centre	245.44
20		Bus Shelters	20.00
21		Junction Improvement-II	26.95
22		Multilevel Car Parking	144.97
23		Purchase of Electrical Buses	213.58

Source: *Agra Smart City Project Update*, Agra Smart City Limited Agra

The outcome is encouraging as a Report highlighted that "due to the execution of this project, admission to these schools have increased by at least 6% in comparison to prior years. The ongoing teacher training programs have been organized to familiarize teachers with smart classes. So far, smart courses have been introduced in 23 classrooms across the two Nagar Nigam schools" (NIUA, 2023).In year 2021, the *news release* of the HDFC Bank brought to the public that the bank has signed a Memorandum of Understanding with Agra Smart City to launch "Mera Agra" app that would enhance ease of living for the citizens and improve tourists' experience. This twin purposes: i) app to provide comprehensive information and services related to the city, and ii) users can pay bills, taxes, book tickets and get quick grievance redressal. Earlier, the *Sarvam Setu* App has been launched under the Agra Smart City initiatives. This meant asa unique initiative for the citizens in any kind of distress. As soon as the SOS button on the mobile of the citizen in distress is pressed, any of the civil defence staff, within a certain radius, who are already serving the needy, either regulating traffic, feeding the needy, etc will be alerted. They will be rushed to action. There are over 600 such civil defence personnel operating currently in Agra. Thus, the management of urban space through digital technologies and platforms may have its own implications in the production of new place where technology determines and directs the public behaviour of the citizens and residents in the city environ.

5. Conclusion

The digital technologies have influenced people's interconnectivity, spatial interaction and also spatial differences.With rapid urbanization and economic development, the metropolitan cities have been centre of technological progress, innovations and sites of technology diffusion in the developed regions of the world. The digital environments created therein affect work, and living. The kind of technology-dependent urban life has

come to, is seen as placeless phenomenon. However, the elites –people and places- have been building blocks of the digital geographies around the world. The mass consumption of emergent technologies is a newer reality of the emerging urban middle class and the aspiring peoples in the global urban south. This transition is very much embedded in the process and forms of urbanization unfolding in this global-half. The digital is outcome of social process and development practices. This is a world of wired or wireless network and gets its meaning only when people use and consume it in the physical world with the help of gadgets and devices. This phenomenon is highly uneven and results in varied spatial manifestation in terms of its controls, its production it and its consumption. The decision making and participation of people in matters affecting their lives and everyday affairs is equally important element of digital environment.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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UNDER PEER REVIEW

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