EasyChair Preprint

№ 7331

# Consequential Development of Internet and Its Conclusive Impact on People and Economy: an India Perspective

Yashwant Kumar, Ateeb Hamdan and Anand Sinha



January 11, 2022

# Consequential Development of Internet and Its Conclusive Impact on People and Economy: An India Perspective

**Yashwant Kumar*, Ateeb Hamdan, Anand**

Department of Civil Engineering, Amity University Jharkhand, Ranchi (834001), India

yashwant.bihar2011@gmail.com

**Abstract** In 21st century connecting people have become a necessity rather than a luxury. Internet in this regard has acted as a catalyst in making the world extensively digital concentric. Internet has functioned as a structural element providing an ambient atmosphere for the integration of advance technologies like Artificial Intelligence (AI), Internet of Things (IoT), Machine Learning (ML) etc. which has brought about an evolution in today's world in different sectors of, education, industry, banking, marketing, communication and customer services. The significant achievements in all spheres, is thus a corroboration of how internet has shaped the present and will impact the future. Internet a commodity gifted by developed countries to the world, has had its maximum use and alterations in fast developing nations like India. The paper thus aims to analyse and interpret the statistical data and elaborately discusses the present scenario and growth - scope - causes that resulted in exponential increase in internet users in rural and urban India. It also reviews the variable consumption and distribution pattern of internet by users in terms of age and gender and the diversified and competitive internet service provider market industry in India. It discusses the rationales and impacts of internet on culture of masses in the country and scrutinizes the dominating effect internet has in pushing the country towards a cashless society. The paper also investigates the fact that the internet has played an effective role in influencing the country's economy. The paper incorporates several relational and regression analyses of statistical interpreted data of internet and telecommunication data sets to give a wholesome context and conclusive result of the positive and negative aspects of internet development, a revolutionary change, on people and economy that transpired in the country in recent times.

***Keywords:*** Internet development; Telecommunication; Wireless network; Tele-density; Digital Economy; Internet Penetration.

## 1. Introduction

As the world has excessively become interlinked economically, financially, and socially, there has been a conspicuous ascend in the percentage of people around the world especially in the emerging and developing nations towards the accessibility of internet. Although individuals in advanced economies utilize internet more and own more sophisticated gadgets, the remnant of the transpiring world is catching up. India in this regard is thus a most congruous example as it has experienced a consequential increase in internet users in the past few years. India has second largest internet user market with more than 500million user's, first being China. However with projects like 'Billion Users' from Google which tends to cater the need of connectivity for the unconnected Billion portrays the potential data market and the immense capabilities of vast user base in India. Many organizations aim to build a strategic roadmap for the next two decenniums, in trying to connect the previously unconnected population by creating and catering products and services for the users. This is primarily

due to the potential promises and opportunities that the large unconnected population offers. These initiatives manifest the foreign interests in India's data market which is fast becoming prosperous strategically and economically.

Availability of cheap internet and affordable data costs attracted users towards the data market resulting in exponential increase in internet users. Other factors like increase penetration of smart phone ownership, rapid adoption of digital technologies and interventions at policy level also assisted in this increment. The ease of information exchange at low cost and government's digital push has made internet more assorted and comprehensive bringing digital revolution to small towns and villages. Promoting E-pay services for paying bills of electricity, water, municipal, other various public facilities and delivery of social services by government to increase accessibility of internet to people is resulting in a momentous digital transformation of the nation.

In view of many, this instant decrease in the price of data is attributed to a single Source; Jio a telecom branch of Reliance which came into existence in 2016, incessantly rolled out cheap and free data for its new subscribers using 'JioPhone'(LYF). Reliance LYF is a subsidiary of Jio, the telecommunication arm of Reliance Industries. It is an Indian manufacturer of 4G-enabled VoLTE Android smart phones. Jio with its beneficial schemes and plans made a stupendous entry in the telecom atmosphere. It swiftly became the largest telecom operator in 3 years of span gaining 186 Billion $ (operating revenue), March 2020, with many accepting that Jio has taken Google nearer to its Next Billion Dream.

## 2. Literature Review

The United Nations Development Program (UNDP) regularly publishes human development reports, distinguishing and classifying between industrialized and third world countries based on Human Development Index (HDI). The term industrialized country includes all countries with an HDI of 0.788 or higher and lower values are classified as developing countries. HDI itself is calculated using four variables out of three different factors: income (GDP per capita), education (adult literacy rate and cumulative enrollment in school), and health (life expectancy at birth) (UNDP 2010 Human Development Report) [1]. Although these factors are significant indicators of human development however, the rise in standard of living due to rapid and undeniable digitalization development in terms of internet penetration can be utilized as an indication of human progress [2].

The author [3] in his paper suggests a positive correlation between human development and Internet penetration rate. His analysis portrayed that a modification in human development level encompasses a weak negative correlation statistics to the increase in Internet penetration rate i.e. the internet penetration rate of nations with a higher change in human development level tends to grow a bit slower than in countries where such a change is lower.

[4] Conducted their analysis with means of explanatory research to achieve predictable results. The author designed a correlation which evaluated two or more variables and explain the degree of relationship between the selected variables. They conducted their research with the help of secondary data of World Bank. The samples data collected were from period (1994 to 2011) and included three South Asian countries: Pakistan, Bangladesh, and India. The model of this research followed that, GDP (Gross domestic product at constant) is a dependable variable, and it depends on three independent variables i.e., TLAB (total labor force), GFCF (Gross fixed capital formation) and TELE (Tele-density) which is calculated by the number of mobile and fixed line per 100 inhabitants. In their study they found, statistics of independent variables i.e. total labor force and tele-density showed highest rate of utilization in India as compared to Pakistan and Bangladesh. Their OLS regression (Econometrics technique Ordinary Least Square method), Pooled Regression Approach, results depicted that all 3 factors had a distinct impact on the GDP of South Asian countries and there is a direct positive correlation between them i.e. if one amongst the independent variables changes, the GDP will change accordingly. His research highlighted that the telecommunication infrastructure represented by tele-density growth plays a vital role in the country's growth and its global economy.

This is evident, as the mobile industry contributes to 6.5% of India's gross domestic product. This number accounts both direct economic activity generated by mobile operators and indirect economy generated by remainder economy, ensuing from enhanced use of cellular technology by individuals and businesses. By 2020, Telecom industry contribution to GDP is expected to contribute 8.2% of GDP [5].

[6] established two regression models wherein they suggests that dependent variables per capita GDP (GPC) and employment rate (EMP) are regressed through the independent variables; internet user (INU), tele-density (TEL), telecommunication investment (TEI), telecommunication revenue (TER), telecommunication revenue percentage of GDP (TRG). According to their first model, the results depicted that tele-density is significantly and positively correlated with GDP per capita. In their second regression model, tele-density was also positively correlated with employment rate. Mobile technology and services created 4.6% of global GDP in 2018, equivalent to US$3.9 trillion of economic value added. By 2023, this contribution is expected to reach 4.8 trillion [7].

## 3. Internet Development

*3.1. Internet development, World scenario.*

Internet a symbol of modernization has been amplifying swiftly and has evolved into a famous alternate media platform for people to communicate, interact, get information from and share it with one another [3].

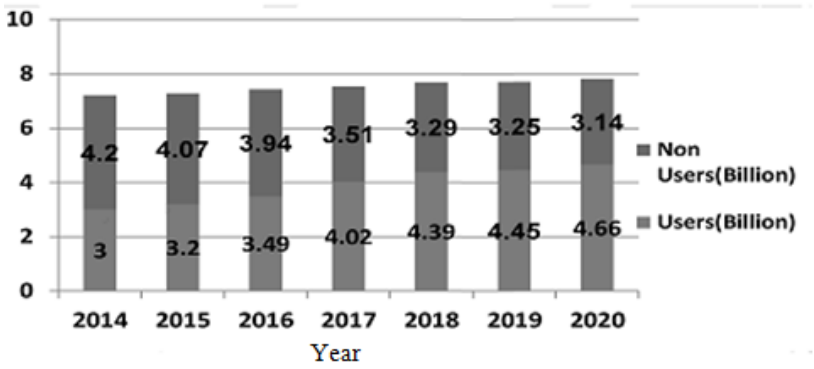



Figure 1 Global internet user statistic.

Figure 1 shows the world internet users, which was 3 Billion in 2014, which increased to 4.45 Billion in 2019 indicating an influx of 1.5 Billion users within a span of 5 years. Internet is consumed for multiple purposes by the masses, in fields of education, entertainment, health and politics to uplift themselves and others, socially and economically. Increase in the number of internet users is directly linked to the rise in standards of living in developed countries and advancement in developing countries [8]. With the advent of 2021approximately 4.66 Billion people which constitutes to 60% of the world's total population now use internet and related services. Internet users are currently growing at an annualized rate of 7% i.e. adding an average 875,000 new users daily [9]. However, Covid-19 pandemic has an enormous impact on internet user, making actual figures even much higher.

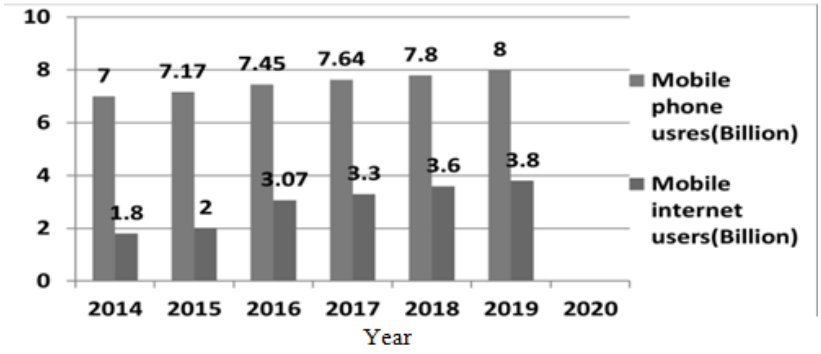



Figure 2 Global mobile user statistics.

Mobile has now become the most significant and facile medium to access internet worldwide. Figure 2 illustrates that from 2014 to 2019 there is an unprecedented increase in mobile internet users, approximately adding 2 Billion in 5 years. From both illustrations (Fig 1, 2) it can be concluded that among the 4.5 Billion users in 2019, 3.8 Billion were mobile phone users i.e. mobile internet user's which accounts for 92.6% of internet activity in general.

*3.2. Internet development and penetration in India.*

Table 1 Comparison between total number of mobile and internet subscriber base in India (in Millions), Source; TRAI (2019-20) Annual Report

| **INDIA** | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| **Mobile subscribers** | 969.54 | 1034.11 | 1170.59 | 1188.99 | 1161.71 | 1217.67 |
| **Internet Subscribers in India** | 302.29 | 342.65 | 422.20 | 493.96 | 636.73 | 696.7 |

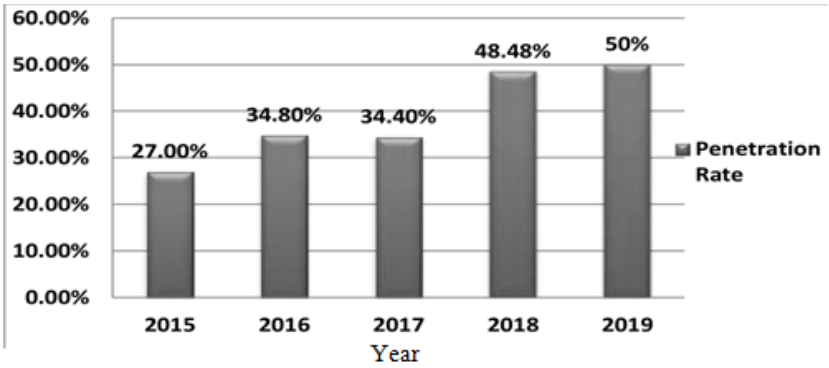


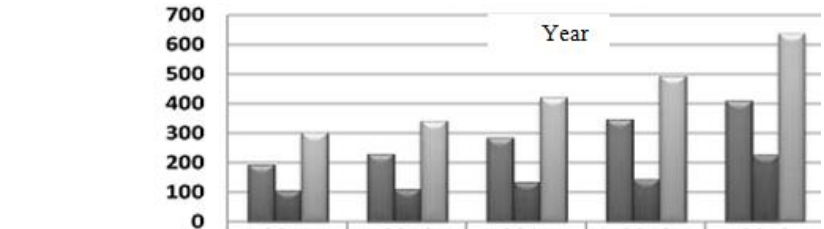

Figure 3 Internet Penetration rate in India. Source; TRAI (2019-20) Annual Report

Internet has had its most significant impact among the developing countries in terms of socio-economic and culture aspects. India has 1161.71 million mobile phone subscriptions and 636.7 million internet subscribers in 2019, (Table 1). This increased to 776.45 million (Sep-2020). The nation has

far achieved 50% internet penetration by 2019 and the penetration rate remains at pace, (Figure 3) for the upcoming years.

*3.2.1. Internet distribution and connectivity.* Although the penetration of internet in India is undeniable however its effective distribution and connectivity remains ambiguous.

There exists a difference in distribution of internet facility among individuals on basis of their geographical positioning and living standards. Thus a schematic difference in internet penetration in urban and rural India can be observed, the later having a higher population but comparatively lower penetration.




| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| urban subscribers | 194.8 | 230.71 | 285.68 | 348.13 | 409.72 |
| rural subscribers | 107.56 | 111.94 | 136.52 | 145.83 | 227.01 |
| Total Internet connection | 302.33 | 342.66 | 422.19 | 493.96 | 636.73 |

Figure 4 Total Internet Connections - Rural & Urban (in Millions), Source; TRAI (2019-20) Annual Report

The share of urban and rural wireless subscribers is 55.24% and 44.58% respectively (Feb 2020). This indicates towards the digital divide existing between rural and urban India. A consistent increment in internet users across various tire towns can be observed while top 8 metros have an internet infiltration of 65% [14]. At state level, NCR of Delhi has reported the highest Internet penetration followed by Kerala, J&K, Haryana, Himachal Pradesh, and Punjab. Jharkhand and Bihar which are considered to be the poorest states witnessed 48% and 36% increase in internet population respectively [14]. Within Metros, Mumbai has the highest Internet population of 13Million with a growth of 12% [14].

Figure 4 show that rural India has 227 million active internet users. This is significant as this depicts an increase of 10% more that the incremental rate of urban users. With exponential increase in penetration rate in urban and rural India, India is keen to grab the billion-dollar digital opportunity for herself. Though the internet users are comparatively higher in urban than in rural areas, there is immense potential for growth in rural areas which will result in strengthening the total internet populace of India in the coming years.

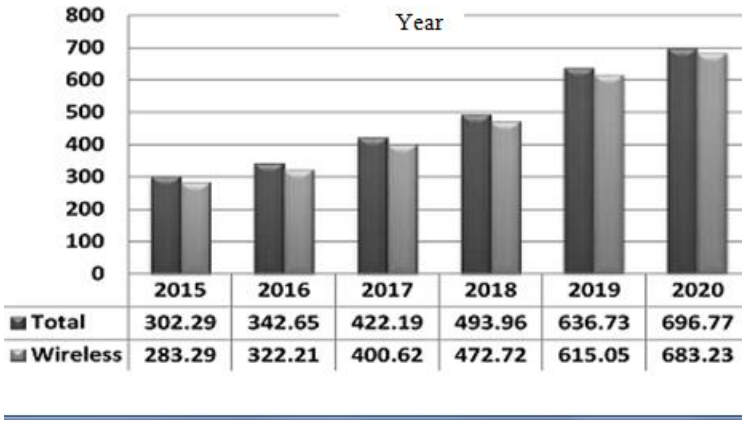



Figure 5 Internet users statistic in India (in Millions).Source; TRAI (2019-20) Annual Report

Another significant difference is observed in terms of connectivity (wireless/wired). Figure 5 depicts, that in terms of internet connectivity, wireless connectivity dictated i.e. from 2015 to 2019 the total internet connection increased from 302.29 to 636.73 million in 2019, of this 283.29 million in 2015 and 615. 05 million in 2019 were wireless users. Also, out of the 776.45 million internet endorsers in 2020, number of wired are wireless Internet subscribers are 24.36 million and 752.09 million respectively [10]. While wireless subscriber base, stands strong having 98% share in the total telephone subscribers and 96.59% share in internet subscribers in India. This completely suggest otherwise of the notion that there exists a digital divide.

The term 'digital divide' was introduced in early 21st century [11] to highlight the effective role of Information Technology (IT) and internet in a country's development. Two case studies in India [12] and South Africa [13] outlined the widening digital divide between rich and poor and concluded that this gap evidently exists.

Even though the disparity in Internet penetration rates between first and third world countries indicates a digital divide, with respect to access to IT and Internet. However, the existence of this phenomenon should be verified. It is important to determine whether it has become stronger in the past [3]. Since the studies took place a decade ago and there have been many intervention and involvements of policies and companies in the field of internet in India and the world since. The current trend of adoption of wireless services and internet subscription though slowed in recent years put forward an observation that digital divide in India persist at a very negligible ratio with those who are already the benefiters of digital India.

The existence of this divide in the country is meagerly visible, due to the factors like-

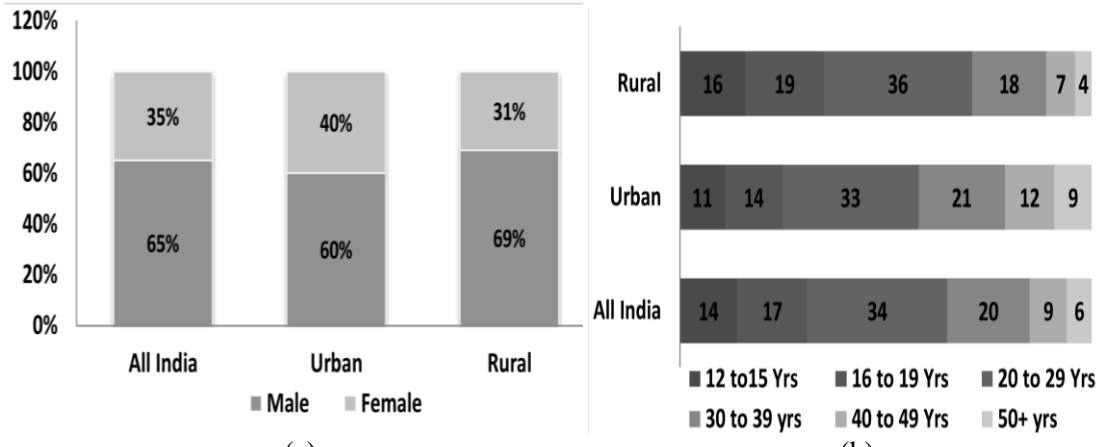
- *Lack of infrastructure*: Inaccessible areas (complicated terrains and inert places) where facilities of cell sites are difficult to provide.
- *Poverty*: The country although changing rapidly and dynamically in all sectors still faces issues of aggravated poverty which affects people to get benefited from internet services.
- *Population*: It is justified for India, to takes time to cater and reach its large masses (1.3 Billion) so as to provide them with best services.
- *Hesitation:* The presence and use of legacy or feature phone systems of the old age by people (mostly senior citizen), who are hesitant to switch or resistive towards the new modern age technologies, also creates a digital gap. However, their numbers are few.
- Although the *Covid-19 pandemic* has left the current situation of digital divide exposed in India. It is however not wise to prejudge, for a developing country in a process of transformation, hit by pandemic and not feel its agony.

*3.2.2. Consumption of data*. Unlike mobile data users in China and South Korea, Indian mobile data users consumes 9.6 gigabytes of internet on average every month as depicted in Table 2, while it is 5 GB in China and approximately 8.5 GB in South Korea, which are advanced digital economies. Average data consumption per subscriber per month was 12GB in 2019, a rise of 157 times from 62 MB in 2014 [15]. India is experiencing excessive data consumption in recent years globally, and this can be expected to rise even further to about 25 GB per month by 2025.

Table 2 Data usage trends *Code-Division Multiple Access* (CDMA) and GSM (Global System for Mobiles). Source; TRAI (2019-20) Annual Report

| Data usage per subscriber per month | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| GSM | 53.94 | 89.06 | 133.7 | 1006 | 2447 | 9.6GB |
| CDMA | 176.24 | 278.22 | 433.64 | 473 | 173 | |
| Minutes of usages for internet | 251 | 245 | 277 | 258 | 258 | 197 |

*3.2.3. Gender and Age of internet consuming users.* Consumption of internet by the population of India is not uniform in aspects of age, gender, and financial capabilities. Figure 6 (a) present's data of 2019 which saw a representation of 70% of internet users as MALE while 30% FEMALE i.e. female internet users is almost half of the 258 million male population. This user gap between genders is more evident in rural India. However the number of female Internet users has steadily increased, with nearly 26 million new female Internet users added in November 2019, a 21% increase, while male increased by 9% [14] . From Figure 6 (b) it can be noted that India has 504 million active internet users using internet services for more than 5 years, of which 433 million are internet users over the age of 12-years-old, and 71 million users are 5-11 year-olds[14].



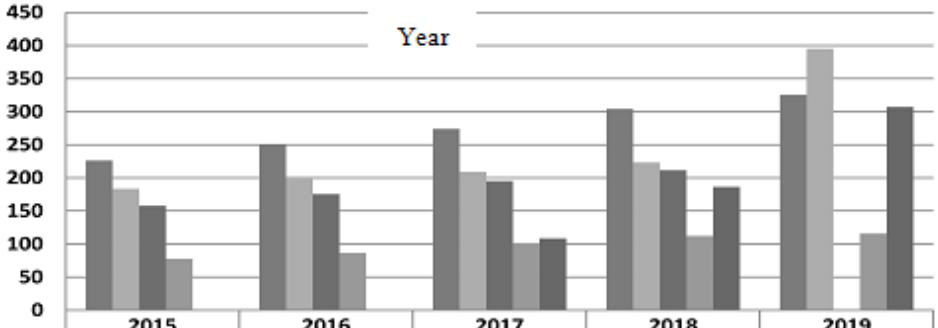

(a) (b)

Figure 6 (a) Gender distribution graph in percentage. (b) Age distribution graph in percentage. Source; IAMAI 2019

*3.2.4. Different wireless service providers in India*. Among the segments of Indian telecom industry, wireless communication segment has by far experienced the fastest growth. The amendment of National Telecom Policy of 1999 benefited private player by including them in the sector which was once solely operated by Indian Telecom Industry. This resulted in their stupendous growth consequently dominating the wireless market. Private telecom operators now have an intermediate role in providing wireless services to the users. Mobile phones are one of the most widely used wireless technologies for accessing internet in India. It has efficiently brought connectivity to several previously unconnected population.. The mobile and telecom industry witnessed exponential growth in recent times., average tariff rate falling from 16 rupees per minute in 1995 to 90 paisa in 2014 to 6 paisa per minute in 2020 (TRAI), wider availability of cheap smart phones, policies like that of Mobile Number Portability (MNP), expanding 3G and 4G coverage, changing consumption patterns, supportive policy and efficient regulatory environment are few reasons behind this growth. According to a recent survey conducted by Nielsen in India, it is estimated that nearly 97% of mobile phone users in India have prepaid connections. Prepaid phones and SIM cards are the main reasons why the numbers of mobile users growing so rapidly in emerging nations like India [16].

The foremost operators within the wireless field are, Reliance Communications (JIO), Bharti Airtel, Tata Indicom, Vodafone, Idea, Cellular, and BSNL/MTNL. The wire line communication which is dominated by public telecom operators like BSNL and MTNL operates landlines and mainly focuses on fixed telephones. It faces stiff competition from wireless sector. Although the fixed telephones network quality has presently improved and the demand has surge in high density urban areas mainly in corporate and business sectors, but the general public prefer to switch or remain with mobile phones due to its portability, cheap prices, efficient services and tactical marketing by private players in terms of provision of services are contributing factors.

Illustration in Figure 7 indicates the loss and gain of subscribers by each telecom service providers in past years. Reliance Jio gained 120.16 million subscribers in 2018-19. Subscription report of Feb 2020 and recent statistics suggest that Jio now owns 32.99% market share in India and has gained a substantial leap over its two main competitors Vodafone Idea (merged) and Bharti Airtel who have 28.05%and 28.35% market share respectively. BSNL occupies 10.32% market shares, and gained a decent 4.06 million subscriber in 2018-19. Bharti Airtel with few setbacks gained subscribers at a moderate rate, adding 20.9 million in 2018-19. It is perhaps Vodafone and Idea (independently) which faced the biggest impediment in terms of loss in number of subscribers. Even after the merger of both the companies in August 2018, and attractive plans to retain customer it lost millions of subscribers in 2019. It can also be observed from the figure that Jio added 6 times more subscribers than that of it's primarily rival Bharti Airtel.




| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| Bharti | 226.02 | 251.24 | 273.65 | 304.19 | 325.18 |
| Vodafone | 183.2 | 197.95 | 209.06 | 222.7 | 394.84 |
| Idea | 157.81 | 175.07 | 195.37 | 211.21 | 0 |
| BSNL | 77.22 | 86.35 | 100.99 | 111.68 | 115.74 |
| Jio | | | 108.68 | 186.56 | 306.72 |

Figure 7 Subscriber Base of Wireless Service providers (in Millions), Source; TRAI (2019-20) Annual Report

## 4. Internet has Great Influence and Impact

*4.1. Ecommerce and Economy.* Internet influences economy to a great extent. [17] Estimates that, development in the telecommunication service by 1 percent boosts the economy by 3 percent thereby resulting in economy growth of nation. The Internet have a positive impact on productivity by increasing the use of digital technology thereby:-

- Reducing the costs for goods and services as a result of increased competition.
- Enhancing management effectiveness, by helping firm to effectively reach out to their customers and partners and within the firm to manage their supply chain and logistics
- Expanding market for the production and distribution of goods and services.
- Promoting by making transactions more transparent resulting in increase user friendly market platforms
- Increasing consumer choice, convenience and satisfaction in different ways.

*4.1.1. Global scenario*. Figure 8 shows global e-commerce sales from 2014 to 2021. According to statistics, the global e-commerce market is expected to grow by 265% from 1.3 trillion US dollars in 2014 to 4.9 trillion US dollars in 2021 i.e. market is surging constantly and shows no signs of decline.

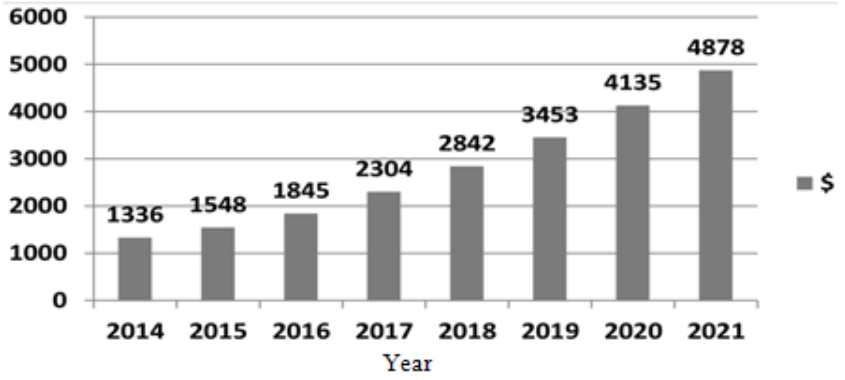



Figure 8 Retail e-commerce sales worldwide (in Billion U.S $).

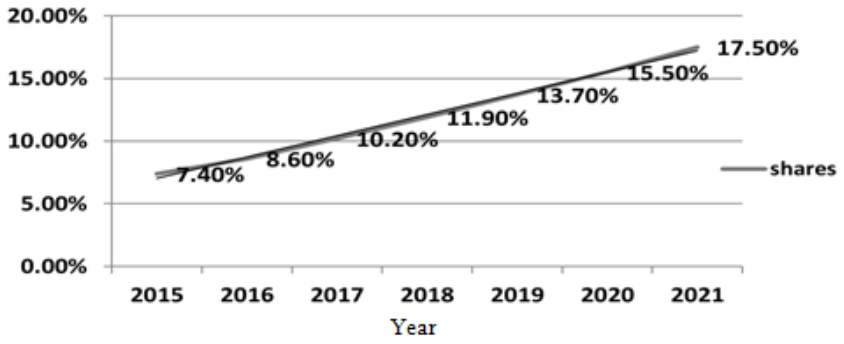



Figure 9 E-commerce share of total global retail sale.

Global e-commerce sales, account for 17.5% of global retail sale in 2021. Figure 9 depicts share of e-commerce sales in total global retail sales from 2015 to 2021. The global e-commerce sales are increasing exponentially and have been eroding the global retail market. It can also be interpreted that the global e-commerce sales revenue has grown at a significant pace in past years.

*4.1.2. Indian scenario.* In India, e-commerce revenue growth is at well pace same can be observed from the illustration (Figure 10). Giving a resilient competition to its competitors like neighbouring China and US. 5G internet will become an essential means for the enhancement of market economy and subsequently GDP. India is witnessing positive growths at high annual rate whose footprints on GDP will be much more evident. United Nations Conference on Trade and Development depicted their analysis, portraying that businesses which focuses on e-commerce tends to cover about 30-40 % of global trade revenue [18]. The Covid-19 pandemic has stricken adversely to small scale business and society, leaving people to face harsh losses in businesses and deep cuts in their pocket. Under such conditions the internet presents itself as a saviour in many aspects like providing remote education in form of online class, remote healthcare through online doctor's consultation, online trading, online shopping of goods, online streaming services, online conference and financing etc.

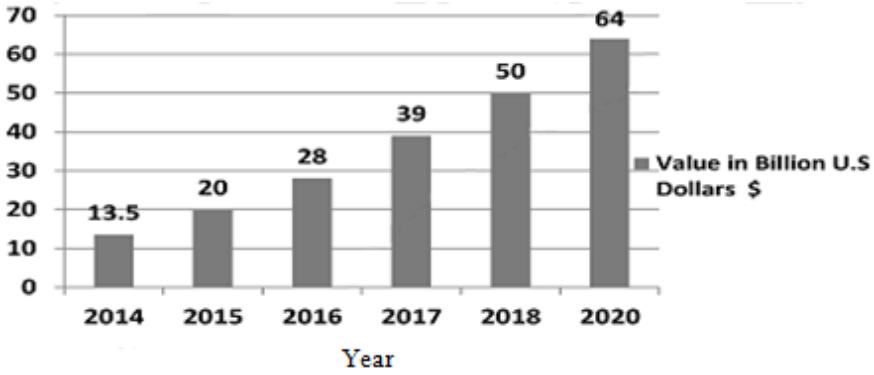



Figure 10 E-commerce industry market sizes across India

*4.2. Culture and Entertainment*

The Indian Media and Entertainment (M&E) industry not only contributes to the nation's economy significantly but also influences Indian cultural. Since humans are influenced by what they are surrounded with, what they view and listen is what changes their ability to cope up with the new changing society. Entertainment and culture goes hand-in-hand where one influences the other. Many previously topics of taboo are now discussed openly and many evil rituals are now banished. As masses are able to relate with contents they watch. Thus increase in users of such platforms outlines a hope for positive change in the society.

Internet is vital for the growth of M&E industry as it provides necessary assistance in coping, the rising consumer demands. Outreaching new users and improving advertising revenue. India having the largest business in film creation, seventh biggest market by film industry income and first biggest market by number of film industry is driven by rapid digitization resulting in higher internet utilization in recent times

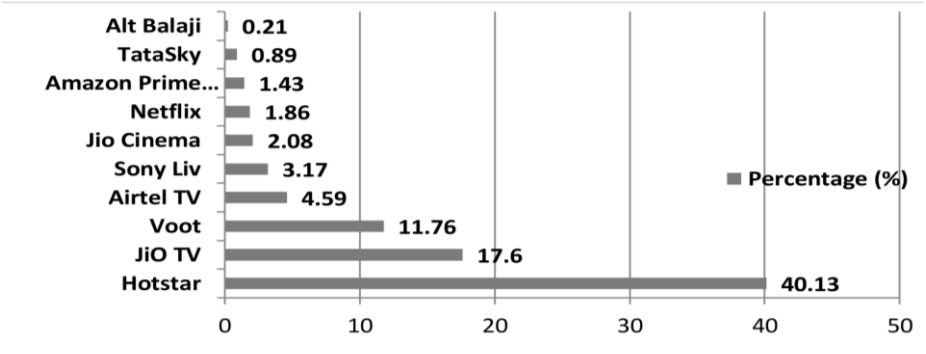



Figure 11 Distribution of the video streaming services market across India, by active users.

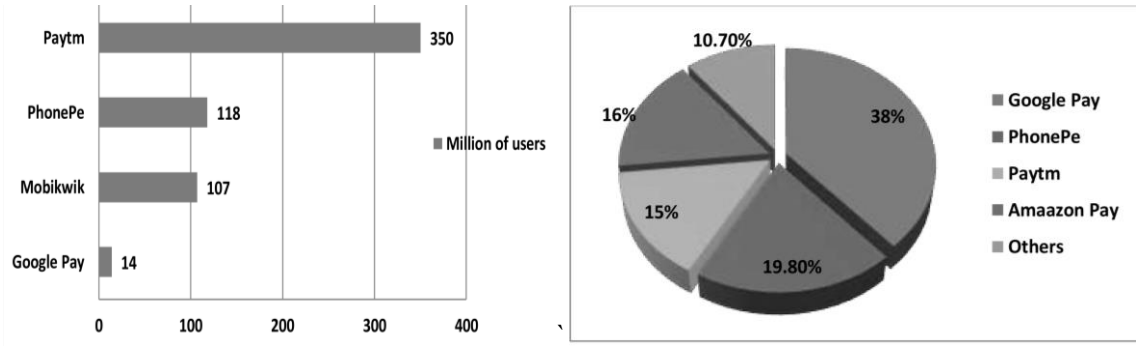
Figure 11 depicts the expansion of internet media platforms and the rise of OTT platforms like Netflix, Amazon Prime and Hotstar. The reasons of such expansion can be;

- They are not only bringing more international content, but also packs it with the latest domestic content faster than the conventional DTH channels.
- The cheap data available to users, by telecom operators created a cut-throat competition, Reliance Jio which was introduced in 2016 has had its role in the sudden change of fancy in OTTs from the long run DTH in individuals.
- Moreover, major telecom players in Indian market like Bharti Airtel, Reliance JioInfocom and Vodafone Idea Limited partnered with major media sector (streaming platforms) like Star India, Sony Entertainment, Disney India, Netflix, Amazon Prime, Zee Entertainment Industries and Hotstar. Together they provide abundant offers to the users i.e. viewers were not required to subscribe to each platform separately, which adds to the cost of streaming but gets a free subscription with the recharge itself.
    i) For instance, Jio first time enrollment at Rs 99 permits JioPhone users with benefit to access bunch of its amusement applications like JioTV, JioCinema, JioMusic among other utility applications, totally free.
    ii) Airtel subscriber on paying Rs 499 or Rs 999 receives benefit of 20 GB, 50 GB data and admittance to tempting entertainment applications like Wynk and Airtel television, among others [19].
    iii) Vodafone Idea (VI) on offer of Rs 401 provides benefit 16 GB in addition to its 3GB per day plan, and free access, not only its own application Vi movies & TV But also to Disney, Hotstar VIP for online streaming of exclusive TV shows, serials, and live sports

Thus, rapid development in M&E industry from its copulation with internet services is influencing Indian culture at all times high.

### *4.3. E-commerce payment systems*

Internet provides 3rd party mobile payment and its finance services [20]. India's push for cashless payments accelerated in 2019 which resulted in the adoption of mobile payment system wherein a Unified Payment Interface (UPI) that links individual's bank accounts with their contact numbers through a payment apps which enables them for efficient end to end transactions.




(a) (b)

Figure 12 (a) Distribution of payment app users (in Millions) 2018. (b) Unified Payment Interface (UPI) market share across India, May 2020, by platform.

Figure 12 (a) depicts Alibaba-backed Paytm, Walmart-owned PhonePe, ,Mobikwik and Google Pay UPI payment apps having 350, 118, 107 and 14 million Indian users in 2018 [21]. However the UPI market share and transactions illustrated in Figure 12 (b) indicates that Google Pay and PhonePe together catered more than 7 Billion exchanges, i.e. 66% of UPI exchanges in 2019. Paytm's UPI exchanges were low however the organization holds a generous offer in wallet.

Data from National Payments Corporation of India, reported that Google Pay, PhonePe and Paytm had 540, 460 and 120 million UPI transactions. Paytm however continue to dominate digital payments having 50%, mobile payments to merchant's market shares.

Due to the confrontation of pandemic and tense India-china relation the growing losses has intensified which in turn had it stalling effects on Paytm and PhonePe making them dependent on investors support. Nevertheless with situations plummeting down, market is bouncing back to normal. Facebook's WhatsApp a popular messaging app with more than 400 million users with its inclusion of payment services at end of 2019 set the industry for even stiff competition.

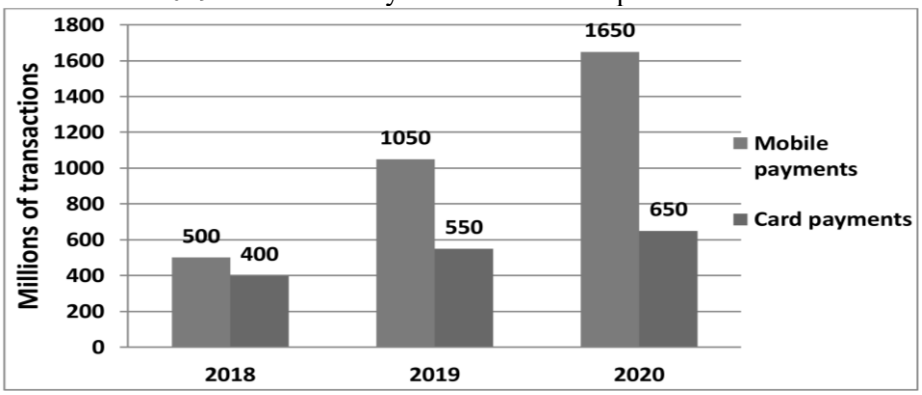



Figure 13 Modes of Payment per transactions per user.

Mobile payments bypass card payments by 163%, $286 Billion in 2019. India witnessed the highest number of real time transitions, comparatively with respect to instant payments in five largest economies in 2019.

Reasons of change from conventional cash transactions are:-

- *Demonetization*: Cashless payments, especially mobile payments, significantly increased as an aftermath of withdrawal of 500 and 1,000-rupee notes by government from circulation in November 2016. The temporary shortage in currency pushed masses towards cashless payment. Even after the cash being back in the system in the years after demonetization, people continued to use mobile and card payments. Suggesting that demand for cash has been slowing in recent times.
- *Covid-19 Pandemic*: High growth in cashless transactions was evident in recent times amid an economic slowdown due to the novel corona virus pandemic. Social distancing measures and concerns around using cash have pushed the use of contactless payments even further.

The widespread use of cashless payments has become prevalent for its low-cost, quick response codes, easy operation, transparency, good cooperation and high participation. These factors results in strengthening the dominance of mobile payment. Transactions done through payment apps include end to end transactions and are used for everyday mere transactions like mobile recharge, paying utility bills. Card payments unable to provide such benefits fall behind in many aspects with mobile payments comparatively, giving it an increasing popularity.

## 5. Relationship between India's GDP, internet users and Tele-density

### *5.1. Tele-density*

[4] Outlined that, telecommunication infrastructure represented by Tele-density of a country acts a distinct role in advancing the country's development process in the global economy. Tele-density i.e. number of telephone/mobile connections per 100 people in a specified geographic area plays a promising role in the growth of economy by increasing the employment rate. This is evident with the gradual increase of employment rate in telecom industry especially in cellular division in India in recent years.

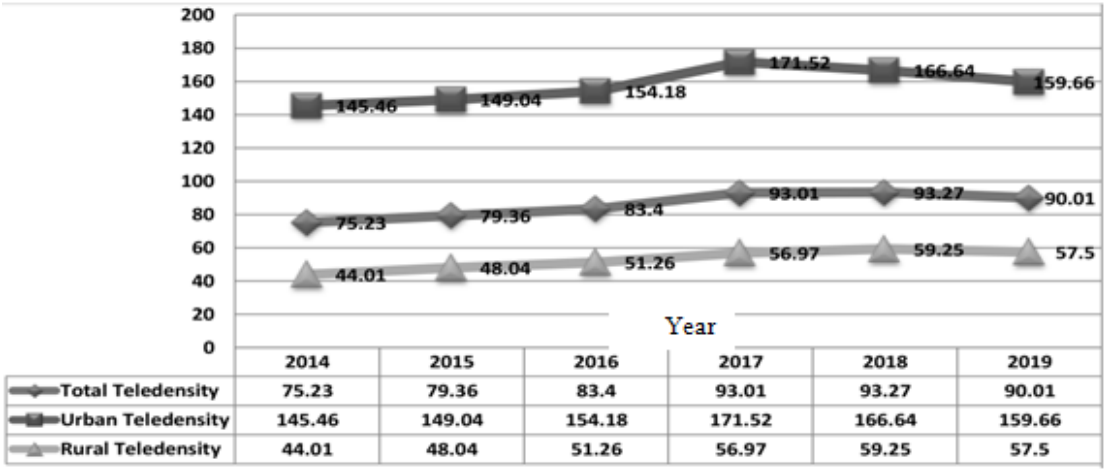



Figure 14 Tele-density (wireless + wired) in India (per 100 inhabitants). Source; TRAI (2019-20) Annual Report

Figure 14 provides the perspective view of the average urban Tele-density in India, which have long crossed its 100 benchmarks by 2010, implying that all towns, cities and metros which is classified under 'urban' has as many mobile connections as that of their population. The intense price war in the telecom space over the past few years has plunged the tariffs to an all time low. This has resulted in the growth of more than 15 million customers singing up for mobile connection every month. In past recent years urban India accounted for 70% of India's large cellular network, but this data is fast changing as the number of mobile connections in rural India is growing at a record growth. The recent Tele-density data suggests India's total Tele-density is now at 90, urban Tele-density is 160 and rural is 57. This is a significant growth, in connectivity and an ideal proof that India is digitalizing at a very appreciable velocity.

Total telephone connections in India, both mobile and landline grew 19% to 1.19 billion in 2018-19 from 0.92 billion in 2014-15. Remarkably 98% i.e. 1.17 billion of those are mobile connections, as of September 2020 (TRAI). The overall Tele-density has increased from 75.23 in 2014 to 90.01 in 2019.The total wire-line and wireless subscription has reached to 21.72 Millions and 1161.71Millions from 28.72 Million and 893.31 Millions in 2014, respectively. Where wire-line notably loss its subscribers, a notable increase was seen in wireless subscriptions (majorly mobile connections)

Thus Ordinary least square (OLS) regression model method is used for analyzing strength of relationship between X taken as Tele-density (TELE) (Calculated by the No. of mobile and fixed line per 100 inhabitants) considered as independent or predictable variable and Y taken as GDP (Gross domestic product) as dependable or target variable. The regression equation of which can be given as:-

$$\mathbf{Y = \alpha + \beta\, X + \varepsilon} \quad \textbf{i.e. GDP} = \boldsymbol{\alpha} + \boldsymbol{\beta}\ \textbf{(TELE)} + \boldsymbol{\varepsilon}$$

Table 3 Year on Year Total Tele-density and GDP (in 100 Billion), (2014-2020)

| Year | Tele-density | GDP (in 100 Billion) |
|---|---|---|
| 2014 | 75.23 | 20.391 |
| 2015 | 79.36 | 21.035 |
| 2016 | 83.40 | 22.941 |
| 2017 | 93.01 | 26.527 |
| 2018 | 93.27 | 27.135 |
| 2019 | 90.10 | 28.689 |

| | | |
|---|---|---|
| 2020 | 87.4 | 25.989 |

Here $\alpha$ is intercept on y-axis, $\beta$ is regression coefficient which is equal to covariance between y and x divided by the variance of x and $\varepsilon$ represents the error or residual. Table 3 depicts total Tele-density and GDP of India from year 2014 to 2020. On calculating the value of $\alpha$ and $\beta$ is obtained. The equation comes to be;

$$\mathbf{Y = 0.4311\ X\ -12.39} \quad \text{i.e.} \quad \mathbf{GDP = 0.4311\ X\ -12.39}$$

The coefficient of correlation came out to be +0.929. i.e., R>0, when interpreting the above observations, the value of 'r' is near to 1 indicating strong correlation between Tele-density is with respect to GDP and it's also positive meaning that with increase/decrease in independent variable X i.e. Tele-density dependent variable Y i.e. t GDP increases increase/decrease accordingly.

*5.2. Internet Usage*

Table 4 Year on distribution of India's Gross domestic product (GDP) in current prices (in Billion U.S. dollars) and total number of internet users in India (in Millions).

| **YEAR** | **GDP in Billion U.S. dollars** | **Total number of Internet users In Million** |
|---|---|---|
| 2014 | 2039.13 | 251.59 |
| 2015 | 2103.59 | 302.36 |
| 2016 | 2294.12 | 342.65 |
| 2017 | 2652.76 | 422.20 |
| 2018 | 2713.57 | 493.96 |
| 2019 | 2868.93 | 636.73 |
| 2020 | 2598.92 | 696.67 |

There has been a colossal increase in internet subscribers in India in recent years. The country's economy also is growing at a fair pace. Internet withholds a diversified importance in Indian economy in terms of revenue generation and also has its fare share. Table 4 portrays year wise GDP and internet users of the same.

Therefore it is important to derive a relationship to scrutinize the impact and relativity of internet users on India's GDP. .Karl Pearson coefficient of correlation method is thus adopted for the analysis. The determination can be done by using the given formula [22] [20]

$$\mathbf{r = (\sum[\ (Xi\text{-}x)\ (Yi\ \text{-}y)]) \,/\, \sqrt{(\sum[\ (Xi - x)^2 \sum (Yi - y)^2])}}$$

According to the Pearson correlation the value of r must lie between -1 to 1, where the positive or negative values indicates the direction of the relationship i.e. correlation will be positive if the statistical variables will result in increase of its counterpart, whereas when a increase will result in decrease of its counterpart a negative correlation is obtained, and the numerical value representing the strength of the relation i.e. values near 1 depicting strong relation and those near 0 as weak or no relativity.

Here **Xi** represents India's GDP while **Yi** signifies total number of internet users; where i = 1, 2 …6. **x** is average India's GDP while **y** is average internet users in India from 2014 to 2020. Based on the above formula, the value of R obtained: +0.8306 which is r>0. Thus it can be concluded that India's GDP is positive related with the number of internet users in India, indicating towards the fact that internet is also one of the most important factors contributing to the growth of nation's economy .

## 6. Conclusion

The inferences in the paper clearly illustrate how the internet has brought paradigmatic changes in Indian economy and its culture, which is conclusively discussed. These invaluable changes will produce new digital services that will reap economic value while positively influencing the development of nation. The statistical data retrieved from official reports and data sets have been analyzed and their findings have been efficiently summarized all of which satisfies the predictive hypothesis that impact of intern in India is positive and strong. The paper effectively discusses and evaluates the positive development and penetration of internet, disparity in its distribution and connectivity, consumption pattern, consumer characteristics, and various service providers in Indian context.

Given statistical review, as above, feasibly identifies the existence, factors and relativity of the digital divide in urban and rural households with assistance of data. It also highlights the government's strong initiatives to develop the domestic telecommunications and internet bandwidth sector by de-monopolizing and privatizing, so as to provide easy access of internet to all Indians thereby minimizing the digital divide as part of its Digital India initiative. In this regard, various platforms such as the e-commerce, entertainment, and e-payment systems have greatly benefitted from the expansion of the Internet. Also the paper portrays the outcome that India's GDP, internet users and Tele-density are strongly correlated, making internet an excellent indicator to measure human development. However the topic content is vast and dynamic and only a limited content is focused in this paper. Thus this statistical review might be analyzed for more detailed research in future articles.

All in all with assistance from government and public-private partnership, a supporting ecosystem provided by B2B, B2C, C2C services facilitated by 5G connectivity will increase consumers acceptance with regards to digitalization which in turn will make India more digital centric. As prices are falling due to competition within the telecom segment, the beneficiaries of the competition are the consumers, who are enjoying a wide variety of services, products and information at a cheap price. At this pace the country is expected to witness a digital revolution, which increases its present subscriber base comparable to developed countries making India’s representation more distinctive globally.

## References


[1] J. Klugman, F. Rodriguez, H. J. Cgoi, B. O. Daponte, and R. F.- Nieva, “Human Development Report 2010 20th Anniversary Edition The Real Wealth of Nations: Pathways to Human Development ;United NationsDevelopmentProgramme(UNDP),” Nov. 2010. Accessed: Nov. 17, 2021.[Online].Available:https://www.academia.edu/12907472/Human_Development_Report_2010_20th_Anniversary_Edition_The_Real_Wealth_of_Nations_Pathways_to_Human_Development_Published_for_the_United_Nations_Development_Programme_UNDP

[2] D. Archibugi and A. Coco, “A New Indicator of Technological Capabilities for Developed and Developing Countries (ArCo),” *SSRN Journal*, 2004, doi: 10.2139/ssrn.487344.

[3] A. Pratama and M. Al-Shaikh, “Relation and Growth of Internet Penetration Rate with Human Development Level from 2000 to 2010,” *CIBIMA*, pp. 1–8, Apr. 2012, doi: 10.5171/2012.778309.

[4] H. Haider and A. A. Sharif, “Impact of Teledensity on Economic Growth: A Comparative Analysis of South Asian Countries,” *Internation Journal of Economic and Empirical Research*, vol. 4, no. 11, pp. 571–581, Jan. 2016.

[5] GSMA Intelligence, “The Mobile Economy,” 2017. [Online]. Available: https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=28999719&file=The%20Mobile%20Economy%202017.pdf

[6] Sharif and S. Hossein, “The Role of Telecommunication Over the Economic Development of Bangladesh,” *SSRN Journal*, Jul. 2016, doi: 10.2139/ssrn.2812019.

[7] GSMA Intelligence, “The Mobile Economy,” GSMA Association, 2018. [Online]. Available: https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=28999769&file=The%20Mobile%20Economy%202018.pdf
[8] P. Uimonen, “The Internet as a Tool for Social Development,” presented at the Annual conference of the Internet Society, Kuala Lumpur, Jun. 1997. Accessed: Nov. 17, 2021. [Online].Available:https://web.archive.org/web/20160103125435/https:/www.isoc.org/inet97/proceedings/G4/G4_1.HTM
[9] S. Kemp, “Digital in India: All the Statistics You Need in 2021 — DataReportal – Global Digital Insights,” Feb. 11, 2021. https://datareportal.com/reports/digital-2021-india (accessed Nov. 17, 2021).
[10] Q. TRAI Telecom Regulatory Authority of India, “The Indian Telecom Services Performance Indicators,” New Delhi India, Sep. 2020.
[11] F. Riggins and S. Dewan, “The Digital Divide: Current and Future Research Directions,” *JAIS*, vol. 6, no. 12, pp. 298–337, Dec. 2005, doi: 10.17705/1jais.00074.
[12] P. C. Mohanty, “Bridging the Digital Divide: The Role of ICT for Rural Development in India,” in *Proceedings of the International Symposium on Information Technology 2008*, Kuala Lumpur Convention Centre, Malaysia, Aug. 2008, pp. 1–12.
[13] W. Brown and I. Brown, “Towards a research framework for a human development-based "Bottom of the pyramid’ ICT development strategy in South Africa" in *ECIS 2009*, Verona, Italy, 2009, Jan. 2009, pp. 1223–1234 [Online]. Available: https://www.researchgate.net/publication/221408276_Towards_a_research_framework_for_a_human_development
based_Bottom_of_the_pyramid_ICT_development_strategy_in_South_Africa
[14] Nielsen and IAMAI, “DIGITAL IN INDIA,” IAMAI Internet and Mobile Association of India, 2, 2019 [Online]. Available: https://cms.iamai.in/Content/ResearchPapers/2286f4d7-424f-4bde-be88-6415fe5021d5.pdf
[15] Ericsson, “Mobile data traffic forecast – Mobility Report,” *ericsson.com*, Nov. 25, 2020. https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/mobile-traffic-forecast (accessed Nov. 18, 2021).
[16] R. Srivastava, B. Sharma, N. Kumar, and M. S. Ranganath, “Analyzing and Forecasting the Mobile Teledensity Growth in India,” in *ICARI*, Jan. 2015, p. 4. [Online]. Available: https://www.researchgate.net/publication/273760674_Analyzing_and_Forecasting_the_Mobile_Teledensity_Growth_in_India
[17] N. K. Gupta, *The business of telecommunication: Networking in the new millennium*. ata McGraw-Hill, 2000.
[18] UNCTAD, “Global e-commerce hits $25.6 trillion,” *unctad.org*, Apr. 27, 2020. https://unctad.org/news/global-e-commerce-hits-256-trillion-latest-unctad-estimates (accessed Nov. 18, 2021).
[19] A. Bhattacharya, “Video OTT vs DTH players: How Netflix, Amazon Prime, Hotstar cornered Indian market,” *The Financial Express*, Nov. 27, 2017. https://www.financialexpress.com/industry/video-ott-vs-dth-players-how-netflix-amazon-prime-hotstar-cornered-indian-market/948816/ (accessed Nov. 18, 2021).
[20] J. Fang and D. Xu, “How the Internet Influences the Development of Modern Market Economy,” *AJIBM*, vol. 10, no. 05, pp. 1002–1012, 2020, doi: 10.4236/ajibm.2020.105067.
[21] R. D. Statista, “India: digital payments user base by company 2018 | Statista,” *Statista*, Jun. 24, 2021. https://www.statista.com/statistics/1034520/india-digital-payments-user-base-by-company/.
[22] X. Z. Mao, L. J. Zhamg, T. X. Mao, Y. Z. Wang, and J. Huang, “The Research of Fund Influence Based on Correlation Analysis of Karl Pearson and Regression Analysis.,” *Journal of Zhejiang Sci-Tech University (Social Science)*, no. 38, pp. 306–311, 2017.