

Impact of Digitalization on Employment Pattern in India

Dr. Disha Pandey

Assistant Professor, Department of Economics, Government Degree College, Doshapani,, Nainital,

ABSTRACT

Digital enablement has proved to be a game changer all over the world. Earlier the concept of Information and Communication technologies (ICT) was confined mainly to services sector in India, however, with the initiation of Digital India programme in 2015, digitalization has entered in all the walks of human life. Studies round the world depict that digitalization has positive impact on economic growth of a nation by driving entrepreneurial innovation and productivity. Though it has impacted various economic parameters, but the present study will try to analyze its impact on employment in India, with special reference to restructuring of employment and changes in job composition in the aftermath of digitalization. On one hand, it leads to creation of new skilled jobs and on the other hand, it also leads to replacement of routine work and other cyber security risks. Thus, an attempt is made to evaluate the change from the perspective of labor markets and ability of people to adapt to the changing employment pattern in the country and responsibility of education sector to reform according to the changes in required skill sets demanded by the industry. Introduction of digital skill set in higher education curriculum can help in enhancing efficiency and flexibility in labor markets and bridging the digital skill gap in India. The study shows that digitalization has the potential to reduce gender gap in employment and also provide vocational training opportunities to youth which can help in harnessing the benefits of demographic dividend. The Government should aim at reducing digital divide by improving accessibility to internet in both urban and rural areas.

Keywords: Digitalization, Labor Market, Entrepreneurial Innovation, Cyber Security, Skill Gap, Flexibility, Curriculum

I. INTRODUCTION

Starting with the third industrial revolution, the process of digitization and rapid technological advancement has continued in the fourth industrial revolution in the form of integration of new technologies like Artificial Intelligence, Internet of Things, Robotics and machine learning by industries round the globe. Not only industry but most of our daily activities are also highly dependent on innovative digital technologies. According to National Payments Corporation of India (NPCI) report, United Payments Interface (UPI) transactions crossed 10 billion mark in August 2023. Internet and Mobile Association of India's (IAMI) report stated that India will have around 900 million internet users by 2025 and corona virus pandemic has led to significant increase in the number of online transactions in the past two years. With digital economy contributing around 11 per cent to India's GDP in 2023, it is expected that digitization is expected to play a key role in realizing the dream of US \$26 trillion Indian economy. Though digitization is not specifically mentioned in any of the 17 Sustainable Development Goals (SDGs)

adopted by United Nations in 2015 yet it can significantly accelerate the progress towards achievement of every single one of the 17 SDGs. Without proper development of digital technology, it is impossible to achieve SDGs by 2030. Some countries including, Finland and France have granted access to internet as the basic human right. However, according to a report published by IAMA and Kantar (2023), 52 per cent of the total population in India accessed internet at least once a month in 2023 and digital divide between states is high. In order to provide last mile internet connectivity to people of the country, the Cabinet has approved setting up of Public Wi-Fi Networks to provide Wi-Fi service through Public Data Offices (PDOs) across the country. This will work like PCOs and has great potential to generate job opportunities in the small and medium scale sectors.

Digital Inclusion through Digital Public Infrastructure (DPI) was also an important topic of discussion in the recent G20 summit hosted by India. In 2022, at the Bali summit, the rollout of digital public infrastructure was described as the most remarkable change. In the recent G20 Summit in Delhi, all the members committed to halve the gender digital divide by 2030. The G20 document focusses on reducing barriers to affordability, accessibility and usage of digital technologies, taking appropriate steps to enhance digital literacy and skills, eliminating all forms of online and offline abuse. The members also vowed to encourage women's livelihood and income security which will help in promoting women empowerment in a digital economy. Thus, the main focus of current G20 summit was to reduce digital divide in the economy.

Digitalization has led to changes in business operations and in order to remain competitive in the market, businesses are shifting to automated business models which have led to restructuring of labor markets in economies. On one hand, labor demand related to low skilled work is decreasing and on the other hand, labor demand of skilled professionals with specialized knowledge in robotics, artificial intelligence etc. is increasing in the economy. Thus, new job profiles have been created because of digitization and job profiles related to manual job work are now being replaced by automatic machines. Recently, Mc Donald's has launched its first outlet in the United States which is entirely run by robotics without any physical labor. In the banking industry, the need for manual workers at the back end has decreased because traditional works like pass book updating, cash deposit, KYC check of customers etc are going digital. With digitization and increasing internet penetration, the demand for online jobs is also increasing giving rise to work from home jobs and gig economy workers. This has helped in reducing operational cost of the companies and also provides flexibility and improved work life balance to employees. Digitalization can also play an important role in reducing gender gap in the economy by increasing the participation of women workforce in labor markets owing to better balance between family responsibilities and work. However, this requires consistent re-skilling and up-skilling of the workforce to enhance and upgrade their skills according to the changing job requirements and this will also help in reducing the level of structural unemployment in the economy. Thus, digitalization has transformed the culture of work and has also altered functioning of labor markets.

A study conducted by Reserve Bank of India has stated that India's digital economy grew 2.4 times faster than its overall economy which shows that there are steps being taken in Indian economy to move to the new era of digitalization. Digital technology is also being used recently to provide access to public services to citizens. This has helped in empowering citizens and also reduced red tapism at various level of government which citizens had to go through earlier. India Stack has also been launched by the Government to use digital infrastructure to shift towards a paperless, presence-less and cash less service

delivery. Thus, digital transformation of Indian economy will help the nation to remain on the path on competitiveness and innovation.

Another important thing to note in this regard is that digitalization can impact all the three sectors of Indian economy. In order to achieve the goal of doubling of farmer's income, digitalization in agriculture can play a crucial role. The use of Artificial Intelligence in agriculture can help in raising agricultural productivity by assisting farmers in choosing best crops for their farms and adopt climate friendly technologies to move towards sustainable agricultural practices. The Government of India has also collaborated with various private IT firms in the market like Microsoft, IBM to provide AI based support to Indian farmers which can play a pivotal role in increasing agricultural productivity. It has been observed that automation and artificial intelligence based technology also has great scope to improve India's manufacturing output whose contribution to total GDP is decreasing in India. This is because it can increase India's manufacturing efficiency which can help Indian economy to remain competitive globally. This can prove to be boom for our nation where employment elasticity of manufacturing is low. Proper upskilling of youth in these new technological areas can increase employment opportunities in manufacturing sector. In the service sector of the economy, the impact of digital technologies has been phenomenal be it e-commerce, financial services, education services, health care services, transport and communication, logistics etc. It has not only increased overall output of services sector in India but also helped in creation of jobs in this sector giving rise to online jobs, gig economy jobs which has great potential to increase female labor force participation in Indian economy. This is because it helps in balancing work and family responsibilities. Digital platforms like Amazon, Zomato, Swiggy, Big Basket, Ola, Uber, etc. not only eases our day to day work but also generates employment for thousands of people who were unemployed earlier.

The present research focuses on analyzing the impact of digitalization on employment patterns in India. The following section reviews the previous studies that have been done in this area and tries to find the research gap. This section will also throw light on various statistics related to digitalization. The third section will lay down the research questions which the study will try to answer. In the next section, research methodology used to answer these research questions has been discussed including explanation of data and indicators used for analysis. In the fifth section, the results obtained using the analysis tool are depicted with respect to the objectives set in the study. The results are also discussed in this section. In the last section, some suggestions are provided based on the results obtained and the section is concluded.

II. REVIEW OF LITERATURE

Sandri, Alshyab and Sha'ban (2022) in their research study have analysed the impact of digitization on unemployment reduction using a modified version of Okun's Law on a balanced data panel set for 58 countries for 7 years starting from 2013 to 2019. The results reveal that increase in digitization leads to significant reduction in unemployment level in these countries. They suggest that digital transformation can play an active role in inclusive development of the nations and thus, steps should be taken to reduce the digital divide by investing in digital literary programmes and up-skilling of the labor force which will help in reaping the benefits of digitization.

Pirosca, Serban-Oprescu, Badea, Puica and Valdebenito (2021) have analyzed the impact of digitization on labor markets within the framework of Covid crisis. The pandemic changes the entire working of labor markets and it became evident that a workforce with digital skills can adjust to the new circumstances. The data of European Union countries depict high digital proficiency and increased internet usage have

direct implications on wages and salaries of people. Thus, there is need to implement policies in our education system that focuses on increasing digital skills of youth.

Sarabdeen and Alofaysan (2023) have analyzed the impact of digital transformation on labor market in Saudi Arabia using ARDL error correction method for the period 2001-19 using fixed broadband subscriptions, mobile cellular subscriptions and computer, communications and other services as digital variables. The results show that labor markets in agricultural sector are not impacted significantly by digital variables. The number of fixed broadband subscriptions has a positive impact on industrial and service sector of the economy. In the short run, digitization does not have a positive impact on the economy because of the digital divide; however, all the three digital variables have significantly reduced the level of unemployment in Saudi Arabia in the long run. Thus, the authors emphasize on state intervention for technology induced organizational arrangements and increase in investment in human capital for up-skilling the youth of Saudi Arabia.

Goel (2021) has analyzed the impact of digitization on employability of faculties in education sector in India using cross sectional data for the year 2020-21. The descriptive study stated that personnel with the least ICT skills are among those who are at the risk of losing jobs. Teachers lack technical abilities and application skills and the need of the hour is to provide new training opportunities for faculties in a digitized environment. This can help to address various challenges faced by education sector, like, lack of industry-academic interface, lack of skill based education etc.

Digitalization and Employment Report of ILO (2022) stated that digitalization has led to a change in the work is organized and performed and new skills are required to do the work. Though it leads to creation of new forms of work but there are many challenges related to adoption of digital technologies by small and medium sector, unorganized sector, blurring of employment relationships, digital skills gap and required infrastructure by low and middle income economies to catch up with the developed economies in terms of adoption of digital technologies. Thus, policy interventions are needed by the government to address these challenges related to growing digitalization of economies.

Thus, the present study will focus on analyzing the impact of increasing digitalization on Indian economy with respect to various employment parameters to check whether digitalization is creating new jobs in the economy or leading to job losses. Since it has the issue of digital divide attached to it as reviewed in the literature, the study will further try to assess whether this is impacting female unemployment rate in the economy or not. The reports and newspaper articles show that digitalization has increased number of online part time jobs in the economy, the study will also try to assess whether the same holds true in Indian scenario or not. Further, we know that digitalization demands inculcation of new skills by the youth according to the needs to the industry, the study will further try to assess whether increasing internet access leads to increase in the percentage of youth with vocational training or technical degrees. Thus, the study aims to see the impact on various parameters of employment. If the impact is positive, then we need to address the challenges that comes with digitalization which is also very important. Based on the research problem formulated above, following research questions have been designed which will be tested using t test of regression analysis to show the impact of digitalization captured using number of individuals having access to internet services and on various employment parameters which are discussed in the section of research methodology.

III. RESEARCH QUESTIONS

In this section, the research questions that will be addressed in the study are spelled out. Since the focus is on computing the impact of digitalization on employment patterns in India, this has been examined by using a descriptive level study to show the level of internet penetration in India using various indicator variables and also by carrying out various regression analysis to shows the impact of digitalization on employment patterns in India. The research questions of this study are as follows:

- How has digitalization impacted the level of employment rate India?
- Whether digitalization has reduced gender gap in employment or not?
- How has digitalization led to restructuring of labor markets and changes in job composition in India?
- How has digitalization impacted persons with vocational training and personnel with technical degrees?
- What are the measures to enhance efficiency and flexibility in the labor markets to bridge the digital skill gap in India?

IV. RESEARCH METHODOLOGY

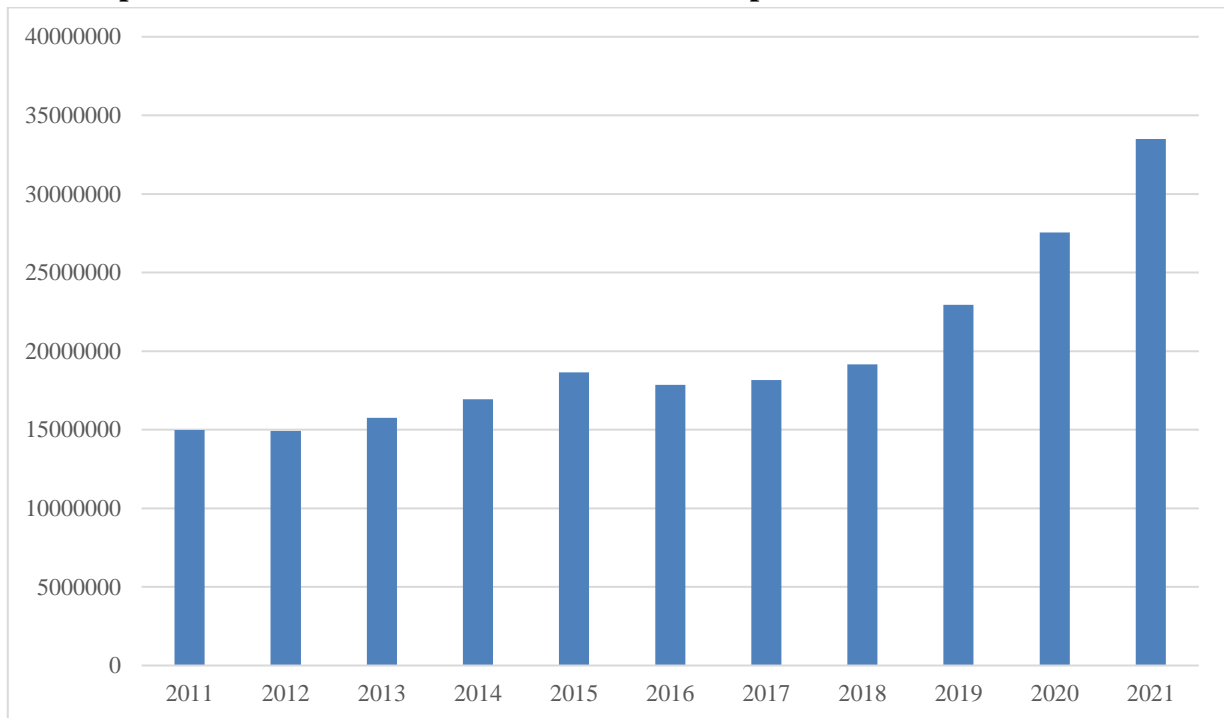
- Secondary Data based research.
- Indicator variable of digitalization – Number of Internet users in India (in % age) – Data retrieved from Databank, World Bank. (<https://databank.worldbank.org/>)
- Indicator variable of labor markets:
 - ❖ Employment in services sector (in % age) : Data retrieved from World Bank, Databank. This is used to test the first research question checking the impact of digitalization on overall employment rate in India.
 - ❖ Female Unemployment Rate: Data retrieved from World Bank, Databank: This is the indicator variable used to ascertain whether digitalization has helps in reducing the gender gap in unemployment rate.
 - ❖ Part time employment Rate: Data retrieved from World Bank, Databank: This is the indicator variable used to analyze the changes in job compositions and nature of the work brought about by increased digitalization in the economy.
 - ❖ Female Part time employment Rate: Data retrieved from World Bank, Databank: This is also the indicator variable used to analyze the impact of digitalization on the changes in job composition with respect to female work force employed in the economy.
 - ❖ Individuals receiving vocational Training: Data retrieved from Annual Report, Periodic Labor Force Survey (PLFS), Government of India: This is used as an indicator variable to assess the impact of digitalization on providing access to various courses that can help them in meeting the industry needs. (<https://dge.gov.in/dge/reference-publication-reports-annual>)
 - ❖ Percentage of individuals with technical education: Data retrieved from Annual Report, PLFS.: This is also the indicator variable used to answer the fifth research question.
- Time Period: The data of the above variables has been collected for a period of 11 years from 2011 to 2021.
- Analysis Tool: Regression is used to compute the impact of digital variables on labor market variables.

V. RESULTS AND DISCUSSION

STATISTICS RELATED TO DIGITALIZATION:

The level of digitalization in India has been studied using various indicator variables available in World Bank Database. Number of Fixed broadband subscriptions and percentage of individuals using internet are depicted graphically to study the trend of digitalization in the country over the past 11 years. In the Graph 1 below, the total number of fixed broadband subscriptions in India from 2011 to 2021 are depicted. It shows that the number of subscriptions were stable till 2018 and from 2018 to 2021, the connections have almost doubled.

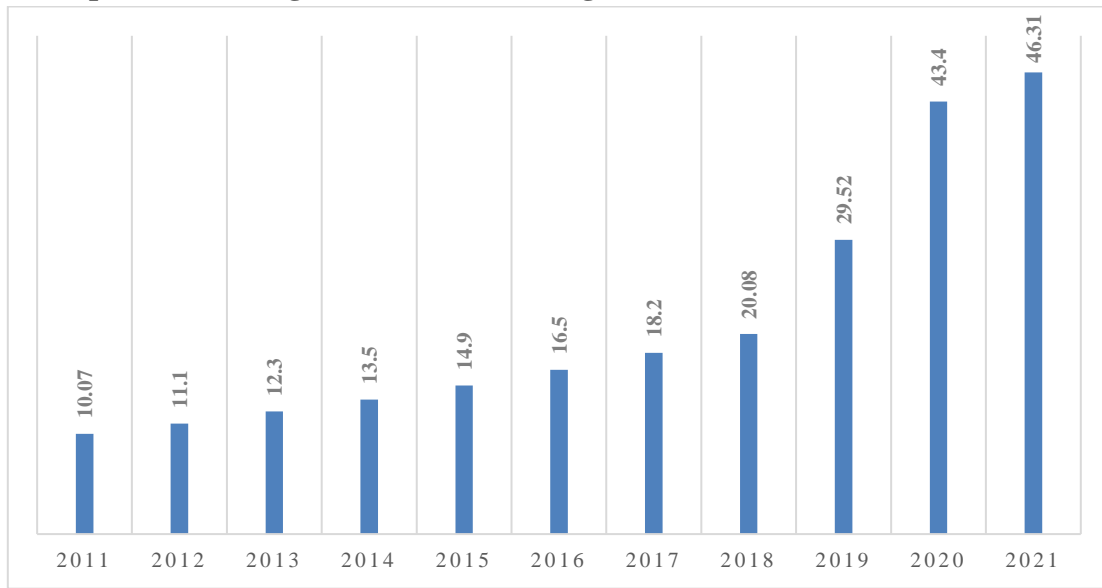
Graph 1: The number of fixed broadband subscriptions in India from 2010-2021



Note: Data retrieved from World Bank Indicators Data Catalog.

In graph 2 below, the level of digitalization in the economy has been captured using the percentage of individuals internet services from the year 2011 to 2021. The same trend has been observed in the case of percentage of individuals using internet services in the economy. There has been a steep increase from 2018 onwards and it is predicted that the percentage of individuals using internet services will further increase in future. The report by IAMAI further predicts that the total number of internet users in India will be 900 million by 2025. One of the reasons of the above change seen from 2018 onwards has been low internet prices which increases its affordability. Most of the growth in the number of internet users has been seen in the rural India because of cheaper tariff rates. The statewide distribution shows that number of internet users are highest in Maharashtra and minimum in Bihar.

Graph 2: Percentage of Individuals using Internet in India from 2011 to 2021



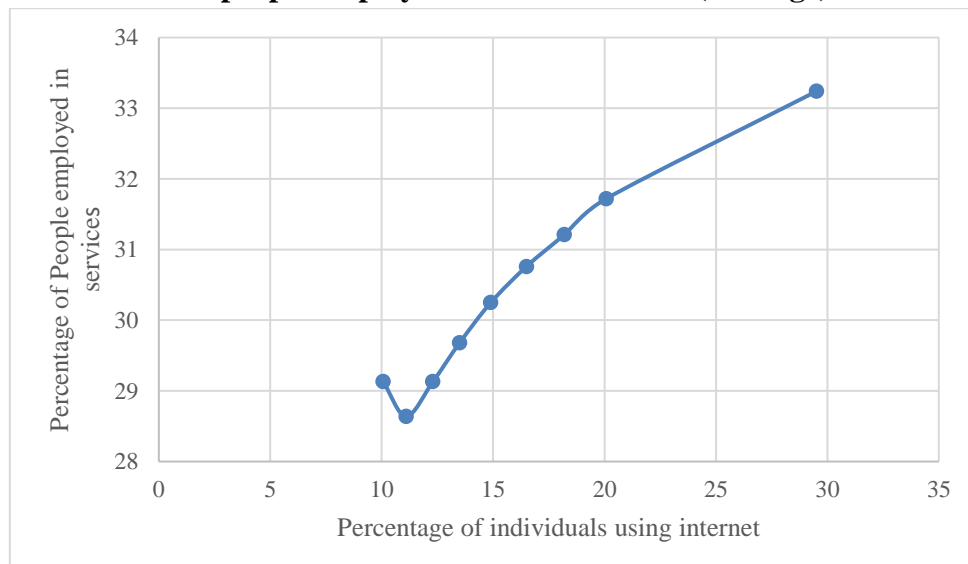
Note: Data retrieved from World Bank Indicators Data Catalog.

According to India Inequality Report 2022: Digital Divide, gender gap in internet usage can also be seen with India women being 33 per cent less likely to use mobile internet services than men. The report also states that only one third of internet users in India are women. Thus, gender gap in terms of internet penetration can be seen in the economy.

Objective 1: To check whether digitalization has impacted the level of employment rate in India.

Result: Regression analysis was used to compute the regression coefficient with percentage of individuals using internet as independent variable (X) and percentage of people employed in services sector as independent variable (Y). The scatter plot depicted a positive relationship between the two variables. The regression equation depicted a strong relationship between individuals using internet services and people employed in the services sector with t value of 11 and R Square value equal to 94 per cent.

Graph 3: Scatter Plot depicting relationship between individuals using internet services (in %age) and people employed in services sector (in %age)

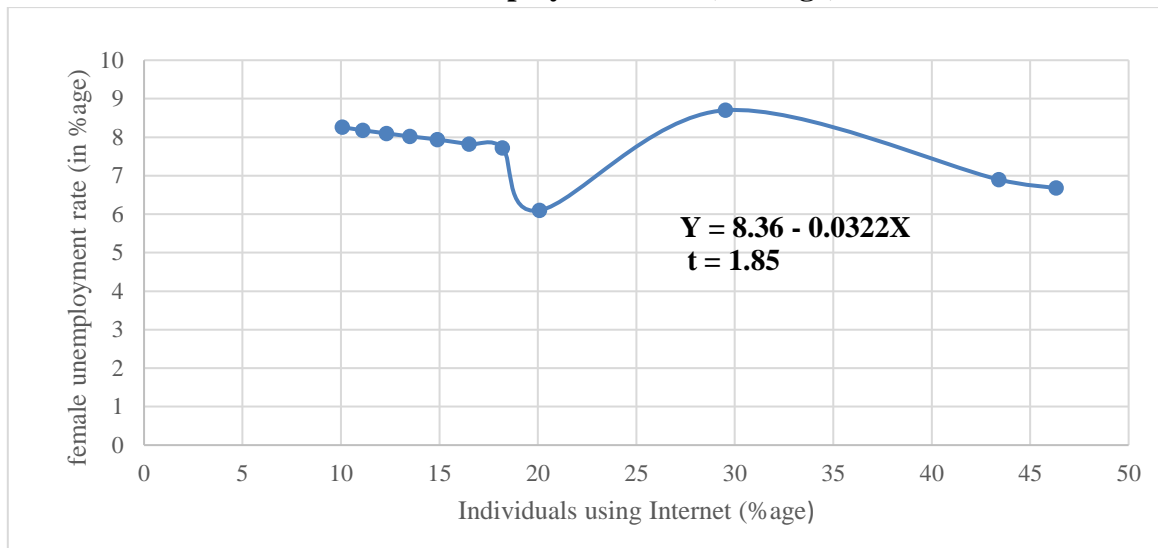


Discussion: It can be stated that with the increase in internet penetration in the economy, there is significant increase in the employment of people in services sector. This is because in some of the sub sectors of service sector, the work can be completed by virtual presence using internet and no physical presence is required. This also increases flexibility of work schedules and has thus led to increase in employment especially in services sector of Indian economy. Thus, if people are provided with internet connectivity in an economy, the level of unemployment rate can be reduced if people have basic computer knowledge.

Objective 2: Whether digitalization has reduced gender gap in employment.

Result: Regression analysis show that digitization has led to significant reduction in the female unemployment rate in the economy. The t value is significant at 90 per cent confidence interval. Thus, we reject null and conclude that digitization has led to a significant reduction in female unemployment rate.

Graph 4: Line Graph depicting relationship between percentage of individuals using internet and female unemployment rate (in %age)



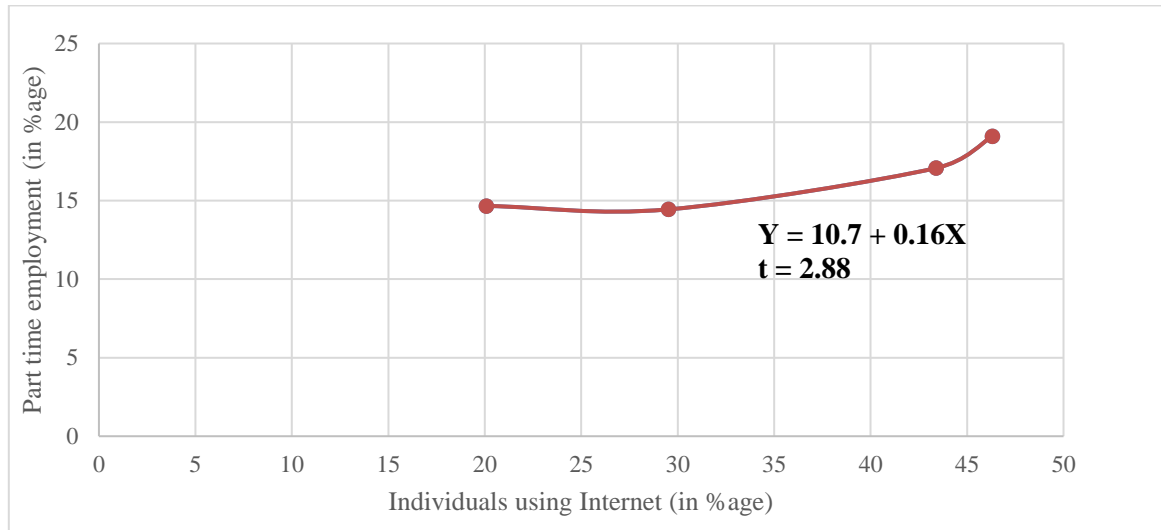
Discussion: This is because digitalization gives flexibility to women to work from their homes maintaining work life balance. Access to internet also opens other avenues for female workforce of the economy which will be studied as a part of Objective 3. From the above analysis, it can be inferred that digitalization can play an important role in reducing gender gap in employment by increasing female employment rates in the economy. This can help the economy in the long run to achieve higher growth rate of GDP because it has been observed that in the economies where female labor force participation rate is more, the growth rate of GDP is also high.

Objective 3: To check whether digitalization has led to restructuring of labor markets and changes in job composition in India.

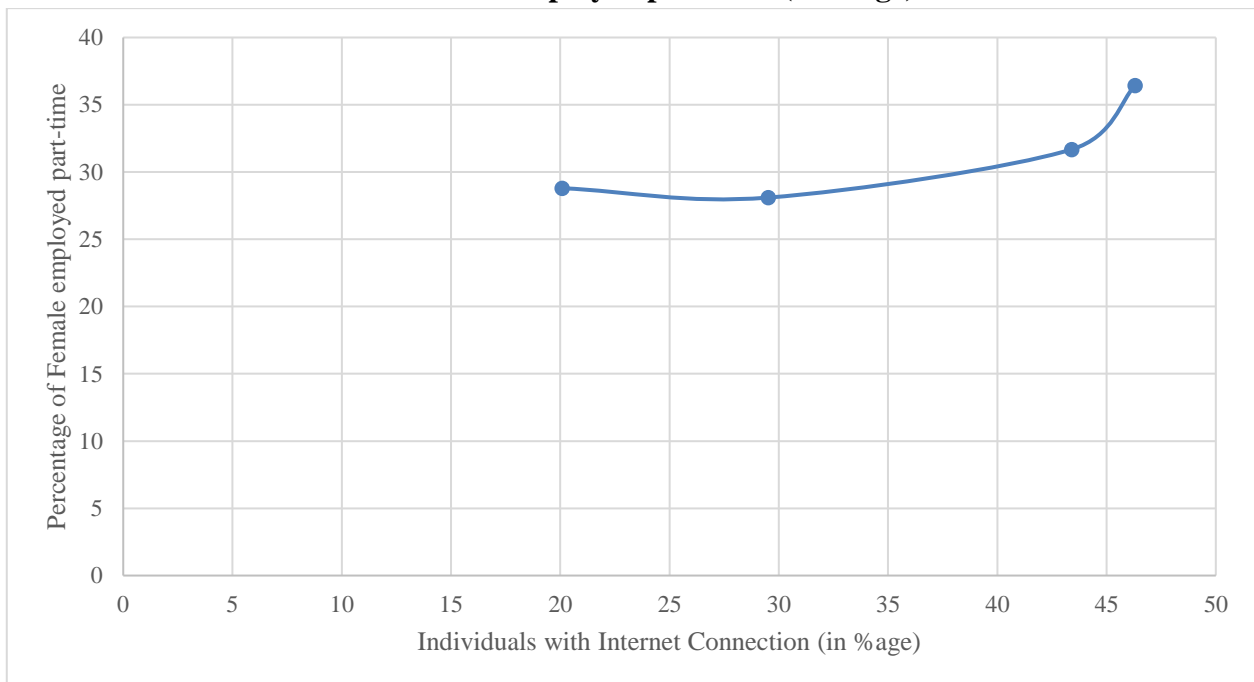
Result: With increase in the number of internet users in India, there has been a significant increase in total percentage of people employed part time. Part time workers are not engaged full time in a particular profession but are working and earning in their free time. They are considered as part of the labor force. Internet access provides workers with an opportunity to work on a project or different projects during their free time using internet. The t value is significant at 98 per cent confidence interval which shows that as

digitalization in the economy is increasing, the number of part time workers are also increasing. Moreover, results also show that there has also been a significant increase in percentage of women who are employed part time as a result of digitalization which is another step forward in the direction of reducing gender gap in employment.

Graph 5: Line Graph showing relationship between individuals using internet services (in %age) and part time workers in the economy (in %age)



Graph 6: Line Graph depicting relationship between individuals using internet services (in %age) and female employed part time (in %age)



Discussion: Access to internet services provides the labor force flexibility to work from their homes because there are various part time jobs which do not require workers to come to the physical offices. It only requires internet connection to complete their work. If access to internet increases with increasing

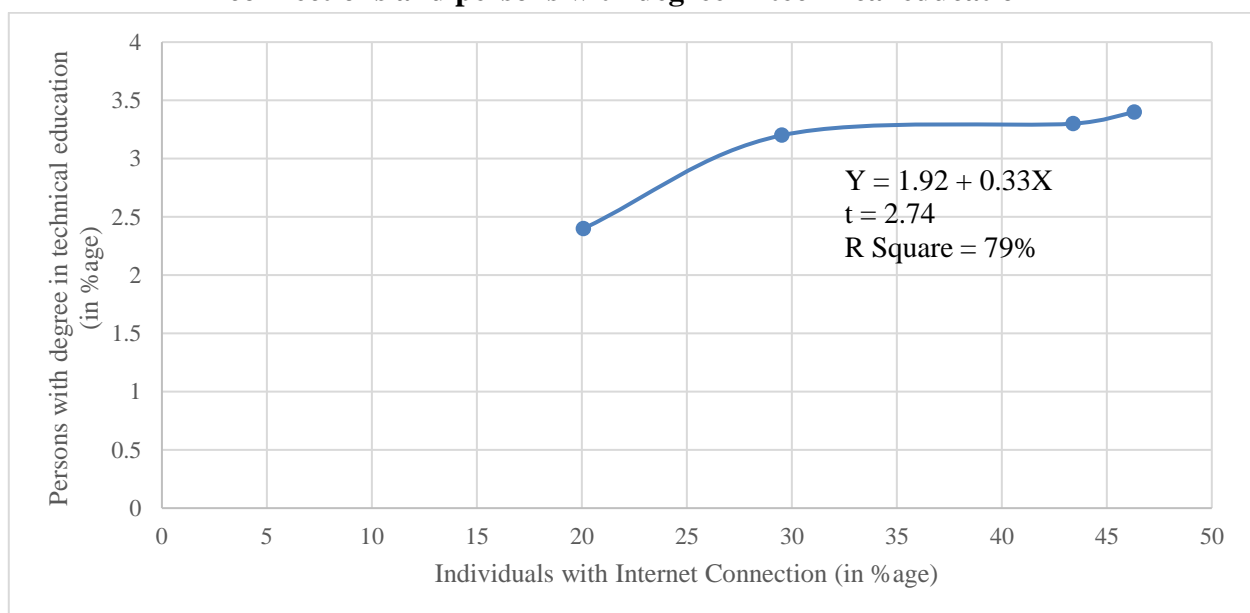
digitalization in the economy, then more number of people can work part time and this depicted in Graph 5 above where strong regression relationship is depicted between part time workers in the economy and individuals using internet services. Graph 6 further shows digitalization can play an important role in increasing the number of women who are employed part time. This is because women find it easier to work part time along with their household responsibilities. This helps them to balance their work better. Digitalization can also play an important role in generating revenue opportunities for women in semi urban and rural areas where there are lack of employment opportunities because they can work with a computer and an internet connection. However, there are no official figures of India’s gig economy workers, however, digitization also increases the number of freelancers or gig workforce of India because work is offered through online platforms. The concept of free lancing work has gained pace with increasing digitalization of Indian economy. Thus, digitalization has led to growth of online jobs in India.

Objective 4: Analyze the impact of digitalization on vocational training and personnel with technical degrees.

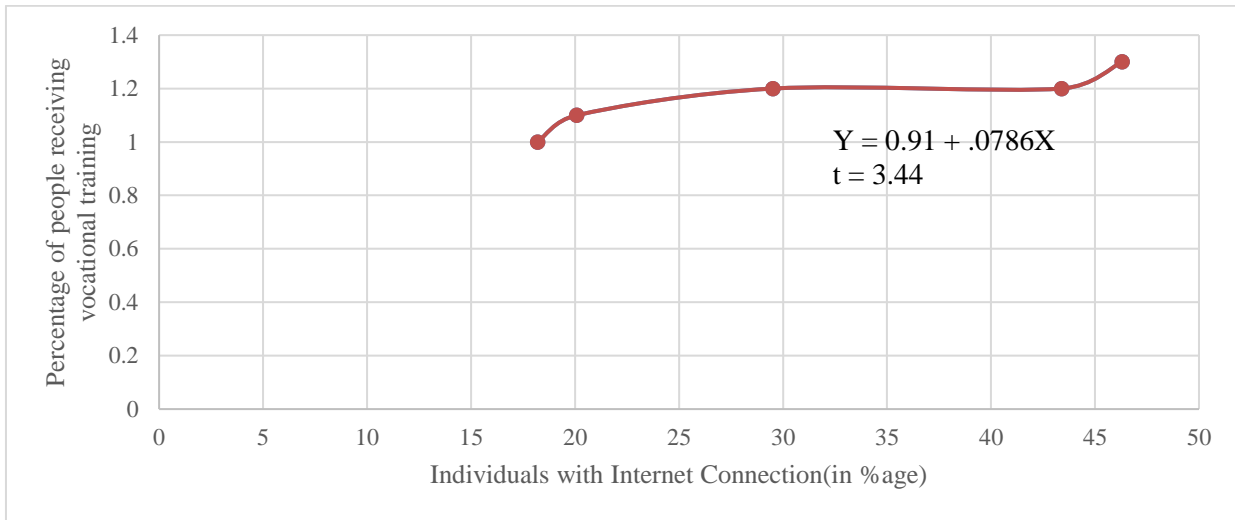
Result: Digitalization has led to a significant increase in the individuals receiving vocational training and has also increased personnel with technical degrees. As internet connectivity is increasing, people are having access to online skill development certified courses and in the long run, this can help in sustainable employment opportunities for Indian work force. (t value in Graph 7 is significant at 95 per confidence interval and in graph 8 at 99 per cent confidence interval). The value of R square also show that the model is a good fit.

Discussion: With the increase in the access to internet connections, the people can have access to online courses offered by various renowned institutes all over the world. This gives an opportunity to people to avail the benefits of these courses from their respective places which reduces overall cost spent in doing these courses because it saves boarding and lodging cost involved in staying in the campuses which everyone cannot afford. It also gives an opportunity to working population to up skill themselves along with their jobs. College students who are doing

Graph 7: Line Graph depicting relationship between percentage of individual with internet connections and persons with degree in technical education



Graph 8: Line Graph depicting relationship between individuals with internet connection in percentage and percentage of people receiving vocational training



their regular studies can enroll in various vocational courses to make themselves employment ready in future. Thus, access to internet services opens ample opportunities for youth and labor force to upgrade and re skill themselves according to the changing job requirements.

VI. SUGGESTIONS FOR POLICY IMPLICATIONS

The Government of India has taken various steps in the past to provide access to internet services to all the people of the economy bringing about a digital transformation in the economy. Digital transformation has different impact on different economic variables which requires in-depth analysis of impact on digitalization on these economic variables, such as, GDP, employment, consumption, Investment, Exports etc. In an attempt to study its impact on employment patters in India, it has been observed that digitalization can lead to employment creation in India and can help in reduction of gender gap in the economy. This is because it has been observed that it has reduced female unemployment rate and also increased the number of people who are employed part time in the economy. In order to free the Indian economy of the label of growing gender gap in employment, the Government should further try to increase the access to internet services by reducing tariff rates and increasing access to PDOs in both rural and urban areas. This can play a major role in increasing female labor force participation rate in the economy which in turn will increase women empowerment in the economy and thus increasing overall economic growth rate of the nation.

Another important area where digitalization can help Indian economy to reap the benefits of its demographic dividend is through skilling of Indian Youth. It has been observed that as the access to internet services increases, more and more people are able to get technical degrees and percentage of individuals having vocational training is increasing. Digitalization can play a major role in reaping the benefits of demographic dividend of our youth and prevent the it to become a demographic burden. This will help in making our youth job ready according to the changing job requirements and thus reduce the level of structural unemployment in the economy. Thus, if we are talking about emerging India in this context, then digitalization has an important role to play in our economy. The government policy should focus on increasing the internet penetration in the economy and also provide access to some vocational courses to our youth which can help them in developing their skills. As the study has shown that increasing digitalization is an opportunity towards sustainable employment which can be reaped if both rural and

urban area of our nation are digitally empowered. Government has already taken steps in this direction but further increasing internet penetration in our economy is a recipe for inclusive development of our economy and it might also lead to growth with employment creation in India rather than jobless growth in our economy.

VII. CONCLUSION

With the initiation of Industry 4.0, the pace of digitalization has increased world over especially after the pandemic. More and more people are now connected to internet and using their laptops and computers to do the work which they were earlier doing manually. This has also changed the way labor markets are functioning giving rise to part time jobs and gig economy jobs. On one hand, it leads to creation of new forms of jobs but on the other, there is fear that it will lead to replacement of routine work and also lead to cyber security risks. Though there are challenges attached to it, however, digital transformation of Indian economy has a great scope of reduce gender gap in employment and increase percentage of youth with vocational training and technical degrees. It will open ample opportunities for our youth to upskill and reskill themselves to make themselves job ready. For the Indian economy as a whole, it is an opportunity to reap its demographic dividend by reducing unemployment rate by generating new forms of work and providing opportunities to the youth to develop their skills and work in part time jobs. Thus, government should further strengthen its steps to increase internet penetration in India especially in rural areas to reduce digital divide and collaborate with private players and developed nations in the market to increase the pace of digitalization in the economy.

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