

Digital Transformation & Talent Quotient: Effects of Digital Transformation on Talent Quotient of Society

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गुरुर्ब्रह्मा गुरुर्विष्णुः गुरुर्देवो महेश्वरः ।

गुरुः साक्षात् परं ब्रह्म तस्मै श्री गुरवे नमः ॥

The above shloka, from *Uttarakhand* section of *Skanda Purana*, is known as *Guru Strotam*. This is a dialogue between *Lord Shiva* (Truth) and *Lady Uma* (Power). This shloka praises teacher or Guru, as the ultimate power, and translates as "Guru – The Teacher is Creator, HE is The Preserver and He is The Destroyer. Guru is the absolute (Singular) Lord and I bow before Him"

I have had many Gurus in my life who have made me virtuous. I am thankful to God and all His creations including my Late Parents and my Late sister Dr Poonam Rani Gupta, whose support, enthusiasm and dream of me having a Ph.D. encouraged me to pursue and, finally, achieve this. I want to thank relentless and unflinching support of my wife Nidhi and sons Shantanu & Sushant, ever since.

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Declaration and Statement

"I do hereby affirm that I am the soul author of this thesis and that its content are the result of readings and research I have done coupled with my industry experience."

-sudhanshu gupta (ID: UNISE1430IT)

1 Synopsis

The society, today, is an information society. Most of the activities done today are judged with the social impact they cause. Information flows very fast socially and affects emotionally. With various revolutions, human took various tools in their hand. Stone age had them hold stones and sticks to make their ends meet. These changed to bows & arrows to spanners, wrenches and other work-tools around industrial revolution. During current Information age and social revolution, the tool we have in our hands is smart phones. These phones are much powerful than yesteryears computers and can perform activities that not only improve quality of life but also give a meaning to connect with other socially, emotionally and financially. These devices coupled with the technology that make these devices ubiquitous, omnipotent and omnificent. Using these devices can help any society bring about the changes that they have been longing for. Once such change is overall upliftment of citizens with better and improved skills, so that they can meet demands of the future.

This thesis delves into the topic of how digital technologies affect talent quotient of society. The thesis deep dives into various industrial sectors that use digital technology to uplift them to next level. Invariable, most of the industries analyzed use Artificial Intelligence, Cloud Computing, Machine Learning, Big Data and Cyber Security to have a better customer experience as well as employee friendly. Basic premises of using these technologies is to make mundane tasks redundant for human beings and free-up them so that they can use this additional time to think critically about the activities that can make better difference to be better quality human life. In this process, they improve and grow their talent. Post this analysis a survey is conducted to check access, usage and adaptability of digital technologies. These results were compared with data freely available with some reliable & authoritative sources to conclude the research. The result of comparison along with Author's personal experience of dealing with various students across India, using digital technologies, is the logical conclusion of this thesis.



2 Introduction

Over the last one decade, there have been many disruptors for Society and organizations. These disruptors range from Socio-Economic elements to Techno-Commercial factors to environmental conundrums. Black Live Matters, Brexit, US Presidential Elections, Elections in India & some other countries, #MeToo Movement, focus on LGBTQ community were some of the major socio-economic factors. Advancements in technology field like use of Drones, Data Analytics & Data Science, Artificial Intelligence, monthly new & upgraded phone models and fluctuation crude oil prices were some of the techno-commercial factors whereas environment showed its fury in form of hurricanes, earthquakes and similar events related to global climate changes were some of the disruptors. Out of all these and various other factors, Use of Technology; and advances in currently used technology were a major focus area for technology providers, innovators, and users irrespective of what the disruptor was. Irrespective of how their lives got disrupted and or uprooted technology came as a soothing factor in most of the cases to provide solace either to come out of it victorious or to use it as a distractor from calamity and hardships.

In most cases, as mentioned above or otherwise, technology itself becomes a disruptor and at times, an enabler. Technology is a disruptor when it brings a paradigm shifts the way we do business and the way we work or the way we conduct ourselves. While it is an enabler when we enhance the ways of doing things and when it helps us to find a better "us". For example, online shopping portals like Amazon used technology as a disruptor and our shopping methods got changed overnight. We had never imagined finishing our shopping from cool confines of homes few years back. There are applications that help us do things at a place and time that were unimagined a decade back. This is how technology works as enabler. So much so, by enabling citizens to perform their duties, conduct their daily chores, go about their usual activities and business citizens can accomplish much more than in twenty-four hours than what could have been done without using technology. But a major pre-cursor for use of this technology is to garner enough means to use the technology and one of most important is to gather enough knowledge to understand, choose, use, and report the technology. This knowledge transfer cannot happen through spoon feeding but citizens need to start learning.



This research thesis has been done to understand how technology shapes the world around an ordinary citizen and its impact on the society by forcing citizens to unlearn some of their basic habits and learn to adopt new habits & skills using technology. In this process, there is a definitive learning opportunity for citizens to upskill themselves and acquire required talent for better use of technology. We will understand what these technologies are, how they modify learning behaviour, how citizens adopt these technologies and become adept at them and how various organizations and institutions are taking steps to uplift talent base of the society.

The research also includes some comparison of literacy data and Internet penetration from various Indian states to understand correlation between accessibility and use of digital technology and its effect on talent building of diverse societies across the country.

I will also include some of the insights about how students have started using technology when COVID-19 acted as a disruptor and everyone was inside their homes. By using technology, they have not only used every opportunity to learn new things but also kept them updated about the future. This is a positive impact of technology on overall talent landscape of Indian Society. These sessions are arranged by ICT academy ⁽¹⁾, with whom I am a registered Industry Expert and a volunteer Key-Note Speaker.

Through these various methods, this research paper will establish a connection between transformation due to digital technologies and its impact on talent quotient of the society.

3 Materials and Methods

“Methodology refers to the choice and use of particular strategies and tools for data gathering and analysis” (Daniel Chandler, 1998) ⁽¹¹⁾. This chapter focusses on the approach and the methods that are used to achieve the research objectives.

3.1 Generic Resources

This thesis is purely a research-based deliberation, based on various sources and knowledge freely available on Internet. Apart from internet author will also explore UniSelinus library ⁽²⁾ for any relevant information.

3.2 Experiential Knowledge of Author

Author of the thesis has more than two decades of digital & related technology experience. In these two decades he has been one of the seats of expertise and have advised customers in selecting the right solutions, technologies, OEM’S and System Integrators. He is also a voluntary expert on few technology sites on Internet and have also participated in worldwide forums. His experience amalgamated with his current foray in talent building and talent transformation is an apt combination to conduct this research. The author is a standing CCIE ⁽³⁾ (Cisco Certified Internetwork expert) since 2001 and has been granted lifetime Emeritus status on 6th May’2021. CCIE is an epitome of technical expertise & technical knowledge for various technologies & solutions ever envisaged in an Enterprise Infrastructure.



Figure 2: CCIE 20 Years Logo



Figure 1: CCIE Emeritus Logo

3.3 Anonymous Survey

To establish the connection apart from analysing the data author has also created a simple anonymous survey to gather data from participants to get an insight from a sample population. Though this sample may not represent whole society, but it will certainly give an insight to the topic of this thesis. Questions have been designed in such a way to seek responses for last two years which is good enough for technology and its effect.

Survey is anonymous so that it elicits candid and appropriate response from the participants. Survey was created on a free website ⁽⁴⁾. The list of questions asked in the survey ⁽⁵⁾ is given below.

Access to Digital Technology

1. Do you own a phone?
2. Do you have continuous access to internet?
3. If required, can you have temporary access to Internet?

Use of Digital Technology

In last 06 Months

4. Have you learnt any new skill or hobby?
5. Have you refreshed your previous skill or hobby?
6. Did you use Internet and/or phone for points 4 & 5 above?
7. Were these sessions led by an instructor in a classroom?
8. Which is preferred method from above two
 - a. Classroom
 - b. Internet

In last 06Mth to 02 years

9. Have you learnt any new skill or hobby?
10. Have you refreshed your previous skill or hobby?
11. Did you use Internet and/or phone for points 9 & 10 above?
12. Were these sessions led by an instructor in a classroom?
13. Which is preferred method from above two
 - a. Classroom
 - b. Internet

In last 02 to 04 years

14. Have you learnt any new skill or hobby?
15. Have you refreshed your previous skill or hobby?
16. Did you use Internet and/or phone for points 14 & 15 above?
17. Were these sessions led by an instructor in a classroom?
18. Which is preferred method from above two
 - a. Classroom
 - b. Internet

Demographics

19. Please mention your gender.
 - a. Male
 - b. Female
 - c. Non-Binary
 - d. Prefer not to mention
20. What is your educational Level?
 - a. No formal education
 - b. less than 4 years of formal education
 - c. 4 to 12 years of formal education
 - d. more than 12 years of formal education
21. Where do you stay?
 - a. Rural
 - b. Urban (Including Suburbs)

All the above he above questions simple radio button answers expecting users to check one of the two pre-defined options to make survey easy to answer and better to comprehend & and generate report.

3.4 Other Resources

Apart from using his expertise on various technologies, their effects on human being in terms of raising their knowledge level, author will also compare some of the data related to literacy rates and phone/internet penetration to establish a correlation between use of technology and knowledge gained.

3.5 Result Compilation

Results from the Survey will be matched to the results obtained through the research from freely available resources, as mentioned above, and combined with authors knowledge will be analysed to conclude this thesis.

3.6 Chapters in the Thesis

3.6.1 Chapter1: Synopsis

This chapter contains a summary of the research to give a quick glance of what is covered in the thesis, thought process of author to go through various resources available, analysis, validation and matching this data with his finding to conclude the results.



3.6.2 Chapter2: Introduction

This chapter starts with disruptors in today's world and builds a foundation for digital technologies as a disruptor. Additionally, this chapter also introduces the philosophy behind this thesis and how results will be arrived at.

3.6.3 Chapter3: Methods and Material

It is this chapter and gives an overview of various resources available to the author, a quick snapshot of his expertise and the survey that will be used to gather results to be substantiated with author's thought process. This chapter also gives a brief of various chapters in the thesis.

3.6.4 Chapter 4: Digital Technology

From this chapter, main content of the thesis starts, and this chapter focusses on Digital Technology, its evolution, and most relevant digital technologies for modern day world. The four technologies that are focussed upon are

- Artificial Intelligence
- Big Data
- Cloud Computing and
- Digital Collaboration Tools.

3.6.5 Chapter 5: Digital Transformation

This chapter will focus on Digital Transformation taking cue from Chapter 4 of Digital Technology. This chapter will contain information about digital transformation, relevance in today's world and how various industries embrace digital transformation. Some insights of digital transformation will be given on various industries to show wide-spread behavioural changes due to digital transformation before focussing on Education and Learning industry.

4 Digital Technology

Before reaching a conclusion to find out effects of digital transformation on talent quotient and talent building, we need to first understand digital technologies, digital transformation as it applies to education industry & social culture, talent quotient and talent transformation. We will get into each of these topics to form a base of our understanding.

4.1 Digital Technology: A Primer

Digital Technologies transform almost every aspect of our daily lives. They are becoming increasingly more important in everyday life from Artificial intelligence to machine learning to augmented & virtual reality. Its use has left no meaning to distance in modern days. Students are studying from teachers that they never imagined. Though

author had planned to conduct research thesis remotely, but he never imagined completing his PhD from a university which is halfway across globe. Not only education, but lot of other fields like hospitality, transport, business, government sector, medical etc. have been benefitted due to use of digital technologies. We have stories of remote surgery (The Lindbergh operation⁽⁶⁾) and remote surgeries being performed



*Figure 3: Placement of Author and PhD Guide on Globe:
This depicts use of Digital Technology*

using 5G technology⁽⁷⁾, where doctor and patient were miles away but the digital technology helped a complex surgery of brain implant by controlling robot using 5G network and plethora of other technologies. Let's focus on digital technologies and their use across various domains of modern society.

4.2 What makes digital technology Digital?

Digital originates from "Digit" which is Latin word *digitus*, which refer to a tool used for counting. Digital Technology refers to knowledge and knowhow that relies on microprocessors and the devices & applications that depends on these microprocessors. Information is transferred between devices in form of binary codes. These binary codes, in the form of 1s and 0s are converted to form those are easily understandable by us. Digital technologies are at the core of all modern communication and information systems. Digital computer systems

deploy various kinds of databases, arrays, protocols, and algorithms to store, process and deliver information on a vast array of user applications. Internet and Intranet interconnect these computer systems across the globe enabling the exchange of this data and information. Rather, more importantly, these networks allow applications to be created and hosted on multiple computers in the network facilitating distributed applications with processing power of enormous magnitude. Once of such example is supercomputers and processing at the backend of cryptocurrencies and more familiar example is torrents that make our personal laptops and desktop originators of files that we download.

Digital technologies are at CenterStage of modern-day life for corporates. Governments and citizens. This implies that assessing capabilities and limitation of what makes a system digital is very important. Nature is not digital and so are human beings, flora, and fauna. Yet most of what modern businesses, governments and corporates do to conduct daily activity for any user or citizen is based on digital technologies.

4.3 Digital Technology as a Transformation agent

The evolution of technology is having a profound effect on any transformation in the society and how this transformation or change is executed. As we embrace new technologies and digitalization – and generally seek to implement digital transformation strategies, new challenges emerge. Human Being resist any change, big or small, and so is this transformation due to technology. Experts in digital transformation often state the fact that people generally resist technologies as a big issue. As a result, better tools to manage these changes and adoption are becoming more important than ever before and are driving new approaches to manage these transformations. This evolution of transformation and change management depends on digital technology.

There are four key digital technologies that are used to bring transformation in modern societies. Developed countries heavy lift these technology for a better daily quality of life of their citizens whereas underdeveloped and developing countries and society use it as per availability and means of these technologies. Out of various digital technologies below four digital technologies drive transformation in a big way. These technologies are

- Artificial Intelligence (AI tools to model COVID-19 waves)
- Big Data (Analysing humongous amount of data to model effect of vaccines)



- Cloud Computing (Using decentralized systems to store real-time vaccination data in a secured manner)
- Digital collaboration tools (means to collaborate across geographies and among countries, Education and Work from home across the globe)

4.3.1 Artificial Intelligence

Perhaps more than any other technological advance to date, artificial intelligence, or AI technology is fundamentally altering change management – particularly the people dimension of change management. First, it introduces far greater efficiency to change management. For instance, using AI technology, change managers can measure digital activity in real time – all day, every day. An example of using AI technology, in today's post pandemic world, is use of tools, especially bots, that learn basis our responses and provide a near accurate answer. Lot of service organizations have downsized their contact centre ⁽⁸⁾ and have introduced with robots that help users' issues and queries answered using knowledge base that is ever increasing and becomes robust over a period. Not only this, home tutors for school children also use AI and bots for their education needs whether it is testing their knowledge or for understanding a complex topic from their syllabi.

Using AI, which uses the flow of data to predict future events, corrective actions can be taken pro-actively before there is a problem. A recent example being use of AI in monitoring two recent cyclones ⁽⁹⁾ in Arabian Sea & Bay of Bengal and planning evacuation to minimise loss of life. In fact, because AI technology can introduce these transformations automatically to sidestep anticipated problems, actions can even be taken without any involvement or intervention from the authorities and executive. They get an alert to what's happened but isn't required to execute the change manually. This speeds things up considerably, helping to ensure that the adoption of change for transformation stays on course. This also helps in governing time and budget for these large projects affecting whole society.

Using AI means that the authorities do not have to input, collate, and analyse huge quantities of data. Instead, they can focus on whoever is managing the transformation or is being affected by the transformation to better leverage their time and improve effectiveness. Suppose a department is using an AI tool for real-time water flow or real time sewer monitoring. If enabled with IoT, either citizens or the operators can feed data into the system real-time. One approach

could be to experiment with different change management strategies within selected sectors of a particular area. After a few initiatives are made, the authorities can analyse data collected to identify which sectors (or areas) were most effective in leading change. They can then observe those areas to determine what they're doing differently that generates success. And then replicate same models to rest of the areas or sectors. The next digital technology that can be used in digital transformation activities is big data.

4.3.2 Big Data

The definition of big data is data that contains greater variety, arriving in increasing volumes and with more velocity. This is also known as the three Vs. Put simply, big data is larger, more complex data sets, especially from new data sources. These data sets are so voluminous that traditional data processing software just can't manage them. But these massive volumes of data can be used to address business problems you wouldn't have been able to tackle before ⁽¹⁰⁾.

Traditionally, the digital transformation has tended not to be based on a data-driven model; It's more likely to be based around qualitative data. And there can be a degree of resistance – whether cultural, personal, or motivational – to doing things differently. So, to facilitate this transformation, it's important to demonstrate the benefits of leveraging big data to convince and persuade people affected by and carrying out the changes. As the name implies, big data refers essentially to a huge volume of structured and unstructured data, which, when analysed computationally, can reveal an array of useful patterns, trends, and other insights.

Recently, Government of India announced cancellation of 12th class examinations for about 15million students. 12th class exams are a turning point for students as basis marks secured in these examinations, they choose their graduation stream. COVID forced these exams to be cancelled. Now an evaluation criterion will be developed to grade these students, based on their past performances. More complexity is added as there are about 174 subjects out of which 5 are to be considered for each student. Simple excel sheets and simple formulas will not help to grade the students in timely manner. Big data comes handy in complex situations with enormous data to be dealt with.



4.3.3 Cloud Computing

Any computational activity needs data storage and computing power. These resources can be had in advance and kept ready for use whenever need arises or they can be requested and provisioned on demand. Cloud Computing is referred to as the on-demand availability of computing power, storage for data, billing for services used, and reporting but without any direct involvement or management by the user. All these resources are provided to multiple users at any single instance through data centres across internet.

Cloud computing is widely used in transformational activities. Cloud-based processes or tools enable authorities to overcome numerous issues that have traditionally affected transformational changes digital or non-digital. For instance, these tools and processes can significantly reduce the number of service interruptions, which could happen on-the-fly due to changes in the backend systems. There are many cloud service options and features that cloud service providers offer that can help provide services with five-nines availability.

4.3.4 Digital Collaboration Tools

To execute transformation tools are an important aspect. Inputs are needed from various people and experts with different skill sets and point of views. Hence collaborations become extremely critical to core of transformation. Collaborating physically in one place is not possible every time. Hence collaboration is to do over internet and by using tools to collaborate digitally. One of the great examples, very relevant in today's scenario is collaboration between scientists, laboratories, and governments to find out a quick and replicable solutions for COVID vaccine. Digital collaboration makes it very much feasible to work on complex & life changing problems with large data sets using methods and tools that are available on demand and online.

The tools that monitor these transformations and track reporting and approval process can be adjusted to either approve or decline further changes. Digital collaboration tools can also be used in large scale transformation activity like current COVID-19 vaccination drive going across the globe. These tools can make transformation more effective through their capacity to improve planning, communication, and scheduling. They also enable departments & governments to better identify whether policy and enforced compliance standards are being properly enforced, reviewed, approved, and implemented.



The relentless drive toward digital transformation is having a profound effect on industries, organizations, societies, and each & every single individual. This includes bringing about new changes to address modern day issues and intricacies. And while some significant challenges remain to its full implementation, there are a range of digital technologies that can be used to meet them.

5 Digital Transformation: Adoption and Use-Cases

5.1 Adoption of Digital Transformation

The modern life landscape is constantly being disrupted by the forces of changing requirements and technological advances. To survive in this landscape, societies, governments, and organizations must embrace digital transformation initiatives, that can help them adapt to these rapidly changing demands.

To meet ever changing business and market requirements, societies, governments, and organizations need to continually innovate and adapt. Digital Transformation helps us to achieve this in one of the most effective ways. But what exactly does this term mean? *Digital transformation is the use of digital technology to update business processes, culture, and customer experiences.* It involves taking traditional approaches to, for example, healthcare or citizen services, food supply, and defence. And updating them using a modern infrastructure that's built upon the latest data science and technology enabled applications. Done correctly, a digital transformation initiative can have a profound effect on every human being, bringing about financial, cultural, strategic, and competitive benefits. It can also increase efficiency and quality of life.

One example of how digital transformation can achieve these benefits can be seen in how a leading provider of package shipping services uses augmented reality, or AR ⁽¹²⁾. As part of a pilot initiative, the company decided to completely revamp their order picking process in their central warehouse, focusing on an innovative system called vision picking.

Using internet enabled AR glasses, warehouse operators view task information, get directions to item locations, scan barcodes, and update stock in real time. Thanks to this transformation initiative, the company eliminated the need for handheld scanners and paper order lists, reducing costly errors and significantly increasing productivity. With so many potential benefits, it's obvious why businesses have tried to implement digital transformation initiatives. And scaling these solutions more widely to support and betterment of lives of citizens isn't too far-fetched.

Unfortunately, these initiatives are not always successful, leading to frustration and a question mark on value of digital transformation. All too often, the failure



of the initiative is linked to a lack of commitment from the authorities, leadership, and citizens. Many departments and organizations delegate the responsibility of implementing digital technologies or digital transformation to a particular department or ministry or a specific function. Neglecting the vital input from other departments that are central to the digital transformation process and to promoting the behaviours that can bring about successful transformations.

Leaders and authorities can make three major contributions as champions of digital transformation for societies. The first is to play an active role in supporting the development of a digital transformation strategy. This involves bringing the wider perspective of the society's goals and mission into the strategic plan for digital transformation.

The second contribution is to budget and fund the investment necessary for successful transformation. This investment, in most cases, is not merely financial, it also refers to the time, effort, education and support needed to achieve true transformation. These four points bring us to the third contribution, to set performance metrics.

There is little point in investing so much in a project if we don't measure and analyse the success of its implementation. As part of this process, government departments and citizens will need to support and work toward these performance metrics. Leaders & authorities must also establish accountability to see things through and stay engaged throughout the transformation. Whether implemented in a section of society or a sector of a city, digital transformation is a potentially game changing endeavour. For it to be successful, it takes the focus, support, and commitment of every citizen and leader of the society.

Since most of the societies reflect industries thriving within them, we will try to understand Digital Transformation in following industries to understand its reflection on Society. This will give us a good understanding of how these transformations will affect Citizens.

- Consumer Good firms
- Banking and financial service
- Health care
- Education Sector



Most of the common digital technologies play a vital role in Digital Transformation. Mention of digital transformation is not complete without mentioning following digital technologies, which are covered in [Chapter 4](#) above.

- Cloud Computing
- Big Data
- Biomimicry
- Cybersecurity
- Digital Cartography
- Artificial Intelligence
- Internet of things
- Enterprise Information System
- Software as A Service

Following section discuss in detail, how these technologies help these key industries in their digital transformation journey.

5.2 Digital Transformation Services in Consumer Goods

Digital transformation technologies are continuing to change the way the world does business. Across all sectors, organizations of all types are exploring their digital transformation elements. For Consumer goods firms, the options and opportunities are significant.

Consumer goods are physical products defined by the ability to be physically touched, which includes things like clothing, cars, food, computers, telephones, and parts or materials used to make something. We will explore the key digital transformation technologies that can be applied to the sales, marketing, engineering, and supply chain functions within the Consumer goods sector.

While a digital transformation initiative can be applied throughout to Consumer goods firm. Let's first look at the benefits that can be derived from using digital transformation technologies in the marketing, sales, research & product development, or R&D, and engineering functions. Using digital transformation technologies in these functions can increase the accuracy of the voice of the user, voice of the market activities and hence, in return can reflect on thought process and aspirations of citizens and human beings.



- Lead to faster new product development cycles.
- Help integrate design with sourcing, procurement, operations, and supply chain early in a cycle.
- Help increase the reliability of engineering support activities.
- And help capture issues at point of production, leading to reduced errors, predictive failure detection, and prevention.

There are few digital transformation technologies that are particularly applicable to the marketing, sales, R&D, and engineering functions within Consumer goods firms. The first of these is **big data**. This is about the firm's ability, to acquire data and apply it for decision support. To make the most of big data, organizations often need to change how they think about data and how it's used.

First, existing data needs to be validated, and organized using the principles of Enterprise Information Management. For example, when Coca-Cola strengthened its data strategy, by building a digital-led loyalty program. Their officials, responsible for data strategy, publicly made it clear that big data analytics is essential to their customer retention efforts.

Second, organizations need to work on identifying, measuring, and managing processes from a data-centric decision-making, human-interface perspective. Only then can practical, actionable processes be defined to align to business priorities. The newly developed real-time synergized data can then be used to proactively address business priorities including enabling the employee to perform at their full potential. And ensuring corporate social responsibility issues are addressed with meaningful, measurable results.

Technology cannot solve business challenges without a clear understanding of the business' and employees' underlying needs, goals and aligned processes. Suppose a company invests in cancer research for its community. This may be coupled with a dedicated push towards investing in reducing medical waste, environmental improvements to reduce carcinogen use and reducing manufacturing waste.

Both air and water have commonly been found to contain cancer causing carcinogens that are commonly linked to industrial efforts. The connection between manufacturing processes, environmental harm, and cancer can become validated through analytics made available through big data. Another technology that can be applied to these functions is **cybersecurity**. These



technologies enhance an organization's capacity to keep data intact and secure from cyber risks.

Since the area of cybersecurity is rapidly evolving, there needs to be continuous and heightened vigilance. This includes having the best available technology, aligned with practices in place, so that IT systems aren't breached. With more and more manufactured equipment being integrated with the Internet of Things and edge sensor technologies. And then installed inside the firewall of customers, cybersecurity challenges are a huge concern.

For producers of Consumer goods, that are managed through the Internet, cybersecurity includes safeguarding these products, software, and technologies, so that they're not compromised in any way. It's a concern that applies to every product or service development cycle. For example, for years, automakers have been working to ensure that vehicles can't be hacked remotely.

So, to this end, manufacturers of equipment with interfaces to the Internet of Things need to ensure that there are no backdoors or vulnerable points. Another Digital Transformation element is **ethnography** support technologies. These technologies can be particularly beneficial for sales, marketing, and engineering functions in that they produce accurate and timely voice of the customer, and voice of the market data and insights.

Using digital ethnographic research, it's possible to gain deeper insights into the consumer, as well as more effectively engaging these consumers, be they B2B or B2C. For instance, you can find out how consumers view your company, how do they see your competitors, what their functional needs are, what values influence their decisions, and what they ultimately want. Depending upon the organizations' needs and customer base, there are several ethnographic techniques that may be useful.

Ethnographic surveys, for example, are especially helpful for conducting international research. The survey mentioned in the Section 3.3 above is also an Ethnographic Survey. Video ethnography is best for capturing real-time reactions, in-store or at trade shows, and other industry events. Another digital transformation technology that can be applied to sales, marketing, R&D, and engineering within Consumer goods firms, is **digital cartography**.

When applied to R&D, for example, it incorporates major functions, including voice of the customer, new product development, innovative solutions to the problems, lean start-up, and agile enterprise. These various design processes depend on project planning, tracking, and reporting, which can often be difficult and inefficient. Using process mining and video ethnography, combined with video analytics, processes can be tracked, and traced to identify areas for improvement.

When applied to strategy, digital mapping provides a clear insight into the overall understanding of the company's strategy. Identifying any gaps or necessary adjustments. When applied to marketing, digital mapping leverages voice of the customer techniques to identify markets and monitor how existing products are being received. It's also useful in developing and testing alternative marketing campaigns.

And similarly, when applied to sales, digital mapping ultimately produces invaluable insights into sales force effectiveness. The automotive industry, for example, was an early adopter of digital mapping to shape their strategies. Applying it to business operations and logistics. Their use of IoT, and edge sensor technologies have also impacted the development of intelligent vehicles and systems with improved safety and functionality.

A final technology that can be applied to these functions within Consumer goods firms is **biomimicry**. Essentially, biomimicry is the use of innovations found in the natural world. Its models, systems, processes, and elements to inspire solutions to human problems or challenges. Although most biomimicry innovations tend to be in the form of physical products.

It's increasingly impacting the areas of digital transformation technology and business innovation. And this will likely be the case more and more in the coming years. For example, GreenBone Ortho ⁽¹³⁾, has patented a technology that transforms bamboo into bone graft scaffolding. Ideally, these scaffolds are created from biomaterials that can mimic the properties and structure of natural bone.

Along with many other functions within Consumer goods firms, the sales, marketing, and engineering functions are well-positioned to benefit from digital transformation. Applying appropriate digital transformation technologies to these functions can bring greater effectiveness and efficiency.



5.3 Digital Transformation Services in Banking & Financial Institutions

The Financial services sector is the part of the economy made up of firms that engage in the business of dealing with financial and monetary transactions. These include banking and finance, insurance, government financial services, and other business-to-consumer financial services. For-profit, public, and not-for-profit providers of these services are also part of the sector. Technology has caused radical disruption to financial services in recent years. This has led number of Fintech companies growing by leaps and bounds. Fintech is used to refer to innovative new applications, processes, products, or business models in the financial services industry. They're composed of complementary financial services, and deliver an end-to-end solution via digital technologies, enmeshing finance, and technology.

Fintech, rapidly evolving, has created new companies or services that use technology to provide financial services to businesses and consumers. Financial Service Firms and Institutions are making big investments to enhance the customer experience through the development of new digital products and capabilities. These firms and institutions recognize the many benefits of using digital technologies, such as improved quality and performance, reduced costs and waste, improved customer satisfaction and enhanced risk management.

When it comes specifically to marketing, sales and product engineering functions of financial services sector firms, there are some further benefits of using digital technologies such as increased voice of customer and voice of market accuracy, faster new product and service development cycles, better integration of design operations and supply chain. Enhanced quality, increased reliability support, and better risk identification and management. There are five key digital technologies particularly beneficial in marketing, sales, and product engineering functions. The first is **Big Data**. Big Data refers to the ability to acquire and use data to support decisions. To truly leverage Big Data, a company's culture must fully transition to measuring and managing business entirely through the lens of data. Achieving this means that practical and actionable steps can then be defined. Well-organized data can be used, for example, to address genuine corporate social responsibility issues to bring meaningful and measurable results. For example, Big Data and analytics are being applied in a wide range of financial services. From identifying the most

likely customers to participate in a specialty bank program, to determining the likelihood of a person committing banking fraud. As well, insurance companies are using Big Data to set more accurate policy premiums, identify fraudulent claims, and improve marketing efforts. Companies like Progressive and Aviva, are taking this step further by offering discounts to drivers who allow them to monitor their driving via smartphone apps.

Cybersecurity is another key digital technology relevant to sales, marketing, and product engineering functions. Cybercrime, cyberespionage, and hackers continuously threaten data security. Cybersecurity keeps data intact, secure, and confidential, but it's a constantly evolving technological battlefield, requiring vigilance and an integrated response from everyone involved. Superior technological and information advantages and the right allies are essential to securing success. For Fintech firms, there are several specific mandates that must be addressed including government regulations compliance, protecting personally identifiable information, fraud prevention, customer errors, and securing collaborations.

Ethnography support Technologies are the future for gaining accurate and timely voice of customer and voice of market data to be utilized in sales, marketing, research, and new products and services development. Digital ethnographic research ensures an understanding of and engagement with customers. These techniques include ethnographic surveys, which are in home surveys that allow you to see how your customers day-to-day lives affect purchase decisions. Mobile and video ethnography and to the 360 ethnographic interviews are also techniques that support business-to-customer and business-to-business markets. Through an effective crafting of discussion and a one-on-one approach, the vital information needed to understand and engage customers can be gleaned with these support technologies.

For example, the IFC-Mastercard Foundation Partnership for Financial Inclusion conducted ethnographic research to understand the factors that impact people's attitudes and perceptions of digital financial services in Africa. The results of the ethnographic research produced a framework for understanding the drivers for and barriers to growing trust in digital financial services in African countries.

Digital Mapping is another key technology useful to R and D, strategizing, marketing, and sales. In R and D, digital mapping accounts for the voice-of-the-

customer, new product development, Lean Start-up, Agile Enterprise, and Rapid. These processes rely on project planning, tracking, and reporting, which are often cumbersome activities. Digital mapping, which includes process mining and video ethnography combined with video analytics means processes can be tracked and traced to identify areas of efficiency improvement.

In sales, digital mapping enables sales reps to learn more quickly from mistakes. In marketing, digital mapping makes developing and testing alternative marketing campaigns more efficient. In strategizing, digital mapping means gaps in company strategy become clear and adjustments can be made to synergize growth. Another key digital technology beneficial to marketing, sales, and product engineering function activities is Biomimicry.

Biomimicry is the examination of nature to solve human problems. By looking at nature's models, systems, processes, and elements, it's possible to find ways to mimic and to take inspiration from nature to find new ways of doing things. The benefits of using digital technologies to accelerate biomimicry include an increasing alignment to sustainability. By following the principles that life uses, it's possible to create products and processes more adapted to life on earth. This can lead to energy efficiency, waste reduction, lowered costs, and new product categories, and industries being defined. Consider honeybees. Bees go out into their surrounding environment to gather data, then return to the hive and engage in active objective sharing of information. They continue the process until the information is complete and compelling. Together, they agree on what makes the best location for a new hive, basing their decisions on shared data. There are no bee experts and consultants, or hidden agendas. The honeybees are motivated solely by finding the best place for the new hive. These investors go out into the world to observe and gather data, using a natural world model to make financial decisions.

Financial institutions, by the nature of the business, have robust functions in finance, accounting, and internal IT operations. Using digital technologies within these activities can result in several important benefits. They can improve the visibility of financial performance, which helps to provide operational efficiencies and strategic effectiveness. They can increase the efficiency of accounting period cycles with fewer errors and less labour. They can improve collaboration and decision-making for increased adaptability to external business and financial challenges. They can also lead to better risk identification



and management, more robust DevOps, and the elimination of shadow IT activities.

Cloud computing enables IT to acquire infrastructure resources on a pay-as-you-go pricing model. This eliminates the need to make big upfront infrastructure purchases with long approval and configuration times. Cloud computing enables IT to transfer large upfront capital costs to smaller operational costs spread out over a longer time-period. It also enables organizations to scale their infrastructure usage to match application usage, and this can help to reduce total infrastructure costs. These technologies enable the design and management of robust processes, products, and services. A corporate security and risk management program along with cyber security enables that the integrity and availability of information and systems are protected. It also helps to create a cyber security aware workforce, and this increases the effectiveness of cyber security measures.

Software as a service, or SaaS, is another key digital technology relevant to this area. One of the key benefits of SaaS is the management of applications in the cloud by vendors. Software as a service and cloud computing means complex technologies, formerly out of reach of most organizations within large-scale IT infrastructure, are now within reach. Internal enterprise systems like ERP, utilizing SaaS to create cloud-based applications provide many benefits. They simplify delivery, standardize interfaces, and enable access from different locations and devices. Software as a service also offers a higher level of security and availability than most small to mid-sized organizations can achieve if they manage the infrastructure themselves. Advanced software as a service models permit better integration of business processes made possible through a single system approach that supports configuring business models to better orchestrate their supply chains and value delivery processes in services.

Enterprise information management is a set of technologies, processes, and practices used to manage data as an enterprise asset. This includes financial data, product and service design data, marketing and sales support data, big data analytics results, and more. Enterprise information management technologies seek to ensure that data as an enterprise asset is secure and accessible to suitable business processes throughout its lifecycle. In addition to being part of a drive for efficiency, EIM is part of the legal compliance for firms with specific requirements for data retention and deletion. By handling sensitive



personal information as part of doing business, many financial firms were early adopters of enterprise information management.

DevOps are practices and tools that combine software development and IT operations. Within an organization, the internal IT and DevOps are key implementers of digital transformation. DevOps increase an organization's ability to deliver applications and services at high speeds. They enable the evolution and improvement of products at a quicker pace than organizations that use traditional software development and infrastructure management processes. This enables organizations to improve their service to customers and increases their competitiveness.

Clearly, fintech is changing the role of accounting. New technologies are making the job of accounting easier, but they're also disrupting the industry in previously unpredicted ways. For instance, emerging platforms now allow finance teams to create business models for their companies with all the organization's specific structures intact just once, and simply update it as is needed thereafter. These platforms use real-time data from the company's ERP, CRM, and financial reporting systems, which means they're far more accurate than manually created budgets and forecasts. These technologies all offer opportunities for the financial service sector, but also portend fierce competition. Those who embrace these technologies to build their expertise and allow their organizations to meet their objectives are also building themselves an edge.

When we impose learnings of fintech organizations to gubernatorial effort and to citizens, we can see a clear linkage on how digital transformation of fintech can push governments and ordinary citizens to learn using and adopting these advances and similarly governments & its departments need to overhaul their system to educate and serve citizens. Privatization of banks and public enterprises is such an effort from governments.

5.4 Digital Transformation Services in Healthcare

Healthcare providers can be for profits, not-for-profits, or governmental entities like the Veterans Hospital System in the US or the government hospitals in India. Most of the countries are, these days, running unimagined and unseen healthcare program in form of COVID vaccination program for their citizens. Governments are extending their hands to other countries who are not equipped too so. All are turning to new generation technologies that can help



address the challenge of delivering optimum healthcare service in line with their mission or charter. For example, contact tracing applications from Israel, Vaccination progress and tracking application from India, patents usage without any obligation by USA is all about optimal patient care outcomes and saving lives while foregoing budget targets.

In the healthcare industry, value and outcome-based results are the top priority. There is more pressure than ever before from payers such as government agencies and health insurers to bring down costs while at the same time improving outcomes. Today, healthcare specialists are looking to harness the power of technologies to deliver in the key areas of quality, value, and care outcomes. Technology can be used in administrative areas to provide smart healthcare and reduce supply costs. However, integrating new technology is not always straightforward. Challenges for healthcare providers include assessing which new technologies to pursue and then, how to develop, launch, and deliver them. They must also assess how new offerings interact in the healthcare delivery systems and market aspects they serve. As with many other sectors, the healthcare industry is developing a digital technology-driven approach to doing business. Organizations are evolving their use of digital processes and models and applying them to their businesses in a strategic way.

Digital technology is being harnessed to provide more streamlined healthcare plans. Digital transformation has already fuelled business innovation in the sector. There are several key digital technologies that can be utilized to overcome these challenges like patients feeling more in control, free-up employee's time & reduce cost of operations to company and to advance healthcare service delivery. While the chief technology officer role is core to these functions, it's important for everyone throughout the organization to have a working knowledge of them. For example, one digital technology that can improve the efficiency of individual patient treatments and services is predictive analytics. Predictive analysis can further research goals through faster and more accurate analyses, thus allowing for better disease treatment.

Machine learning can suggest treatments based on information mined from a patient's medical history. For example, more medical devices are now being built with health measurement capabilities ⁽¹⁴⁾ as a standard feature, making yet more data available. Another exciting digital development is in the realm of big data, because it allows the pooling of cross-departmental data, gathering all

the patient's medical information in one place. Big data helps doctors treat patients with personalized plans and is proving particularly effective in oncology research, and it improved healthcare delivery overall. The use of big data in medicine and healthcare is not without its challenges. For example, one of the biggest hurdles is the way medical data is often scattered across different administrative silos, be they inter department, inter hospital, or inter regional.

A better technology solution of integrated systems is needed before the true power of medical records can be harnessed by big data. **Artificial intelligence** (AI) is a powerful tool in the battle for greater accuracy within healthcare. It can enable more precise identification of which services to provide, and which systems to acquire and use. While AI concepts have been used within healthcare for some time, the way in which they're applied is evolving as organizations gain more data and AI techniques improve. AI can improve patient treatment plans by providing doctors with general regional data about similar patients and their outcomes. It adds value to registries, where those that are AI enabled provide more accurate information about healthcare users than those that are rule-based. It also has practical applications in a clinical setting. For true value in healthcare, AI needs data that is not only wide reaching, but also in-depth. It is important that an organization focuses on collecting a detailed account of each patient. It is this data rather than the overall number of records held by the organization that is valuable. The more individual patient information that is gleaned, the more successful AI applications will be.

Healthcare providers typically make very little in the form of consumer and tangible goods, but they do consume large volumes of goods, equipment, and services. Supply chain, planning, sourcing, procurement, and improved collaboration with suppliers of goods and services are essential in these organizations. A major unique supply chain challenge for healthcare organizations is the fact there are many competing priorities in operating the end-to-end supply chain. Consider some typical stakeholder agendas in the healthcare supply chain. Physicians have specific preferences for which medicine sources, devices, and equipment they are comfortable with. When there are many different doctors driving what to source, it creates a much larger variety of goods needed, defeating the notion of a streamline supply chain with few choices of a given category of items. Payers, patients, insurers, and governmental agencies all want the cost of supply chain to be reduced, while increasing quality at the same time.



Pharma and medical device firms primarily target physician communities to get their goods preselected and resist the notion of rationalizing the array of goods and services provided. Patients want the best possible options available, whatever they may be, to provide care, increasing demand for a wide variety of goods and service options. For the supply chain professional in healthcare, these competing priorities make the task of streamlining extremely difficult. Digital transformation in the healthcare supply chain therefore mostly addresses common supply challenges, while at the same time making the realities of the trade-offs transparently visible across the supply chain. Improved collaboration in supply chain decision-making is where digital transformation must be carefully integrated. Collaborative decision-making about supply chain is very important in healthcare. Artificial intelligence, or AI, and team collaboration enabling tools, like cloud computing are important. Since so many stakeholders in healthcare must come together to get the best overall decision. AI supports engagement for stakeholders, whether on-site or remote, paving the way to streamline supply chain decision-making. Consider, for example, chatbots that help stakeholders find information just when they need it. Team collaboration enablers include AI tools that can assure improved engagement and resolve conflicting agendas.

AI serves as a smart manager, setting up meetings for individuals based on calendar availability and suggesting whom to invite to the meeting based on their expertise. These days, lot of Android and iStore application use AI to suggest doctors and medical examinations based on prescription uploaded by doctors after video consultation. Tele-medicine and Tele-Consultation helped almost whole world during COVID.

Using cloud-based services like Microsoft Teams and Zoom to allow physicians and therapists to confer with patients and each other to provide and expedite safe, remote treatment. **Cloud computing** offers many advantages that improve stakeholder engagement, including quickly onboarding stakeholders to the decision team and from anywhere in the world with an Internet connection. Additionally, in healthcare, less paperwork is a mandate. Information must be accessible online. Cloud computing and AI work together to deliver information to stakeholders, often before they even realize they need it. This helps to optimize the decision-making and execution of supply chain sourcing. Then, when it comes to supply chain execution, digitizing the supply chain offers a cost-effective opportunity to deliver the right product or service

to the right place at the right time, every time. It can also contribute to improved data flow and analytics, asset tracking, and regulatory compliance. For example, one area these technologies tackle well is in reducing maverick spending, where stakeholders buy products or services outside the prescribed purchasing functions of their organization.

Digital supply chains also help reduce errors and free up employee hours for use in higher-value patient care. While these technologies are too numerous to cover in total, there are several that can be used for healthcare supply chain and procurement optimization that can be reviewed in more detail. The first of these is the Internet of Things, or IoT, which allows devices to communicate directly with one another. It has great potential as a means of gathering timely information about customers to allow planning for handling customer care or service requests. An example of this is medical monitoring devices, which flag early warning signs of problems to healthcare providers, allowing them to intervene and prevent a return for treatment or termination of healthcare. They can contact the patient directly and make the necessary intervention to ensure recovery and stability in their health. The IoT can also monitor equipment for repairs, and opportunities to provide further patient services.

Another technology with enormous potential is **big data**. It delivers improved inventory visibility from digitizing the supply chain at the point of use. Improved visibility allows healthcare providers and vendors to adjust direct movement of inventories in real time to areas experiencing shortages or increased need. Intelligent process automation, or IPA, is another key digital technology that helps automate substandard processes and communication with suppliers. IPA techniques can illuminate supply chain risks and resiliency gaps and provide visibility into maverick or rogue employee spending. For example, in the case of rogue spending on information technology by a function other than IT, suspicious credit card or purchase order transactions trigger a hold on payment with the vendor until approved and released by the IT department.

Additive manufacturing and advanced materials technologies support healthcare for a future with more advanced equipment and materials to utilize in treatment. For example, bio interfaces, which encompass natural interfaces between biomolecules, populations of bacteria, and human cells allow the development of materials for biosensors, diagnostics, stem cell technology, and drug delivery systems that have the potential to transform healthcare and

positively impact millions of lives. By working with suppliers who can co-develop solutions and deliver quality products, the healthcare organization will gain an advantage of better supply chain related performance and patient outcomes.

Another important digital technology is **blockchain**, a streamlined way to securely track assets across the healthcare continuum. In the case of rigorous healthcare payer requirements, it provides a means to assure a financial transaction is accurate. And carries a reduced risk of fraud, speeding up the flow of money to the medical provider. Suppliers who can work with edge sensor technologies, a machine-assisted information flow, offer improved healthcare quality levels, faster response times to changes, and lower cost of ownership for their customers. Machine assisted information flows handle the capture of data and information formerly requiring a human, which in turn improves the quality, reliability, and speed of information flow.

Finally, autonomous supply chain technologies can be used throughout any supply chain's lifecycle to support collaboration, decision-making, and execution. These are fully automated supply chains and require little or no human presence. Digital technologies are revolutionizing the supply chain in healthcare. Building a digital supply chain allows them to effectively leverage technological advances designed to improve their data flow and analytics, decision-making collaboration, provider recipient correctness, asset tracking, and regulatory compliance.

5.5 Digital Transformation Services in Education & Talent Development

Digital transformation has dramatically impacted many functional areas across industries and organizations throughout the world, and it is now having a similar effect on human resources, talent development, and organizational change management. Since the thesis is directly related to talent development, we will dig deeper into this aspect of digital transformation effects on various areas of talent building and skilling. Essentially, we will try to understand various digital technologies in area of

- Recruitment
- Managing transformation in talent development functions
- Digital Technologies for Workforce development

- Supporting virtual workplaces
- Increasing engagement levels

5.5.1 Recruiting Top Talent

Digital Transformation is at the helm of today's business environment and societal changes. Organizations and Governments all over the world are looking to leverage digital tools to transform their operations, increase efficiency, and boost innovation. Most organizations either already have a digital transformation role or strategy in place or are actively working on one. Digital technologies are also having an impact on the process of recruiting talent because companies and indeed entire industries, are changing at a faster rate than ever. It's increasingly important to find the right people at the right time, intensifying the pressure to recruit faster and better. For many businesses however, digital transformation adoption is being obstructed by a lack of skills and talent. A good percentage of organizations with a digital strategy in place say they lack employees with skills to support it or need more security expertise and need more strategic digital transformation skills. Larger companies are having a harder time than smaller companies when it comes to recruiting this talent. For companies of all sizes, however, the ultimate objective is to recruit the optimal mix of skills to migrate legacy systems and processes to new and transformative ways of doing business. And this is where digital technologies come into play as a powerful tool for evolving talent acquisition in organizations.

Artificial intelligence can also analyse the profiles of successful employees already working in a specific position – figuring out what kinds of backgrounds these top performers have, and then search for candidates with similar characteristics. It can pinpoint the qualifications, work history, educational history, and other factors most likely to indicate whether a candidate has the right profile to succeed. Further useful technologies for talent acquisition are big data and social media.

Social media is so central to many jobseekers' job searches that it's important for recruiters to have an active presence and up-to-date information on sites such as LinkedIn. In fact, a LinkedIn survey found that 62% of jobseekers use LinkedIn as a job search resource. There are several benefits to using social media for recruitment. First, it significantly widens the talent pool. Social media is a powerful tool for maximizing a job vacancy's exposure, enabling a recruiter

to reach more potential candidates – and a more diverse range of candidates from anywhere in the world. It also builds and improves brand image. An organization can tailor its social media presence and activity to reflect the desired brand image, including the ethos and values of the brand. Using social media also gives access to analytics tools that provide valuable insights into traffic flows such as user flows and page visits. This data enables a recruiter to track and monitor posts, and better understand how best to reach the target audience.

Another useful technology is **cloud computing**. Cloud computing gives added flexibility and improved productivity to all things related to IT. For example, it facilitates high-quality, rapid video interviewing, which is particularly important when recruiting on a global basis. Cloud automation allows for screening thousands of resumes for a specific skill, messaging shortlisted candidates, and scheduling interviews for a large group of candidates at the same time. In addition, to recruit top talent that can work remotely from anywhere in the world, there needs to be high-quality data feeds that can be accessed through computers and mobile devices from anywhere. And that's precisely what cloud computing provides.

Another useful technology for talent acquisition is modelling and predictive analytics. **Predictive analytics** uses data to identify patterns or models that can be used to predict future talent requirements. Predictive analytics won't tell you exactly what the future holds, but it will help to model talent needs, including everything from forecasting roles that don't yet exist to eliminating roles that will become unnecessary – which is key to operating successfully in a dynamic environment. When sourcing candidates, predictive analysis can help a recruiter identify the best candidates quicker and more accurately than traditional techniques. In fact, using predictive models, a recruiter can have a solid list of potential candidates as soon as a requisition is opened. In addition to sourcing, predictive analytics can be employed throughout the recruitment process to maximize the efficiency of the recruitment funnel, from the moment a candidate applies for a job to when the employment contract is eventually signed through the onboarding process. In making the process more efficient, predictive analytics means you need fewer applicants to ultimately hire the right person. It ultimately results in reduced time-to-fill, reduced cost-per-hire, and, most importantly, increased quality-of-hire.



Recruiting the right person for the right job can be a challenging task – particularly when the market is competitive and fast moving, and in today's market, making a bad hire can have serious negative consequences. Fortunately, there's a range of off-the-shelf and accessible digital transformation technologies that can be deployed for effective talent acquisition, making the process better and faster.

5.5.2 Managing Transformation in Talent Development Function

The evolution of technology is having a profound effect on how organizational change management is conducted. As organizations embrace new technologies and digitalization – and generally seek to implement digital transformation strategies, new challenges are emerging. Experts, like me, have observed that people (social citizens or employees in an organizations) generally resist technology and its use as a big issue. Adoption to new technologies is a long and slow curve. As a result, better tools to manage change and adoption are becoming more important than ever before and are driving new approaches to change management. This evolution of change management depends highly digital technology. There are four key digital technologies that can be used in organizational change management activities. These are artificial intelligence, big data, cloud computing, and digital collaboration tools.

More than any other technological advance to date, **artificial intelligence**, or AI technology is fundamentally altering digital transformation – particularly the people dimension of the transformation. First, it introduces far greater efficiency to transformation. For instance, using AI technology, change managers can measure digital activity in real time – all day, every day. Using AI, which uses the flow of data to predict future events, change managers can also take corrective action before there's a problem. In fact, because AI technology can introduce changes automatically to sidestep anticipated problems, actions can even be taken without any involvement or intervention from the change manager. The manager & authorities gets an alert to what's happened but isn't required to execute the change manually. This speeds things up considerably, helping to ensure that the adoption of change to enable projects staying on course. This supports on-time and on-budget results more consistently.

For example, machine learning tools like Decision Trees can uncover change initiative risk factors and generate predictions. In addition, as mentioned, AI greatly enhances the people dimension of change management. For instance,

using AI means the change manager doesn't have to input, collate, and analyse huge quantities of data. Instead, leaders can focus on whoever is affecting the changes or being affected by the changes to better leverage their time and improve change effectiveness.

Traditionally, the change management profession has tended not to be based on a data-driven model; It's more likely to be based around qualitative data. And there can be a degree of resistance – whether cultural, personal, or motivational – to doing things differently. So, to facilitate change, it's important to demonstrate the benefits of leveraging **big data** to convince and persuade change managers. As the name implies, big data refers essentially to a huge volume of structured and unstructured data, which, when analysed computationally, can reveal an array of useful patterns, trends, and other insights. Applying this technology to change management delivers better, sharper outcomes.

Cloud computing is another technology that can be used in organizational change management activities. Cloud-based processes or tools enable change managers to overcome numerous issues that have traditionally affected change management. For instance, these tools and processes can significantly reduce the number of change management-related service interruptions. Consider that using solutions like Cloud Load Balancer or cloud-based disaster recovery sites, organizations can seamlessly direct users from one server or site to another while performing planned or emergency maintenance, ensuring continuity of service for end users.

Digital collaboration tools can also be used in organizational change management activities. There are various tools that make digital transformation more effective through their capacity to improve planning, communication, and scheduling. They also enable organizations to better identify whether policy and enforced compliance standards are being properly enforced, reviewed, approved, and implemented. Digital collaboration tools can also facilitate easier and more effective management of traditional change management frameworks by allowing project managers to organize projects using virtual cards organized on a virtual whiteboard.

The relentless drive toward digital transformation is having a profound effect on industries, organizations, and even individual functions within organizations



and on Societies on a much wider scale with these technologies having an inherent effect on citizens.

5.5.3 Digital Technologies for Workforce development

Not only is digital transformation fundamentally altering how industries, organizations, societies, and institutions operate in general, but it's also having a profound effect on specific activities, including workforce and talent development. There are four key areas within workplace development: Forecasting demand for the skills that will be needed; providing career awareness and recruiting; developing talent through training and skills acquisition; and transitioning people from training into careers or new roles. All these areas are being dramatically impacted by digital transformation.

There are three reasons why digital transformation of workplace development is so important. The first is that it's changing the traditional definition of work. With new models of work such as telecommuting or remote work, how work gets done isn't what it used to be. For many, the when, where, and how of work have all changed. The second reason is that it's changing employees' perceptions of employers. Allowing employees, a degree of flexibility as to when and where they work dramatically alters their view of the company – as well as making them more productive if they are supported properly with technologies and enabled business processes. And last, workplace demographics are changing. Over the coming years, much of the global workforce will be made up of people born from around 1980 onward. And who would disagree that these factors do not have an everlasting impact on societies and its citizens.

Unlike prior generations, the younger generations are extremely discerning about why they should work for a particular organization – and, if they do, whether they should stay or not. Workforce development is one of the main reasons someone joins or leaves an organization. The objective then is to create a modern digital workplace. This is the ideal work environment where business processes and technologies work in tandem to facilitate genuine employee engagement. Properly integrated digital transformation technologies and business processes results in employees who are more productive, more efficient, and more satisfied.



In addition, a modern digital workplace empowers the workforce because people can work how, when, and where they choose. Initiating a digital transformation and developing a modern digital workforce makes it easier for employees to thrive, contribute constructively to business decisions, and feel invested in the business. In many ways, digital transformation and workforce development are a perfect match. But how does a modern digital workplace come about? One digital technology that can help construct a modern digital workforce is artificial intelligence.

Artificial intelligence, the simulation of human intelligence by computers has transformed numerous industries, sectors, and businesses. Whether we realize it or not, AI is already a feature in our personal and professional lives. It also has the potential to have just as great an impact on learning and development. With AI, it's possible to offer personalized learning experiences instead of the one-size-fits-all model, learning and development is set to be automatically customized and personalized. This is possible because of the insights based on the collection and analysis of huge amounts of data that AI provides. Learning content can then be smarter and better positioned, flexible, intuitive, and responsive to the learner's personal requirements. When learning content is personalized, it's more relevant, useful, and aligned with business values. And it provides enhanced understanding and retention. For example, an organization could use AI to create a chatbot with employee and geolocation data. This could then automatically send the employee highly relevant, personalized information supporting a current or soon-to-be-undertaken activity. This might happen before it even occurs to the employee to access learning materials.

Suppose a sales rep is about to meet a potential customer for the first time. Just before the meeting, the learning-bot sends a notification to the rep's phone with tips and notes on the company, the issues within its industry, and an option to view a quick lesson on first impressions. That would be a genuinely personalized learning experience. Another way AI is set to change learning and development is through virtual mentoring – monitoring and evaluating a learner's progress through an assigned training program. It can estimate understanding, gauge retention, and retool the program when and where necessary. These smart tutor systems can provide the learner with feedback, guidance, and targeted training, making the entire learning process more effective, efficient, and strategic. A third way AI is changing learning and development is through application of advanced analytics. Collecting and

analysing data produces invaluable insights into learners' progress, information retention, and so on.

Aside from artificial intelligence, there are some other digital technologies that can be used for workforce development. One is **big data**. By drawing inferences from performance data at individual to organizational levels, it enables learning to be tailored. Because it's especially attractive to tailored learning and coaching sales where data is readily available, and coaching is generally integrated into the development process is an especially ripe area for tailoring.

Another is **cloud computing**, which can improve learning and development in several ways. The cloud is always on, allowing users to access learning and course content anywhere and at any time. It also saves money, letting learning providers pay for IT needs, and lowering management costs by allowing organizations to focus less on administrative and managerial tasks and more on the needs of the learner. With the cloud's almost endless capacity, organizations can readily scale up to accommodate increased learner populations, or spikes in traffic due to things like special events or training registration.

Conversely, they can also quickly scale down in periods of low activity, avoiding the need to maintain idle systems. A final digital tech for development is modelling and **predictive analytics**. In the past, predicting how employees' careers would progress was more art than science. With predictive analytics, however, organizations can gather information about all the ways employees engage with learning content, like what training they've taken, how deeply they engage with it, and how they perform on any included assessments.

The impact of digital transformation has already been fundamental and far-reaching, transforming entire industries, organizations, functions, and activities. It's having an effect now on workplace development, with artificial intelligence at the forefront of the transformation.

5.5.4 Supporting Virtual Workplaces

The rate at which organizations employ remote or distributed workforces has grown steadily in recent years. The 2020 COVID-19 pandemic accelerated the need for all aspects of operations and functions to master technologies for operating remotely. Virtual workplaces are those not located in any one physical space or tied to any geographic or even national boundaries. Generally, employees and management are connected via a private network or the

Internet, and interact with each other using the phone, web conferencing tools, cloud computing applications, or any of a host of other virtual options.

Employees may work from home, in satellite offices, or virtually anywhere they can access the proper digital technologies and be productive. Even before the pandemic, lot of countries and companies supported citizens and employees spending at least some time working remotely; post-pandemic, those numbers are certain to grow faster than before. This is likely because employees working remotely offers benefits to many organizations. Virtual workplaces reduce overhead costs, saving on real estate and office costs. It's also highly sustainable. Another recent study⁽¹⁵⁾⁽¹⁶⁾ found that if 10 million employees telecommuted twice a month, it would equate to 21 million barrels of oil saved per year. For organizations focused on sustainability, this is a major boon. And further research^{(17),(18) &(19)} has shown that employees who work from home are also more productive, less stressed, and miss fewer workdays.

While not all employees or their job roles are suited to working remotely, the practice is rapidly changing and revolutionizing the landscape of the typical office as it only recently existed. And overall, it's a win-win situation – if the organization succeeds in adopting strategies and processes that integrate new digital technologies. But it's not without its challenges. As more people work remotely, there is a greater risk to data privacy and security. The three major security concerns related to the virtual workplan include home Wi-Fi security, phishing scams, and insecure passwords. Thankfully, there are digital **cybersecurity** tools to mitigate those concerns. VPNs, firewalls, private servers, and encryption all help protect data and are employed, in one form or another, by nearly all businesses with an online presence. It is important to educate remote workers to be disciplined about cybersecurity to protect company and customer information, much as they would their own personal property.

Staying connected, organized, and focused can be an issue as well. **Cloud-based technologies** mean that instead of relying on locally owned computers or servers, the technology providers store your data on servers that may be located anywhere. This allows for the support of several virtual workplace activities. In addition to stronger security overall, the cloud also offers the use of **virtual personal assistants**, or VPAs. As the name implies, VPAs assist virtually with anything from keeping workers' calendars up to date, to booking travel, and making online purchases. VPAs serve to automate repetitive,



mundane, and even risky tasks, much as a robot might in a factory. They also allow for the use of big data and associated analytics to gather, process, and analyse large data sets to help employees make informed decisions with optimum efficiency, accuracy, and speed. Further, cloud-based technologies aid and assist other digital collaboration tools in sharing information and allowing people spread all around the world to work together as though in the same room. **Collaboration tools** and platforms like Slack, Microsoft Teams, Trello, Jabber, and Quip allow remote and virtual work teams to communicate, hold meetings, share documents, manage projects, and track their progress in real-time.

In many cases, using cloud-based tools provides the advantage of requiring no new software or upgrades. The software is delivered as a service for a monthly fee, or in some cases, like Google services, for free for most users. Digital transformation has created virtual workplaces, which are now evolving at ever-increasing speed. It's important to adjust to the changes to maximize organizational productivity and employee engagement. And that means knowing the digital technologies that support and enable it.

5.5.5 Increasing engagement levels

For any organization, a high level of employee engagement is worth its weight in gold. Employee engagement describes how passionate employees feel about their work, how committed they are to the organization, and whether they're willing to go the extra mile to do a good job. Although employee engagement is not the same thing as employee satisfaction, it does result in happier employees. It also promises lower turnover, higher productivity, and reduced costs. Engaged employees also lead to a higher customer retention and customer satisfaction rate; The way an organization treats and engages its employees is a major factor in how those employees treat the organization's customers.

Increasingly, employee engagement activities depend on leveraging technology. Businesses are turning to digital transformation and technologies to facilitate information sharing and creative thinking for competitive advantage. Technology is also being used by organizations to communicate and collaborate with employees, whether they're in the office or not, which enables the employees to maintain a better work-life balance. Social networks, online portals, and other such tools can all enhance employee engagement.



There are several key technologies that can be used to advance employee engagement in an organization. The first of these is **artificial intelligence**. Whether for on-site or remote employees, AI holds enormous potential to boost employee engagement – and, in doing so, help HR retain valuable talent. For instance, AI-enabled chatbots can be used to facilitate an employee's onboarding or subsequent training. A chatbot can provide the information that's needed as and when that need arises. AI can also be used for daily experience captures, which provide insights into employees' moods and feelings about their work, teams, managers, and the company. Because it tracks these things regularly, issues can be identified and addressed before they become a major problem. AI can also be used to enhance team collaboration.

Using data collected through employee performance and sentiment analysis, AI can determine which employees are likely to work well and collaborate well together. Getting this right improves productivity and morale. Finally, AI can help identify timely learning and development opportunities, and when used with predictive analytics, determine which employees are best suited for promotion or leadership positions, while also identifying employees who require more engagement.

Another key digital technology that can be used for effective employee engagement is **big data** – especially when used with predictive analytics. This is essentially about leveraging data and how it relates to predicting the future, to boost engagement. It has several applications. One example, as mentioned earlier also, is predicting future performance of employees. It has been shown that past performance is a reliable indicator or predictor of future performance, so it makes sense to recruit individuals with a track record of consistent high performance. Another way big data and predictive analytics can be applied is in developing line manager effectiveness. Predictive analytics can give detailed insights into the attributes of a good or a bad line manager in the context of a specific function or organization. Big data and predictive analytics can also be applied to improving the quality and timeliness of feedback. Given that these tools can provide real-time feedback, employees can better understand what's immediately required to improve or correct their performance.

A final way big data and predictive analytics can be applied is in predicting learning and development needs. Predictive analytics technologies analyse workforce inefficiencies in the context of employee skill set gaps. Doing this



provides real-time data indicating whether employees are on course to reach the point they need to be to achieve optimal performance.

One final technology that can be used in employee engagement activities is **cloud computing**. For instance, employees appreciate a streamlined onboarding process that enables them to contribute on day one after being hired. Further, there's less paperwork with cloud computing as many routine business forms that used to be paper are now accessible online. Additionally, employees can be frustrated and stressed when feedback or coaching conversations are delayed. Cloud computing enables real-time accessible performance reviews that drive faster decisions by employees, managers, and HR. And related to HR, in the past, accessing pay and benefits information required the paperwork and time. Cloud computing and AI can deliver access to information before employees even realize they need it, thus saving time for employees and HR personnel.

Savvy organizations know that employee engagement is fundamental to morale, productivity, and retention. That's why it's worth investing time and effort into the use of predictive analytics and other technologies to achieve it. As we see, most of these digital technologies appear and have direct impact on various industry whether the industry deal directly with citizens and human beings or indirectly. In conjunction to changes in their work, they have direct impact on employees due to these technologies and taking a cue from these organizations, government departments and authorities can engage citizens in various initiatives while supporting them and in turn getting supported by them.

6 Digital Transformation and Talent Building

With rapid changes in technology demands and uncertainties related to the global pandemic and ever-changing socio-economic horizon, citizen's growth hinges on right behavioural and technical competencies. Though digital transformation creates tremendous opportunities to address many challenges in our current time, it requires citizens to leverage the investment in these technologies, and development which is agile & innovative to maintain engagement and morale.

This can be achieved by enabling a learning culture and enabling skills transformation through-out the society. Government of India has developed two such programs. Skill India ⁽²³⁾ launched in 2015 aims to develop skills of Indian citizens to cater to various industry related jobs. Trained citizens can be absorbed in their acquired skills. The program provides a holistic approach to cover short-term training, arrange job fairs, recognition of prior skills, arranging special projects, monitoring guidelines and placement guidelines. There are various skills considered under Skill India. To develop and focus on management and development programs, train the trainer programs, entrepreneurship development program, skills development programs for dairy, carpentry, fashion designing industry etc and promotion of skill supporting micro, small and medium enterprises. Government not only provide avenues to acquire these skills and but also help citizens in securing loans to start their business to generate employment.

Then there is "SWAYAM" ⁽²⁴⁾. *This is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity, and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy. This is done through a platform that facilitates hosting of all the courses, taught in classrooms from Class 9 till post-graduation to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. More than 1,000 specially chosen faculty and teachers from across the country have participated in preparing these courses.*

The courses hosted on SWAYAM are in 4 quadrants –

- *video lecture,*
- *specially prepared reading material that can be downloaded/printed*
- *self-assessment tests through tests and quizzes and*
- *an online discussion forum for clearing the doubts.*

Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology. All these are free of cost to learners, but they need to pay in case they want to get a certificate through a proctored exam. This certificate is recognised by most of the universities in India.

The first and foremost aspect to enable learning culture at such a massive scale of society is digitalization. Digitalization infers to the digital transformation or the fourth industrial revolution brought in by technologies like AI, machine learning, robotics, RPA, blockchain, big data, and so on, that we also focused earlier in [Section 5](#). What this really means from authorities' and leadership's perspective are factors like virtual leadership & cultural dexterity, learning agility, collaboration. But from citizen's perspective it could be access to internet, conversing with Alexa or Siri and being on Facebook or Instagram. To focus completely on skills transformation, we need to distinguish three shorter waves in The Wave of digital disruption – these could be Unbundling, Disintermediation and Decoupling. Most of the citizens and societies are already on this digital evolution where these technologies are incorporated already. So, if instead of buying LP records or listening to radio we resort of google play or apple music; we have decoupled ourselves from legacy and moved on to new one. This gives a lot of choices and flexibility be it music or learning platform. We have stopped intermediating ourselves if we have taken some of the work in our hands for which we used to depend on some one else like booking flight tickets or a hotel room. This saves lots of cost and we interact directly for a better customer experience. And lastly, we have lot of choices to choose our services from. We have decoupled ourselves from one service if, instead to going for government department for electricity I can buy it from a private player and hence decoupling myself from these services. What we, thus realize, is a society agile enough to complete with itself.

This agility has been expected for a long time and World Economic Forum in 2018 had indicated that about 50% of all roles that we will be doing have not

yet even been created yet ⁽²⁵⁾. This was seconded by the US Department of Labour and again by the World Economic Forum last year when it indicated 67% of all roles that we will be doing have not yet even been created yet. Data Science, Healthcare and E-commerce are some of the domains that have seen spurt in recent times, maybe due to COVID. But roles related to these domains were not even existing few years back.

Hence, it is important to create enough and new opportunities for re-skilling, up-skilling, and cross-skilling. It is critical for organizations and societies to take an active role in supporting their workforce, citizens and dwellers through reskilling and upskilling, individuals taking a proactive approach to their own lifelong learning, and governments creating an enabling environment to facilitate this transformation. This must happen not only for current & existing skills but also for future skills.

People should be more concerned about their future skills. Technology and delivery of services has been changing so fast that the way service industry and governments initiative worked few years back is completely changed. Just like organizations, governments are also changing the way of their operations. They were more concerned about their future skills. Simple things like token system in banks and government office has replaced long queues. Prior appointment for government services is now in ^{(26) & (27)}. Automated driving license test is being adopted and so is robotics in lot of areas. Robots were adopted big time in hospitals during CORONA pandemic so that human contact can be minimised and same was replicated in hospitality industry. Quite a few leading chains have experimented with Robotic helps for room service and entertainment ^{(28) & (29)}. All this leads to a kind of uncertainty for human beings to retain their jobs and the have to re-purpose themselves by re-skilling or cross-skilling or up-skilling. Digital technology leading to talent transformation and talent building is only way out.

For talent transformation and talent building to come to mainstream to common citizens in society, there must be a language that brings in fluency. The idea of fluency and a common language is inter-passing each other. We can consider fluency as a common language that everyone can speak & understand. For digital transformation this refers to Internet of things, Computational/Algorithmic thinking, Data driven decision-making, Infrastructure & Networking, Machine learning & AI, Software automation,



agile, customer centricity, lean product management, cloud computing, design thinking, big data and analytics, platform thinking. When authorities think of imparting skills, how do they project the concepts so people can understand the opportunities that are around. Digital transformation is going to be somewhat of a common language and a common idea. Close groups of learning, within a smaller geographic area can be the cement that will bind all learners together to compete & learn with each other.

The year 2020 with CORONA pandemic accelerated and taught us many aspects of dealing with many unseen situations. The pandemic increased our adoption and roll-out of these technologies not for economics, not for proficiency or efficiency, but for safety. Coronavirus pandemic is seen as an opportunity for us to digitally transform. During COVID times there was lot of learning and many of the citizens broadened their skills and apart from their core skills, where they had deep knowledge, they also developed knowledge about other allied areas also. For example, author has been learning German language, for last one year, using freely available tools on Internet and he can speak, read, and write this new language.

This empowerment by digital technology is amazingly applicable not only to large organizations but also to the societies. Not only to the leadership of the organization but authorities and politicians as well and equally. These leaders should be like opera conductors. They do not tell instrument players about what to play and how to play. What they do is they try to make sure that each of these people is aligned in the cadence. They're aligned in the direction. And they have a particular role in forming the organization and forming the team. But if it is not done, and they are put in same learning network, overall learning goal may be missed because they lack cadence and the alignment.

Not only, learning but nature of work is also changing. This also renders learning as an imperative to our lives. As said earlier, the jobs we do now were not even defined few years back. And what we do now will not be relevant few years down the line. We never thought that we will be writing codes for machines so that they can code further. In last few years since artificial intelligence has become our way of life, there are no new inventions that could redefine the way we work and live. Moreover, physical proximity of co-workers, relatives, friends, and family has lost its meaning and has gone virtual with no time boundaries. The digital technology provides this empowerment. When we think of

constricted mindset, everyone should have a baseline media literacy in these small mindsets for things like making a small video, being able to teleconference, browsing the web and access and use simple application that help in e-commerce or online payments. This creates the right and expected perception about the society. This is minimal digital literacy and digital fluency expected from a society at a large to bridge digital divide.

This is the fulcrum point we should focus on. This focusses on learning in general and importance on it is very paramount. This calls for the societies to develop learning and be reliable across and accessible across a range of platforms. Future work depends solely on nothing without training, learning, and development. We have to societies engaged with learning, training, and development through use of digital technology.

And the idea of, again, that engagement overall is around helping societies be the best they can be and learning development is going to help them. So, as we do this, what steps have we done and what steps can we do to make sure your learning developments are as effective as possible versus just acknowledging the consumer-based tendencies of the individuals who are in-charge of such learning efforts. Citizens may not know what a curriculum is, but they know what a channel is because they subscribe Amazon prime or Netflix. They may not know what a learning program is, but they know what a playlist is because they subscribe to Apple Music and they may not know, of course, what the ideal learning management system is like or learning experience platform, but they do know what a good shopping experience is. As in shopping we are more likely to look for a product that has rating compared to one that is not even rated, this brings in some efficacy because there is some trust that someone has used it. This idea of overall engagement and community learning or group learning is very important when we talk about learning and engagement on such a large scale. Internet access, digital technologies, and platforms like Skill India ⁽²³⁾ program and Swayam ⁽²⁴⁾ make it possible to percolate feedback into the system and to the participants for continuous improvement.

We need to have such a solution, as described in previous sections, a solution that is engaging, that is scalable, that is going to have consistent messaging, and of course, leveraging digital technology is going to be important. Now, in terms of technology, it's not just about technology.

Also, important to understand is which device do learners and citizens prefer to consume information? Is it a desktop, a laptop, a tablet, or a mobile device? Internet is of course all pervasive. Internet access is must for whichever device is it. Internet is first step whenever we want to search any information. So much so, at slightest of the requirement we now have a habit of using google to search the information. So much so google itself has become a verb and found its place in dictionaries ^{(30) & (31)}. In most case, a device that is generally handy is the first choice. This is from my personal experience on what I have seen in my family of five. If someone is working on a computer, they will just use it and if mobile phone is in hand, they just use that device to look for information. Internet and a device to access internet is empowering people to learn and skill themselves and will remain an engaging solution in near future for talent building and using digital technologies.

Making learning, skilling or talent building fun and consumable is very important. If we look at various age groups in a society folks who are more than fifty will be very adamant to limit their knowledge to what they already know. Working population, which is critical mass for a developing society, is to be tapped in. They may not like the old ways. This population looks for contextualized information as they are used to Facebook and YouTube. They want personalized information. General, cookie cutter solutions may not work for them. They are technology dependent. They may not be tech-savvy but depend lot on technology and Gen-Z, Gen-Y and Millennials are mostly dependent on digital technology. Lastly, they are all used to mobile devices since their primary schools. So, talent building opportunities that are personalized, use mobile device and digital technology through internet will remain call of the day, if we must transform talent of a society.

There is no going back because if it's not as easy to use and as intuitive to use as those things, people are not going to engage in content. Gartner's digital dexterity index survey gives such an indication. The survey ⁽³²⁾ revealed that three countries, and number one was India, number two was the United Kingdom and number three was The United States. What they indicated was these are the three most digitally dextrous countries, not because of the individual organizations or businesses that were in those countries, but because of the widest swath of the population that was dedicated to learning digital transformation, information, and leadership skills. This is due to their desire of learning new skills using digital technologies. Sixty-seven per cent of digital



workers in India indicated that the digital technologies such as machine learning, artificial intelligence, and Internet of Things are increasing their effectiveness at work, according to this survey by Gartner, Inc.

As we are settling into new normal and we slowly move to what looked like a distant future few month back with the idea of the pandemic waning, we will still have digital transformation going forward and it is going to be really around learning and talent building.

7 Talent Quotient

Talent quotient is an intriguing term so to say. There have been a few definitions of talent quotient. Most elaborate definition is given by Ajay Kr. Singh and Ms. Sonia Sabharwal for The Indian Journal of Commerce, Vol 64 No. 2, April-June 2011 in the article titled as Talent Quotient Model for Effective Talent Management ⁽²⁰⁾.

As per this definition Talent Quotient is a summation of factors like Customer Orientation, Teamwork, Judgement, Analysis and many more. It can be represented as”

$$TQ = CTCQ + MJRQ + AQIQ + APPQ + TFEQ + ACOQ + LEDQ$$

- TQ is abbreviation of Talent Quotient
- CTCQ (Customer Orientation, Teamwork and Communication) → A Combination of
 - Customer Orientation (CO)
 - Interpersonal Sensitivity (IPSy)
 - Interpersonal Skills (IPSk)
 - Teamwork (TW)
 - Oral Communication & (OC)
 - Written Communication (WC)
- MJQ (Motivation, Judgement & Resilient Quotient) → This factor is a combination of
 - Personal Motivation (PM)
 - Critical Judgement (CJ)
 - Resilience (R)
 - Flexibility (FY)
 - Planning & Organising
- AQIQ (Accountability, Quality & Integration Quotient) → This factor is a combination of
 - Accountability (AC)
 - Quality Orientation (QO)
 - Collaboration Integration (CI)
 - Creativity & Innovation (CY)
 - Commercial Awareness (CA)

- APPQ (Analysis, Probing & Integration Quotient) → This is combination of
 - Problem Solving and Analysis (PSA)
 - Questioning / Probing (Q/P)
 - Persuasiveness (P)
 - Strategic Awareness (SA)
- TEEQ (Technical & Functional Expertise Quotient) → This is combination of
 - Technical & Functional Expertise (TFE)
- ACOQ (Action Orientation Quotient) → This is Action Orientation (AO).
- LEDQ (Leadership Quotient) → This is leadership (L).

This model can be represented pictorially as given below:

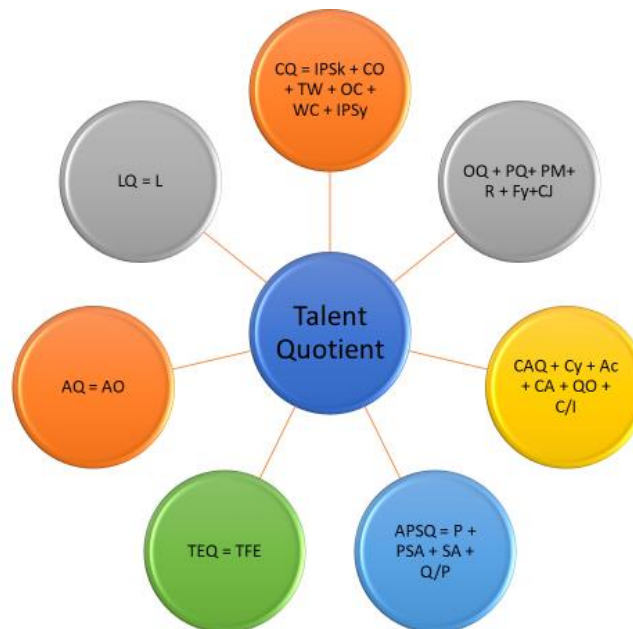


Figure 4: Talent Quotient Model Reproduced from reference #20.

Though this definition is very elaborate and covers every aspect of talent but may not be practical for measurement and tracking. For an very large organizations and for the purpose of this thesis – in a society, due to various obvious factors. These factors can be anything from socio-economic & cultural background; reach, & surroundings; interdependency, intra-dependency, independency of various strata of society; and intent, access, and willingness to change. With this fluid nature of definition of talent, when seen at such a large scale, it is imperative to simplify definition to cover most important factors and markers for this thesis. Within this thesis, talent quotient will be considered as

a function of access to digital technology in terms of Internet, willingness to change and skills or knowledge acquired.

$$\text{Talent Quotient} = f(x \text{ (access to digital technology, willing to change, skills acquired)})$$

Access to digital technologies defines how governments and authorities are bringing services closure to citizens. Governments go all out to make these services successful as these services make them look forward, make them accessible and beneficial to the citizens. At the same time citizens need to adopt to these services to understand these services and improved the quality of their lives. To do this, they naturally need to have few ammunitions under their belt

- Understanding of Technology
- Convenient access to Internet
- Willingness to use these services
- Acquire skills to use these services.

Once they understand technology and have convenient access to internet, they would use the services provided by government. Using these services help them learn things that were unknown to them and acquire knowledge to use. One of the examples is e-Chaupal ^{(21), (22)} in India. Chaupal is predecessor of community centres in rural areas in India and neighbouring countries. Its where most of the village folks meet and discuss issues and concerns related to village. It could be a building or simply a raised platform under a tree. Now with e-Chaupal, it has been modernised to provide real-time information and custom knowledge by means of digital technologies. Farmers are now, aware of key challenges that they face like fragmented farming, weak infrastructure, and various intermediate agencies. With e-Chaupal initiative they have digital technology at hand in the internet kiosk of the village and can look for all the information whether its weather condition or crop-insurance or even the markets to sell their crops or to buy good quality seeds from.

Using e-Chaupal has made farmers learn how to use digital technologies. Earlier they depended on someone else to get them the information now with the new acquired skills, they can look for the information themselves with lesser interference & deterioration of information and to be put to timely use.

Hence, looking at how digital technologies help citizens build their skills and improve their talent, this definition will hold good for this thesis.

8 Survey Introduction and Results

8.1 Survey Introduction

As mentioned in [Section 3.3](#) above, an online survey was conducted across for about approximately 2000 participants. Out of these respondents X numbers took the survey. Since the survey was conducted using free of cost platform the results were compiled off-line. In addition to this, the students of a nearby school were roped into to conduct offline survey in rural areas, while following COVID protocol. Students explained the purpose of the survey to the respondents and captured their answers. Both these surveys were kept anonymous to ensure that participants could answer freely. For clarity, survey questions are given below:

Access to Digital Technology

1. Do you own a phone?
2. Do you have continuous access to internet?
3. If required, can you have temporary access to Internet?

Use of Digital Technology

In last 06 Months

4. Have you learnt any new skill or hobby?
5. Have you refreshed your previous skill or hobby?
6. Did you use Internet and/or phone for points 4 & 5 above?
7. Were these sessions led by an instructor in a classroom?
8. Which is preferred method from above two
 - a. Classroom
 - b. Internet

In last 06Mth to 02 years

9. Have you learnt any new skill or hobby?
10. Have you refreshed your previous skill or hobby?
11. Did you use Internet and/or phone for points 9 & 10 above?
12. Were these sessions led by an instructor in a classroom?
13. Which is preferred method from above two
 - a. Classroom
 - b. Internet

In last 02 to 04 years

14. Have you learnt any new skill or hobby?
15. Have you refreshed your previous skill or hobby?
16. Did you use Internet and/or phone for points 14 & 15 above?
17. Were these sessions led by an instructor in a classroom?
18. Which is preferred method from above two
 - c. Classroom
 - d. Internet

Demographics

19. Please mention your gender.
 - e. Male
 - f. Female
 - g. Non-Binary
 - h. Prefer not to mention
20. What is your educational Level?
 - e. No formal education
 - f. less than 4 years of formal education
 - g. 4 to 12 years of formal education
 - h. more than 12 years of formal education
21. Where do you stay?
 - c. Rural
 - d. Urban (Including Suburbs)

All the above he above questions simple radio button answers expecting users to check one of the two pre-defined options to make survey easy to answer and better to comprehend & and generate report.

8.2 Online Survey Responses

Responses to various questions are depicted below. The tables below give a total of responses received for both the modes of surveys. In online mode 2000 (Two thousand) respondents were shared survey links and on an average 85% of respondents answered the questions. Some of the participants cared to answer all questions but some skipped some answers, may be as an oversight, but such variance is not visible.

Since the participants were reposing to online survey, access to digital technology and internet is given and same was visible in the survey. Moreover, respondents were very much progressive on acquiring new skills and improvising their talent.

Table 1: Participants and Respondents for Online Survey

Participants of Online Survey				
#	Question Text	Approached	Answered	% Answered
Access to Digital Technology				
1	Do you own a phone	2000	1695	84.8%
2	Do you have continuous access to internet?	2000	1689	84.5%
3	If required, can you have temporary access to Internet?	2000	1688	84.4%
Use of Digital Technology				
In last 06 months				
4	Have you learnt any new skill or hobby?	2000	1689	84.5%
5	Have you refreshed your previous skill or hobby?	2000	1689	84.5%
6	Did you use Internet and/or phone for 4 & 5?	2000	1689	84.5%
7	Were these sessions led by an instructor in a classroom?	2000	1689	84.5%
8	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	2000	1689	84.5%
In last 06 months to 02 Year				
9	Have you learnt any new skill or hobby?	2000	1689	84.5%
10	Have you refreshed your previous skill or hobby?	2000	1689	84.5%
11	Did you use Internet and/or phone for questions 9 & 10 above?	2000	1689	84.5%
12	Were these sessions led by an instructor in a classroom?	2000	1689	84.5%
13	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	2000	1689	84.5%
In last 02 years to 04 years				
14	Have you learnt any new skill or hobby?	2000	1689	84.5%
15	Have you refreshed your previous skill or hobby?	2000	1689	84.5%
16	Did you use Internet and/or phone for questions 14 & 15 above?	2000	1689	84.5%
17	Were these sessions led by an instructor in a classroom?	2000	1689	84.5%
18	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	2000	1689	84.5%
Demographics				

Participants of Online Survey				
#	Question Text	Approached	Answered	% Answered
19	Gender <ul style="list-style-type: none"> • Woman • Man • Non-Binary • Prefer not to say 	2000	1705	85.3%
20	Education Level <ul style="list-style-type: none"> • No formal Education • Less than 04 years of Formal Education • 05 to 12 Years of Formal Educations • More than 12 years of Formal Education 	2000	1692	84.6%
21	Habitat <ul style="list-style-type: none"> • Rural Area • Urban Area (Including Suburbs) 	2000	1712	85.6%

8.2.1 Response to Individual Questions (online survey)

Access to Digital Technologies: Response to Question No. 1:

Question number one sought to check if participants owned a smart phone and it was heartening to know that out of 1695 participants who answered the question, 84.6% (1557) respondents owned a smart phone.

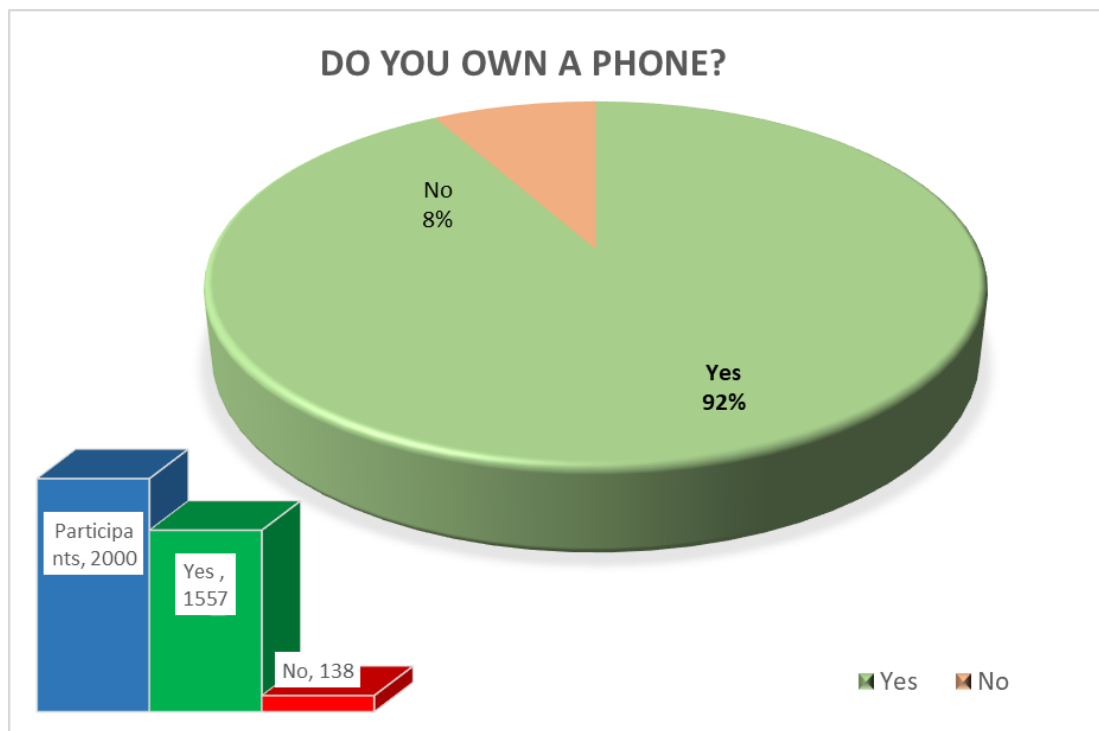


Figure 5: Question 1 (Online Survey)

The graph above (and further such graphs depicting responses) has two parts. The mail part shows “Yes” and “No” in pie chart and the bar graph on bottom left corner shows total number of participants and binary Responses received from them.

Access to Digital Technologies: Response to Question No. 2:

Question number 2 sought to check access to Internet. India is a developing nation and Internet access, though is in Gbps in metros but is lower in tier 2 & 3 cities and could be sporadic in rural areas. Since this was an online survey, almost equal number of participants who answered affirmative for owning a phone answered positively about access to Internet.

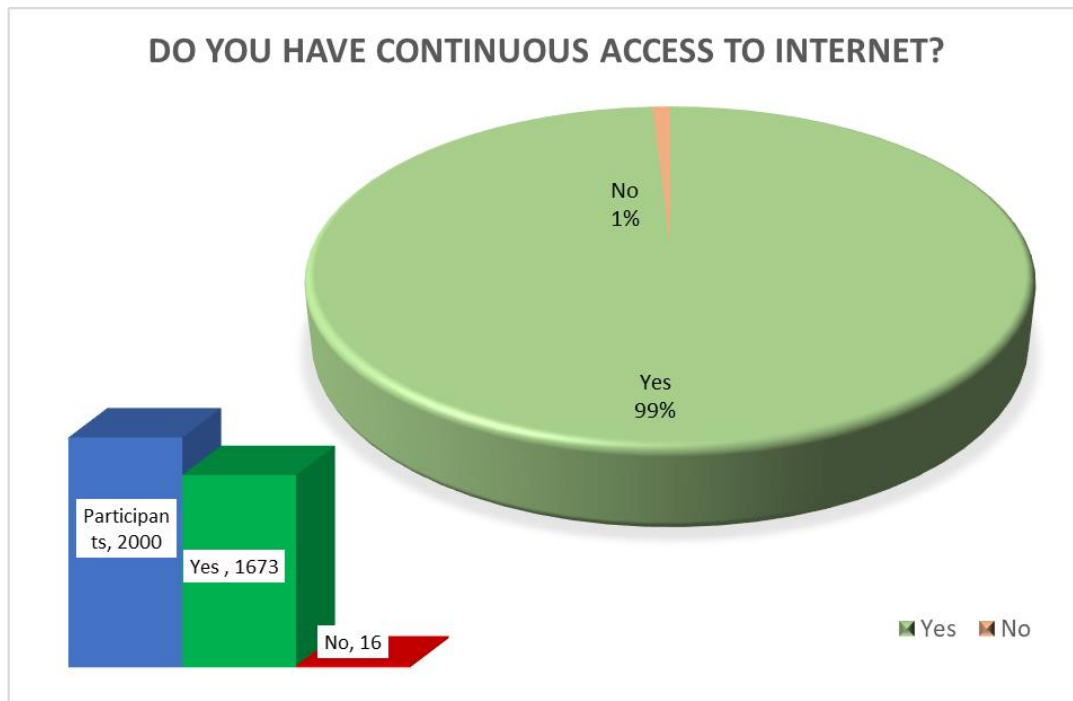


Figure 6: Question 2 (Online Survey)

Access to Digital Technologies: Response to Question No. 3:

Question number 3 sought responses on internet access on temporary basis. So that intent to learning can be checked. In case, someone intends to learn something they should not be worried about borrowing internet access with their friends or neighbours for a short period of time. Since our society is a cooperative society, temporary internet access was something respondents confirmed to have access to and similar (84%+) respondents confirmed it, as is visible from graph below.

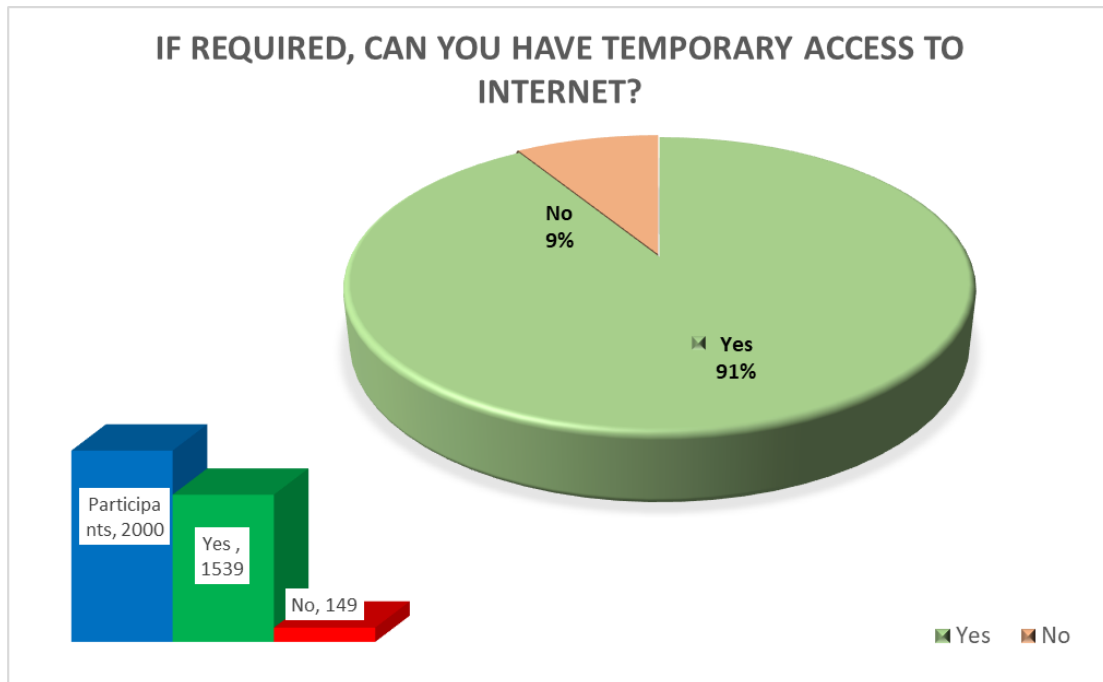


Figure 7: Question 3 (Online Survey)

Use of Digital Technology: Response to Question Nos. 4, 9 and 14:

In “Access to Digital Technology”, we checked if citizens could access digital technology, particularly Internet. In this section, we checked on how are they using Digital Technologies. Are these technologies really making a difference in their lives? The responses were checked in a horizon of two years, to bank upon the fact that we remember events of recent past more vividly and events beyond that are remembered only if they casted an impact on us. So, we divided this section in following three parts

- Period of last 6 months
- Period of last 6months to 02 years
- Period of Last 02 years to 04 years

Since the Survey was floated during first two weeks of August’21, following are broad timeline that can be considered for period mentioned above

- Period of last 6 months → Mar/Apr’21 to July/Aug’21
- Period of last 6months to 02 years → July/Aug’19 to Feb/Mar’21
- Period of Last 02 years to 04 years → May/June’17 to June/July’19

Same questions were asked from the citizens for above three periods.

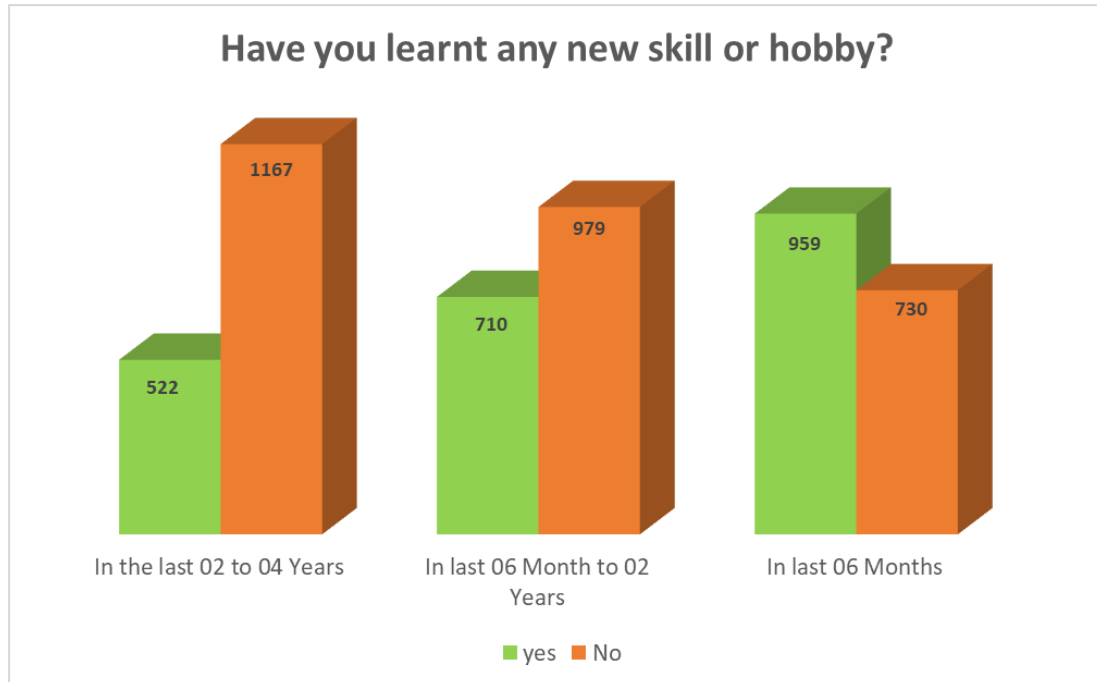


Figure 8: Question 4, 9 and 14 (Online Survey)

As is clearly visible from the graph above more and more citizens used technology and devices at hand to learn new skills or hobbies in the period ranging from last 4 years. There was a gradual increase in number of participants who learnt something new and decrease in participants who didn't. Any of these skills or hobbies, irrespective of what they are help improve talent quotient of the society. If someone has used his phone to play a game or learn to speak another language, he or she would be sure to utilize his time, at some point in future, to advance his career or skills and earning potential.

Use of Digital Technology: Response to Question Nos. 5, 10 and 15:

In previous questions participants answered if they acquired any new skills and this set of questions checks if they improved their already acquired skills using digital technologies. It's not only skilling which has its importance, but re-skilling and up-skilling are equally important. A good number of participants up skilled or re-skilled themselves and this number increased in the period of last 4 years. This shows that the participants upgraded themselves by using digital technologies as is evident from the pandemic period, as we see a substantial jump in the period of 06 Months to 02 years from its previous period. This jump kind of stagnated in the previous 06 months.

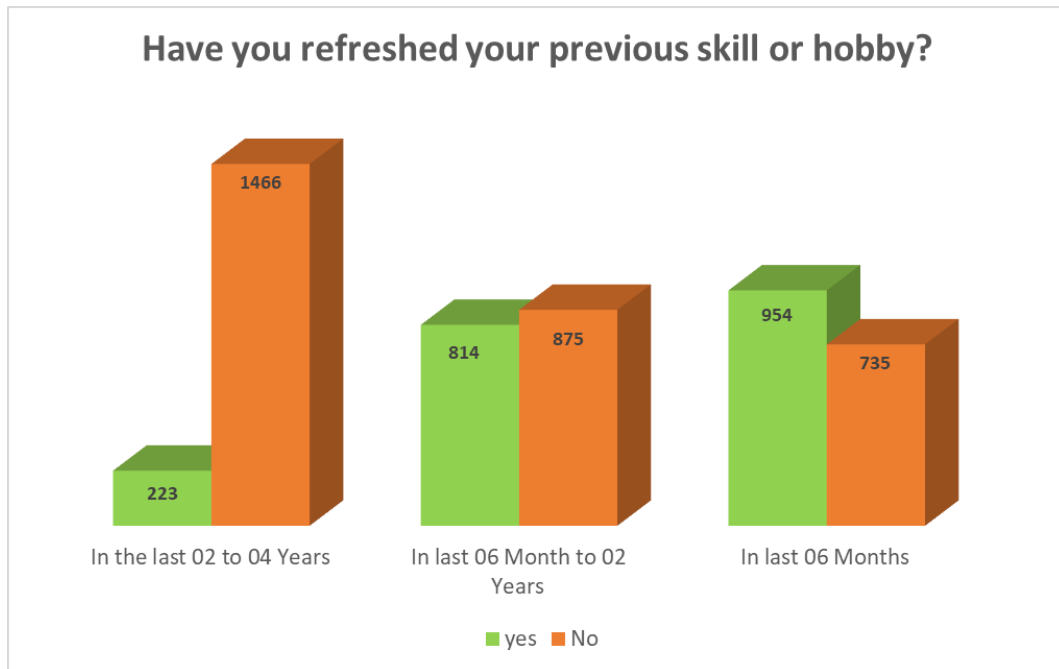


Figure 9: Question 5, 10 and 15 (Online Survey)

Use of Digital Technology: Response to Question Nos. 6, 11 and 16:

This set of questions checks if respondents used phone/internet or similar devices for upskilling and re-skilling or were in a classroom. We can see a steep tilt towards use of digital technologies in learning in past two years which than plateaus. From classroom and face-to-face learning participant moved to online learning.

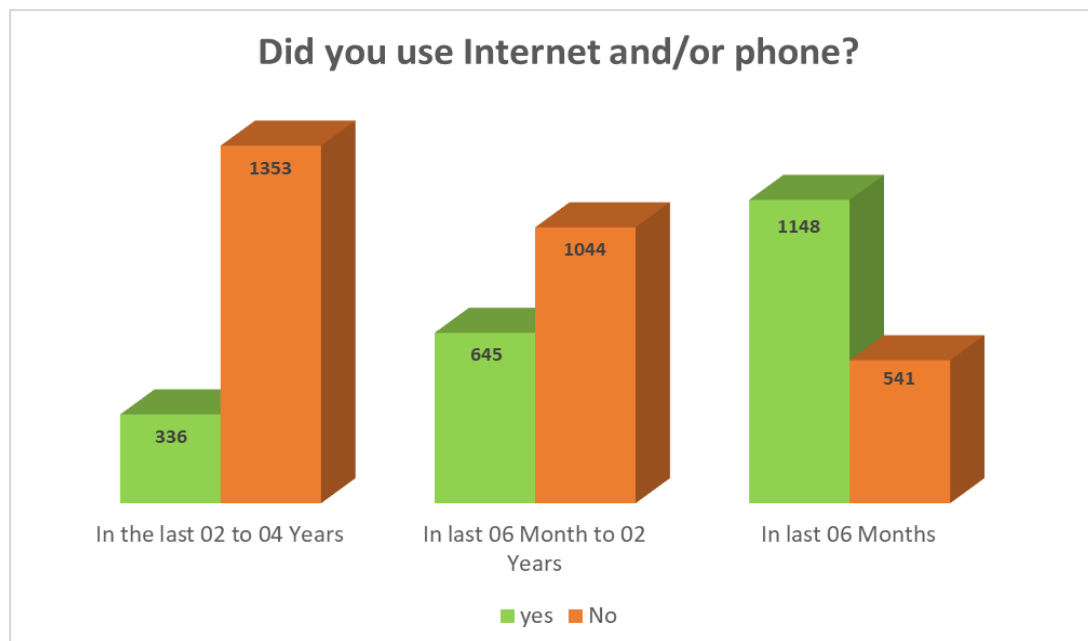


Figure 10: Question 6, 11 and 16 (Online Survey)

Use of Digital Technology: Response to Question Nos. 7, 12 and 17:

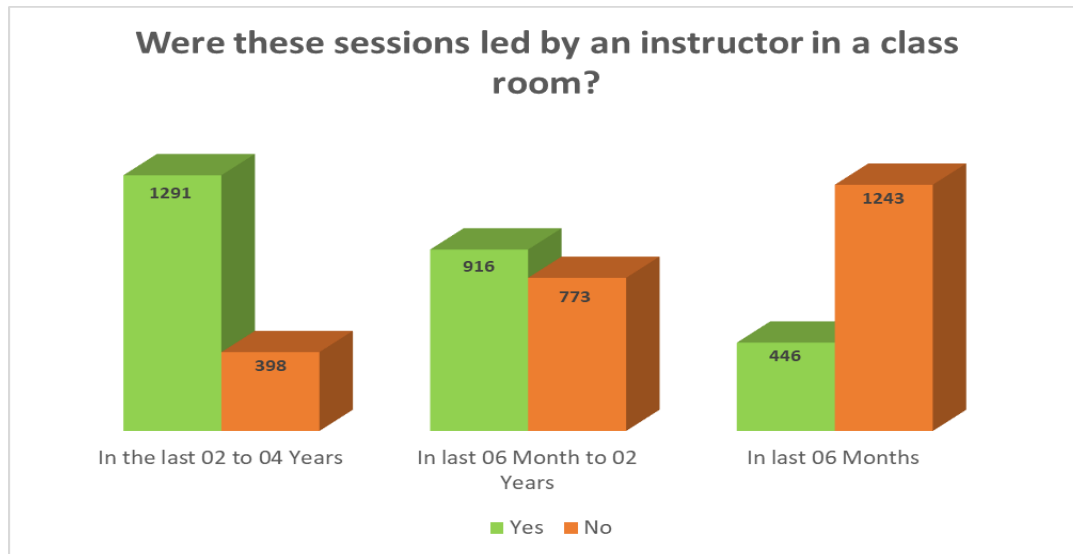


Figure 11: Question 7, 12 and 17 (Online Survey)

This set of question checked if participants attended these sessions in a classroom with an instructor. With time and with advent of technology, lot of participants shifted to online learning and which was in vogue due to pandemic also. In last 02 to 04 years, lot of participants attended learning session with an instructor in a physical setup which changed to more citizens attending online classes in recent past.

Use of Digital Technology: Response to Question Nos. 8, 13 and 18:

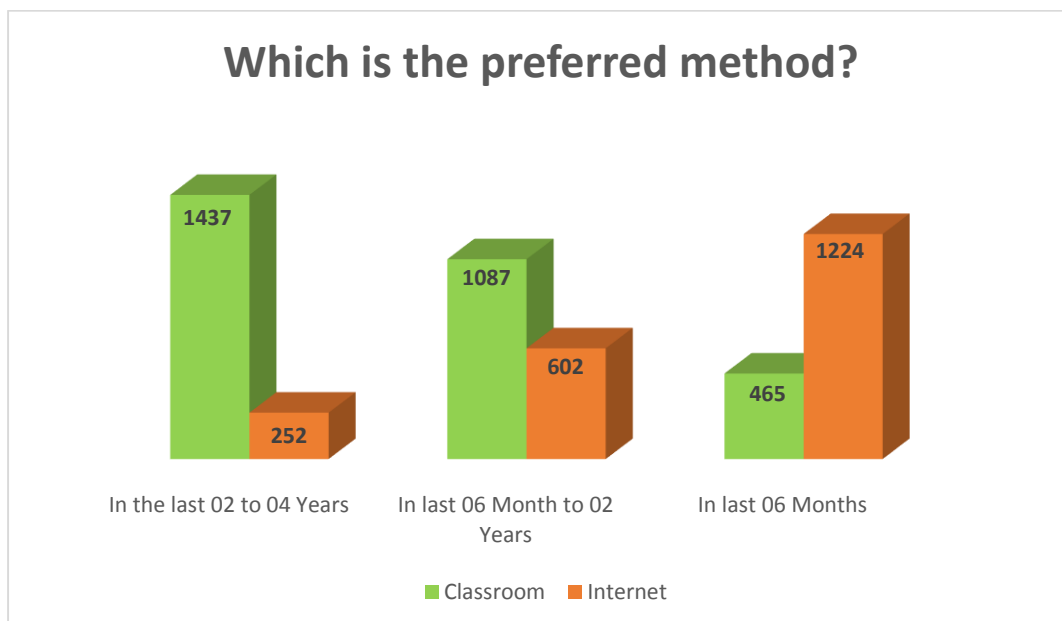


Figure 12: Question 8, 13 and 18 (Online Survey)

This set of questions check preference of respondents if they preferred classrooms or internet for their skilling needs. As is visible from the results from correspondents, within last four years people shifted from classroom to Internet. Most respondents shifted their preference to Internet from classrooms and this could be attributed not only to the pandemic but also to the availability of Digital Technologies.

Demographics: Response to Question Nos. 19, 20 and 21:

This section looks at various demographic status of the respondents just to understand linking of previous education, places of stay and gender with the talent development initiatives of the individuals.

Gender Diversity

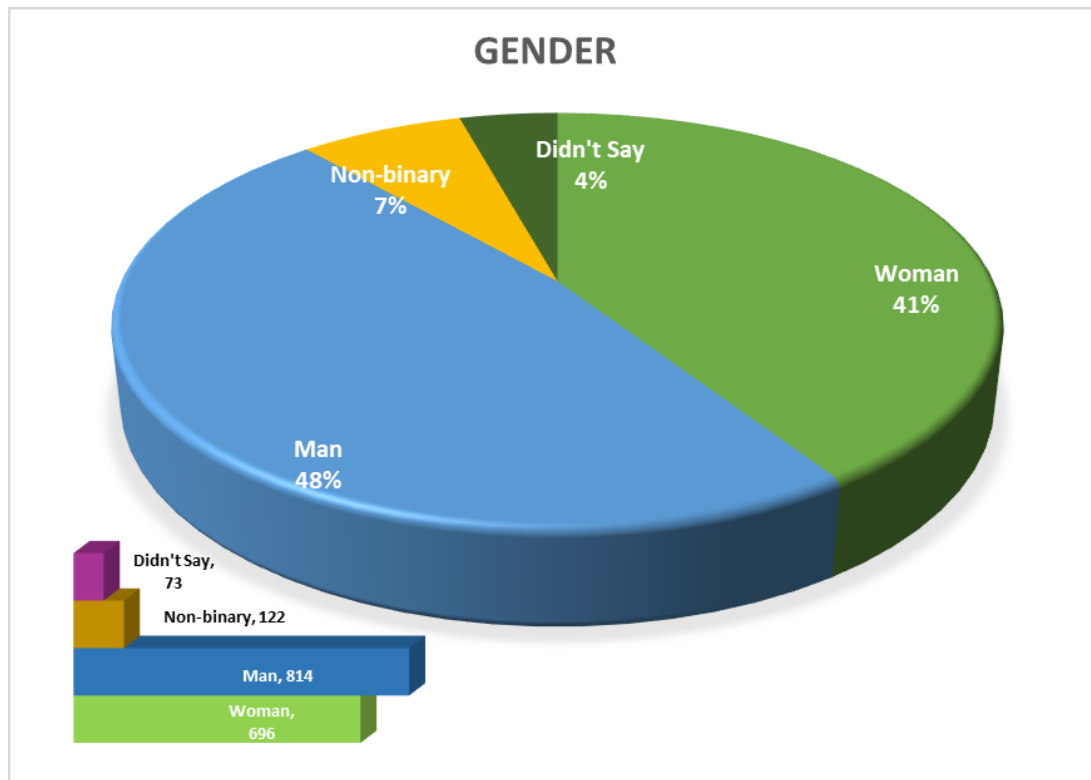


Figure 13: Gender Diversity (Online Survey)

The graph above shown gender diversity among the correspondents. Approximately ninety percent of respondents were fine revealing their sex while remaining 10% of respondents were not comfortable and said “non-binary” or didn’t want to disclose. This also shows effect of access to digital technologies, else we would have got only “male” and “female” answers. Since respondents were aware and had access to digital media, they were comfortable in not-

announcing or say that they do not fall in category of either male or female. This shows that access to digital technologies and various other arena that access to digital technologies open various facets of life and give them freedom of expression as well as freedom of choice.

Education

We captured educational background to understand what percentage of participants understood digital media or if they know internet and how to use it. As the graph below shows, more than 75% of respondents had formal education of more than 05 years and more than 50% participants had received more than 12 years of formal education. Most interesting fact that we found was that about 25% of respondents had very less formal education but all of them were still aware of using internet, as they responded the survey, and digital technologies. This is the indication that digital technology can be used as a liberator and enabler for anyone who has a will to improve his skills and citizens who want to learn and gain some additional skills.

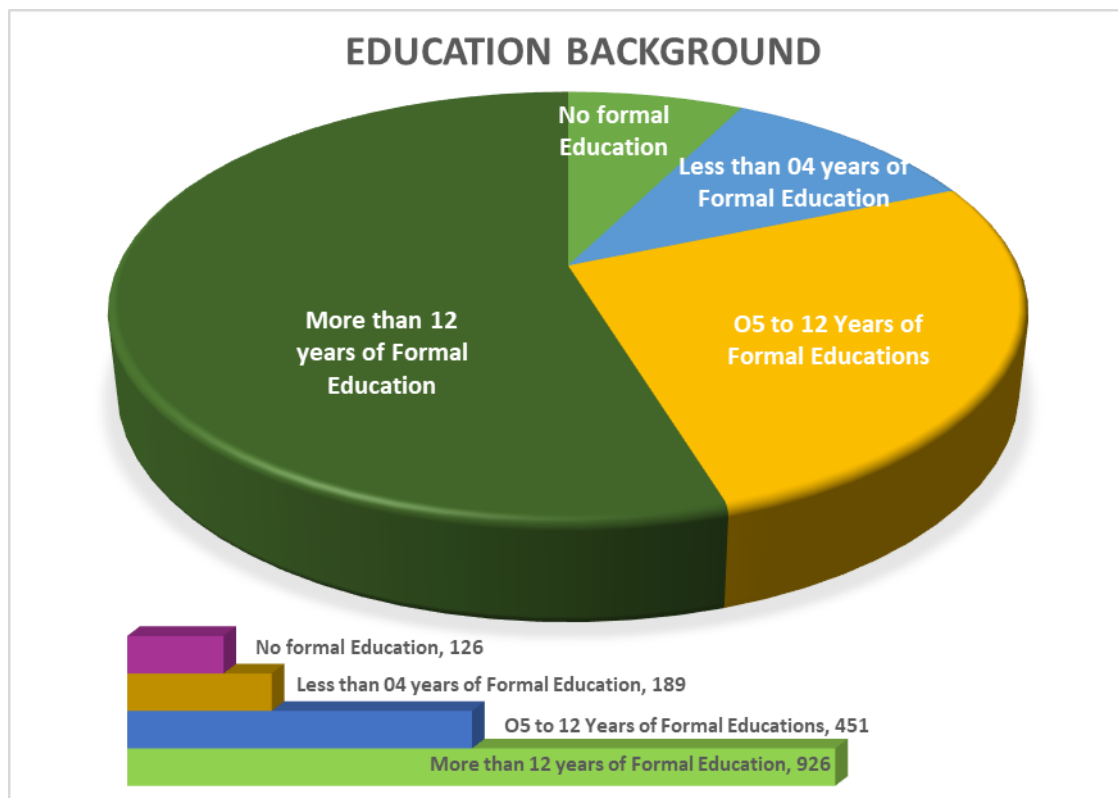


Figure 14: Education Background (Online Survey)

Habitat

Survey was shared with two thousand participants. Out of seventeen thousand respondents about 77% were residing in urban areas and 23% were from rural areas. Interestingly, these 23% participants had not only the access to internet but were also avid users of digital technologies to increase their talent and thereby increasing talent of the society.

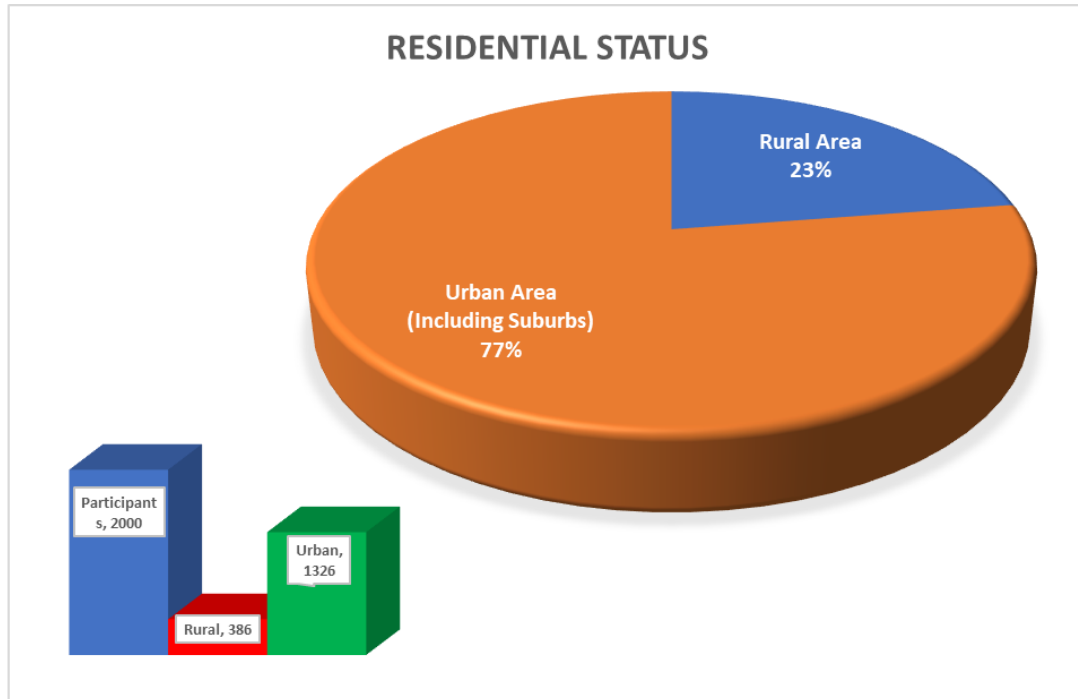


Figure 15: Residential Status (Online Survey)

In all, online survey had a very positive response indicating digital technologies being part of mainstream vehicle on learning journey of the participants. We saw a shift, gradual turning to steep, in favour of digital technologies improving digital quotient of the society of which these respondents were part of.

8.3 Offline Survey Responses

To reach out to participants who may not have access to Internet in their hands, the survey was conducted offline as well. This was done with the help of ten students from local community school on paid basis and to engage youth to connect with new faces. All COVID appropriate protocols and behaviour were observed and followed. Survey co-ordinators were given gloves, masks and sanitizers during the survey and small training was done regarding COVID Appropriate Behaviour. We had targeted 450 respondents for the survey conducted over two days by ten co-ordinators. The percentage of responses

received is not in similar range as seen from online survey and varies between 30 to 80%. The variance was wide in the responses received but it being in-person responses, they too represent the right sample. The table below shows number of responses against the respondents approached:

Table 2: Participants and Respondents of Offline Survey

Participants of Offline Survey				
#	Question Text	Approached	Answered	% Answered
Access to Digital Technology				
1	Do you own a phone	450	361	80.2%
2	Do you have continuous access to internet?	450	360	80.0%
3	If required, can you have temporary access to Internet?	450	363	80.7%
Use of Digital Technology				
In last 06 months				
4	Have you learnt any new skill or hobby?	450	139	30.9%
5	Have you refreshed your previous skill or hobby?	450	272	60.4%
6	Did you use Internet and/or phone for 4 & 5?	450	363	80.7%
7	Were these sessions led by an instructor in a classroom	450	315	70.0%
8	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	450	343	76.2%
In last 06 months to 02 Years				
9	Have you learnt any new skill or hobby?	450	289	64.2%
10	Have you refreshed your previous skill or hobby?	450	229	50.9%
11	Did you use Internet and/or phone for questions 9 & 10 above?	450	343	76.2%
12	Were these sessions led by an instructor in a classroom	450	252	56.0%
13	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	450	270	60.0%
In last 02 years to 04 years				

Participants of Offline Survey				
#	Question Text	Approached	Answered	% Answered
14	Have you learnt any new skill or hobby?	450	319	70.9%
15	Have you refreshed your previous skill or hobby?	450	210	46.7%
16	Did you use Internet and/or phone for questions 14 & 15 above?	450	335	74.4%
17	Were these sessions led by an instructor in a classroom	450	257	57.1%
18	Which is preferred method from above two <ul style="list-style-type: none"> • Classroom • Internet 	450	257	57.1%
Demographics				
19	Gender <ul style="list-style-type: none"> • Woman • Man • Non-Binary • Prefer not to say 	450	358	79.6%
20	Education Level <ul style="list-style-type: none"> • No formal Education • Less than 04 years of Formal Education • 05 to 12 Years of Formal Educations • More than 12 years of Formal Education 	450	330	73.3%
21	Habitat <ul style="list-style-type: none"> • Rural Area • Urban Area (Including Suburbs) 	450	347	77.1%

8.3.1 Response to Individual Questions (offline survey)

Access to Digital Technologies: Response to Question No. 1:

As in online survey, this question checked if participants owned a smart phone and it was heartening to know that out of 80% respondents who answered the question, 95% (342) respondents owned a smart phone. Extrapolating it to our sample would give more than 75% of participants in whole same having a smart phone and hence access to digital technology.

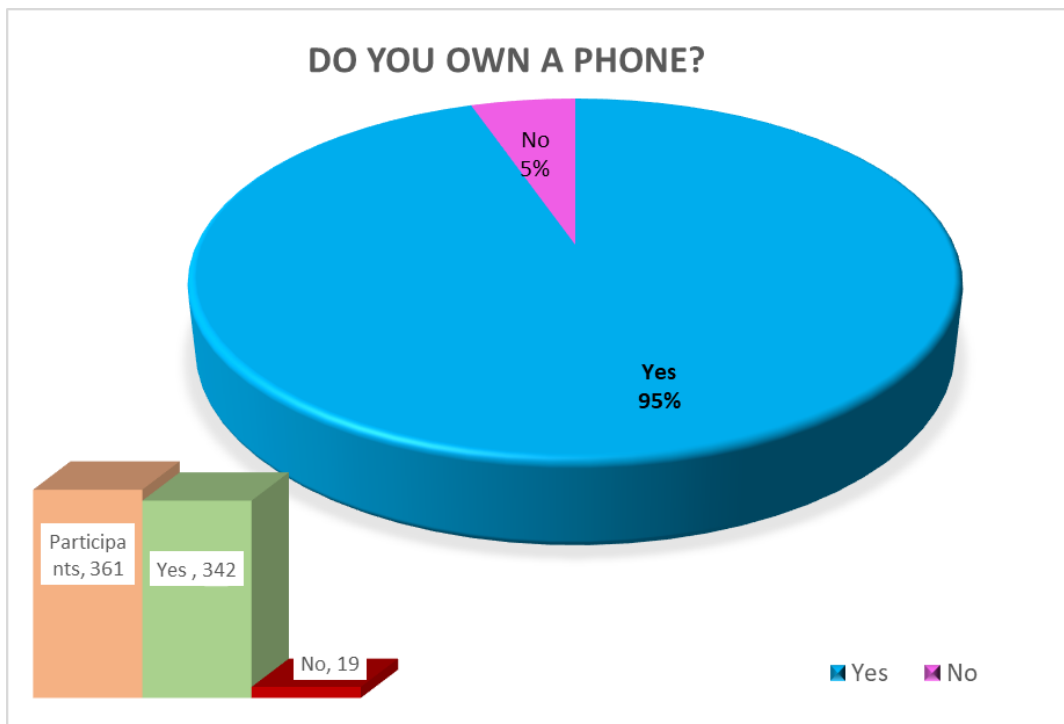


Figure 16: Question 1 (Offline Survey)

The graph above (and further such graphs depicting responses) has two parts. The main part shows "Yes" and "No" in pie chart and the bar graph on bottom left corner shows total number of participants and binary Responses received from them.

Access to Digital Technologies: Response to Question No. 2:

Question number 2 sought to check access to Internet. India is a developing nation and Internet access (availability, speed, and Service provider reach) varies across regions. Some of the service providers over-provision their telecom network beyond global standards resulting in slower access. Since this was the offline survey, unlike equal number of participants who answered affirmative

during online survey, there was a drop of about 20% respondents who owned a phone answered positively about access to Internet.

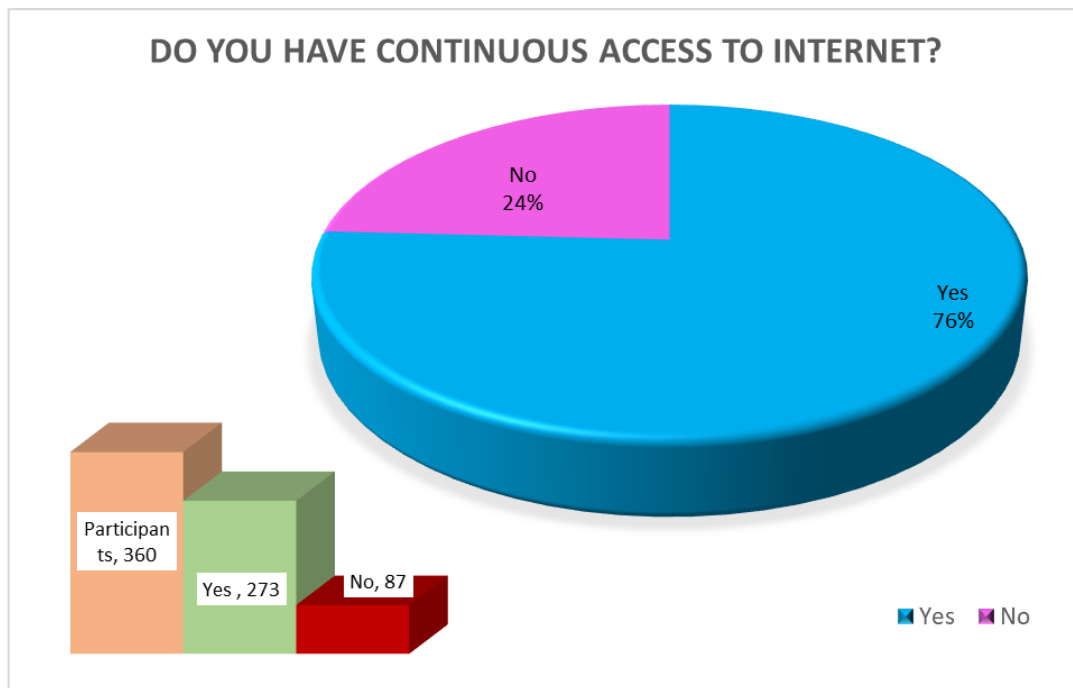


Figure 17: Question 2 (Offline Survey)

Access to Digital Technologies: Response to Question No. 3:

Question number 3 sought responses on internet access on temporary basis. So that intent to learning can be checked. In case, someone intends to learn something they should not be worried about borrowing internet access with their friends or neighbours for a short period of time. Since Indian society is a cooperative society, temporary internet access was something respondents confirmed to have access to. While in online survey we had 84%+respondents who confirmed having temporary access in case they needed however in offline survey we found 98% of respondents confirming having temporary access to internet.

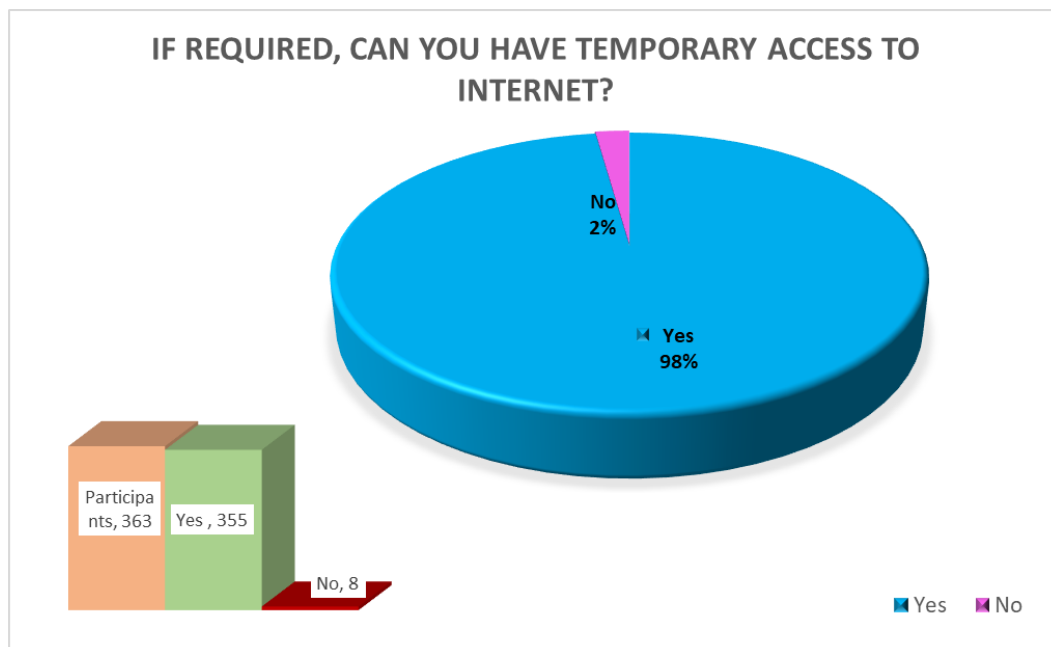


Figure 18: Question 3 (Offline Survey)

Use of Digital Technology: Response to Question Nos. 4, 9 and 14:

In "Access to Digital Technology", we checked if citizens could access digital technology, particularly Internet. In this section, we checked on how are they using Digital Technologies. Are these technologies really making a difference in their lives? The responses were checked in a horizon of two years, to bank upon the fact that we remember events of recent past more vividly and events beyond that are remembered only if they casted an impact on us. So, we divided this section in following three parts

- Period of last 6 months
- Period of last 6months to 02 years

- Period of Last 02 years to 04 years

Since the Survey was floated during first two weeks of August'21, following are broad timeline that can be considered for period mentioned above

- Period of last 6 months → Mar/Apr'21 to July/Aug'21
- Period of last 6 months to 02 years → July/Aug'19 to Feb/Mar'21
- Period of Last 02 years to 04 years → May/June'17 to June/July'19

Same questions were asked from the citizens for above three periods.

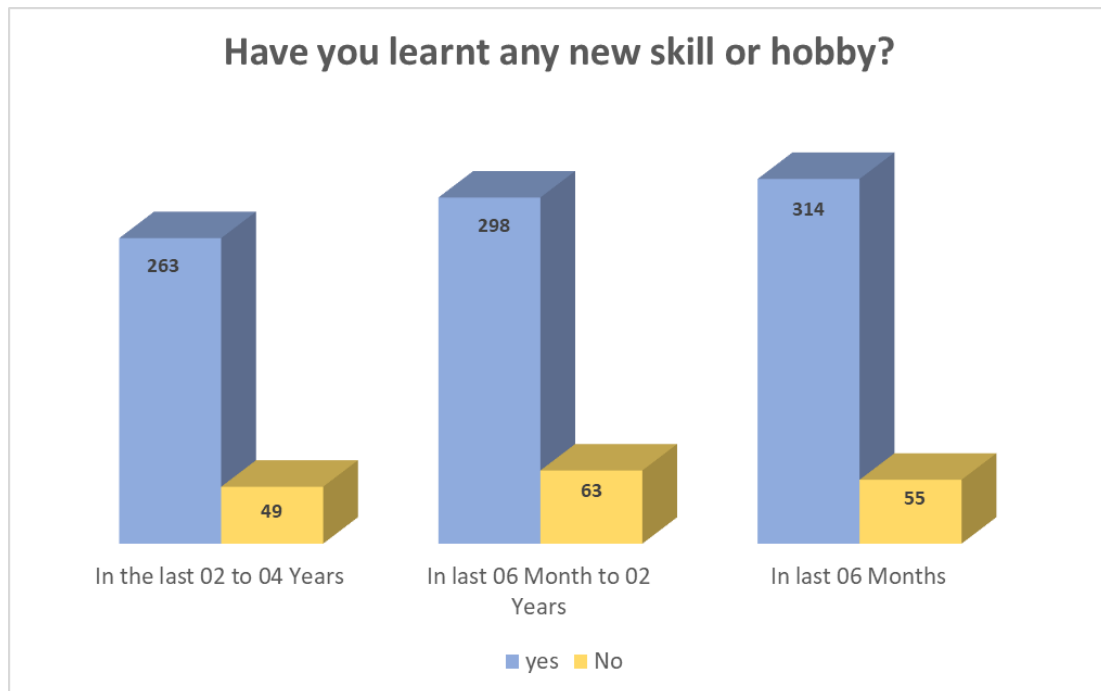


Figure 19: Question 4, 9 and 14 (Offline Survey)

As is clearly visible from the graph above more and more citizens used technology and devices at hand to learn new skills or hobbies in the period ranging from last 4 years. There was a gradual increase in number of participants who learnt something new and decrease in participants who didn't. Any of these skills or hobbies, irrespective of what they are help improve talent quotient of the society. If someone has used his phone to play a game or learn to speak another language, he or she would be sure to utilize his time, at some point in future, to advance his career or skills and earning potential.

Use of Digital Technology: Response to Question Nos. 5, 10 and 15:

In previous questions participants answered if they acquired any new skills and this set of questions checks if they improved their already acquired skills using

digital technologies. It's not only skilling which has its importance, but re-skilling and up-skilling are equally important. A good number of participants up skilled or re-skilled themselves and this number increased in the period of last 4 years. This shows that the participants upgraded themselves by using digital technologies as is evident from the pandemic period, as we see a substantial jump in the period of 06 Months to 02 years from its previous period. This jump kind of stagnates in the previous 06 months. These are the similar results as seen in online survey as well. This is an indication that irrespective of their situation, citizens wanted to learn something new.

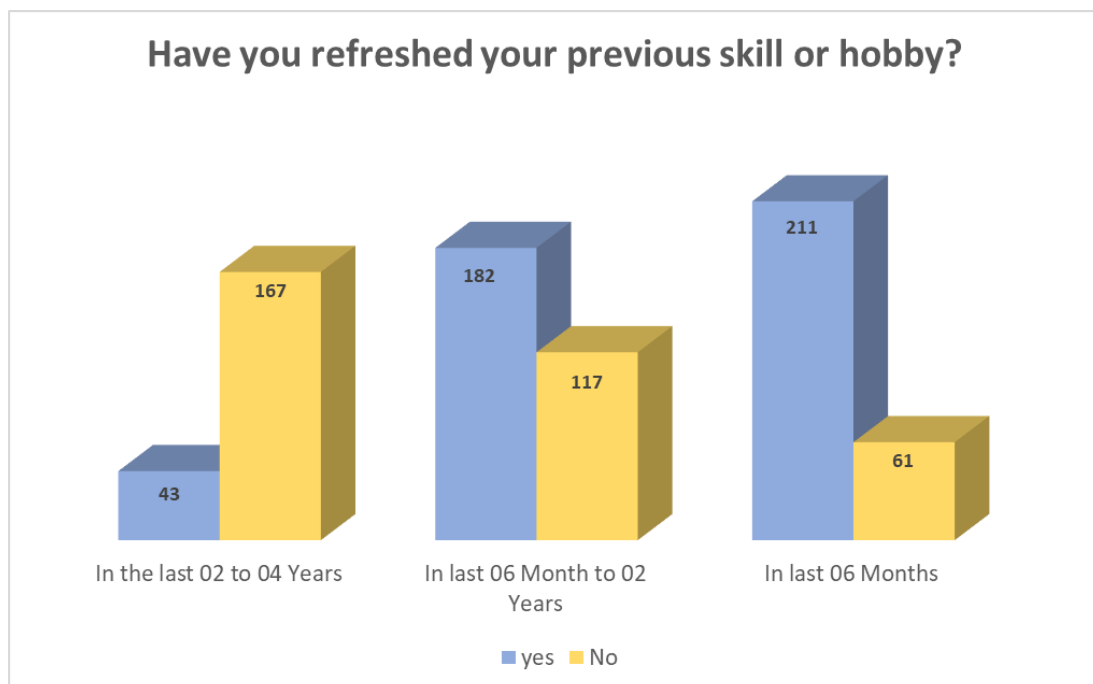


Figure 20: Question 5, 10 and 15 (Offline Survey)

Use of Digital Technology: Response to Question Nos. 6, 11 and 16:

This set of questions checks if respondents used phone/internet or similar devices for upskilling and re-skilling or were in a classroom. We can see a steep tilt towards use of digital technologies in learning in past two years which than plateaus. From classroom and face-to-face learning participant moved to online learning.

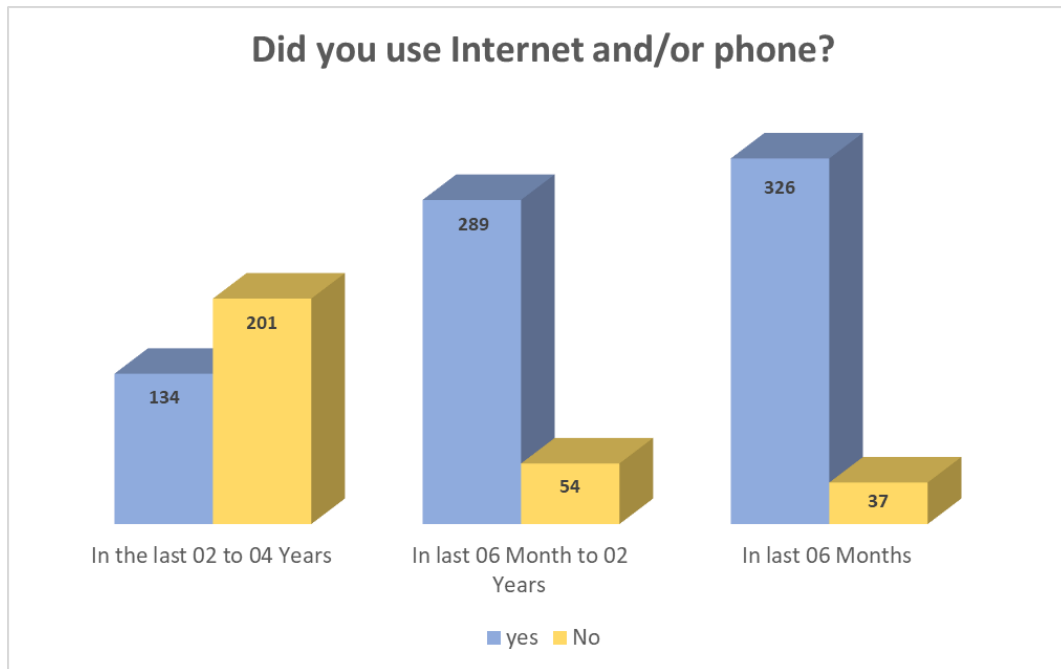


Figure 21: Question 6, 11 and 16 (Offline Survey)

Use of Digital Technology: Response to Question Nos. 7, 12 and 17:

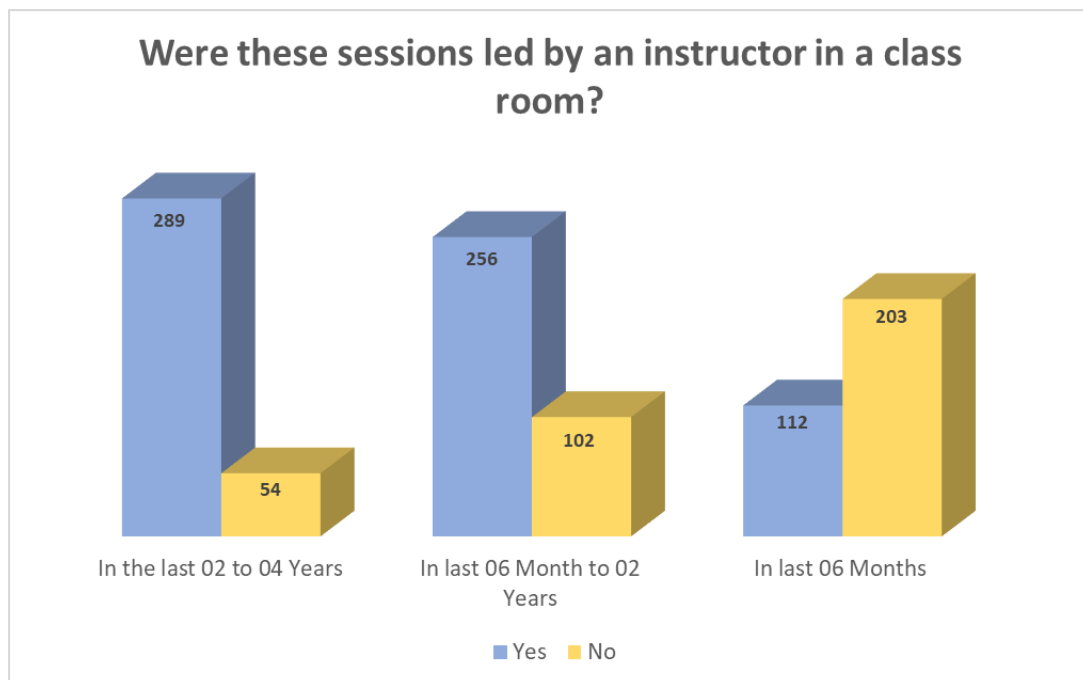


Figure 22: Question 7, 12 and 17 (Offline Survey)

This set of question checked if participants attended these sessions in a classroom with an instructor. With time and with advent of technology, lot of participants shifted to online learning and which was in vogue due to pandemic also. In last 02 to 04 years, lot of participants attended learning session with an instructor in a physical setup which changed to more citizens attending online

classes in recent past. In the last section, as is also seen in online survey, majority of respondents attended classes online.

Use of Digital Technology: Response to Question Nos. 8, 13 and 18:

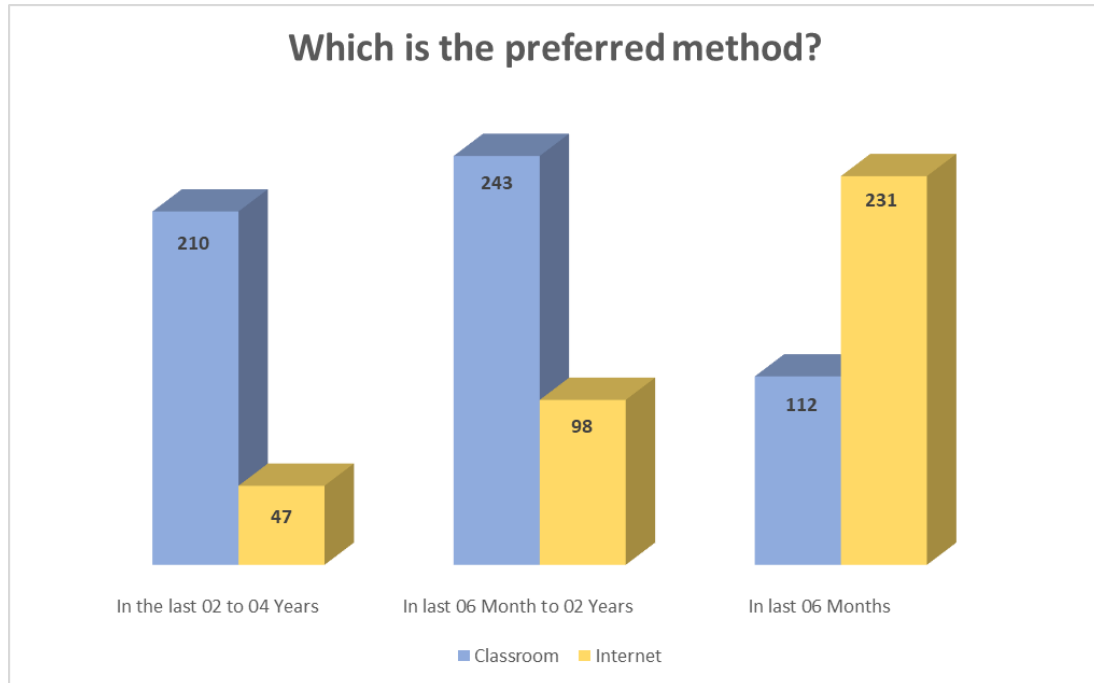


Figure 23: Question 8, 13 and 18 (Offline Survey)

This set of questions check preference of respondents if they preferred classrooms or internet for their skilling needs. As is visible from the results from correspondents, within last four years people shifted from classroom to Internet. Most respondents shifted their preference to Internet from classrooms and this could be attributed not only to the pandemic but also to the availability of Digital Technologies.

Demographics: Response to Question Nos. 19, 20 and 21:

This section looks at various demographic status of the respondents just to understand linking of previous education, places of stay and gender with the talent development initiatives of the individuals.

Gender Diversity

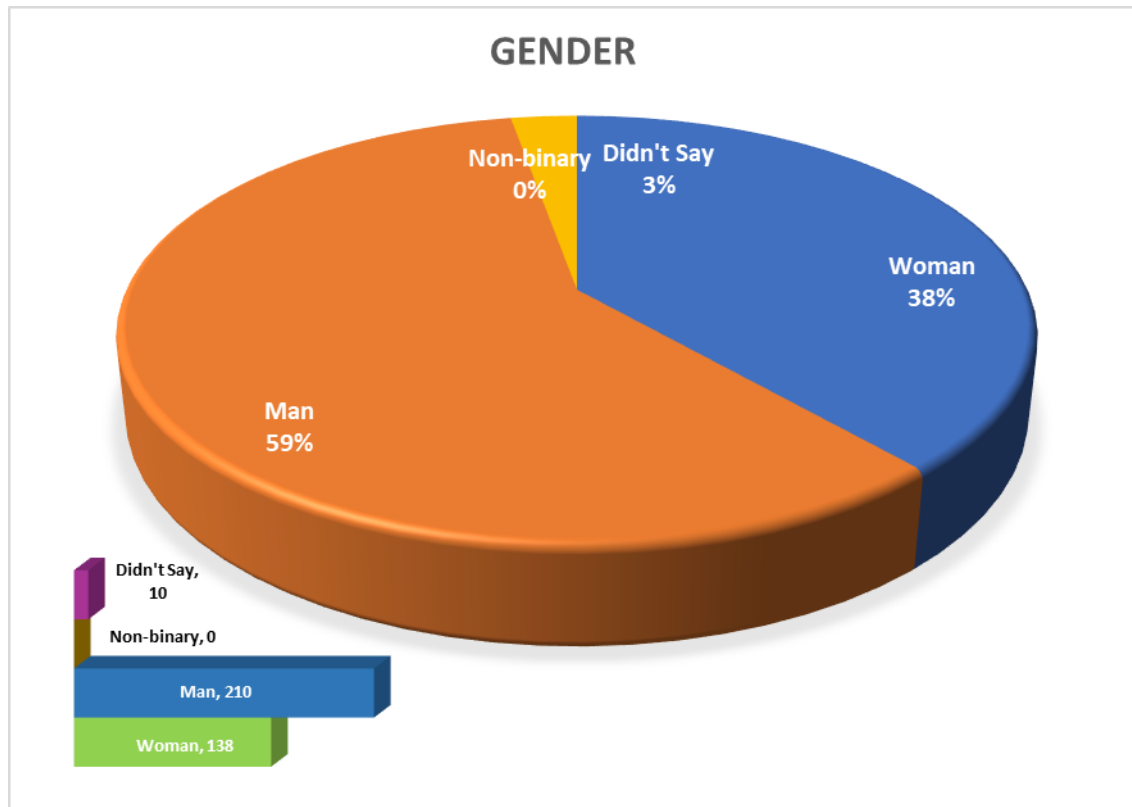


Figure 24: Gender Diversity (Offline Survey)

The graph above shown gender diversity among the correspondents. Approximately ninety seven percent of respondents were fine revealing their sex while remaining 3% of respondents were not comfortable and didn't disclose. Interestingly, none of them said "non-binary" may be out of embarrassment as Indian Society is now opening to these facets of gender preferences. This also shows effect of access to digital technologies, else we would have got only "male" and "female" answers. Since respondents were aware and had access to digital media, they were comfortable in not-announcing or say that they do not fall in category of either male or female. This shows that access to digital technologies and various other arena that access to digital technologies open various facets of life and give them freedom of expression as well as freedom of choice. Similar results were seen in online survey also.

Education

We captured educational background to understand what percentage of participants understood digital media or if they know internet and how to use it. As the graph below shows, about 77% of respondents had formal education of more than 05 years and more than 43% participants had received more than

12 years of formal education. Most interesting fact that we found was that about 23% of respondents had very less formal education but all of them were still aware of using internet, as they responded the survey, and digital technologies. This is the indication that digital technology can be used as a liberator and enabler for anyone who has a will to improve his skills and citizens who want to learn and gain some additional skills.

Similar finding are there from online survey as well.

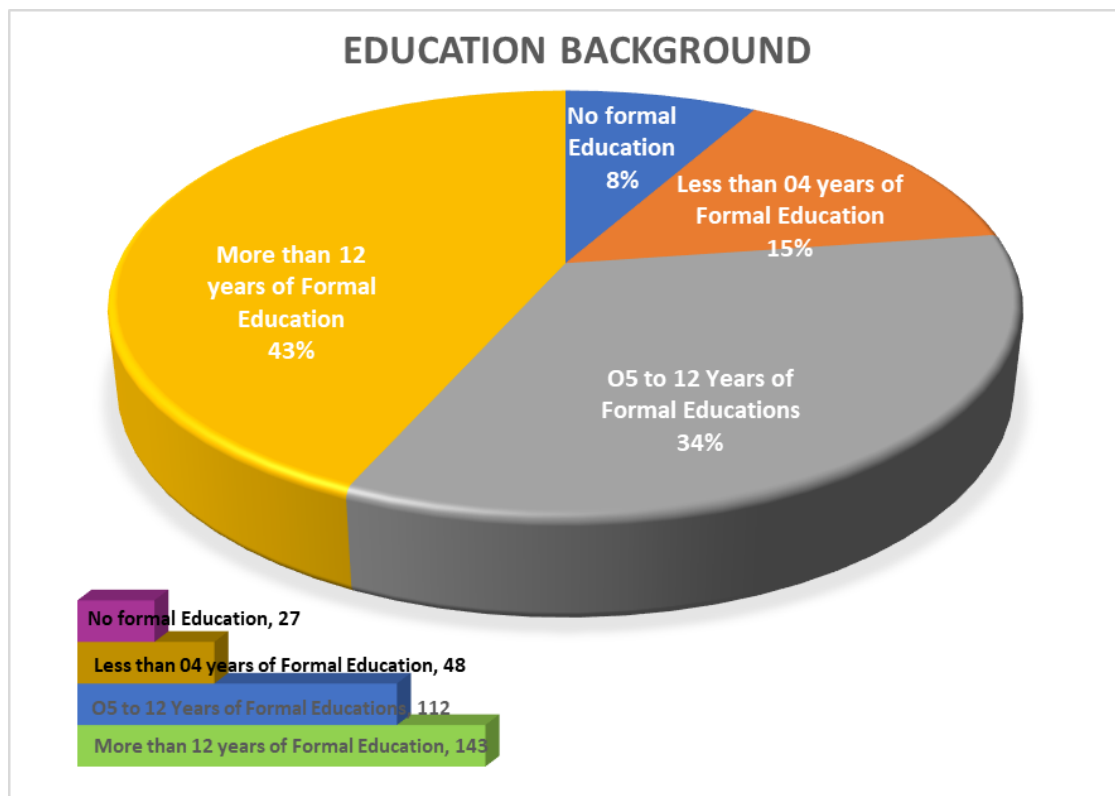


Figure 25: Education Background (Offline Survey)

Habitat

Survey was shared with four hundred fifty participants. Out of three hundred fifty-eight participants who responded, about 84% were residing in rural areas and 16% were from suburbs. Interestingly, these 16% participants had not only the access to internet but were also avid users of digital technologies to increase their talent and thereby increasing talent of the society. We saw similar results from online survey however residential status were inverted but everyone was geared up to upskill or reskill themselves and ultimately to increase talent quotient of the society,

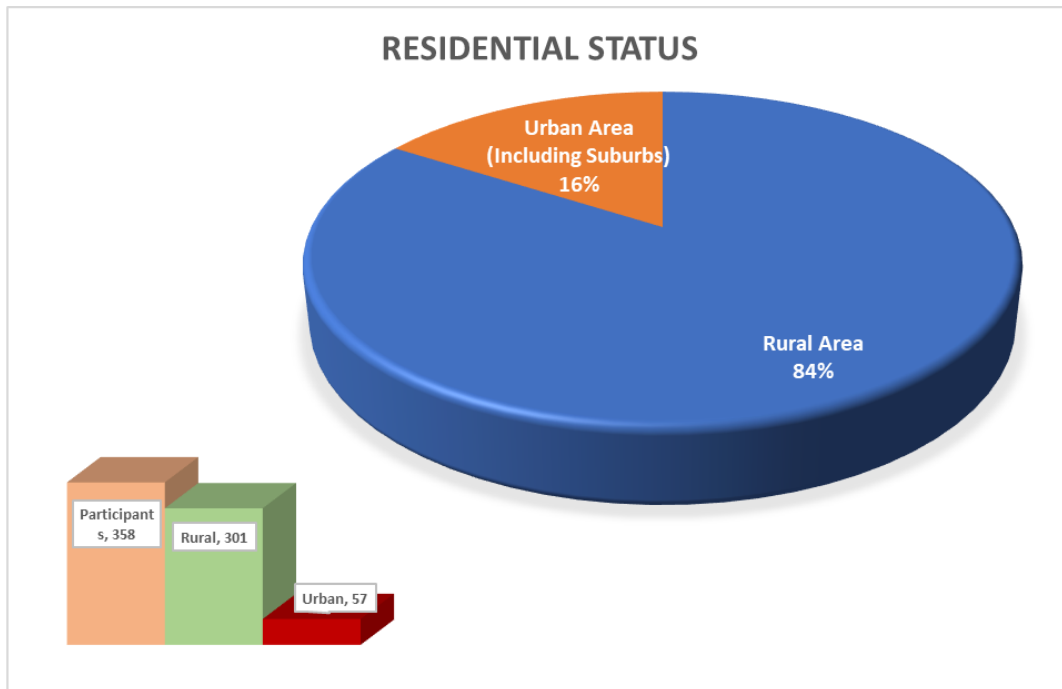


Figure 26: Residential Status (Offline Survey)

In all, offline survey had a very positive response indicating digital technologies being part of mainstream vehicle on learning journey of the participants. We saw a shift, gradual turning to steep, in favour of digital technologies improving digital quotient of the society of which these respondents were part of.

Both online survey and offline survey has very similar results as per our analysis, which means that irrespective of educational background or residential status or gender, respondents were very much aware of their surroundings and need to bring their talent a notch higher than what it previously was.

9 Survey Result Interpretation: Survey vs Data available on Internet

India, as is with developing nations, is greatly impacted by digital divide and digital transformation. More than 50% of population of India still dwell in rural areas and is agrarian centric. Penetration of digital technologies is still not as expected by government or as the citizens would expect due to various reasons which could be techno-commercial, social and cultural. However, the data from survey in [Section 8](#) gives us encouraging results especially in offline section where the sample has comparable access and use of digital technologies as in the online survey. In this section, we will analyse and compare this data with some other reliable sources that have made data public on Internet. As part of this comparison, data from renowned bodies providing independent statistics for betterment of citizen is considered. The three factors listed below were part of survey and the data from internet is also collected around these.

- Internet penetration in India
- Mobile subscriptions in India
- Literacy rate in India

9.1 Internet Penetration in India

Internet Penetration in India has been increasing for last 20 years. The portal hosted by “Hootsuite” and “We Are Social” Statista ⁽³³⁾ lists following statistics about Internet Usage in India.

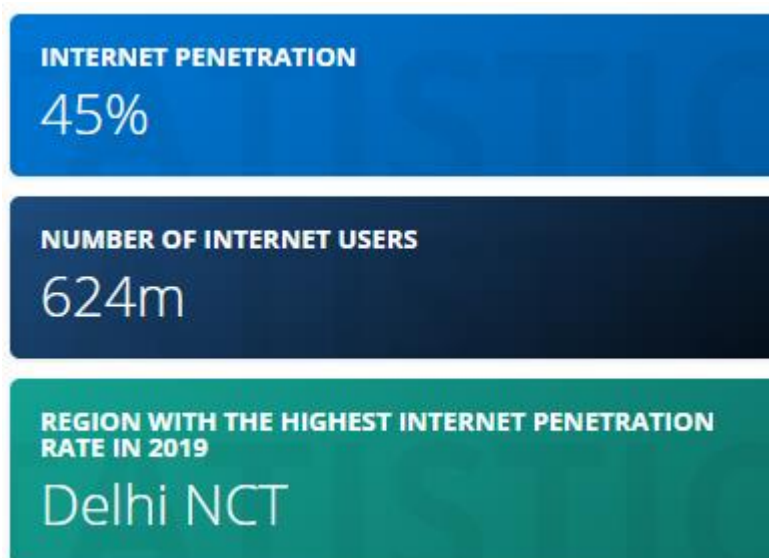
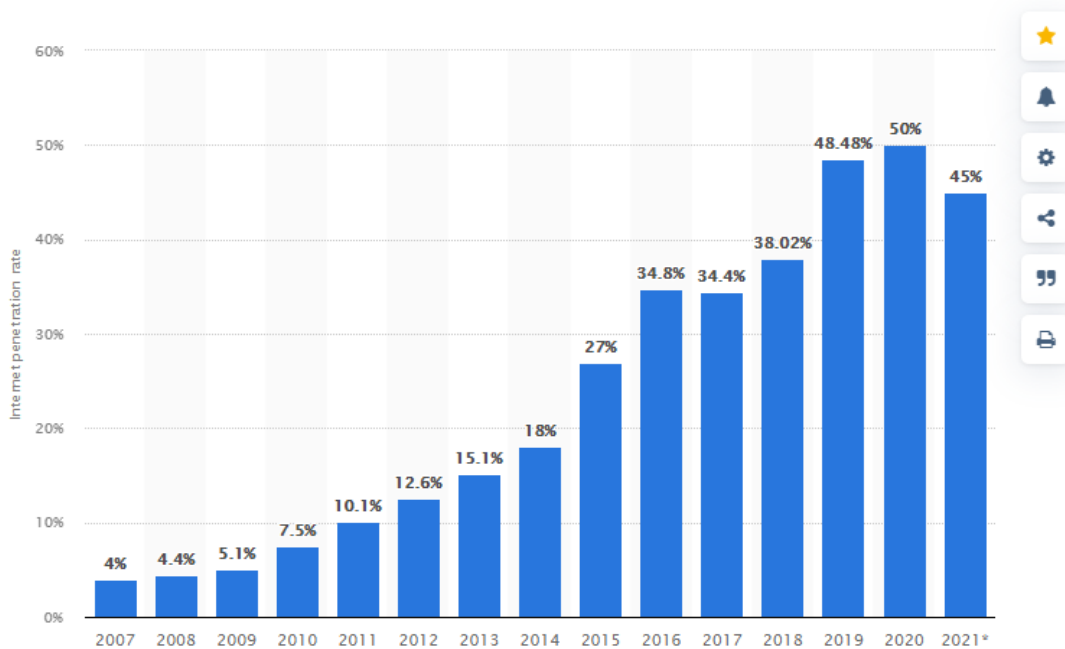


Figure 27: Internet Usage in India, Source: Statista

Similarly, Internet Penetration rate also show continuous increase over a period of years from 2007 with a dip in 2021 which could be because of partial year consideration during collation of statistics.



Details: India; DataReportal; 2007 to 2021; not sourced from social media platforms.

© Statista 2021

Figure 28: Internet penetration rate in India from 2007 to 2021; Source: Statista

Similar results are seen from The World Bank databank ⁽³⁴⁾. Some of the results are shown below for last 20 years (2000 to 2021).

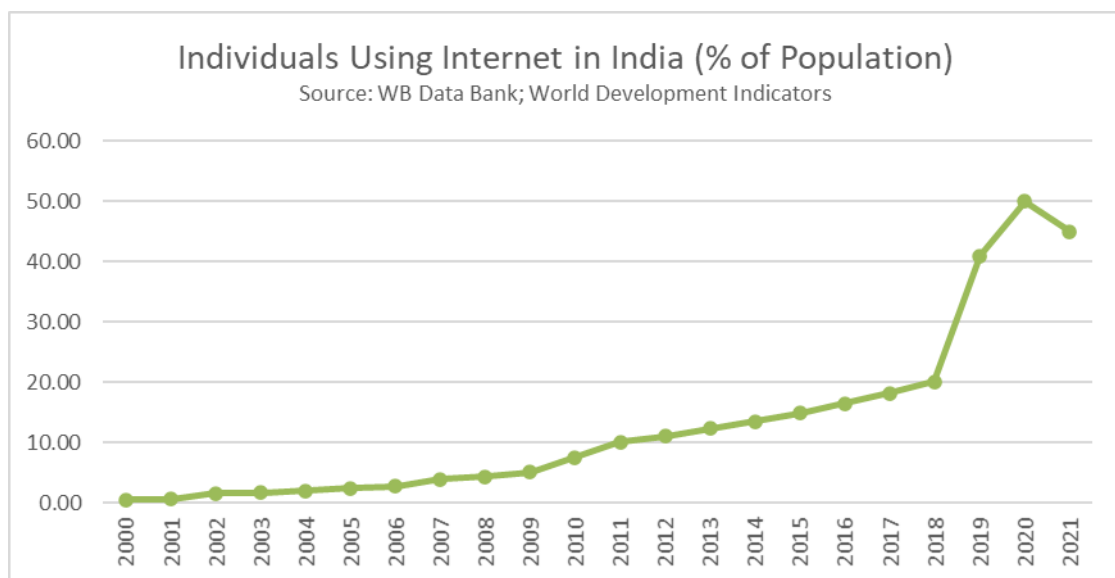


Figure 29: Internet penetration % in India; Source: The world Bank Data Bank

9.2 Mobile subscriptions in India

India is one of the largest consumers of mobile phones and smart phones. Its digital journey is an example of astonishing growth. The country had the world's second-largest internet population at over 749 million users in 2020. Of these, 744 million users accessed the internet via their mobile phones. Estimates suggest that this figure would reach over 1.5 billion by 2040 as shown in the figure below from Statista ⁽³³⁾.

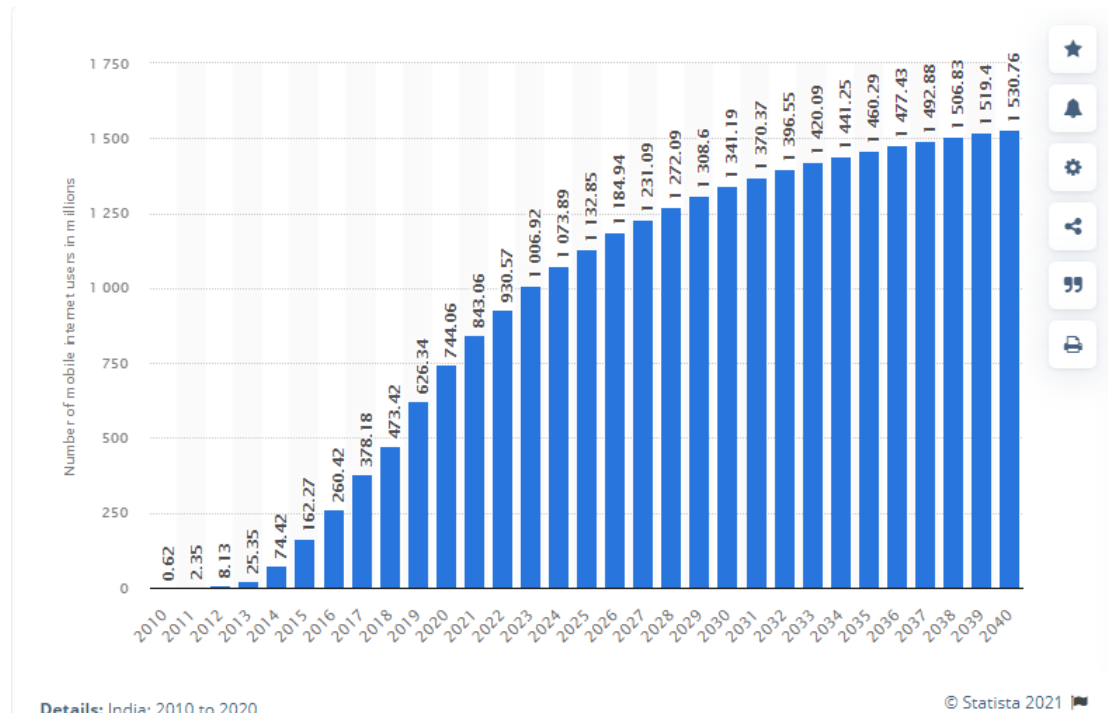


Figure 30: Number of mobile phone internet users in India from 2010 to 2020, with estimates until 2040

Similar projects regarding mobile subscriptions are seen from The World Bank Data Bank ⁽³⁴⁾.

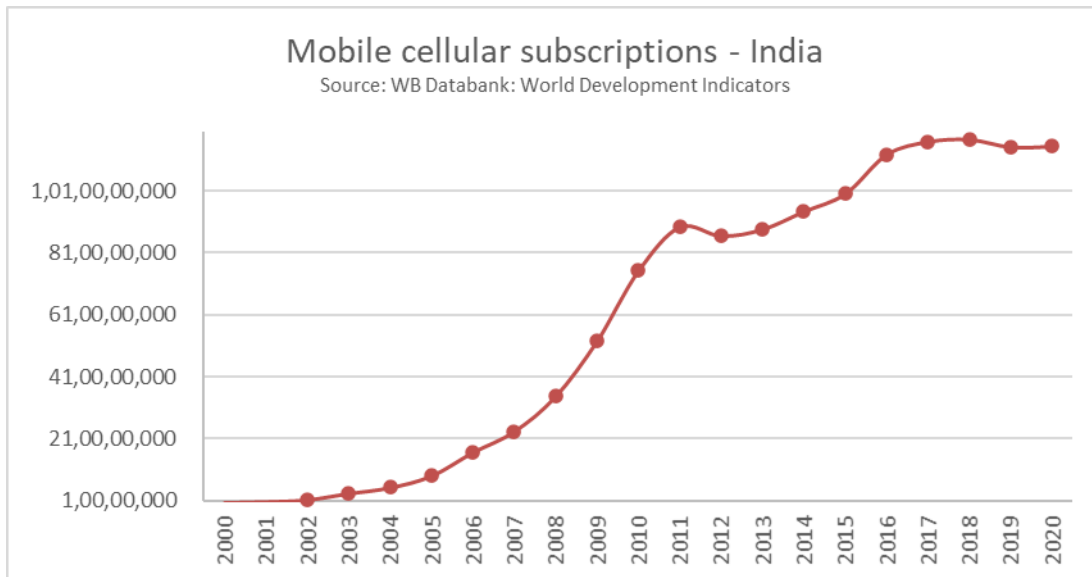


Figure 31: Mobile Cellular Subscriptions in India

The portal "Statista" also shows declining growth rate in mobile internet usage which means that as users start accessing Internet from mobile, every year there are lesser number of users are added as previous users continue to use mobile internet. Hence new users added are lesser and this declining growth rates,

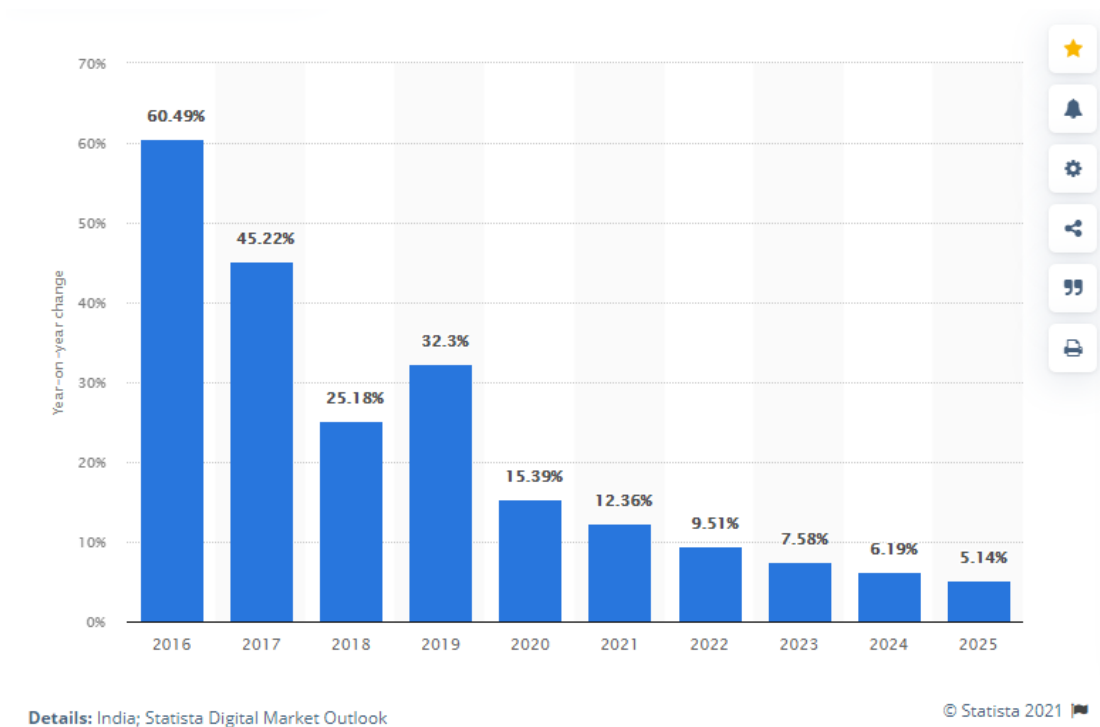


Figure 32: Mobile internet user growth rate in India from 2016 to 2025

9.3 Literacy Rate in India

Literacy is a key factor to show socio-economic growth. Literacy rates are an important part of census data collection. Census in India happens every ten years. Census of India ⁽³⁵⁾ calculated average literacy rate to be 73% in 2011 while National Statistical Commission ⁽³⁶⁾ surveyed literacy to be 77.7% in 2017–18. Literacy rate in urban areas was higher 87.7% than rural areas with 73.5%. Following figure containing table and graph from Census of India ⁽³⁷⁾ shows literacy rates since Independence and some other interesting observations.

Table 3: Literacy Rates in India

Census Year	Persons	Males	Females	Male-Female gap in literacy rate
1	2	3	4	5
1951	18.33	27.16	8.86	18.30
1961	28.3	40.4	15.35	25.05
1971	34.45	45.96	21.97	23.98
1981	43.57	56.38	29.76	26.62
1991	52.21	64.13	39.29	24.84
2001	64.83	75.26	53.67	21.59
2011	74.04	82.14	65.46	16.68

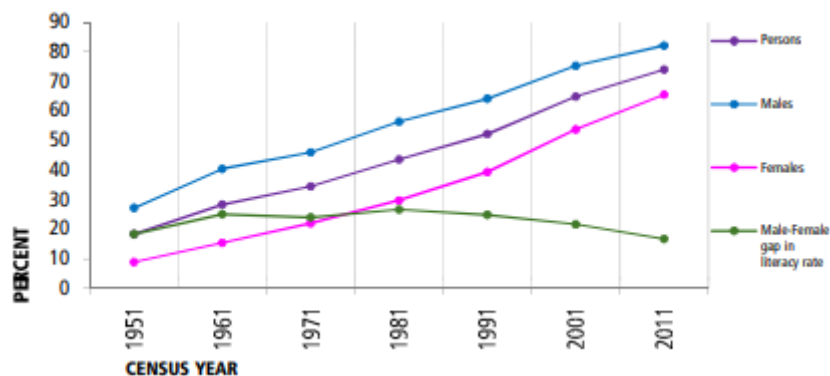


Figure 33: Literacy Rates in India - 1951 - 2011

Figure 33 and Figure 34 above show literacy rate in India since Independence. Every 10 years there is an increase of approximately 10% in the literacy rates, but males took a major share and are the main beneficiaries of education. However, from the graph in Figure 34 gap between male and female literacy rates is declining. This indicates that females are also being considered for education and are getting educated. Since 1981 this gap has been declining and is currently at 16.68%. This also indicates that female literacy is increasing at a faster rate than male literacy.

The next table from Reserve Bank of India (38) shows these details across states for these five censuses.

Table 4: State Wise Literacy Rates

STATE-WISE LITERACY RATE (Per cent)							
State/Union Territory	1951	1961	1971	1981	1991	2001	2011
Andaman and Nicobar Islands	30.30	40.07	51.15	63.19	73.02	81.30	86.63
Andhra Pradesh	-	21.19	24.57	35.66	44.08	60.47	67.02
Arunachal Pradesh	-	7.13	11.29	25.55	41.59	54.34	65.39
Assam	18.53	32.95	33.94	-	52.89	63.25	72.19
Bihar	13.49	21.95	23.17	32.32	37.49	47.00	61.80
Chandigarh	-	-	70.43	74.80	77.81	81.94	86.05
Chhattisgarh	9.41	18.14	24.08	32.63	42.91	64.66	70.28
Dadra and Nagar Haveli	-	-	18.13	32.90	40.71	57.63	76.24
Daman and Diu	-	-	-	-	71.20	78.18	87.10
Delhi	-	61.95	65.08	71.94	75.29	81.67	86.21
Goa	23.48	35.41	51.96	65.71	75.51	82.01	88.70
Gujarat	21.82	31.47	36.95	44.92	61.29	69.14	78.03
Haryana	-	-	25.71	37.13	55.85	67.91	75.55
Himachal Pradesh	-	-	-	-	63.86	76.48	82.80
Jammu and Kashmir	-	12.95	21.71	30.64	-	55.52	67.16
Jharkhand	12.93	21.14	23.87	35.03	41.39	53.56	66.41
Karnataka	-	29.80	36.83	46.21	56.04	66.60	75.37
Kerala	47.18	55.08	69.75	78.85	89.81	90.86	94.00
Lakshadweep	15.23	27.15	51.76	68.42	81.78	86.66	91.85
Madhya Pradesh	13.16	21.41	27.27	38.63	44.67	63.74	69.32
Maharashtra	27.91	35.08	45.77	57.24	64.87	76.88	82.34
Manipur	12.57	36.04	38.47	49.66	59.89	70.50	76.90
Meghalaya	-	26.92	29.49	42.05	49.10	62.56	74.43
Mizoram	31.14	44.01	53.80	59.88	82.26	88.80	91.33
Nagaland	10.52	21.95	33.78	50.28	61.65	66.59	79.60
Odisha	15.80	21.66	26.18	33.62	49.09	63.08	72.89
Puducherry	-	43.65	53.38	65.14	74.74	81.24	85.85
Punjab	-	-	34.12	43.37	58.51	69.65	75.84
Rajasthan	8.50	18.12	22.57	30.11	38.55	60.41	66.11
Sikkim	-	-	17.74	34.05	56.94	68.81	81.42
Tamil Nadu	-	36.39	45.40	54.39	62.66	73.45	80.09
Tripura	-	20.24	30.98	50.10	60.44	73.19	87.22
Uttar Pradesh	12.02	20.87	23.99	32.65	40.71	56.27	67.68
Uttarakhand	18.93	18.05	33.26	46.06	57.75	71.62	78.82
West Bengal	24.61	34.46	38.86	48.65	57.70	68.64	76.26
ALL INDIA	18.33	28.30	34.45	43.57	52.21	64.84	72.99

Source: Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Gol.

Each state has shown continuous progress in these five censuses. Though education has been an important factor in government policies, but various factors affect its reach and one of them is technology and access to the resources. Though literacy rates are still lower than world average (86.62%) but will certainly reach there and since 2021 census was not conducted, but literacy rate would certainly have shown an improvement.

10 Conclusion by Comparing Data with Survey

The data shown in sections above may seem disjointed but when plotted together show a close co-relation. The data plotted on a single graph show very close relation between mobile subscriptions, internet users and literacy rates.

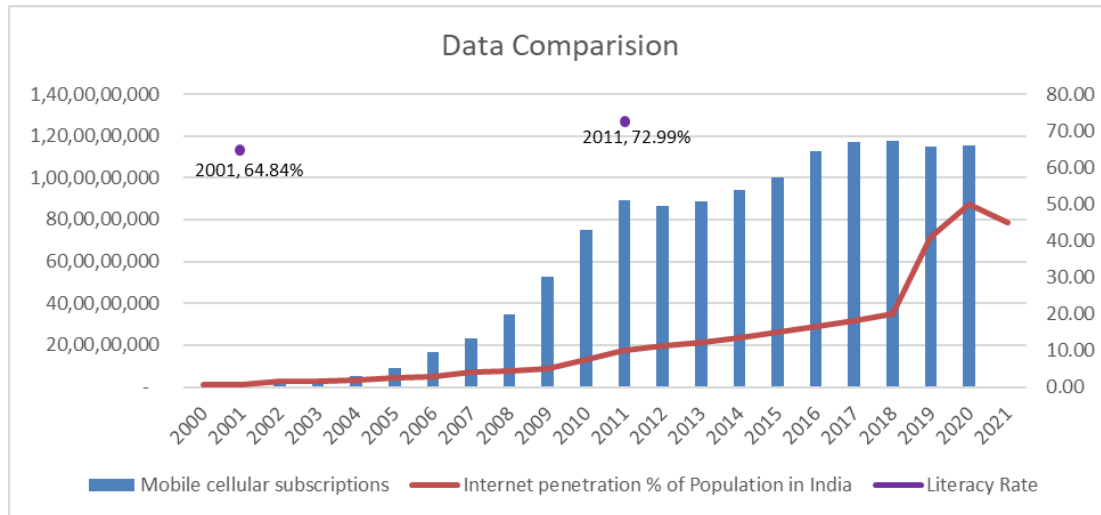


Figure 34: Data Comparison

The chart above shows mobile cellular subscriptions in blue bars and internet penetration is shown in red line. There has been continuous increase in mobile subscriptions as well as continuous increase in internet subscriptions. Since the data is considered for last 20 years and census happens every 10 years, we have only two data points on literacy rates, shown as two dots. Even literacy has shown an increase.

Though mobile subscriptions have shown exponential rise of 136% from 2001, whereas Internet penetration increased by 9.41 points whereas Literacy rate increased by 8.15 points. Though this data is from totally different domains and sources, but the increase is comparable.

From the survey results shown in Section 8, we saw a similar trend for some of the questions where we checked following from the respondents.

- Have you learnt any new skill or hobby?
- Have you refreshed your previous skill or hobby?
- Did you use Internet and/or phone above?
- Which is preferred method from above two – Classroom or Internet

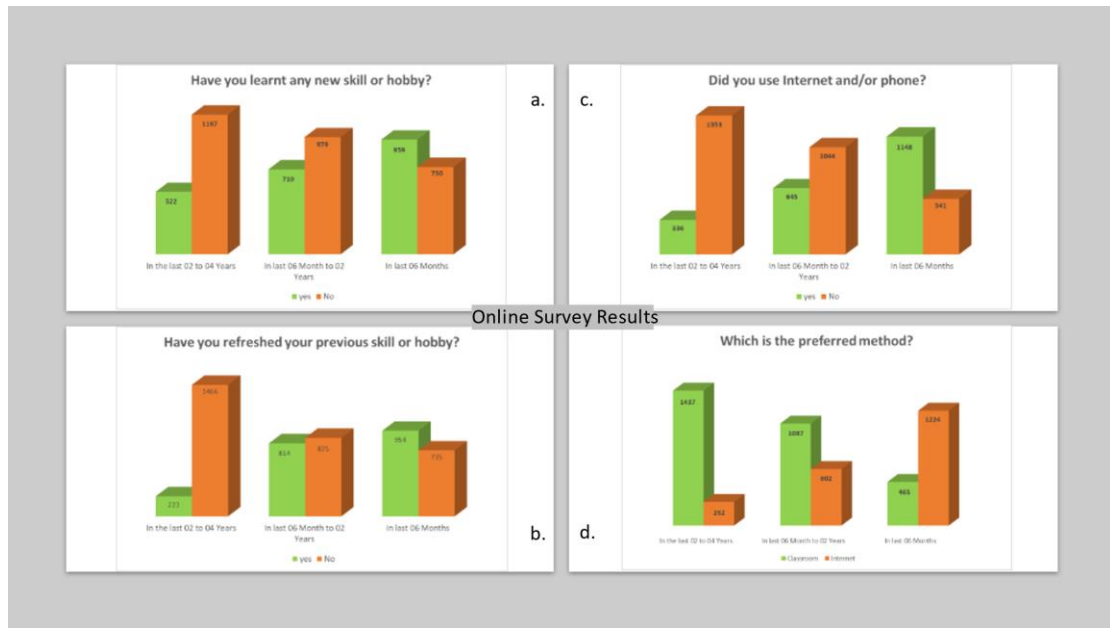


Figure 35: Compilation of Online Survey Results

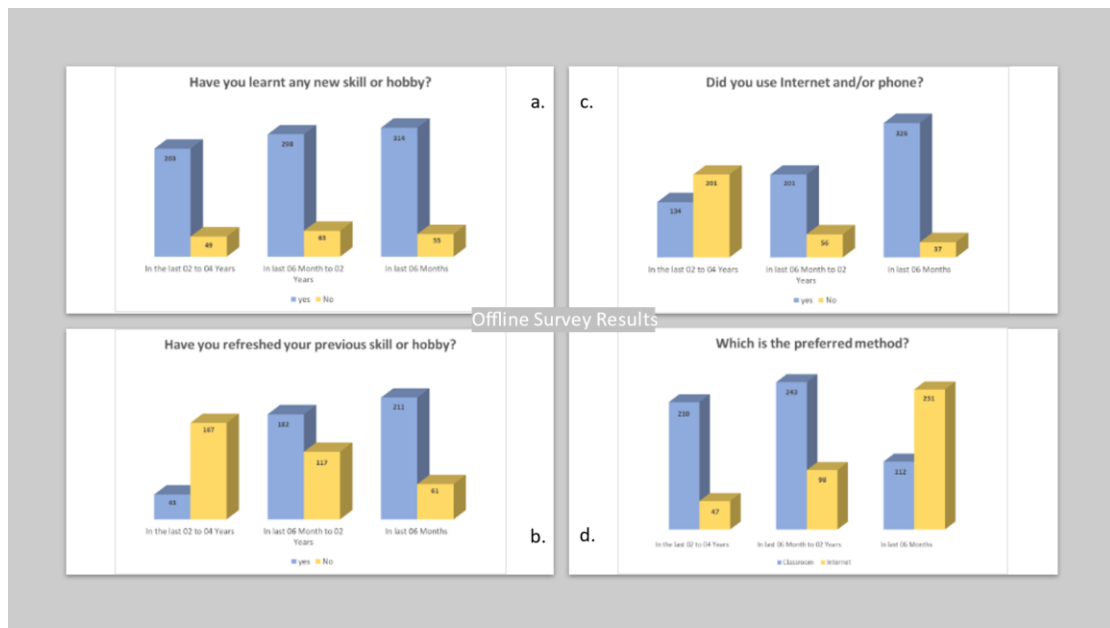


Figure 36: Compilation of Offline Survey Results

Survey results were discussed in detail in Section 8 above and are reproduced here again to show co-relation of digital technology and intent to improve talent and skills among citizens.

Combined Graph of figure 34 shows close co-relation between mobile phone subscription, internet usage and increase in literacy rates. Similar co-relation is seen in survey results. During surveys unanimous findings were



- There was a gradual increase in number of participants who learnt something new and decrease in participants who didn't. Any of these skills or hobbies, irrespective of what they are help improve talent quotient of the society.
- A good number of participants up skilled or re-skilled themselves and this number increased in the period of last 4 years. This shows that the participants upgraded themselves by using digital technologies
- We can see a steep tilt towards use of digital technologies in learning in past two years which than plateaus. From classroom and face-to-face learning participant moved to online learning.
- Most respondents shifted their preference to Internet from classrooms and this could be attributed not only to the pandemic but also to the availability of Digital Technologies.

The results were similar in online as well as offline survey. The above inferences from independent and anonymous survey are in-line with the data available on reliable sources mentioned in above sections. Thus, we can deduce that use of Digital technologies using internet and mobile phones have helped citizens increase their talent quotient substantially.

11 My experiences while interacting with Students across India

Pandemic period was a period where everyone did their bit for the society. The author has been contributing for some time and continued the same during pandemic as well. Author is a mentor with NASSCOM's ⁽³⁹⁾ W²RT (Women Wizards Rule Tech) ⁽³⁹⁾ program. The National Association of Software and Service Companies is an Indian non-governmental trade association and advocacy group focused mainly on the technology industry of India. Established in 1988, NASSCOM is a non-profit organisation. W²RT program focusses on female candidates and employees across organizations to build their skills in digital technologies like Cloud Computing, Big Data & Analytics, Cyber Security, Robotic Process Automation, Artificial Intelligence, and IoT (Internet of Things). Author has been a mentor for quite a few participants for Cloud Computing and participated in Panel Discussion arranged by NASSCOM to share knowledge. The session was live, broadcast on various platform and was liked by participants.



Figure 37: Author participating in NASSCOM panel discussion

Similarly, author participated in various sessions with ICT Academy, ⁽¹⁾ Where he shared his knowledge with participants across various parts of country and at times number of participants ran more than 1500. Best part and live use of such session was seen when knowledge was shared with such a huge number of participants in one session using digital technologies at both ends. Participants

not only used digital technology to improve their talent but also through these sessions learnt how and where to use their talent. Some of the links for such sessions from LinkedIn are given below followed by a collection of images with invitation and live session.

- https://www.linkedin.com/posts/ictacademyindia_ictacademyindia-powerseminar-onlineseminar-activity-6664162428399554560-x9AC
- https://www.linkedin.com/posts/ictacademyindia_ictacademyindia-powerseminar-onlineseminar-activity-6660447702557564929-STG5
- https://www.linkedin.com/posts/ictacademyindia_renaultnissan-vuca-ictacademyindia-activity-6659374824328167425-EsST

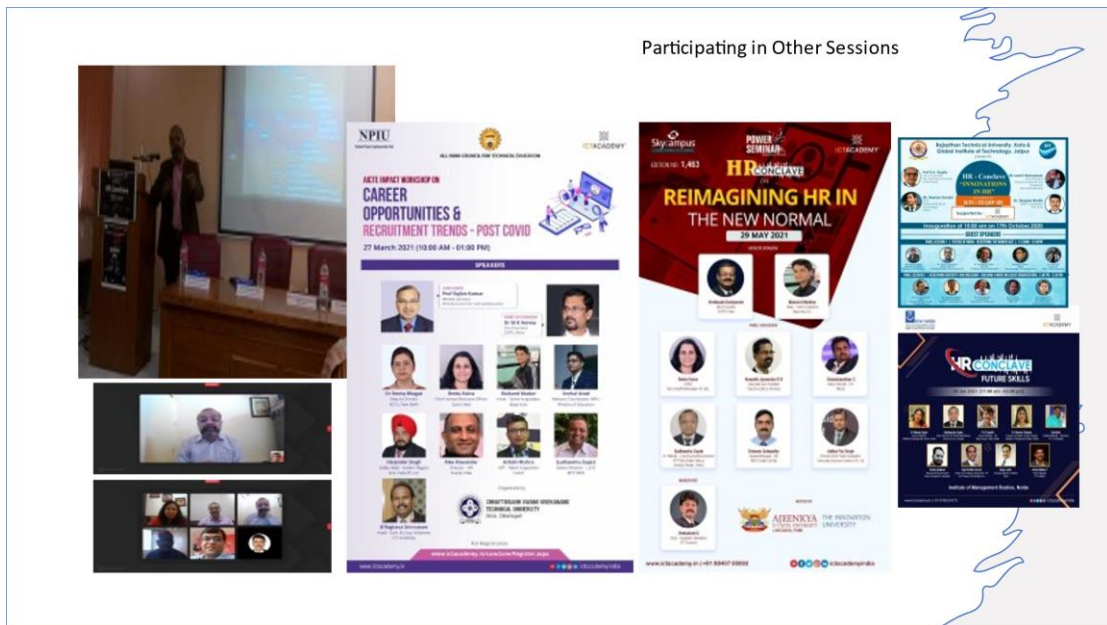


Figure 38: Author in other sessions

12 Certificate of Enrolment

Given below is certificate of enrolment of the author just for reference.



The certificate is for Sudhanshu Gupta, student ID UNISE1430IT, enrolled in a Ph.D. program at Uniselinus Europe. It includes personal, current address, and study information. The program is accredited by the World Certification Institute. The enrolment date is 12 April 2021.

UNISELINUS EUROPE

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WORLD CERTIFICATION INSTITUTE
Global Authority on Occupational Certification

Certificate
OF ENROLMENT AT
SELINUS UNIVERSITY

DATE 12 APRIL 2021

N° UNISE1430IT

STUDENT INFORMATION:
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Postal code: **110075**
Citizenship: **INDIAN**

STUDY INFORMATION:
Department: **DOCTOR OF PHILOSOPHY**
Faculty of **BUSINESS & MEDIA**
Major: **PUBLIC POLICY**
Study program: Bachelor Master Ph D (Doctor of Philosophy)
 by APEL by Research Honoris Causa
Study method: **by Research**

TUITION INFORMATION
Last payment date: **24 APRIL 2021**
Payment option: **SINGLE PAYMENT**
Payment modality: **Bank remittance or PayPal**

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Figure 39: Certificate of Enrolment

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ICT Academy is an initiative of the Government of India in collaboration with the state Governments and Industries. It is a not-for-profit society, the first of its kind pioneer venture under the Public-Private-Partnership (PPP) model that endeavours to train the higher education teachers and students. Through its various initiatives, ICT Academy has been part of strengthening the India's four important visions on Skill India, Digital India, Start-up India, and Make in India
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