# Future of Jobs in India: 3.0

## Navigating Skills in Digital Age

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FICCI

EY
Building a better working world

# Foreword

# FICCI

The disruptive changes along with the structural transformation that is leading to a new work order, has magnified the significance of developing a 'skilled ecosystem'. Several studies around the world have conclusively proven that appropriate and relevant skill sets within a population not only leads to increase in productivity and standards of living but also reduces inequality and poverty.

The World Economic Forum (WEF) Report on Future of Jobs 2023 report, while highlighting the evolution of skill sets over the next five years, provides new insights on the rapidly changing socio-economic order and technology trends that will shape the workplace of the future. Learners today, need to be equipped with employability skills that are transferable across a broad range of job opportunities and help them modify their approach to solving business problems in a dynamic industry environment.

With a vision of 'Making India the Skill Capital of the World', the government is focusing on speed, scale, and standardisation to the ongoing efforts of the various central and state governments and public and private sector organizations in the area of skilling and entrepreneurship. This year's Union Budget (2024-25) has emphasized on having skilling programs in partnership with the industry and aimed at reorienting them to promote continuous skilling avenues, sustainability, and employability.

The third series of FICCI EY Report 2024 on "Future of Jobs 3.0" delves into this dynamic landscape, providing insights and projections that are essential for understanding and preparing for the future of jobs. This report brings together a comprehensive analysis of current trends and future projections and explores the implications of emerging technologies, focussing on green of jobs and workforce mobility. By providing a detailed analysis of these factors, the report aims to equip readers with a nuanced understanding of how the nature of work is being redefined.

This report, while focussing on five sectors, viz Manufacturing, Healthcare, Infrastructure, FMCG and Energy, examines the changing trends in job market and addresses the evolving expectations of potential workers, trainers and employers. As we look forward, understanding the future of skills is not just about keeping pace with the rapidly changing industrial environment but also about anticipating it and preparing proactively. The report has further reaffirmed that the time has now come for us to reimagine career paths, invest in lifelong learning, and foster an inclusive and adaptive workforce.

I would also like to extend my gratitude to the senior industry leaders and FICCI members for their valuable inputs and thoughtful responses to the survey that was carried out as a part of this study. I am confident that this report will serve as a crucial guide for policymakers, business leaders, and individuals alike.

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EY

Innovations in technology is moving at a rapid pace necessitating an equal, if not faster, response to meet its demands. The pressure is on the whole ecosystem of education, skilling and work to be agile and transformative in this digital age. The traditional way of working is disrupted by factors such as advanced capabilities of artificial intelligence, global push to reduce carbon footprint and need for sustainability in operations across sectors. To remain competitive, industry must have the right talent in the right place and at the right time for growth and resilience.

Guidance to navigate in this digital age comes from Government of India in several ways. First, under the Union Budget 2024-25, a notable highlight was the announcement of a new centrally sponsored scheme under the Prime Minister's package, in collaboration with state governments and industry to skill 20 lakh youth over five years and upgrade 1,000 Industrial Training Institutes (ITIs). Second, the budget provides guidance for boosting the skilling ecosystem with Skill India Digital Hub (SIDH). It is a part of the India stack for integrating the entire skilling ecosystem in one accessible platform for citizens, empowering users with the tools and resources to thrive in the digital age and enabling skilling for all, anytime, anywhere and on any device. Third, it focuses on developing Digital Public Infrastructure (DPI) at population scale, as ratified through the G20 declaration. Fourth, it provides an action plan for the development and deployment of AI in India and operationalizing AI India Mission. It reflects the government's focus on developing AI infrastructure, funding innovation and making benefits of AI accessible in Indian languages.

Disrupted by AI and democratized by DPI, we believe that the India story of skilling and employment is already making strides in the country. AI and data driven insights empower learners to make informed decisions on skills leading to employment. It also helps trainers to adapt training courses aligned to industry needs and employers to find and right-skill for their workforce.

DPIs on the other hand offer numerous social, economic and practical benefits to users. In the skilling and jobs ecosystems, it democratizes learning for maximum reach and inclusion to learners irrespective of language and facilities. It offers curated content that best suits their needs. DPI also holds potential to amplify the reach of government initiatives by providing tried, tested, secure software greatly reducing cost to roll out and a faster time to launch. The biggest benefit DPI offers is facilitating ease of working in the skilling and employment ecosystem by allowing interoperability between various stakeholders for a citizen centric view. It allows for discovery, trust and fulfilment of various journeys of all stakeholders.

Like rest of the world, India is also at an inflexion point where no organization or a leaner can afford to be left behind. Sustained investment and collaboration between government, industry, and skilling ecosystem players will be crucial to ensuring that every learner has access to quality skill development opportunities, thus realizing the full potential of India's demographic dividend.

It our pleasure to present Future of Jobs 3.0 - navigating skills in the digital age in collaboration with FICCI which explores the evolving employment landscape, sectoral development prospects, and the urgent need for a resilient workforce. We hope you find this report useful and are eager to hear your feedback.

Happy reading.

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# Abbreviation

**AI**
Artificial Intelligence

**API**
Application Programming Interface

**BFSI**
Banking, Financial Services, and Insurance

**CAGR**
Compound annual growth rate

**DDUGKY**
Deen Dayal Upadhyaya Grameen Kaushalya Yojana

**DGT**
Directorate General of Training

**DPG**
Digital Public Goods

**DPI**
Digital Public Infrastructure

**DVC**
Digitally Verified Credential

**EV**
Electric Vehicle

**EY**
Ernst & Young

**FDI**
Foreign Direct Investment

**FICCI**
Federation of Indian Chambers of Commerce & Industry

**FMCG**
Fast-moving consumer goods

**FOJ**
Future of Jobs

**GDP**
Gross Domestic Product

**GeM**
Government e-Marketplace

**Gen-AI**
Generative Artificial Intelligence

**ILO**
International Labour Organization

**IoT**
Internet of Things

**ITI**
Industrial Training Institutes

**LFPR**
Labour Force Participation Rate

**ML**
Machine Learning

**MSDE**
Ministry of Skill Development and Entrepreneurship

**MSME**
Ministry of Micro, Small and Medium Enterprises

## N

**NCVET**
National Council for Vocational Education and Training

**NEP**
National Education Policy

**NSDA**
National Skill Development Agency

**NSDC**
National Skill Development Council

**NSDF**
National Skill Development Fund

**NSTI**
National Urban Livelihood Mission

**NULM**
Global value chain

## P

**PMKVY**
Pradhan Mantri Kaushal Vikas Yojana

**PLI**
Production Linked Incentive Scheme

## S

**SDG**
Sustainable Development Goals

**SSCs**
Sector Skill Councils

## U

**UMANG**
Unified Mobile Application for New-age Governance

**UN**
United Nations

**UPI**
Unified Payment Interface

## W

**WoE**
World of Education

**WoS**
World of Skill

**WoW**
World of Work

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# Executive Summary

The job and skilling landscape is witnessing a paradigm shift with the emergence of transformative trends coupled with technological advancements and digital adoption impacting business requirements across India and the globe. The emerging trends anticipated to shape future of jobs are the industry 4.0 technologies (cloud computing, artificial intelligence (AI), internet of things (IOT), robotics and more), digital public infrastructure (DPI), environmental concerns, and evolving workforce dynamics.

This FOJ (Future of Jobs) 3.0 report is in continuation to previous FICCI-EY reports released in 2017 & 2018, and deep dives across 5 sectors namely Manufacturing, FMCG, Healthcare, Energy and Infrastructure to understand the macroeconomic trends, international benchmarking and diverse perspectives on emerging role of jobs and skills. For this study we conducted thorough primary and secondary research wherein we interacted with over 200 respondents, a mix of senior leaders and industry experts, learners, trainers, academicians, and policy makers.

- Our research revealed a positive outlook of industry experts towards job creation with the advent of AI and Gen AI however it also highlighted challenges in its preparedness and adoption along with workforce resistance. The findings highlight that the issue of workforce resistance to AI/Gen AI adoption could be resolved by providing reskilling and upskilling training interventions.

- Ubiquitous acknowledgement amongst all respondents that AI has brought major disruption in existing job roles the need to equip first timers with skills related to sector specific technology requirements. This could be achieved by stronger collaboration between industry and academia for curriculum upgradation, apprenticeship/internship opportunities and faculty trainings.

- Our survey saw majority of the respondents having a keen interest in understanding the dynamics of DPI and how it can be leveraged to improve the skilling and employment ecosystem. The report elaborates many functional usages of DPI along with examples in the later section.

- Adoption of sustainability practices to address environmental concerns was seen as a top priority for majority of the respondents and it also highlighted the need for skills for creating and filling green jobs. The survey findings highlight very strong interest of learners to join this sector.

- The survey of trainers highlighted the trend of AI, Green technology, digital and soft skills picking up pace amongst learners as they are seen to have maximum impact on jobs of tomorrow. The survey findings emphasize the support from government required by trainers and institutions in developing industry relevant content and on the job trainings.

- Gaining cross-cultural competency and adaptability was additionally seen as an evolving skill and global mobility takes centre stage.

The survey emphasizes the expectation of industry to revamp the basic infrastructure of ITIs and similar institutions by Government so that basic training needs are met leading to enhanced associations between them. It also highlighted the need for improved communication and engagement from skilling institutions which could significantly boost the interest of industry in linking with academic institutions.

This report covered with the inputs of industry's senior leaders and experts complemented with detailed literature review, highlights accelerating transformations in the labour market which will impact the jobs and skills of tomorrow. The report highlights the immediate need for a framework for industry academic linkages in our country. The framework will be able to address the concerns of employers, trainers and learners and recommend ways to navigate through these social, environmental and technological transitions.

# Report structure

The report is structured to largely cover three parts. After executive summary, chapters 1 and 2 provide an overview of job and skilling statistics and demographic profile in the labour market briefly mentioning the emerging trends, international best practices and government policy reforms and schemes in the skilling ecosystem.

Chapter 3 deep dives into each sector manufacturing, FMCG, healthcare, energy and infrastructure covering macroeconomic trends, employment scenario, international benchmarking and sectoral trends arrived from primary and secondary research. It concludes the analysis of findings and goes into detail on role of AI/GenAI, DPI perspective, technology, climate change, global mobility, industry 4.0 and 21st century soft skills in the context of skills and employment.

Chapter 4 provides key recommendations for learners, trainers and employers and suggests policy reforms for government to address overall employment challenges and provide supportive role to the industry.

The FOJ 3.0 report is an amalgamation of industry oversight provided by top leaders coupled with detailed literature review of evolving job and skilling landscape in India and the world while highlighting new challenges emerging from disruptive trends and policy measures to redress them.

# 1

# Overview

## 1.1 Introduction

According to the World Economic Forum's[1] "Future of Jobs Report 2023", the global skills landscape is undergoing significant transformation, driven by the rapid pace of technological change, demographic shifts and evolving job requirements. As per the report, 83 million jobs are projected to be lost but 69 million jobs are projected to be created in the next five years. Technology adoption and broadening of digital access will be the major trends in driving business transformation with big data, cloud computing and AI as the key drivers.

Governments and organizations around the world are investing heavily in upskilling and reskilling initiatives to ensure their workforces remain competitive in the global market. For example, the European Union's Pact for Skills program aims to mobilize a collective effort to upskill and reskill at least 60% of the EU's adult population by 2030[11].

India's skilling and employment landscape is a complex and dynamic ecosystem, influenced by a myriad of factors. Economic policies and technological advancements impact the landscape, apart from demand of skills in an ever-changing employment scenario and the impact of globalization necessitating need for constant change in the skills and employment ecosystem.

This section of the report delves into the demographic dividends, the advent of transformative technologies and the burgeoning gig economy. Additionally, it discusses India's potential to become the skilling capital of the world, the integration of education, skills, and work, and the implications of Generative-Artificial Intelligence, (Gen –AI) Artificial Intelligence (AI), and Digital Public Infrastructure (DPI) on employability, employment and the skilling ecosystem.

Around 1.8 billion people in the world are between the ages of 10 and 24, of which, a sizeable proportion can be found living in developing countries. Projections from United Nations suggest that the youth cohort aged 15-24 is likely to reach around 15.1% of the total population of the world by 2030 and 13.8% by 2050[2]. Presently, among this age group of 15-24, around 500 million survive on less than US$2 per day and more than 73 million face unemployment. Young people, especially in developing countries, face higher socio-economic challenges and are more likely to be employed in the informal sector working in poor conditions. They are either underemployed or unemployed as compared to adults in those countries[4].

> In the Indian context, the large proportion of the young population numbering more than 371 million[5] necessitates the need for innovative and sustainable solutions to convert the demographic advantage of this population into a demographic dividend.

In India, youth face several challenges such as unemployment, gender gaps in the economy, few industry linkages, and low levels of vocational education among others. According to ILO, Annual Report 2023, the unemployment rate in India stands at 4.4% and the Labour Force Participation Rate for women is 33.2% compared to 62.2% for men[6]. Moreover, 57% of women and 34.2% of men in the age group of 15 to 29 years are Neither in Employment, Education or Training (NEET).[7]

The Indian job market is bifurcated into formal and informal sectors. The formal sector encompasses organized employment with regulated working conditions and statutory social security benefits. Conversely,

the informal sector is characterized by unorganized employment, with no written contract, paid leave, health benefits or social security. According to ILO, 2024 data, informal sector continues to dominate the Indian labour market, accounting for 71.7% of all workers.

In the midst of an anticipated slowdown in employment, the Indian economy recorded 6.5-7% real GDP in FY25 as per the Economic Survey for 2023-24[8], and Union Budget 2024-2025 announcement of allocating INR1.48 Lakh crore for education, employment and skilling.

In addition, India's demographic profile had a median age of 28.1 in 2023 as per World Population Prospects (WPP) data of UN which is significantly lower than that of many developed nations[9]. This demographic dividend can potentially yield economic prosperity if leveraged through appropriate education and employment opportunities. The challenge lies in equipping this burgeoning young population with the requisite skills to meet the demands of a rapidly evolving job market.

The proliferation of cutting-edge technologies such AIDL, Gen-AI, platform thinking and focus on sustainability, is revolutionizing the industrial landscape of India. At the same time, the country is witnessing a digital transformation and development and adoption of Digital Public Good (DPG) and Digital Public Infrastructure (DPI) across sectors. With this background and buoyed by Government focus on skilling and employment, reforms brought in by National Education Policy 2020 and recent budget announcements, India is on the pathway to be the skilling capital of the world.

**We are committed to energising skills with a new level of empowerment. In sync with the Industry 4.0 revolution, our focus is on comprehensive skill development, spanning every sector - from agriculture to sanitation. Through 'Skill India' programme, we have ignited growth and a new momentum**

PM Shri Narendra Modi
*15th August, 2024*[10]

## 1.2 Trends and disruptions influencing future of jobs

The future of jobs and skills will be shaped by a variety of emerging trends that are driven by technological advancements, industry 4.0 technologies (cloud computing, artificial intelligence, internet of things, robotics and more), environmental concerns, and evolving workforce dynamics. These trends shall not only transform the way we work but also impact the skills required to thrive in the new economy. Here is a look at some of the key trends that are going to impact jobs and skills in the coming decade:

- DPI
- AI and GenAI
- Green technologies
- Workforce Mobility
- 21st century skills

### 1.2.1 AI and Gen AI

AI might just be the single largest technology revolution of our lifetimes, with the potential to disrupt almost all aspects of human existence. Andrew Ng, Co-founder of Coursera and Professor at Stanford university and formerly founder and Lead of Google Brain, compares the transformational impact of AI to that of electricity 100 years back. With many industries aggressively investing in cognitive and AI solutions, investments in AI are forecasted to approach $200 billion globally by 2025 as per Goldman Sachs report[11].

AI and GenAI are not just impacting existing jobs, they are also creating new ones. The demand for AI specialists, data scientists, machine learning engineers and AI ethics consultants is on the rise. Additionally, the creative capabilities of GenAI are leading to new roles

in content creation, digital marketing and design, where AI-generated content can be used as a starting point or a tool for human creativity. This shift underscores the need for a workforce that is skilled in these new technologies, capable of leveraging AI to enhance their work rather than being replaced by it.

The report explores the impact of AI in the five key sectors for this study, i.e., manufacturing, healthcare, infrastructure, energy and FMCG.

- In manufacturing, AI optimizes production lines and reduces downtime.
- In healthcare, AI enhances diagnostics and personalized treatment plans.
- The infrastructure sector benefits from AI in project management and smart city development.
- In the energy sector, AI helps optimize energy consumption and integrate renewable sources.
- In FMCG, AI improves supply chain management and customer insights. These advancements demonstrate the transformative potential of AI in driving efficiency and innovation across India's diverse economic landscape.

The sectors expected to benefit most include business services, finance, transportation, education, retail and healthcare due to their digitalization and focus on productivity, efficiency and personalized experiences.

## 1.2.2 Going green

The global push towards sustainability and the reduction of carbon footprints is influencing job markets. The 'green economy' encompasses renewable energy, sustainable transportation, energy efficiency, waste management and green construction. This shift towards sustainability is driven by the need to combat climate change, conserve resources and promote environmental responsibility. Jobs in these sectors are expected to grow as countries invest in cleaner technologies and infrastructure. As a result, there is a growing demand for green jobs—roles that contribute to preserving or restoring the environment, whether in traditional sectors like manufacturing or emerging fields like renewable energy. Workers with expertise in environmental science, sustainable design, green technology and environmental regulations, audit compliances will be in high demand. According to Global Green Skills Report 2023, the share of green talent in the workforce rose by a median of 12.3% across the 48 countries between 2022 and 2023, whereas the share of job postings requiring at least one green skill grew by a median of 22.4%.[12]

In India, the focus on going green is having a notable impact on five key sectors identified for this study.

In manufacturing, sustainable practices are being integrated into production processes to reduce waste and energy consumption.

The healthcare sector is adopting green initiatives to minimize environmental impact through eco-friendly hospital designs and waste management systems.

Infrastructure projects are increasingly incorporating sustainable materials and energy-efficient designs.

The energy sector is at the forefront of this movement, with a significant shift towards renewable energy sources such as solar and wind power.

In FMCG, companies are prioritizing sustainable sourcing and packaging to meet consumer demand for eco-friendly products. According to the Green Industry Outlook report [16] by Team Lease Digital, India has the potential to double the current employment of 18.52 million green jobs to 35 million by 2047, with contractual workers being major contributors to the industry's growth.

## 1.2.3
## 21st century skills

21st century skills refer to the knowledge, life skills, career skills, habits and traits that are critically important to a student's success in today's world, particularly as they move on to college, the workforce and adult lives. The demand for 21st-century skills is transforming the future of jobs, emphasizing the need for competencies that align with the evolving digital and global landscape. These skills include critical thinking, creativity, collaboration, communication, digital literacy and adaptability.

The top 10 future skills as per World Economic Forum are:

- Analytical thinking and innovation
- Active learning and learning strategies
- Complex problem-solving
- Critical thinking and analysis
- Creativity, originality and initiative
- Leadership and social influence
- Technology use, monitoring and control
- Technology design and programming
- Resilience, stress tolerance and flexibility
- Reasoning, problem solving and ideation

As technology continues to advance rapidly, traditional job roles are being redefined, necessitating a workforce capable of navigating complex problems, innovating solutions, and working effectively in diverse and dynamic environments. Educational institutions and training programs are increasingly focusing on imparting these essential skills to prepare individuals for the future job market.

## 1.2.4 Digital Public Goods (DPG)/Digital Public Infrastructure (DPI)

DPGs are defined by the Digital Public Goods Alliance (DPGA) as "open-source software", open data, open artificial intelligence models, open standards and open content. As of 2024, there are 162 DPGs in existence[13]. Built on free, open-source software, the technology allows governments and organizations to take existing solutions, customize and adapt them, and integrate them into their own digital infrastructure, greatly expediting digital transformation around the world. In the coming years, DPGs will be critical to digital transformation as they offer cost-effective, tried and tested solutions that allow the digital transformation of citizen-focused services and are aligned with SDGs. The DPG market is still young, but growing fast, and expected that it will be worth around US$100b by 2030[14].

Digital Public Infrastructure - DPI refers to fundamental digital solutions that enable and catalyze the provision of society-wide functions and services, both in the public and private sectors. They are typically population-scale systems on which the digital public services operate, such as identity systems (for example, India's Aadhaar system), payment systems (such as Unified Payment Interface (UPI)) and data exchange networks (for example, Estonia's X-Road). DPI enables effective provision of essential society-wide functions and services in the public and private sectors. A country's digital public infrastructure may include implementations of either multiple proprietary or open-source solutions (including DPGs) or both.

> DPI plays a crucial role in driving economic growth, improving service delivery, and enhancing citizen engagement. By providing a solid foundation for digital services, DPI can enable countries to achieve their development goals and improve the lives of their citizens.

A leading example of DPI in skilling, education, employment and entrepreneurship is Skill India Digital Hub (SIDH)[15]. It is built on principles of open source, inter operable and scalable framework. Launched in September 2023 by Hon'ble minister Shri Dharmendra Pradhan, it was also declared as 'the Digital Public Infrastructure (DPI) for skilling, education, employment and entrepreneurship ecosystem of India .' Some of the unique features of the platform are digital verified credentials (DVC) for all learners, recommendations for learning and job matching, integration with other government schemes and a range industry relevant courses. Currently it has over 9 million registrations and 750+ self-paced courses in 11 languages.

## 1.2.5 Workforce mobility

India's vision of becoming the skilling capital of the world is driven by its demographic advantage and the government's strong emphasis on skill development. With initiatives like the National Skill Development Mission and the Skill India program, the country has embarked on an ambitious path to train millions of its citizens in a wide range of sectors, from traditional trades to emerging technologies. The focus is on creating a workforce that is not only skilled but also globally competitive.

The global demand for skilled Indian labour is robust, with countries in the Middle East, East Asia, Europe, and North America being key destinations. Enhancing workforce mobility through international accords and the global recognition of Indian qualifications is crucial in capitalizing on this demand.

### International mobility

The international demand for skilled labour is on the rise, particularly in sectors such as information technology, healthcare, engineering and construction. India's skilled workforce is highly sought after in these industries due to their technical expertise, proficiency in English, and adaptability to different working environments. Countries in the Middle East, Europe, North America and Asia-Pacific are increasingly looking to India to fill gaps in their labor markets, especially in fields where there is a shortage of local talent.

As per the recent NSDCI report[16] of 16 high potential countries (Saudi Arabia, UAE, USA, Canada, Qatar, Kuwait, Oman, Bahrain, Australia, Germany, Japan, UK, Singapore, Malaysia, Sweden and Romania) to understand India's overseas employment landscape,

- A five-year potential of approximately 3.9 million Indian workforce has been identified for international deployment in these countries.
- Sectors like construction, healthcare – personal care and social care, hospitality and tourism management, energy (oil & gas and renewables), education (teachers), shipping and logistics, IT and Digital, retail, manufacturing and media & entertainment.
- A few of the sector observations and demand insights are as follows:

**IT and technology sector:** India has long been recognized as a global leader in information technology (IT) and software services. The country's IT professionals are known for their technical skills, problem-solving abilities, and experience with cutting-edge technologies such as Artificial Intelligence (AI), Machine Learning, and Blockchain. As digital transformation accelerates across industries worldwide, the demand for Indian IT professionals continues to grow, with countries like the United States, Canada, and the United Kingdom being key destinations for Indian tech talent.

**Healthcare and allied services:** The global healthcare sector is also experiencing a surge in demand for skilled professionals, particularly in nursing, caregiving and medical technology. Indian healthcare workers are valued for their expertise, cultural sensitivity, and ability to work in high-pressure environments. Countries facing aging populations, such as Japan and Germany, are actively recruiting Indian healthcare professionals to address their workforce shortages. The recognition of Indian medical qualifications by several international bodies further boosts the mobility of Indian healthcare workers.

**Engineering and construction:** India's engineers and construction workers are known for their technical proficiency and hands-on experience in large-scale infrastructure projects. The Middle East has been a significant destination for Indian engineers and construction workers, driven by the region's ambitious infrastructure development plans. Indian professionals in these fields are contributing to the construction of mega-projects, smart cities, and renewable energy initiatives across the globe.

Some of the sunrise sectors[17] providing growth impetus are-

- **Electronics and semiconductors:** India's electronics industry is poised for substantial growth, with projections indicating a production value of $300 b by FY26. The semiconductor market is estimated to touch $64 b by 2026, almost three times its 2019 size of $22.7 b. This surge is fuelled by initiatives such as the Production Linked Incentive (PLI) scheme, aimed at bolstering large-scale electronics manufacturing under the Make in India campaign. With domestic production accounting for 65% of the electronics market valued at $155 b, India is emerging as a key player in the global electronics landscape.
- **Electric vehicles (EV):** India has set an ambitious target of having 30% of all vehicles electric-powered by 2030. To facilitate this, the government has implemented a multifaceted approach. It has opened doors to 100% foreign direct investment (FDI) in the EV sector, encouraging international players to invest in India's burgeoning electric mobility landscape. Furthermore, the establishment of over 12,146 operational public EV charging stations nationwide, coupled with schemes like FAME II (Faster Adoption and Manufacturing of Electric Vehicles) which includes financial support in the form of subsidy for setting up Public Charging Infrastructure to instil confidence among the EV users, underscores the government's commitment to incentivizing EV adoption across various vehicle segments.
- **Renewable energy:** With the third largest energy consumption globally, India's transition to renewable energy is pivotal for global climate action. The country's enhanced target of achieving 500 GW of non-fossil fuel-based energy by 2030 marks the world's largest expansion plan in renewable energy.
- **Agro and food processing:** The agricultural sector remains one of the key drivers of the Indian economy. Significant drivers fuelling this growth include increasing demand, expanding exports, supply-side advancements such as hybrid seeds and advanced irrigation infrastructure, and supportive government policies.

Other sectors include, Artificial Intelligence, Geospatial Systems and Drones, Space Economy, Genomics and Pharma, Green Energy and Clean Mobility Systems.

Some of the key trends and disruptions impacting World of Work (WoW)-

- **Gig economy:** The gig economy which refers to short-term work contracts or freelance work, has gained significant traction in India, offering flexible employment opportunities through platforms. Youth participation in the gig economy has increased 8-fold between 2019 and 2022. The gigification (which also includes platformization) of jobs and the acceptance of remote work are two important trends that have appeared in the labor market in recent years.
- **Reducing industry – skill gap:** Another trend is how educational institutions are increasingly aligning with industry requirements, ensuring that academic curricula are attuned to the practical needs of the job market. The proliferation of vocational training and apprenticeship programs is bridging the gap between theoretical knowledge and practical application, thus fortifying the workforce's employability.
- **Platform thinking:** As India is poised to become a global epicentre for skill development, the 'Skill India Digital Hub (SIDH)' mission is a testament to the nation's commitment to train millions in a plethora of vocational trades.
- **Integration of WoE-WoS-WoW:** The disruptions brought about by globalization and technological advancements have necessitated a seamless integration of the Worlds of Education (WoE) – World of Skills (WoS) – World of Work (WoW).

  Key trends driving this integration include:

  - **Lifelong learning:** As the pace of technological change accelerates, individuals need to continuously update their skills to remain competitive. Lifelong learning initiatives are becoming increasingly important in ensuring that the workforce has the necessary competencies.
  - **Digital transformation:** The digital revolution is transforming the way we work and learn. Online education platforms, digital tools and virtual work environments are becoming increasingly prevalent, blurring the boundaries between education, skills and work.

In summation, the employment and skilling ecosystem in India is at a pivotal juncture, with demographic advantages, technological advancements, and globalization shaping its trajectory. The nation's capacity to harness its demographic potential, embrace technological innovation, and cultivate an inclusive workforce will be determinative of its role as a global leader in skills. The harmonization of education, skills and work, coupled with proactive policy measures to adopt the future skills will be critical in navigating the challenges and capitalizing on the opportunities that the new world of work will bring.

# 2

# India skilling landscape

## 2.1
## India skilling landscape

As per the publication World Economic Forum's "Future of Jobs Report 2023", analytical thinking is the core skill for mass employment which ranks first, creative thinking, ranks second, ahead of three self-efficacy skills – resilience, flexibility and agility, motivation and self-awareness. AI and big data skills are gaining precedence and is a most strongly prioritized skill in certain industries.

> The India Economic Survey 2023-24 reveals that Indian economy needs to generate an average of nearly 78.5 lakh jobs annually until 2030 in the non-farm sector to cater to the rising workforce presenting both opportunities and challenges.

### Government initiatives:

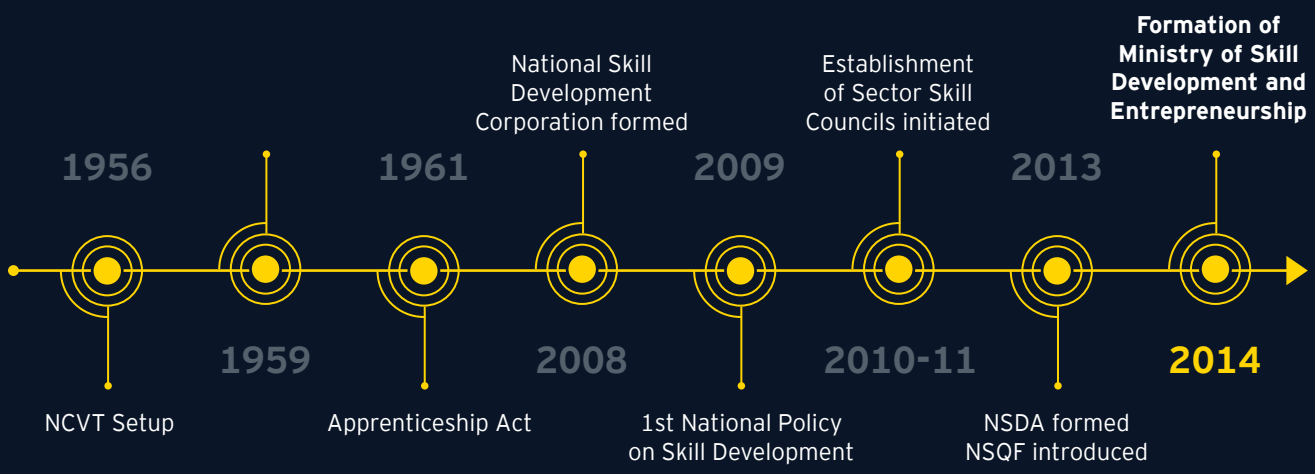
The National Education Policy (NEP)[18] 2020 has given guidance for revision and revamping of all aspects of education, including the educational structure, regulations, and governance, to create a new system which is aligned with the aspirational goals of 21st century students. According to the policy, by 2025, at least 50% of learners through the school and higher education system shall have exposure to vocational education, for which a clear action plan with targets and timelines are to be developed.

The Ministry of Skill Development and Entrepreneurship (MSDE) is responsible for co-ordination of all the skill development efforts across the country, removal of disconnect between demand and supply of skilled manpower, building the vocational and technical training framework, skill up-gradation, building of new skills and innovative thinking not only for existing jobs but also jobs that are to be created. It is aided in these initiatives by its functional arms – Directorate General of Training (DGT), National Skill Development Agency (NSDA), National Council for Vocational Education and Training (NCVET), National Skill Development Corporation (NSDC), National Skill Development Fund (NSDF) and 38 Sector Skill Councils (SSCs) as well as 33 National Skill Training Institutes (NSTIs/NSTI(w)), about 15000 Industrial Training Institutes (ITIs) under DGT and 290 training partners registered with NSDC.

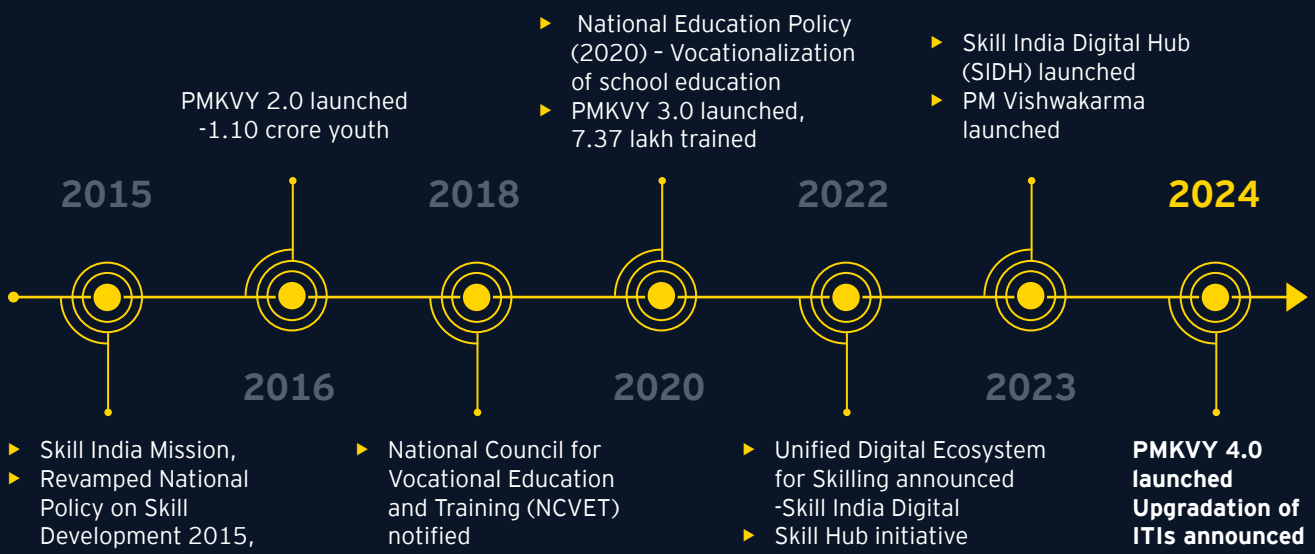
The following landscaping illustration outlines the key interventions launched by the central government towards improving youth skilling and development over the years.

## Journey of Indian skilling ecosystem

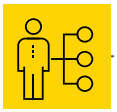
Evolution journey of competency based skill development ecosystem in India




## Journey of Skill Development: Post Ministry formation



## 2.2 Overview of key schemes



### Pradhan Mantri Kaushal Vikas Yojana

Pradhan Mantri Kaushal Vikas Yojana - PMKVY was introduced first in 2015. The scheme promotes skill development among young people across the country through provision of free and short trainings along with recognition of informally gained skills (through skilling, reskilling and upskilling). The scheme has undergone various iterations to ensure that it remains relevant, and its delivery stays efficient[19].

The scheme relies heavily on State Governments for implementation and monitoring processes. With PMKVY 2.0, 25% of the overall implementation target was dependent entirely on State Governments through State Skill Development Missions. Under this scheme 812 Pradhan Mantri Kaushal Kendras (model training centres) have been introduced across 707 districts and 540 Parliamentary Constituencies[20] as of December 2020. From the first and second edition of the PMVKY scheme, more than 12.6 million young people have been trained successfully[7].

> Under the three phases of PMKVY (i.e., PMKVY 1.0, 2.0, 3.0) a total of 1.37 crores candidates have been trained/ oriented and 1.10 crores are certified across the country. Total reported placements of (under STT and Special Projects) is 24.36 lakh candidates till 2022.

PMKVY 4.0 announced in 2023 with emphasis on emphasize on on-job training, industry partnership, and alignment of courses with needs of industry. She further highlighted that the scheme will also cover new age courses for Industry 4.0 like coding, AI, robotics, mechatronics, IOT, 3D printing, drones and soft skills.

### PM Vishwakarma

PM Vishwakarma Scheme launched in 2023 to enable the recognition of artisans and craftspeople as Vishwakarma, making them eligible to avail benefits under the scheme. The scheme aims to support artisans and craftspeople who work with their hands and tools, including 18 trades such as carpenters, blacksmiths and potters. It has provision for skill upgradation to hone their skills, provide support for better and modern tools to enhance their capability, productivity, and quality of products and services, provide the beneficiaries an easy access to collateral free credit and reduce the cost of credit by providing interest subvention, provide incentives for digital transactions, provide a platform for brand promotion and market linkages to help them access new opportunities. The scheme aims at providing several benefits to the Vishwakarmas, who are either self-employed or intend to setup their own small-scale ventures.

The scheme seeks to promote empowerment of women, and those belonging to the marginalized or under-served groups like the Scheduled Castes, Scheduled Tribes, OBCs, Specially Abled, Transgenders, residents of NER states, Island Territories and Hilly Areas. There are16,58,000 applicants registered under the scheme currently[21].

### Long-term skill development through Directorate General of Training (DGT)

Long-term skill development through Directorate General of Training (DGT)

- Craftsmen Training Scheme (CTS)
- Apprenticeship Training Scheme (ATS)
- National Apprenticeship Promotion Scheme (NAPS) for Designated Trade
- Crafts Instructor Training Scheme (CITS)
- Sub-Mission on Polytechnics under the Coordinated Action for Skill Development
- Women Training
- Skills Strengthening for Industrial Value Enhancement (STRIVE)
- Enhancing Skill Development Infrastructure in North eastern States (ESDI)

**As the Digital Public Infrastructure (DPI) for Skilling, Education, Employment, and Entrepreneurship, SIDH serves as a comprehensive information gateway for government initiatives in these domains, making it a go-to hub for citizens pursuing career advancement and lifelong learning**

*Shri Jayant Chaudhary,*
*Minister of State (Independent Charge) Ministry of Skill Development, and Entrepreneurship*
*in a written reply in the Rajya Sabha*[23]

## National Apprenticeship Promotion Scheme

National Apprenticeship Promotion Scheme - NAPS is a flagship program under the Ministry of Skill Development and Entrepreneurship (MSDE) designed to promote apprenticeship training in India. It offers structured, industry-aligned training to young people, boosting their employability and contributing to the nation's skilled workforce. NAPS fosters collaborations between industries and training providers to ensure practical learning and relevant skill development. According to the Apprenticeship India report for 2023, there are 931,988 apprentices currently in training, with 500,805 having completed their training and 35,387 certified. In 2023, claims totalling INR43 crore have been disbursed. For 2024, approximately 324,800 apprentices are engaged in training, with INR395 crore in Direct Benefit Transfer available across India and 634,294 live vacancies[22].

## Skill India Digital Hub – SIDH

Skill India Digital Hub – SIDH is a comprehensive digital platform designed to synergize and transform the skills, education, employment and entrepreneurship landscape in India. SIDH plays a crucial role in preparing the Indian workforce for Industry 4.0 by offering futuristic courses on areas such as, Big Data, Machine Learning and Analytics, provided by its digital learning partners. The hub also offers several Industry 4.0 courses such as:

- Python with Advanced Artificial Intelligence (AI)
- Artificial Intelligence Foundation
- Generative AI
- Build Classical Machine Learning Models with Supervised Learning
- Data Analytics Essentials
- Analytics Data in a Relational Data Warehouse
- Cyber security Essentials
- Introduction to Data Science
- Kisan Drone Operator
- EV Service Technician
- Bio-waste Management
- Other certification courses

## Prominent skilling initiatives taken up by other ministries include -

- **Ministry of Labour and Employment (MoLE)'s** eSHRAM portal for creating a National Database of Unorganized Workers (NDUW) and eMigrate for the Overseas Employment Division of Ministry of External Affairs (MEA).
- **Ministry of Rural Development (MoRD)'s Deen Dayal Upadhyaya Grameen Kaushal Yojana (DDU-GKY)** – was launched in September 2014. The scheme focuses on diversifying family income of the rural poor and providing skilling and career support. The scheme emphasizes providing support to youth (15- 35 years old) in rural areas. Through this scheme, young people who have been unable to complete their education are able to obtain vocational training to build their careers. As of 2023, a total of 14.51 lakh candidates have been trained and 8.70 lakh candidates placed under the program. Further, a sum of INR7015.61 crore was released under DDU-GKY in 2023.
- **National Urban Livelihoods Mission –** NULM focuses on providing educational and skilling opportunities specifically to the urban poor. The main aim of this scheme is to reduce poverty and vulnerability of the urban poor by facilitating their access to different employment opportunities (including self-employment, wage employment, etc.), and access to shelter for those without homes and providing social security. According to Annual report of NULM 2023, 1,92,122 candidates were skilled and trained, while 89,432 candidates were placed in jobs.
- **Ministry of Agriculture and Farmers' welfare scheme** - Agri-Clinic Agri-Business centres scheme (ACABC) with NABARD acting as subsidy channelizing agency.
- **Ministry of Textiles scheme Integrated Skill Development Scheme (ISDS)** to upgrade the skills of textile workers/ handloom weavers and Samarth (Scheme for Capacity Building in Textiles Sector).
- **National Apprenticeship Training Scheme** - NATS is a flagship scheme under the Ministry of Skill Development and Entrepreneurship (MSDE) aimed at promoting apprenticeship training in India. It provides structured, industry-aligned training to young people, enhancing their employability and contributing to the country's skilled workforce. NATS fosters partnerships between industries and training providers to ensure practical learning experiences and relevant skill development. As per the NATS report till date, 36,58,130 students registered, 2,61,703 students undergoing apprentices training. Direct Benefit Transfer (DBT) till date is around INR76.96 crore[24].

Even though there is a significant push towards prioritizing critical sectors such as employment, skilling, MSME, the skilling landscape of India continues to face barriers.

### Vocational education and skilling are not aspirational

India's youth carry negative social perception towards vocational training as they are not considered a viable alternative to traditional formal education. It finds limited acceptance as dignified labor.

### Lack of quality and standards in the skilling space

India faces scarcity of qualified trainers, quality infrastructure and course content combined with a lack in standardization in assessment and accreditation in vocational education.

### Skill mismatch in the labor market

Mismatch in educational qualification and skills; often poorly connected to the qualification needed to perform a job.

### Inadequate industry interface

India lacks alignment between industries and educational and training courses in terms of the demand and supply of skills, lack of industry exposure among students, poor placements and internship opportunities.

### Duplication of efforts due to overlapping skilling initiatives across multiple departments

A number of government ministries and departments at the central and state level offer multiple skilling schemes and programs which lead to overlap and duplication of efforts and resources.

## Private sector initiatives

Numerous private sector organizations are working towards supporting youth for skilling and employment. In addition to collaborating with the NSDC (through Sector Skill Councils), the private sector is invested in the youth through the following strategic engagements:

- Vocational training and capacity building for specific industries
- Working with ITIs, universities and academic institutions for placement drives, hiring of apprentices, on the job training, curriculum and faculty development and much more
- Mentorship and guidance to disadvantaged youth, such as rural youth, urban poor youth, women, youth with disabilities and youth from marginalized communities
- CSR and skilling collaborative initiatives

In a nutshell, India, through its various initiatives and investments is striving towards creating a democratized access to education and training to enable millions of people to acquire the skills they need to succeed in today's rapidly changing economy. Endorsing its commitment, the recent Indian Union Budget of 2024-2025[25], announced several measures for youth and employment, such as:

- Allocation of INR1.48 lakh crore for education, employment and skilling
- INR2 lakh crore package announced for five schemes on jobs and skilling of 4.1 crore youth
- Financial support for loans up to INR10 lakh for higher education in domestic institutions
- One month wage to all workers newly entering the work cycle. INR15,000 to entrants with monthly salary up to INR1 lakh. This will benefit 210 lakh youth
- Internship opportunities to one crore youth in 500 top companies across the country in five years
- Modernization of 1000 Industrial Training Institutes (ITIs) over the next five years through a hub-and-spoke model, supported by a total outlay of INR60,000 crore
- Priority to be given to increase women's participation in the workforce through the establishment of hostels and partnerships to conduct women-specific skilling programs

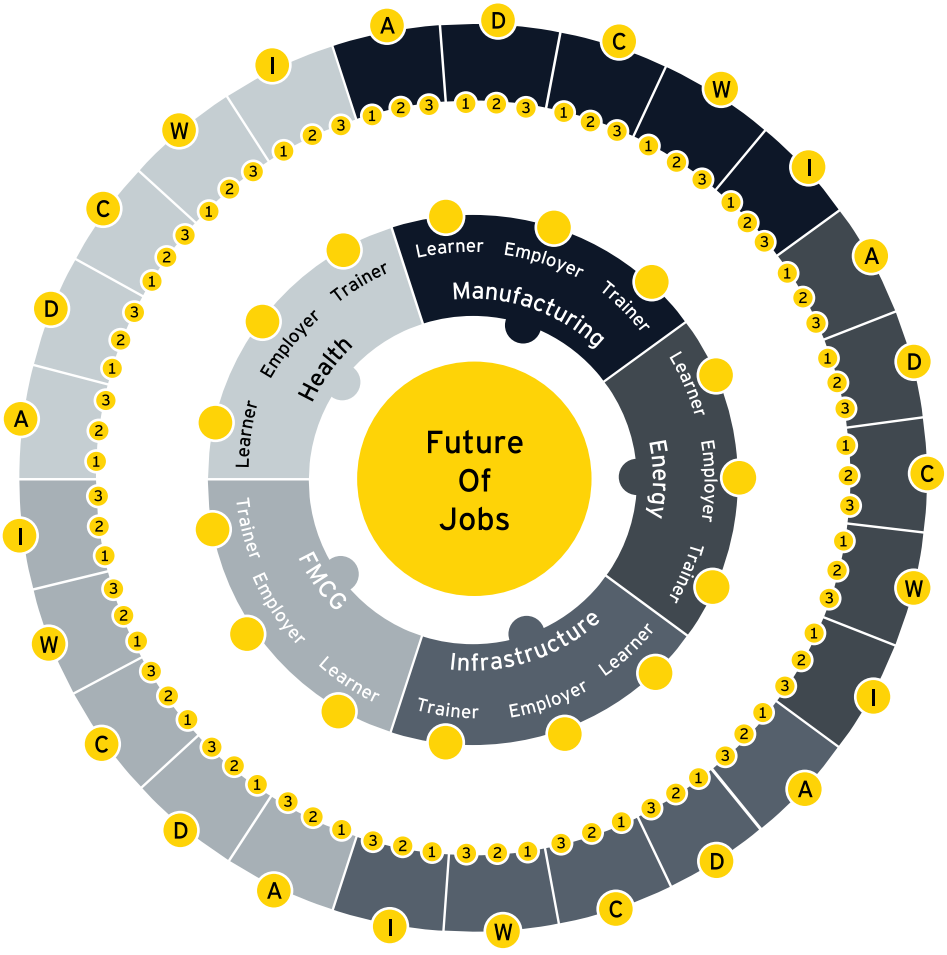
## 2.3 FICCI-EY future of jobs reports

As the job and skilling landscape evolves at a rapid pace with disruptive technologies making way, and COVID-19 pandemic which brought significant changes to the labor market, a committee comprising senior industry experts and panel of FICCI and EY made an informed decision to publish a new edition of FOJ report which studies in-depth the jobs and skills landscape of India across five sectors, namely manufacturing, FMCG, healthcare, energy and infrastructure.

### Study methodology

For this report, the committee outlined a framework focused on assessing the impact of five trends– Artificial Intelligence (AI), DPI, Climate, Workforce Mobility and Industry 4.0– on the five sectors and how its interplay will affect three key stakeholders– learners, employers and trainers in the future in terms of jobs and skills.

We further sub-divided the five lenses into key factors, which we then individually considered to assess the impact on all sectors and stakeholders. We completed the assessment with the help of primary (interviews and digital survey) and secondary research (literature review) and then analyzed and drew insights from the data collected.




**Legend**

**A: Artificial Intelligence**
1. GenAI
2. Skills
3. Cost

**D: Digital Public Infrastructure**
1. Efficiency
2. Skills
3. Innovation

**C: Climate & Green Jobs**
1. CFP
2. Skills
3. ESG

**W: Workforce Mobility**
1. Digital
2. Skills
3. Policy

**I: Industry 2.0**
1. Digital
2. 21st Century Skills
3. Policy

***Sectors (5):*** *Manufacturing, Health, FMCG, Infrastructure, Energy*
***Lens (5) :*** *Artificial Intelligence (AI), DPI, Climate, Workforce Mobility and Industry 4.0*
***Personas/Stakeholders (3) :*** *Employer (Industry), Learner (in education, skilling-upskilling and re-skilling) and Trainer (Industry, private sector and Government)*

In the concluding section, we have presented our findings of the assessment in the form of Harvey Balls visualization.

## Model of study

In addition to the secondary research, we sought an informed view by interacting with over 200 respondents, a mix of senior leaders and industry experts, learners, trainers, academicians and policy makers. Structured and unstructured form of interview along with digital survey (including multiple choice questions) was part of the methodology. The respondents were probed on their views on industry 4.0 technologies that will set the narrative in the future. They include:

- How the five lenses (AI,DPI, climate, workforce mobility and Industry 4.0 technologies) are expected to impact jobs and skills
- Challenges anticipated with its integration
- Emergence of new job roles or transformation of existing ones if sustainable practices are a priority for business operations and its subsequent impact on green jobs and skills
- Increasing importance of global mobility and cross-cultural skills
- Role of skilling institutions in aligning educational curriculum with the skill requirements of employers
- How effective current government policies are
- Additional support needed from government
- Recommendations to improve the job and skilling ecosystem

### Primary research: consultation with stakeholders

- Identification of industry's top leaders and employers in selected sectors, learners across all levels and trainers
- Developed questionnaire on digital tool for each of the five sectors
- Conducted interviews with senior leaders and industry leaders
- Collation and analyzing of data of primary research

### Secondary research: Literature review of future of jobs scenario across the lens of AI/Gen AI, technology, climate change, global mobility, and 21st century skills

- Comprehensive document review of existing reports, research, statistics, global standards and best practices
- Quantitative and qualitative research from multiple data sources such as Union Budget 2024-25, Ministry of Skill Development and Entrepreneurship (MSDE), IBEF, Periodic Labour Force Surveys, Economic Survey of 2023-24, ILO and WEF reports
- Collating and analysing data to identify factors impacting FOJ

### Validation by industry leaders

Validation by industry leaders of the findings and recommendations for Learners, Trainers and Employers and the need for Government reforms and support

**Below is a summary of previous FOJ reports:**

### Future of Jobs 1.0: Year 2017

Future of Jobs in India – A 2022 perspective was published by FICCI in 2017 in partnership with NASSCOM and EY. The report was the first research study exclusive to the Indian context on the future of jobs across five key sectors of the Indian economy in detail: IT-BPM, retail, textiles and apparel, automotive and BFSI (Banking, Financial Services, and Insurance).

### Future of Jobs 2.0: Year 2018

Future of Jobs in India-2.0 published by FICCI in collaboration with EY in the year 2018 analyzed five more sectors in the second phase of its study. These sectors together form the foundation of India's socio-economic development and are healthcare, education, construction, transportation & logistics and tourism & hospitality. The report was a product of quantitative and qualitative research and strategic foresight received from top leaders and employers in selected sectors for the study.

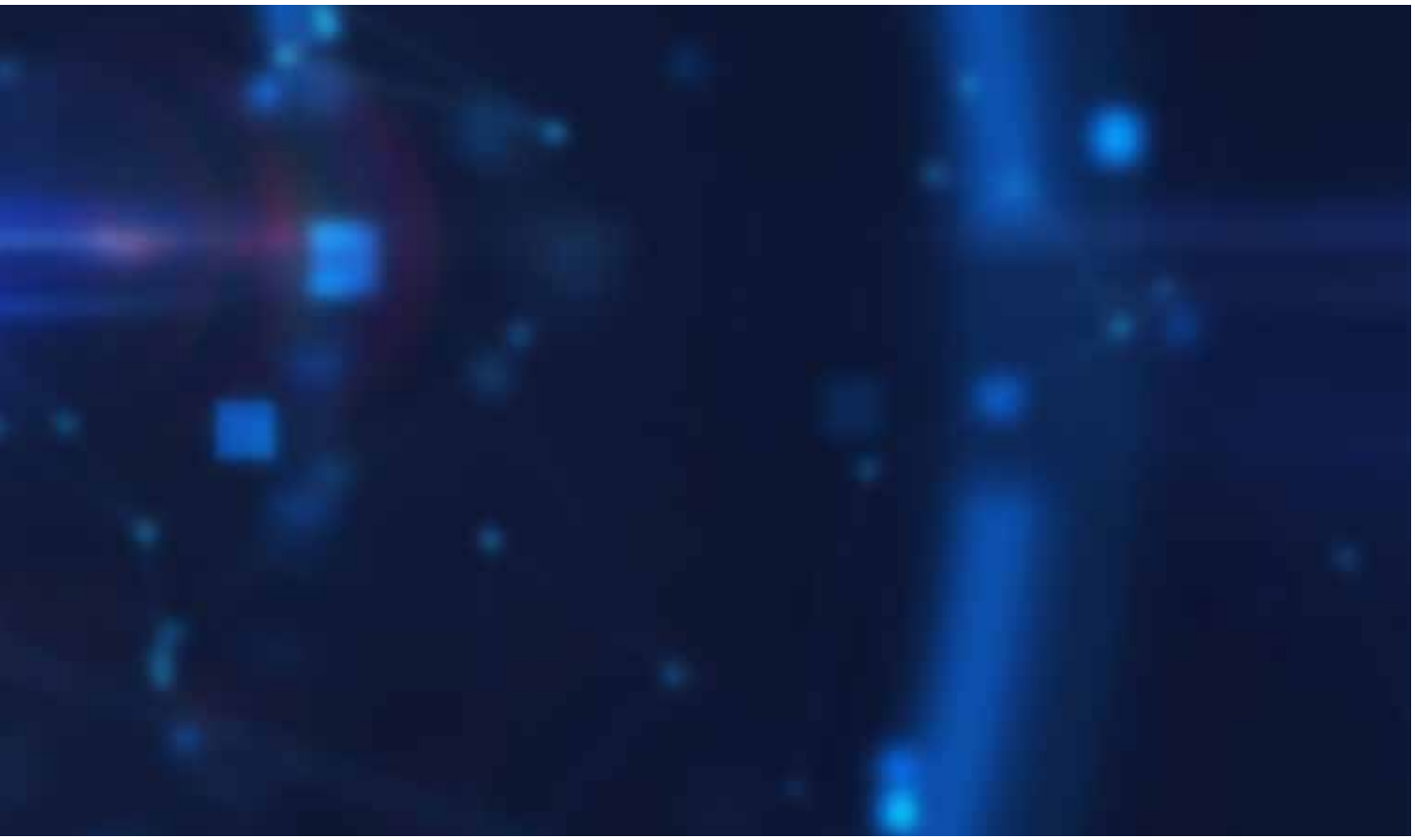
### Future of Work for Women (COVID specific): Year 2021

The report "Impact of COVID-19 and Industry 4.0 on Future of Work for Women" was published by FICCI in May 2021 in collaboration with UNDP. The report studied the unprecedented changes in the world of work necessitated by COVID-19 and how post COVID-19, the situation could change and so will the impact of technology on jobs and employment in India.

### Future of Jobs 3.0: Year 2024 (Current report)

This report of Future of Jobs (this report) aims to provide deep insights about job creation, reskilling and upskilling opportunities for the next 2-3 years for learners, trainers and employers. The entire study and research on FOJ 3.0 were conducted over a period of 2.5 months with rigorous effort put in by EY and FICCI.

FOJ 3.0 analyzes five sectors with a lens of emerging technologies, global workforce mobility and provides recommendations for future ready policy. These five sectors are manufacturing, FMCG, healthcare, energy, and infrastructure. The rationale for choice of these five sectors is presented below-



## Manufacturing

- Market size projected to reach US$1 trillion by 2025
- CAGR growth rate of 3.32% expected 2024-2029
- Currently employs around 27.3 million people

## Healthcare

- Indian healthcare market was valued at approximately US$ 98.98 billion in 2023
- Projected CAGR of 8% from 2024 to 2032
- One of the largest employers in India, employing 7.5 million people in 2024

## Energy

- India is the 3rd largest producer and consumer of electricity worldwide in April 2024
- 2.69% of the total FDI inflow in India between April 2000 and March 2024
- Jobs projected to reach 139 million globally by 2030

## FMCG

- 10% of India's GDP comes from the FMCG sector
- Indian food processing market expected to reach US$547.3 billion by 2028
- Industry predicted to develop at a CAGR of 7-9%

## Infrastructure

- FDI in construction (infrastructure) stood at US$ 33.91 billion between April 2000-March 2024
- Union Budget 2024-25 has increased capital investment outlay for infrastructure, which would be 3.4 % of GDP
- Infrastructure is a key enabler in helping India become a US$26 trillion economy.

# 3

# Future sectoral trends

In this chapter, we deep dive into the macroeconomic trends, employment scenario, international benchmarking and sectoral trends for five sectors.

## 3.1 Manufacturing

The Indian manufacturing sector is undergoing significant transformation, driven by various macroeconomic factors, technological advancements and evolving global dynamics. This section provides a comprehensive analysis of sectoral trends, benchmarking against international practices, and insights drawn from both primary interviews and secondary research. The focus is on understanding the future of jobs in the manufacturing sector, highlighting emerging trends, challenges and the promising opportunities that lie ahead.

### 3.1.1 Macroeconomic trends

#### Key statistics

India's manufacturing sector is on the brink of substantial growth, expected to generate an additional 6.33% in new jobs during the first half of FY 2024-25[26]. Notably, the manufacturing, engineering, and infrastructure sectors are among the top three with the highest proportion of employers expanding their workforce, with 66% planning to increase headcount. This expansion is driven by government reforms like the Production Linked Incentive (PLI) scheme, which has already attracted significant investments in automobiles, electronics, and textiles. Additionally, increased capital investments and rise in mergers and acquisitions, particularly in the automobile, electronics, and textiles categories, indicate strong future prospects for the sector.

As a key contributor to India's economy, the manufacturing sector accounts for

**16-17%**
of GDP as of 2021

market size projected to reach
**US$1 trillion by 2025**

GVA (Gross Value Added) at current prices was
**US$ 110.48 billion**
in the first quarter of FY24[27]

compound annual growth rate (CAGR) of
**3.32%** expected
**between 2024 and 2029**[28]

Between April 2000 and December 2023, the automobile sector attracted FDI inflows of US$36.26 billion, while the chemical manufacturing sector (excluding fertilizers) received FDI inflows of US$22.14 billion. These figures underscore the sector's critical role in India's economy and its potential for future expansion, with substantial FDI inflows reflecting global confidence in India's manufacturing capabilities[29] and reinforcing the sector's importance as a major job provider.

## B Employment scenario

As of 2024, the manufacturing sector employs approximately 27.3 million people[30]. This sector has consistently expanded its employment opportunities, driven by growing industrial activities and supportive government initiatives.

## C Key drivers of growth and government schemes

The Union Budget 2024 has solidified manufacturing as a cornerstone of India's path to becoming a developed nation, unveiling a comprehensive package of incentives and policy reforms. These include significant investments in industrial infrastructure, the expansion of the National Industrial Corridor Development Programme, and strategic adjustments to customs duties to bolster domestic manufacturing and exports. These measures aim to enhance India's global competitiveness and support the 'Make in India' initiative, laying a strong foundation for continued growth[31].

Key initiatives and developments include:

**Production Linked Incentive (PLI) Scheme:** The Interim Union Budget 2024-2025 saw a significant boost in allocations for the PLI Scheme, with a 360% increase to INR6,903 crore (US$830 million) for the semiconductors and display manufacturing ecosystem, and a 623% rise to INR3,500 crore (US$421 million) for the automobile sector.

**Electric Vehicles (EV) expansion:** The government has placed a strong emphasis on promoting the transition to electric vehicles (EV) by expanding EV charging networks, creating opportunities for small vendors in manufacturing and maintenance.

**Defence allocation:** The Ministry of Defence's budget was increased to INR621,541 crore (US$74.78 billion), highlighting a commitment to enhancing domestic manufacturing capabilities in the defence sector.

**The National Manufacturing Policy (NMP)** aims to increase the sector's GDP contribution to 25% and create 100 million new jobs. This policy includes establishing National Investment and Manufacturing Zones (NIMZs) and offering incentives for green technologies. While there are challenges, such as bureaucratic hurdles and the need for continuous upskilling, these initiatives underscore the government's commitment to sustainable growth in manufacturing.

**SANKALP**[32] (Skills Acquisition and Knowledge Awareness for Livelihood Promotion) program, which strengthens institutional mechanisms for skill development and enhances access to quality, market-relevant training. Similarly, the SAMARTH[33] (Scheme for Capacity Building in Textile Sector) scheme is focused on providing skill development training in the textiles sector, a significant component of the manufacturing industry, ensuring the workforce is equipped to meet evolving demands.

**The Vishwakarma**[34] Scheme is designed to enhance the skills of traditional artisans and craftsmen through modern training programs, integrating them into the contemporary manufacturing sector.

These measures are designed to enhance India's global competitiveness and support the 'Make in India' initiative, laying a strong foundation for the manufacturing sector's continued expansion.

## 3.1.2 International benchmark

India's adoption of Industry 4.0 technologies, while growing, remains behind global leaders like Germany, Japan and the USA.

India's position in the global manufacturing sector is strong, ranking among the top in the Global Manufacturing Risk Index (GMRI) due to its cost-effectiveness, workforce availability, and market potential. India's labor costs are notably lower than in several key Asian markets, and it ranks fifth in global manufacturing output with a 2.78% share .

Adopting international best practices, such as those outlined in the Smart Industry Readiness Index (SIRI) and the Global Lighthouse Network, can further enhance India's manufacturing capabilities. These frameworks emphasize digital transformation, sustainable practices, and the development of advanced skills, positioning India for greater competitiveness in the global market.

## 3.1.3
## Sectoral trends

### A Emerging technologies in the sector

The anticipated impact of AI in areas like quality control and customer service is driving a shift in perception, indicating future growth. Industry 4.0 technologies like IoT-enabled predictive maintenance and supply chain optimization are already enhancing efficiency by reducing downtime and improving order fulfilment.

- AI is set to revolutionize agile manufacturing and quality control, though challenges such as high implementation costs and the need for skilled labor remain.
- Digital Public Infrastructure (DPI)[37] plays a crucial role in supporting seamless operations, including secure data exchanges and real-time processing, further boosting manufacturing efficiency.

### B Workforce trends

In the manufacturing sector, hiring trends highlight an increasing demand for technically skilled professionals with qualifications in engineering, computer science, and specialized fields such as robotics and automation. Employers are actively seeking candidates with experience in Industry 4.0 technologies, including IoT, AI and advanced analytics. Additionally, skills in lean manufacturing, quality control and supply chain management are highly valued. The focus is on building a workforce capable of adapting to rapidly evolving technological environments and driving innovation and efficiency improvements.

Workforce mobility is another key factor shaping the job landscape in manufacturing. Increased mobility facilitates the exchange of skills and best practices across regions, fostering innovation and efficiency.

## 3.1.4 Future of jobs: insights from industry leaders

The primary survey has reached out to industries with strength of more than 500 employees working with their presence in regional, national and international markets.

### A Emerging job roles in the sector

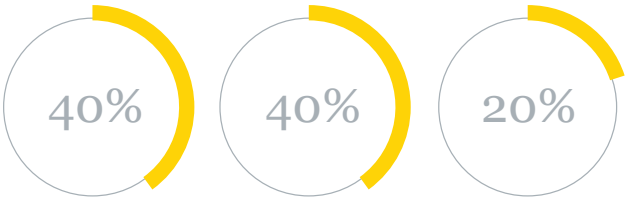
The future of jobs in the manufacturing sector is poised to be shaped by roles that capitalize on advanced technologies. According to the survey, 60% of respondents anticipate significant growth in jobs for AI and robotics technicians, as well as IoT specialists, 40% foresee high demand for sustainable manufacturing engineers and digital supply chain analysts.

The survey further reveals that 40% of respondents believe skills in robotic programming, advanced analytics, and Internet-of-Things connectivity will be most in demand for future manufacturing roles. Only 20% expect a high demand for AI and machine learning application skills, which presents an interesting contrast, highlighting the evolving landscape of skill requirements in the sector.

### B Impact of GenAI, AI, sector-specific technology, international mobility, DPI, climate and green jobs on the job and skilling ecosystem

The impact generated by generative AI and AI technologies in the manufacturing sector is likely to be very strong. The use of these technologies may likely result in creating new job roles and altering the nature of existing ones, particularly in the case of supply chain optimization and predictive maintenance. The survey revealed concerns related to sector preparedness in picking up these technologies. As much as 40% of the respondents registered ongoing initiatives in AI adoption preparedness, while 40% mentioned that organizations were not prepared at all and only thinking about it. By itself, this presents an enormous gap between recognition of AI potential and readiness towards its realization. Secondly, majority respondents highlighted the major challenges in AI integration are workforce's resistance, and lack of technical skills. The other factor identified was data privacy and security concerns. This is also related to secondary research, emphasizing a need for upskilling and reskilling initiative to face these challenges. The gap that ultimately exists between the projected level of influence that AI will have and the levels of preparedness and usage actually being at work within the manufacturing sector speaks to the fact that a more concerted approach needs to be taken with regards to the way in which such technologies will be integrated.

**Preparedness of AI adoption**




Somewhat prepared with ongoing initiatives

Not prepared but considering it

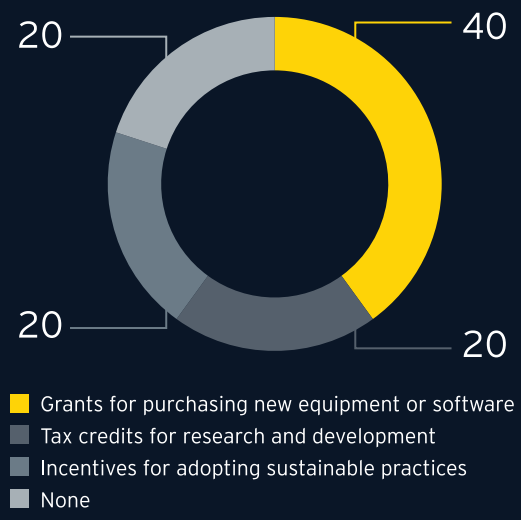
Not prepared and no plans to adopt

The surveyed organizations are increasingly adopting sustainability practices, with organizations implementing programs such as energy-efficient machinery (50%), waste reduction (33%), and sustainable sourcing (33%). AI and generative AI are expected to significantly impact supply chain optimization (44%), predictive maintenance (36%), and production line automation (27%).

### C Suggested programmatic and policy interventions

Most of the industry representatives felt that the program and policy interventions had to match the dynamism of the sector. 80% of the respondents felt that governmental support in creating renewable energy infrastructure would be beneficial, 40% mentioned the importance of stringent environmental regulations to encourage sustainability. Equally, 40% believe that the grants for acquiring new equipment and software would be the most effective government incentives towards technological advancement. Out of the total workforce sample, 80% preferred a supportive government partnership with the private while none suggested the government to be at the frontline in training and education. This testifies to the preference for public-private collaboration over government initiatives in a situation where the urgency for skill development is well recognized.

**Government incentives or subsidies can be/ have been most beneficial for technological advancements**




**Challenges manufacturing companies face in collaborating with educational and skilling institutions (respondents could select multiple options)**

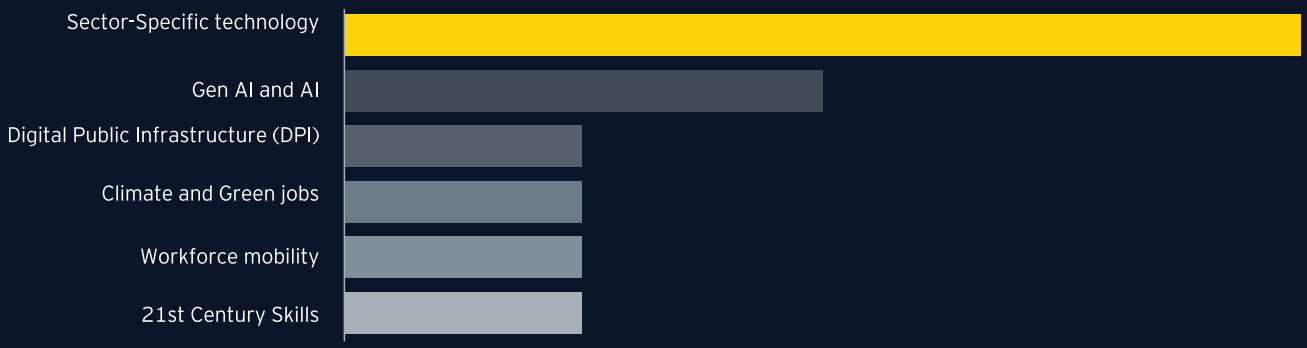
100%

Lack of awareness about schemes and programs

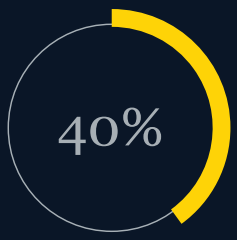
20%

Misalignment of training outcomes with industry needs

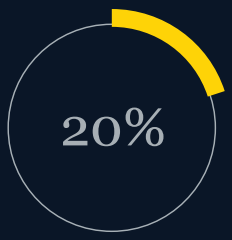
**Areas skilling institutions needs to focus on:**




**What role should skilling institutions play in preparing the workforce for the adoption of new technologies?**




Collaborative role in designing industry-specific courses




Primary role in providing foundational and advanced tech training

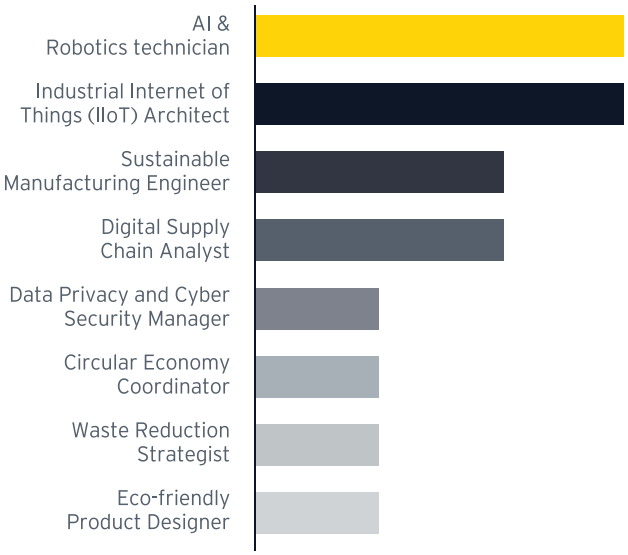

Supportive role with on-the-job training provided by employers


Advisory role in identifying future skill needs

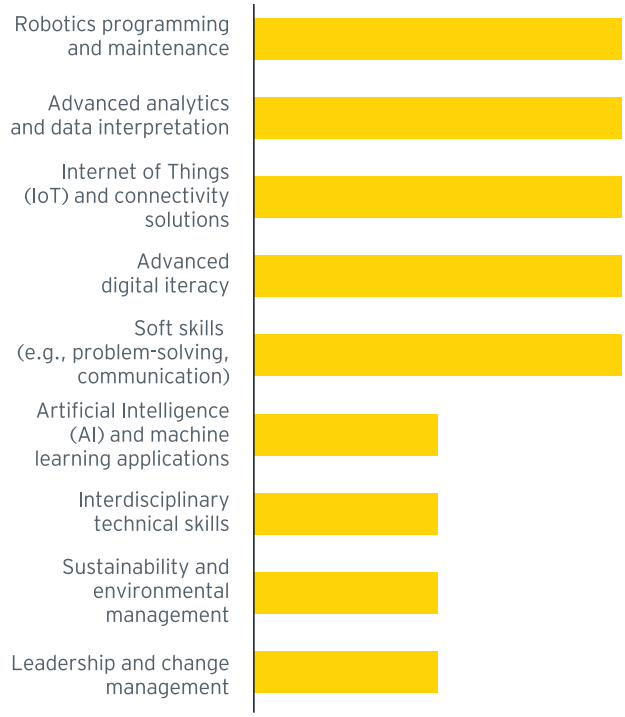
## 3.1.5
## Overall impact on job roles and skills in the sector

The key challenges as identified in the primary research include the need for better alignment between the industry, skill development institutions, and government. 80% of the surveyed believed continuous learning and upskilling are very important. Majority of the respondents believed that lack of awareness about schemes and programs is the major challenge manufacturing companies face in collaborating with educational and skilling institutions. This points at the need for richer, stronger connections in training initiatives between industry and academia.

### Emerging job roles in manufacturing sector




### Skill sets that will be most in demand for future manufacturing job roles:




The future of jobs in the manufacturing sector in India is being influenced by a confluence of economic growth, technological advances and sustainability imperatives. While the sector is on a promising path toward growth and innovation, challenges such as skill gaps, technological readiness, and workforce resistance have to be accommodated. The findings of this survey call for a more coordinated and focused approach toward workforce development that aligns industry needs with skill development initiatives and government support.

# 3.2 Healthcare

The healthcare sector has emerged as a major driver of India's economy, significantly impacting both revenue and employment with public expenditure on healthcare being 2.1 % of GDP in FY23 as per the Economic Survey 2022-23. The healthcare industry includes diverse sub-sectors such as hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment.

In 2023, the Indian healthcare industry witnessed substantial growth, with the sector valued at approximately US$230 billion. This growth is supported by advancements in healthcare infrastructure, increased digital health adoption, and rising private and public investments. The sector is expected to continue its expansion at a robust rate of 17-18% annually, reflecting its crucial role in India's economic development.

Employment within the sector records a significant contribution with over 5 million people employed in various healthcare roles as of 2023.

## 3.2.1 Macroeconomic trends

### Key statistics

The healthcare sector in India significantly contributes to the nation's economy and employment landscape.

As of 2023,

the Indian healthcare market was valued at approximately **US$ 98.98 billion**

Projections suggest a compound **annual growth rate (CAGR) of 8% from 2024 to 2032**, potentially reaching **US$ 638 billion by 2025**[38]

The sector's contribution to India's GDP has been steadily increasing, with public expenditure on healthcare rising from **1.6% of GDP in FY21 to 2.2% in FY22** and it is projected to reach **2.5% by FY25**

Conducive policies have encouraged FDI in the sector, for instance, from April 2000 to March 2024, the FDI inflow for the drugs and pharmaceuticals sector stood at US$22.57 billion followed by US$10.26 billion in hospitals and diagnostic centres, significantly enhancing the quality and accessibility of healthcare services nationwide[39].

## B Employment scenario

As of 2024, the Indian healthcare sector ranks among the country's largest employers, providing jobs to a total of 7.5 million people. Advancements in telemedicine, virtual assistants and data analytics are anticipated to generate 2.7 to 3.5 million new jobs in technology-related roles[40]. This industry is poised for significant job growth owing to the expansion of healthcare facilities and rising demand for healthcare services. Between 2021 and 2023, there was a notable 22.4% increase in demand for healthcare professionals. This diverse workforce will include doctors, nurses, lab technicians, healthcare administrators, medical coders, AI engineers, pharmacists, dentists, data analysts and telemedicine specialists. This demand is expected to double by 2030 due to a shortage in this workforce.

## C Key drivers of growth and government schemes

The 2024-25 Union Budget[41] allocated INR90, 659 crore to the Ministry of Health and Family Welfare, which is a 13% rise over the revised estimates of 2023-24. Key government initiatives driving this transformation:

- **Ayushman Bharat:** Launched in 2018, this health insurance scheme provides up to INR5 lakh (US$6,000) per family annually for hospitalizations. As of 2023, over 300 million Ayushman cards have been created, making it the largest health insurance program globally.[42]
- **National Digital Health Mission (NDHM):** The National Digital Health Mission (NDHM) launched in 2020 to digitize health records and integrate digital health services. By mid-2024, over 120 million individuals were registered, with the aim to cover more than 1.4 billion people.
- **The National Health Policy 2017 and Pradhan Mantri Jan Arogya Yojana (PMJAY)** have broadened healthcare coverage and improved service delivery, creating more job opportunities, especially in tier 2 and 3 cities. The National Healthcare Professional Registry and Accreditation System is crucial for managing the workforce by maintaining a comprehensive database of practitioners, ensuring regulatory compliance, and promoting continuous professional development. These policies help address immediate workforce shortages and support long-term planning.
- **The Indian Medical Association (IMA)** notes a continuing shortage of about 600,000 doctors as of 2024. Evolving technology and healthcare needs have given rise to an increasing demand for professionals skilled in the latest technologies and sustainable practices. Continuous upskilling is crucial to keep up with these changes and maintain a responsive, patient-focused healthcare system.

## 3.2.2 International benchmark

Healthcare Access and Quality (HAQ) Index is a measure developed to assess the performance of healthcare systems worldwide, focusing on how well a country or region provides access to and quality of healthcare services. The index ranges from 0 to 100, with higher scores indicating better access to and quality of healthcare.

> India ranks 44th in the global Healthcare Access and Quality (HAQ) Index with a score of 65.4. Key improvement areas include expanding infrastructure, increasing the workforce, and enhancing service quality and accessibility, particularly in rural areas.

Top-ranked countries are Taiwan (1st, score 89.5) for AI integration and quality services, South Korea (2nd, score 88.0) for sustainable practices and technology, and Japan (3rd, score 87.8) for personalized healthcare and prevention.

Worldwide, the USA and UK are leading the way in offering advanced programs that could benefit India. The USA's initiatives include cutting-edge training, focus on telemedicine, and AI diagnostics, while the UK's NHS focuses on comprehensive training and digital health tools. Adopting these practices could enhance India's healthcare system by improving access, quality, and efficiency.[43,44]

## 3.2.3 Sectoral trends

### A Emerging technologies in healthcare sector

The top healthcare trends and innovations include Artificial Intelligence, the Internet of Medical Things, Telemedicine, Big Data and Analytics, Immersive Technology, Mobile Health, 3D Printing, Blockchain, Cloud Computing and Genomics[45].

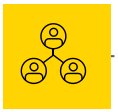
According to the World Economic Forum, the healthcare sector is set for significant job growth in the coming years, especially in tech and data roles which will open new opportunities for professionals with healthcare knowledge with tech skills. The Indian healthcare sector is focusing on training its workforce in emerging technologies such as IoMT, blockchain, Telehealth, telemedicine Artificial Intelligence and Machine Learning, Big Data and Analytics and Augmented and Virtual Reality to enhance service delivery.

### B Workforce trends

By 2030, the demand for healthcare professionals is expected to double due to a shortage of workers. Roles such as medical and health services managers, nurse practitioners, physician assistants, home health aides and physical therapists will see the highest growth[46].

Some of the other emerging job roles also highlighted during discussion in healthcare sector are as follows:

**AI and Machine Learning specialists:** These professionals develop and implement AI algorithms for healthcare applications, such as diagnostic tools and predictive models.

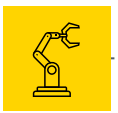


**Telemedicine coordinators:** They oversee virtual care programs, arrange remote consultations, and facilitate clear communication between patients and healthcare providers.

**Health data scientists:** These professionals analyze complex healthcare data to extract insights, enhance patient outcomes and optimize healthcare operations.

**IoMT systems engineers:** They design, implement, and maintain networks of connected medical devices and ensure data security and interoperability.

**Digital health product managers:** Oversee the development and implementation of digital health solutions, ensuring they meet user needs and regulatory standards. They collaborate with stakeholders to drive product strategy, manage roadmaps, and optimize user experience.



**Robot-assisted surgery technicians:** Surgical professionals assist surgeons in operating AI-powered robots and manage the technical aspects of robotic surgical systems during procedures.

## 3.2.4
# Future of jobs: insights from industry leaders

### A Emerging job roles in healthcare

The healthcare sector is poised for substantial transformation, leading to the creation of several new job roles. Our survey reveals the following job roles are anticipated to emerge in the near future:

**Health data analyst:** This role is expected to be in high demand, with 50% of respondents identifying it as a critical job role for the future. The increasing reliance on data-driven decision-making in healthcare underscores the need for professionals capable of analyzing vast datasets to improve patient outcomes and operational efficiency.

**Genomic counsellor:** Another emerging role, highlighted by 50% of respondents, is that of a genomic counsellor. As personalized medicine and genomics gain traction, the demand for specialized guidance based on genetic information will grow, making this role essential.

**Digital health specialist:** Identified by 33% of respondents, the Digital Health Specialist will play a key role in integrating and managing digital health technologies within healthcare systems. This position will be crucial as the sector continues to adopt more sophisticated digital tools.

**Telemedicine coordinator:** With 33% of respondents foreseeing the growth of telehealth services, the role of telemedicine coordinator is expected to become increasingly important for managing remote patient care.

**AI healthcare ethicist:** As AI integration in healthcare expands, 33% of respondents believed there will be a need for professionals who can navigate the ethical challenges associated with AI applications, ensuring that these technologies are used responsibly.

### B Impact of Gen AI, AI, sector-specific technology, international mobility, DPI, climate, and green jobs on the job and skilling ecosystem

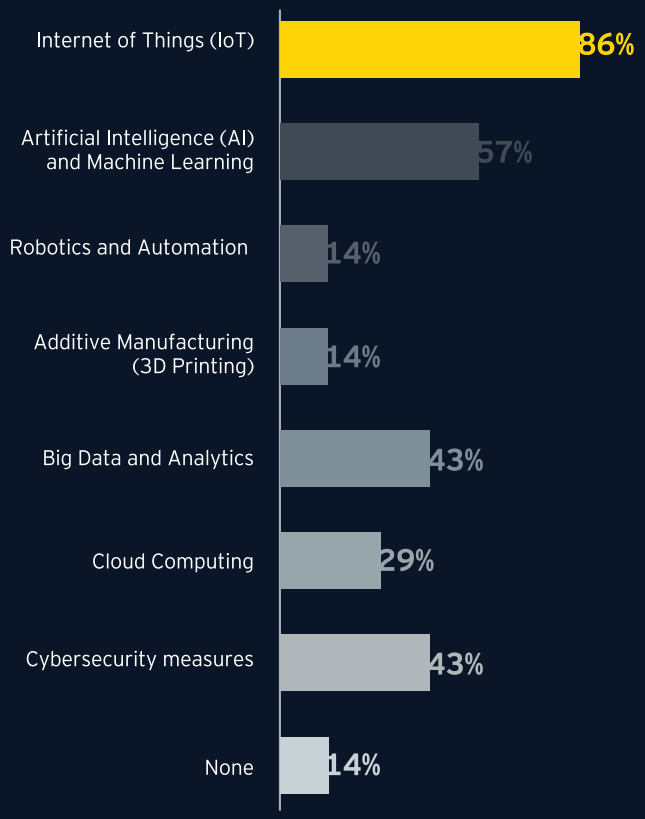
**Artificial Intelligence (AI) and Gen AI:** AI is expected to have a profound impact on the healthcare sector, with 66% of respondents rating its future impact as high as 9 or 10 on a scale of 10. However, respondents anticipate significant challenges in integration, including technical complexity, high costs of implementation and workforce resistance. 67% of the respondents expect AI to reshape job roles through reskilling and upskilling initiatives.

**Sector-specific technology:** Adoption of Industry 4.0 technologies is widespread, with 86% of respondents using IoT and 57% utilizing AI and Machine Learning. Despite this, the organizations feel there is lot of scope to be able to integrate AI and Gen AI, completely.

**International mobility:** Given that 71% of the organizations operate on an international scale, there is an increasing need for skills related to global operations. Cross-cultural competency and adaptability (50%) and global regulatory awareness (67%) are identified as crucial skills for the future healthcare workforce. Multilingual communication abilities are also highlighted by 33% of respondents as important for facilitating international mobility.

**Climate and green jobs:** Sustainability is a growing priority, with 43% of respondents identifying it as a top priority and another 43% considering it somewhat of a priority. However, 43% of organizations have not yet adopted any sustainable practices. Nevertheless, initiatives like waste reduction and recycling (67%) and increased energy efficiency (50%) are already underway in many organizations, highlighting a shift towards greener operations. On the jobs front, 67% of respondents affirm that economic feasibility and resistance to change are the primary challenges in creating and filling green jobs.

## Utilization of any of the Industry 4.0 technologies




## Challenges anticipated in integrating AI into existing Healthcare systems

**50%**
Technical Complexity

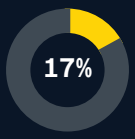
**50%**
High cost of implementation

**50%**
Workforce resistance

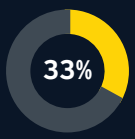
**33%**
Lack of technical skills

**83%**
Data privacy and security concerns

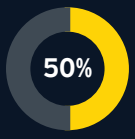
## How prepared are organizations to adapt AI and Gen AI




Fully prepared with strategies and resources in place




In the early stages of preparation




Not prepared but considering it

## Expected Healthcare sectors to have greatest impact of AI

## Suggested programmatic and policy interventions

### For industry leaders

- **Reskilling and upskilling initiatives:** Industry leaders should prioritize regular training programs, as 67% of respondents emphasize the need for reskilling and upskilling to adapt to AI and other emerging technologies. These initiatives will be essential to address the gaps in technical skills and prepare the workforce for future challenges as industry 4.0 technologies take precedence.
- **Adopting sustainable practices:** With 43% of organizations already recognizing sustainability as a priority, it is critical to continue integrating sustainable practices into core operations. Green jobs, supported by targeted training programs, will be vital for this transition.
- **Enhanced collaboration with government:** To leverage government incentives effectively, industry leaders should engage in partnerships that align with policy objectives. These collaborations will help maximize the benefits of subsidies and incentives for technology adoption and sustainability.

**How effective are current government policies in promoting technology adoption in the Healthcare sector**

**40%**
Very effective

**60%**
Neutral

### For government

- **Financial incentives for green investments:** With 60% of respondents indicating the need for financial incentives, the government should consider offering robust support to encourage the adoption of sustainable practices in healthcare.
- **Support for AI and technology integration:** The government can provide subsidies for employee training in new technologies, as 40% of respondents have identified this as beneficial. Stricter environmental regulations (40%) and incentives for adopting sustainable practices (60%) are also necessary to drive progress.
- **Policy support for workforce mobility and gender diversity:** To ensure an inclusive and diverse workforce, the government should consider implementing gender quotas (40%), offering grants for diversity initiatives (20%), and providing childcare support services (20%). Additionally, the government should play a supportive role (20%) in addressing skill gaps through public-private partnerships, ensuring that the healthcare sector is equipped to meet future demands.

These interventions will be critical in shaping the future of jobs in the healthcare sector, ensuring that the workforce is equipped with the necessary skills to adapt to technological advancements, sustainability challenges, and global operations

**Government incentives/subsidies can be/ have been most beneficial for technological advancements**

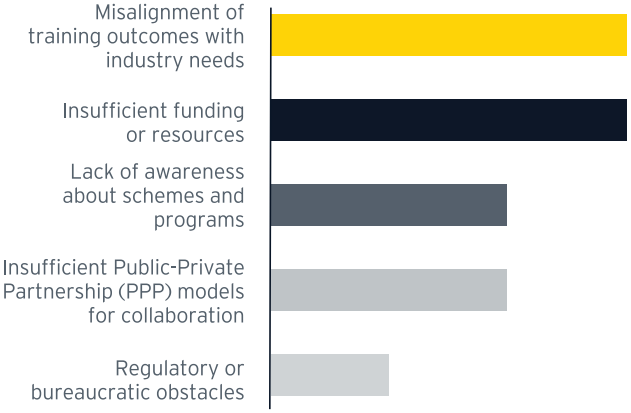
**40%** Subsidies for training employees in new technologies

**60%** Incentives for adopting sustainable practices

**20%** None have been beneficial

**Areas skilling institutions should focus on**


**Challenges healthcare companies face in collaborating with educational and skilling institutions**

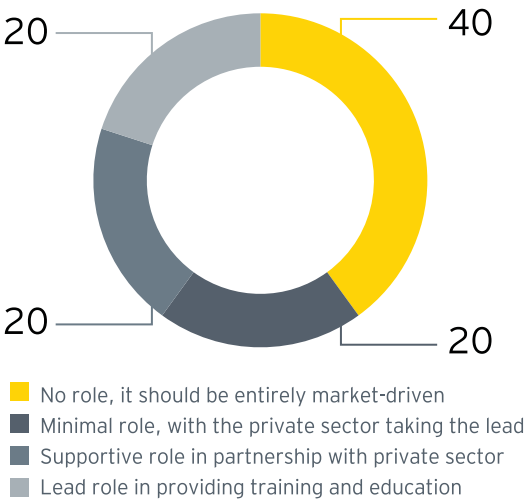



## 3.2.5 Overall impact on job roles and skills in the sector

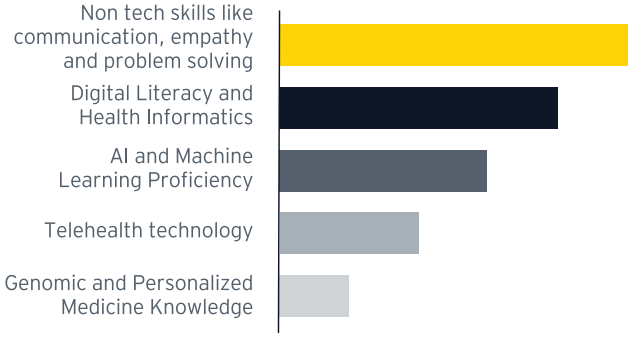
Our primary and secondary research in the healthcare field shows encouraging trends. Both types of research emphasize the importance of healthcare to India's economy. They consistently predict solid growth and the creation of new jobs due to technological advancements. Primary research highlights the emergence of new roles like Health Data Analysts, Genomic Counsellors, and Digital Health Specialists. According to 50% of respondents, these roles will be crucial in the future.

**Emerging job roles in healthcare sector**


**Role should the government play in addressing skill gaps in the Healthcare sector**




**Skill sets that will be most in demand for future healthcare job roles**




*Full form of above mentioned variable "Non tech skills like communication , empathy and problem solving"*

Collectively the research highlights the significant role of AI and emerging technologies in improving diagnosis and tailoring treatments. Research shows that 66% of respondents expect AI to significantly impact healthcare, although challenges such as technical complexity and resistance from the workforce remain. In the next few years, the healthcare sector will merge advanced technologies with traditional practices, creating exciting opportunities for those who can adapt and acquire the skills needed for the digital health era.


## 3.3 Infrastructure

The infrastructure sector in India plays a pivotal role in the economic progress of the country, propelling its overall development. This sector encompasses a wide array of services including transportation (roads, railways, airports, and ports), energy and electricity, real estate and construction, urban infrastructure (water supply, sanitation, and waste management), and telecommunications. The Indian government has been actively promoting infrastructure growth through initiatives like the National Infrastructure Pipeline (NIP) and the Smart Cities Mission, aiming to enhance the quality of life and attract foreign investment. The sector has seen substantial investments, both from public and private sources, leading to significant improvements and modernization. However, it faces certain challenges such as regulatory hurdles, financing gaps, and the need for technological upgrades. Despite these challenges, the infrastructure sector in India is on an upward trajectory, with ongoing projects set to bolster connectivity, improve efficiency, and key enabler in helping India become a US$26 trillion economy.[47]

### 3.3.1 Macroeconomic trends

#### Key statistics

The Indian infrastructure sector is on a promising trajectory

- Forecasts indicate substantial growth from approximately US$204.06 billion in 2024 to US$322.27 billion by 2029
- This growth reflects a robust Compound Annual Growth Rate (CAGR) of 9.57% over this period[48]
- The Budget for 2024-25 has further reinforced this momentum with an 11.1% increase in capital investment outlay for infrastructure, totaling INR11.11 lakh crore (approximately US$133.86 billion), which is 3.4% of India's GDP
- Additionally, the budget allocation for the Railways has seen a notable 5.8% increase, reaching INR2.55 lakh crore (US$30.72 billion) compared to the previous year[49]
- The infrastructure sector's contribution to the GDP is anticipated to remain significant, accounting for approximately 3.4% of India's GDP in the fiscal year 2024-25[50]. This underscores the sector's pivotal role in driving the country's economic progress.

Foreign Direct Investment (FDI) continues to be a strong pillar for the sector, with total investments in construction development and infrastructure reaching approximately US$ 60.06 billion from April 2000 to December 2023. Of this, US$26.54 billion was directed towards construction development, while US$33.52 billion was invested in infrastructure.

Looking ahead, India is committed to improving its Logistics Performance Index ranking to 25 and reducing logistics costs from 14% to 8% of GDP over the next five years. These ambitious goals highlight the government's strategic focus on enhancing efficiency and competitiveness in the sector.

## B Employment scenario

The infrastructure sector is a vital contributor to India's employment landscape with an estimation of 9.8 million jobs to be created in FY25[51]. This underscores the sector's critical role in providing job opportunities across the country.

In the construction sector, the percentage of workers has increased to 13.0% in 2022-23 as compared to 12.1% in 2020-21[52]. This scenario opens significant potential for new entrants into the workforce, particularly as the sector continues to expand.

The Union Budget for 2024-25 has reinforced this commitment by announcing plans to upgrade 1,000 ITIs using a hub-and-spoke model[53]. This initiative is designed to align course content with current industry skill requirements and introduce new, relevant courses, thereby enhancing the quality of technical education and ensuring that graduates are well-prepared for careers in the infrastructure sector.

A new centrally sponsored scheme under the Prime Minister's package, set to be introduced in collaboration with state governments and industry partners, aims to skill 20 lakh first timers over the next five years. This ambitious initiative underscores the government's strong commitment to bridging the skill gap and ensuring a steady supply of skilled labor for the infrastructure sector.

While there is a recognized need for skilled labor, particularly certified professionals and those with specialized skills in operating advanced construction equipment and technologies, this also creates a promising landscape for upskilling and training initiatives. Addressing this skilled labor requirement is poised to unlock even greater potential in the sector, contributing to its sustained growth and the overall economic development of the country.

## C Key drivers of growth and government schemes

Government of India has made a substantial commitment to infrastructure development, significantly increasing the budget allocation to INR5 lakh crore (approximately US$60 billion) for FY2024, up from INR3.7 lakh crore in FY2023. This investment aligns with the objectives of the National Infrastructure Pipeline (NIP), which oversees projects worth INR108 trillion (approximately US$1.3 trillion) at various stages of implementation, all aimed at enhancing the country's infrastructure.

The sector is also embracing emerging technologies such as smart construction, digital infrastructure, and renewable energy solutions, which are set to drive both efficiency and sustainability in infrastructure development.

Several major government initiatives are in place to support sustainable infrastructure development:

- **National Infrastructure Pipeline (NIP):** Focused on improving infrastructure quality while promoting green practices, the NIP plays a crucial role in the nation's long-term growth strategy.
- **PM Gati Shakti:** This initiative is accelerating the construction of national highways, with a target to complete 200,000 km by 2025, significantly enhancing connectivity.
- **UDAN Scheme:** Designed to improve air connectivity to underserved regions, the UDAN Scheme has operationalized 415 routes and 66 airports, fostering regional development.
- **Sagarmala Project:** Aimed at enhancing port connectivity and logistics, the Sagarmala Project has attracted significant investments, boosting cargo handling capacity and overall maritime infrastructure.

- **India Infrastructure Project Development Fund (IIPDF):** Supporting Public-Private Partnership (PPP) projects, the IIPDF provides financial assistance for project development expenses, encouraging private sector participation in infrastructure projects.
- The government is proactively addressing these areas to ensure sustained progress. The establishment of the Urban Infrastructure Development Fund (UIDF) with an annual outlay of INR10,000 crores is a testament to these efforts, targeting the improvement of urban infrastructure and quality of life in cities.
- To further bolster infrastructure development, the government has introduced diverse financial instruments aimed at mobilizing substantial resources for various projects. These include Infrastructure Debt Funds (IDFs), Real Estate Investment Trusts (REITs), and tax-free bonds, all contributing to a more dynamic and resilient financing ecosystem.

Collectively, these comprehensive policies and initiatives underscore the government's strong commitment to advancing India's infrastructure landscape, overcoming existing challenges, and paving the way for sustained economic prosperity.

## 3.3.2 International benchmark

India has achieved remarkable progress in its infrastructure sector, as evidenced by its improved ranking in the World Bank's Logistics Performance Index (LPI). In 2023, India advanced to 38th place out of 139 countries, up from 44th in 2018. This significant improvement reflects the effectiveness of key government initiatives such as PM Gati Shakti and the National Logistics Policy, both of which are focused on enhancing the nation's soft and hard infrastructure. Furthermore, India has made substantial progress in the International Shipments category, climbing from 44th in 2014 to 22nd in 2023, driven by successful modernization and digitalization efforts within the logistics sector[54].

In addressing job roles and skills within the infrastructure sector, international best practices offer valuable insights:

**Long-term strategic planning:** Countries like the UK and Australia emphasize the importance of long-term strategic infrastructure planning, which aligns workforce skills with future needs, ensuring the sector remains adaptable and prepared for upcoming challenges[55].

**Skill development roadmaps:** The UK's National Infrastructure Commission provides a comprehensive roadmap for future skill requirements, allowing educational institutions to tailor their curricula to meet these evolving demands.

**AI and efficiency:** Germany and the USA are at the forefront of leveraging artificial intelligence (AI) to optimize construction processes and project management, enhancing efficiency and reducing costs.

**Sustainable practices:** The Netherlands and Scandinavian countries are leaders in integrating green building technologies and renewable energy into infrastructure projects. This focus on sustainability is driving the development of green skills through specialized training programs, creating new job roles such as sustainability consultants and green building specialists.

India's continued emphasis on adopting such best practices, coupled with its commitment to modernization and sustainability, positions the nation to further enhance its infrastructure sector while simultaneously fostering the development of a skilled, future-ready workforce.

## 3.3.3 Sectoral trends

### A Emerging technologies in the sector

The infrastructure sector is undergoing a dynamic transformation, driven by the adoption of Industry 4.0 technologies. These key emerging technologies are setting the stage for enhanced efficiency, safety, and sustainability across various infrastructure projects:

**Internet of Things (IoT):** The IoT facilitates a network of interconnected devices and sensors that collect and exchange data, enabling real-time monitoring and decision-making in infrastructure projects. For example, real-time monitoring allows for the early identification of potential issues, enabling proactive maintenance and minimizing downtime.

**Big data analytics:** By analyzing large sets of data, big data analytics enhances forecasting, risk management, and operational efficiency, leading to more

informed decisions in infrastructure development.

**Autonomous robots and drones:** These technologies are increasingly being used for surveying, inspection, and maintenance tasks, improving safety and efficiency on construction sites.

In ports, digitalization is revolutionizing operations and boosting efficiency, while in the power sector, AI and machine learning are optimizing energy generation and grid security. The transportation sector is benefiting from AI systems that enhance road safety and monitor infrastructure conditions, and water management is seeing improvements through real-time monitoring and predictive analytics. In the oil and gas industry, digital communication technologies are enhancing asset management and predictive maintenance.

While the integration of these advanced technologies presents challenges, such as the need for a skilled workforce and the implementation of robust cybersecurity measures, these are also opportunities for growth and innovation. As India continues to invest in its infrastructure, fostering public-private partnerships and enhancing digital connectivity will be pivotal in driving these advancements forward, ultimately improving the quality of life for its citizens.

## B Workforce trends

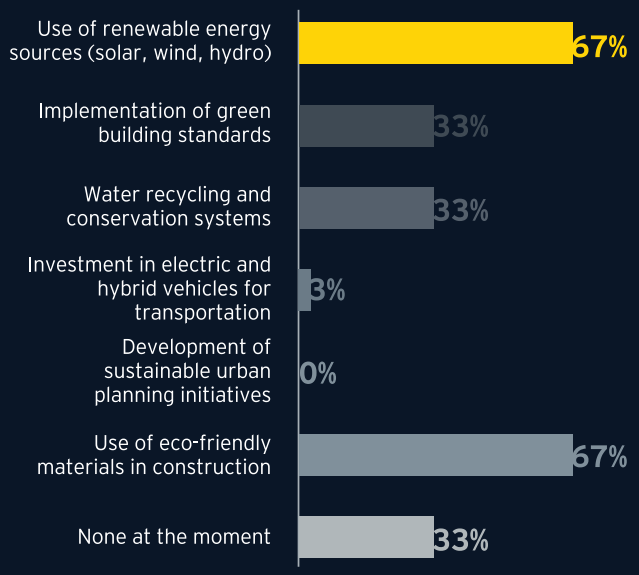
According to the National Skill Development Council (NSDC), the real estate sector is a major employer, which includes both skilled and unskilled labor. The infrastructure sector complements this by employing a large section of the workforce. Among the 71 million individuals working in the construction industry, there are approximately 4.4 million core skilled workers, including engineers, technicians, and clerical staff, alongside 6.9 million employees who have received vocational training.

The demand for freshers across various sectors has increased by 5% over the past six months, signaling a positive recovery in hiring trends. This uptrend is bolstered by improvements in the IT sector, which also has a beneficial impact on infrastructure-related roles. As the industry evolves, specialized certifications such as Project Management Professional (PMP) and LEED accreditation are becoming increasingly valuable for roles focused on sustainability and project delivery.

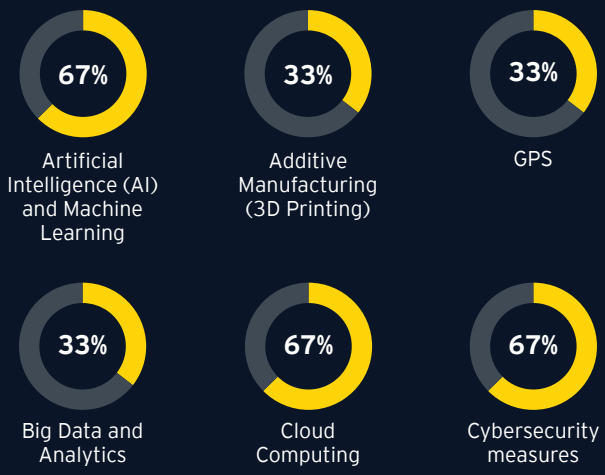
While there are challenges in workforce development, particularly in bridging the skill gap between current capabilities and the needs of modern infrastructure projects, these challenges also present opportunities for growth. The gap is especially pronounced in areas related to sustainable practices and advanced technologies, where there is significant potential for upskilling. The National Federation of Independent Business (NFIB) has noted that 43% of business owners report job openings that are difficult to fill, underscoring the need for targeted training and development programs.

Retention remains an area for improvement, as high turnover rates can disrupt project continuity and increase training costs. However, addressing these challenges with strategic workforce development initiatives will enhance the sector's resilience and contribute to its ongoing success.

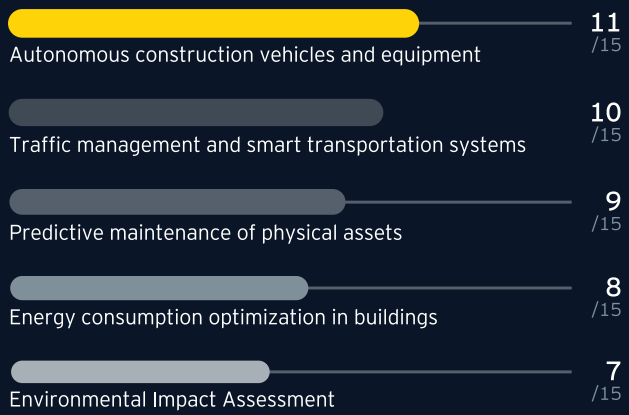
## Sustainable practices the organizations in the secor have adopted



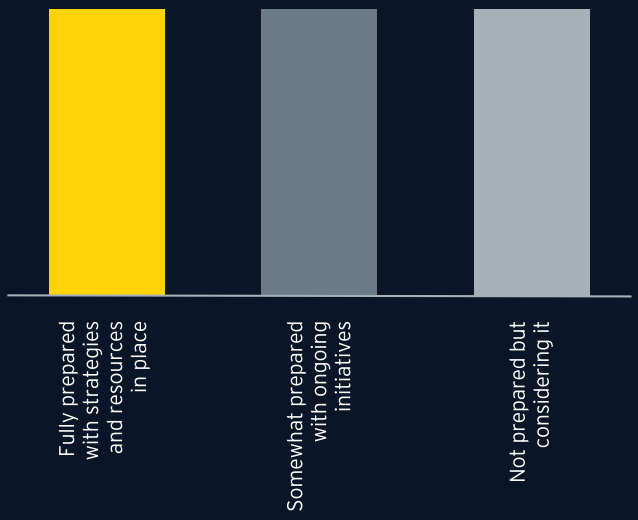

## Utilization of any of the Industry 4.0 technologies



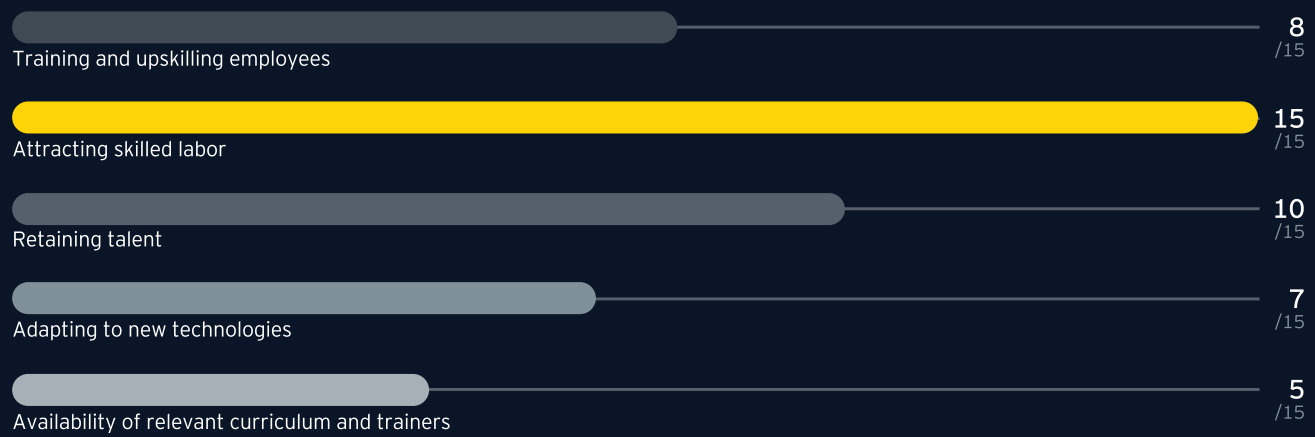

## Areas of infrastructure sector where AI is expected to have the greatest impact




## Preparedness level of organizations to adopt AI and Gen AI technologies




## Biggest challenge in workforce development in infrastructure operations



## 3.3.4 Future of jobs: insights from industry leaders

### A Emerging job roles in the sector

Based on the survey conducted with industry leaders in the infrastructure sector, several emerging job roles are anticipated within the next decade. These roles are primarily driven by advancements in technology, sustainability and the increasing complexity of infrastructure projects. The following key job roles are expected to see significant growth:

- **AI and Machine Learning specialists:** With the increasing adoption of AI and machine learning, there will be a high demand for specialists who can develop, implement, and manage these technologies within the infrastructure sector as per 67% of the respondents.
- **Renewable energy technicians:** 67% of the respondents believe that as the focus on sustainability intensifies, there will be a growing need for technicians skilled in the installation, maintenance and optimization of renewable energy systems.
- **Sustainable infrastructure engineers:** Engineers with expertise in sustainable design and green technologies will be crucial as the sector moves towards more environment friendly practices as per 33% of the respondents.
- **Smart City planners:** 33% of the respondents believe that the development of smart cities will create a demand for planners who can integrate IoT, AI, and other advanced technologies into urban infrastructure.

### B Impact of GenAI, AI, sector-specific technology, international mobility, DPI, climate, and green jobs on the job and skilling ecosystem

The infrastructure sector is on the cusp of significant transformation due to several technological and environmental factors:

- **AI and GenAI:** AI is expected to have a moderate impact on the infrastructure sector over the next two years, with key areas including autonomous construction vehicles, traffic management systems, and predictive maintenance. However, challenges such as the lack of technical skills (100% of respondents' observation) and high costs of implementation (33% of respondents' observation) may slow adoption.
- **Sector-specific technology:** Technologies like cloud computing and cybersecurity are already in use by 67% of respondents, and there is a growing interest in integrating more advanced tools like AI, 3D printing, and smart sensors. The sector is still lagging in the adoption of IoT and robotics, which presents opportunities for future growth.
- **Climate and green jobs:** The sector's move towards sustainability is evident, with 67% of respondents using renewable energy sources and eco-friendly materials in construction. However, the creation and filling of green jobs face challenges such as the lack of qualified candidates and resistance to changing traditional practices, as 1/3rd of the respondents observing this.
- **International mobility:** As infrastructure projects become more global, skills related to international trade and logistics are becoming increasingly important, with 67% of respondents recognizing the need for these competencies.

### C Suggested programmatic and policy interventions

To meet the evolving needs of the infrastructure sector, both industry leaders and the government need to take the following actions:

#### Industry initiatives

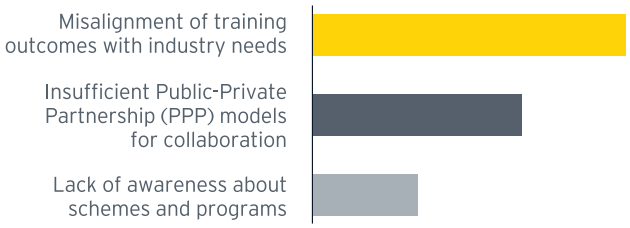
- **Reskilling and upskilling:** With the anticipated impact of AI and other technologies, 67% of the respondents agree reskilling and upskilling programs to be essential to prepare the workforce for new roles and responsibilities
- **Sustainability practices:** 67% of the respondents confirmed that their organization has adopted sustainable practices such as use of renewable energy sources (solar, wind, hydro) and eco-friendly materials in construction followed by water recycling and implementation of green building standards

#### Government Intervention

- **Financial incentives:** 100% of respondents identified the need for financial incentives for green investments. The government should introduce subsidies and tax credits to encourage the adoption of sustainable practices

- Support for technology adoption: While 67% of respondents find current policies somewhat effective, there is a clear demand for more targeted support, especially in providing grants for new technology and training employees
- 100% of the respondents believed that the skilling institutions should focus on sector specific technology interventions

### Challenges infrastructure companies face in collaborating with educational and skilling institutions




The future of jobs in the infrastructure sector is heavily influenced by advancements in AI, sustainability and global mobility. There is a clear need for strategic interventions from both the industry and the government to address skill gaps, promote technology adoption, and ensure sustainable development. The anticipated job roles and required skills highlight the evolving landscape of the sector, where technology and sustainability will play pivotal roles in shaping the workforce of tomorrow.

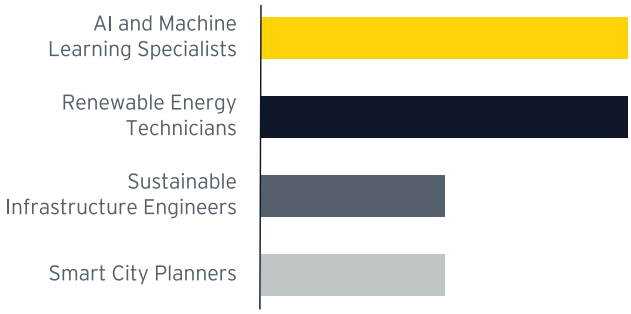
## 3.3.5 Overall impact on job roles and skills in the sector

As the infrastructure sector continues to integrate new technologies and sustainable practices, job roles are undergoing significant evolution. There is a growing demand for positions cantered on project management, data analysis, and environmental compliance, reflecting the sector's shift towards modernization and sustainability.

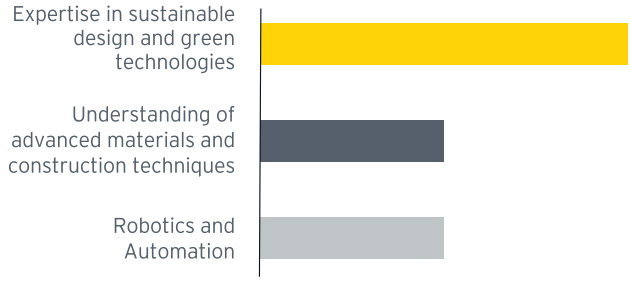
New roles, such as data centre engineers and site reliability engineers (SREs), are emerging, requiring specialized expertise in cloud technologies and automation. While the rise of automation and artificial intelligence (AI) may lead to a reduction in jobs involving routine and repetitive tasks, such as manual server provisioning and configuration management, it also opens the door to new opportunities. The demand for skills in AI, automation, and sustainable practices will increase, highlighting the need for continuous learning and adaptation within the workforce.

As automation streamlines manual tasks, the emphasis will shift towards skills that are uniquely human and difficult for machines to replicate, such as problem-solving, critical thinking, and adaptability. Despite the challenges posed by technological advancements, the ongoing investment in infrastructure and the transition to sustainable practices are expected to generate long-term employment opportunities, particularly for those with the right skills and qualifications.

### Emerging job roles in infrastructure sector




### Skill sets that will be most in demand for future infrastructure job roles




This evolving landscape underscores the critical importance of preparing the workforce to meet the future demands of the infrastructure sector, ensuring that they are well-equipped to thrive in a rapidly changing environment.

## 3.4 Energy

The energy sector in India is a dynamic and rapidly evolving segment of the economy, playing a crucial role in supporting the country's development and growth aspirations. It is characterized by a diverse mix of coal, oil, natural gas, renewable energy sources and nuclear power, along with energy efficiency and management services, and energy storage and battery solutions. The government has been actively promoting the adoption of renewable energy through ambitious targets and policy support, leading to an increase in solar and wind energy installations. The energy sector is also undergoing reforms aimed at improving efficiency and reducing carbon emissions. With a large and growing population, the demand for energy in India is expected to continue to rise, presenting both challenges and opportunities for the sector's expansion and modernization in emerging technologies.

### 3.4.1 Macroeconomic trends

#### Key statistics

India is the third-largest producer and consumer of electricity globally, boasting an installed power capacity of 442.85 GW as of April 30, 2024. The country's growing population, coupled with increasing electrification and rising per-capita usage, will continue to drive this upward trajectory.

> In 2023, power consumption in India recorded a robust 9.5% growth, reaching 1,503.65 billion units (BU)[56].

The energy sector is a cornerstone of India's economy, playing a pivotal role in both GDP and employment.

India is the third largest energy consuming country in the world[57]

It has attracted substantial foreign direct investment (FDI), with total inflows amounting to $18.28 billion between April 2000 and March 2024, representing 2.69% of India's total FDI inflow

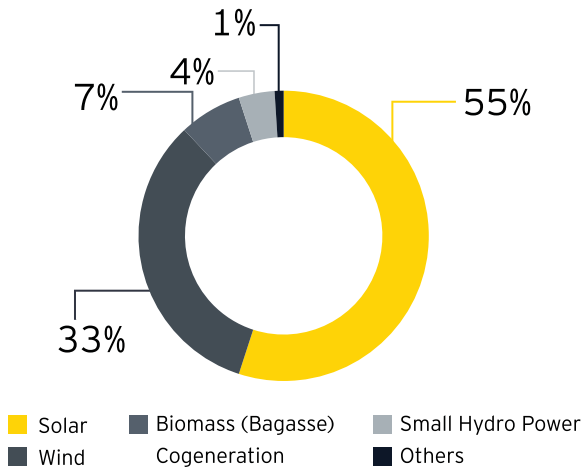
Solar generation in India increased significantly from 7.45 BU in 2015-16 to about 102 BU in 2022-23 at a CAGR of 45.3%[58]

Gross electricity generation in India has increased from 747.07 BU in 2008-09 to 1624.47 BU in 2022-23, at a CAGR of about 5.7%

India's installed renewable energy capacity is expected to increase from 135 GW in December 2023 to about 170 GW by March 2025

India is making significant strides in the global shift towards renewable energy, with a commitment to achieving net-zero carbon emissions by 2070. India plans to add a considerable amount of renewable energy capacity annually over the next five years, a strategy that is expected to generate millions of new jobs within the sector[59]. This ambitious growth trajectory highlights India's leadership in advancing renewable energy and underscores the potential for substantial employment opportunities.

**India Renewable Energy Mix (2024)**




## B Employment scenario

Employment in the energy sector is set to expand significantly. By 2030, global job numbers in the industry are projected to reach 139 million, with renewable energy alone contributing 38.2 million jobs and other energy transition technologies accounting for 74.2 million[60].

> In India, the sector employed nearly 1 million people in 2022, with a notable portion engaged in renewable energy projects. Solar PV, the fastest-growing segment, employed 2.82 lakh people in both on-grid and off-grid systems, with grid-connected solar PV jobs increasing by an impressive 47% to 2.01 lakh in 2022.

Hydropower continues to be the largest employer within the sector, with 4.66 lakh jobs. The wind sector also plays a vital role, providing 40,000 jobs, nearly half of which are in operations and maintenance. Overall, the solar and wind sectors employed 1.64 lakh workers in FY2022, reflecting a remarkable 47% increase from FY2021. This growth is largely driven by India's expanding renewable capacity, particularly in solar, which saw a record addition of 13.5 GW in 2022.

The government's ambitious target of achieving 500 GW of non-fossil fuel capacity by 2030 is projected to generate over 2 million jobs in the renewable energy sector.

## C Key drivers of growth and government schemes

The energy sector in India is experiencing remarkable growth, fueled by government policies, technological advancements and the rising demand for sustainable energy. In recognition of the sector's importance, the government has allocated INR19,100 crore to the

Ministry of New and Renewable Energy in the Union Budget 2024-25, with a significant INR10,000 crore earmarked specifically for solar energy projects[61]. This reflects a 110% increase in budgetary allocation for solar initiatives compared to the previous year, underscoring the government's commitment to energy security and the promotion of innovative solutions such as pumped storage projects for electricity[62].

Key government initiatives are:

- **The National Infrastructure Pipeline (NIP)** has projected a substantial infrastructure investment of INR111 lakh crore during 2020-2025, with approximately 24% dedicated to the energy sector. Within this framework, an investment of INR9.295 lakh crore is projected for renewable energy, aiming to achieve an installed capacity of 265.73 GW by December 2025
- **The National Green Hydrogen Mission (NGHM)** is anticipated to create approximately 6 lakh jobs across the green hydrogen value chain by 2030[63], spanning electrolyzer and component manufacturing as well as green hydrogen production, highlighting the sector's commitment to sustainable energy solutions
- **The Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)** and the Integrated Power Development Scheme (IPDS), are driving progress along with strong emphasis on solar and wind energy
- Additional government initiatives, such as the **Production Linked Incentive (PLI)** scheme for high-efficiency solar PV modules and the National Programme on High-Efficiency Solar PV Modules, are expected to enhance domestic manufacturing capabilities and generate numerous job opportunities in the solar energy sector underlining its potential for significant job creation and its transformative impact on the energy landscape

These initiatives highlight the sector's dynamic growth and its critical role in shaping India's sustainable future.

## 3.4.2 International benchmark

### Ranking of India against global indices

India is currently ranked 63rd on the Global Energy Transition Index (ETI), which assesses countries based on their readiness for energy transition, considering factors such as economic development, environmental sustainability and energy security. This ranking highlights India's significant strides in enhancing energy equity, security and sustainability, driven by a strong emphasis on renewable energy. As of 2023, India stands as the third-largest solar power generator globally, boasting an installed solar capacity exceeding 65 GW.

### International best practices

International best practices for integrating AI with sustainability in the energy sector emphasize several critical areas for effective implementation and long-term impact. AI significantly enhances efficiency through smart grids that enable real-time energy management and optimization. Predictive maintenance powered by AI helps reduce downtime and operational costs. Demand response systems optimize energy usage, while advanced algorithms improve renewable energy forecasting and energy storage management. The adoption of green technologies and robust cybersecurity measures is also crucial. Global collaboration plays a vital role in sharing policy frameworks and technological advancements, fostering innovation and resilience in the energy sector[64]. Leading examples include Denmark and Germany, which excel in integrating AI with sustainability through AI-driven green finance strategies and consistent renewable energy policies[65].

## 3.4.3 Sectoral trends

### Emerging technologies in the sector

The future skills demand in the energy sector is anticipated to centre around renewable energy technologies, energy storage, and digital skills. Government programs including the Green Energy Corridor Projects and the Solar Energy Corporation of India (SECI), will play a vital role in addressing these needs through skilling institutions and apprenticeship programs.

Some of the emerging technologies in the sector are enumerated below-

**Solar energy innovations:** Solar photovoltaic systems, wind turbines, and other renewable energy technologies are becoming more efficient and cost-effective. Innovations like floating solar farms and offshore wind turbines are opening new possibilities for energy generation.

**Smart grids and smart meters:** The adoption of smart grids and smart meters can improve energy efficiency and manage demand. The integration of smart grids with IoT devices allows for real-time monitoring and management of energy flow. This leads to increased grid stability, optimized energy distribution, and the facilitation of distributed energy resources.

**Energy storage solutions:** The energy storage technologies include advanced battery systems and pumped hydro storage projects.

**Electric mobility:** The rise of EVs is driving the need for more efficient batteries and charging infrastructure. Vehicle-to-grid (V2G) technology also allows EVs to return energy to the grid during peak demand.

**Digitalization and AI:** The use of AI, machine learning, and data analytics is growing in energy sector for predictive maintenance, load forecasting and optimizing grid operations.

As the sector adopts new technologies and transitions towards more sustainable energy production and distribution, technical proficiency and critical thinking skills become increasingly essential.

## B Workforce trends

The Indian energy sector is undergoing a dynamic transformation as it moves towards cleaner, more advanced energy solutions. This transition is not only creating new job opportunities but also facilitating workforce mobility from traditional roles to emerging green jobs in solar, wind and energy storage. Some of the workforce trends in the energy sector:

**Increasing demand for renewable energy skills:** As India aggressively pursues renewable energy targets, there is a growing need for professionals with expertise in solar, wind, hydro, and biomass energy technologies. This includes roles in project planning, installation, operation and maintenance.

**Diversification of roles:** The energy sector is no longer limited to conventional roles. It now encompasses a variety of positions in areas such as energy storage, smart grid technology, energy efficiency, and electric vehicle infrastructure.

**Adoption of digital tools:** As digital technologies become integral to energy operations, there is a higher demand for professionals skilled in data analytics, cybersecurity, and software development within the energy domain.

**Regulatory and policy expertise:** As the energy sector evolves, there is a need for professionals who understand the regulatory and policy aspects of energy, including international agreements.

The sector demonstrates significant potential for workforce growth, with 62% of employers planning to expand their workforce during the first half of FY 2024-25. This anticipated growth is driven by the sector's transition towards a low-carbon future, supported by increased capital expenditure, incentives for clean

energy, and private sector investment. Embracing these trends will not only support the sector's evolution but also contribute to its continued success and resilience.

## 3.4.4 Future of jobs: insights from industry leaders

### A Emerging job roles in the sector

The energy sector is expected to witness the creation of several new job roles in the coming years. Key roles identified include:

- **Renewable Energy technicians:** 40% of respondents anticipate growth in this role, reflecting the sector's shift towards renewable energy sources.
- **Smart Grid analysts:** Also expected by 40% of respondents, this role will be crucial in managing the increasingly complex grid systems.
- **Sustainability managers:** With a focus on environmental impact, 40% of respondents foresee the need for roles dedicated to managing sustainability initiatives.
- **Carbon Capture technicians:** As carbon management becomes a priority, this role is expected to grow, indicated by 40% of respondents.

These roles will require specialized skills in renewable energy technologies, energy storage solutions, and energy data analytics.

### B Impact of GenAI, AI, sector-specific technology, international mobility, DPI, climate, and green jobs on the job and skilling ecosystem

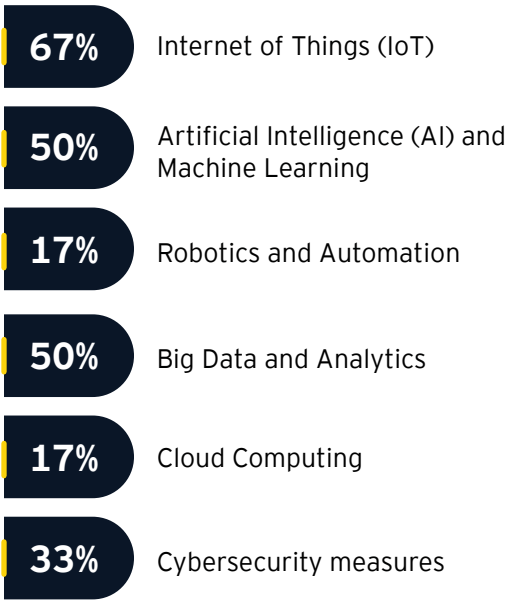
The energy sector is on the cusp of significant transformation due to several technological and environmental factors:

**AI and GenAI:** AI and GenAI are expected to have a profound impact on the Energy sector, particularly in areas like renewable energy forecasting, predictive maintenance, and energy consumption analytics. However, there are challenges such as the technical complexity of integration, high costs, workforce resistance, and a lack of technical skills, with 60% of respondents citing these concerns.

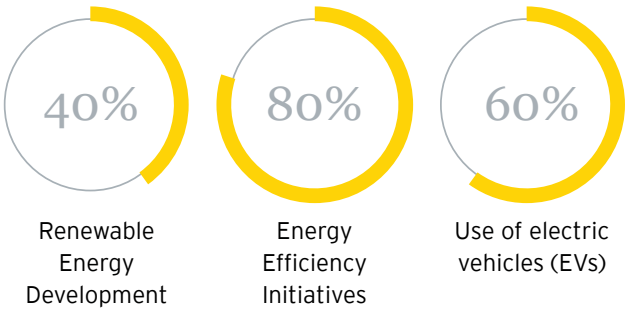
**Sector-specific technology:** Technologies like the Internet of Things (IoT), AI, and Machine Learning (ML) are already in use, with 67% and 50% of respondents utilizing these, respectively. However, the adoption of more advanced technologies like robotics, additive manufacturing, and cloud computing remains limited.

**International mobility:** Skills related to international trade, logistics, and cross-cultural competencies will become increasingly important. 60% of respondents believe that these skills will be crucial as the sector becomes more globally integrated.

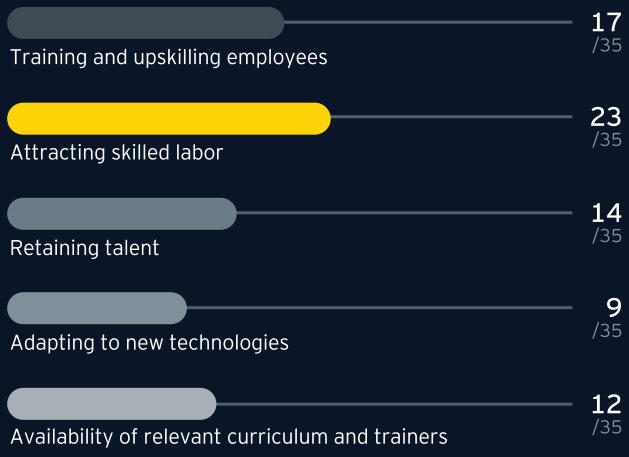
**Utilization of any of the Industry 4.0 technologies**



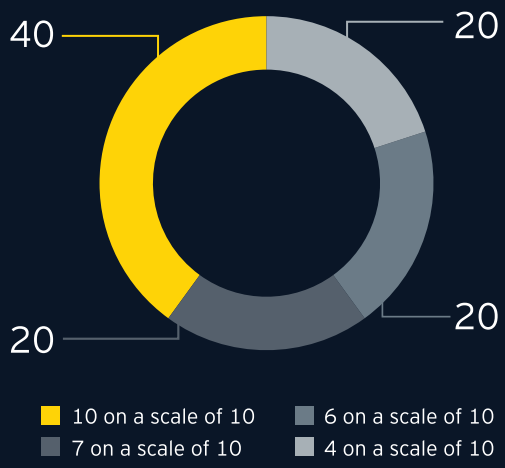

**Sustainable practices organizations in the sector have adopted**



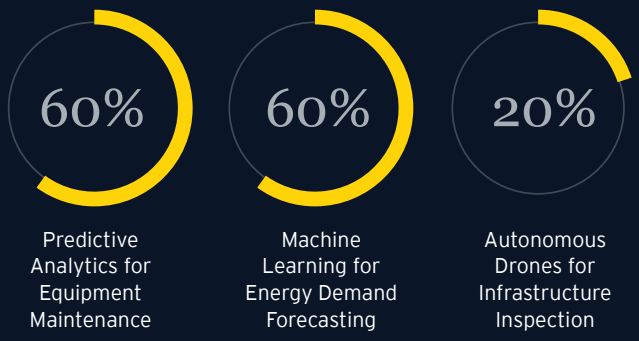
## Biggest challenge in workforce development in Energy operations



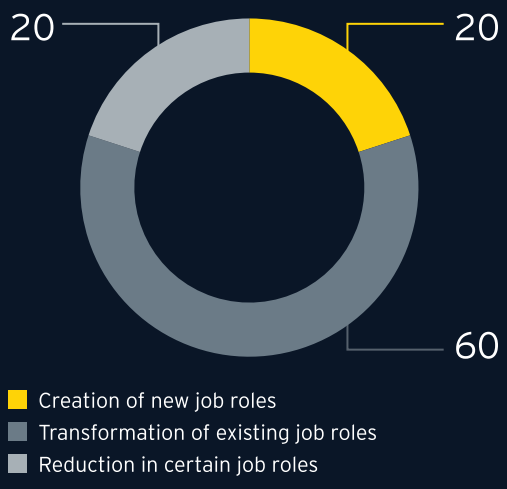

## Significance of positive impact of AI and Gen AI on the energy sector in the next two years




## AI applications are currently in use or planned for use in the sector

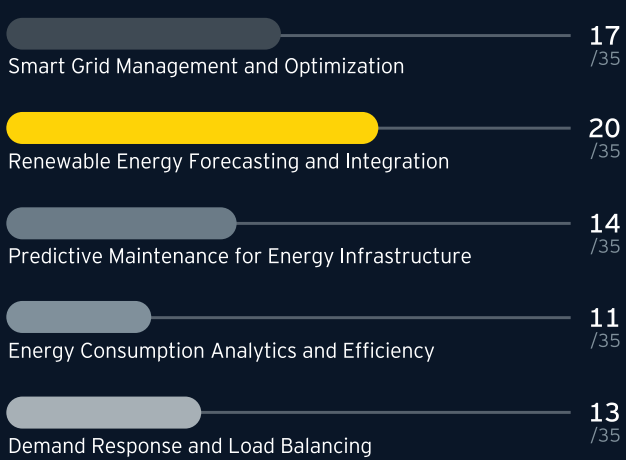



## Impact of adoption of AI had on job roles




## Anticipated challenges in integrating AI into existing energy systems


## Areas of Energy sector where AI is expected to have the greatest impact



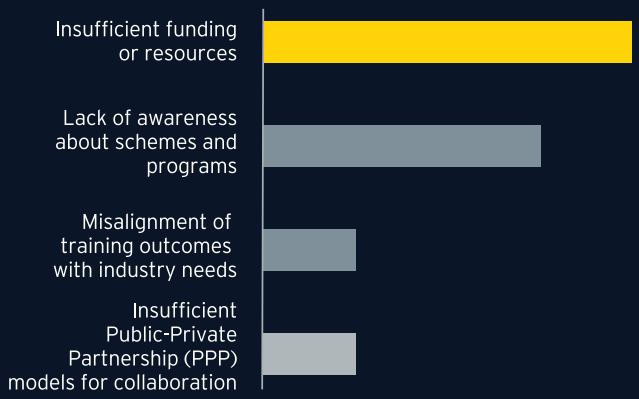
## Suggested programmatic and policy interventions

To meet the evolving needs of the energy sector, both industry leaders and the government need to take the following actions:

### Industry initiatives

- **Upskilling initiatives:** With 60% of respondents identifying the need for reskilling programs, industry leaders should prioritize upskilling the workforce to adapt to AI and other technological advancements.
- **Sustainability practices:** While energy efficiency initiatives are common (80% adoption), there is a need to expand the adoption of practices like smart grid technology and sustainable bioenergy.

**Challenges energy companies face in collaborating with educational and skilling institutions**




**Skills that will be crucial for future energy professionals for workforce mobility**

40% Multilingual communication abilities

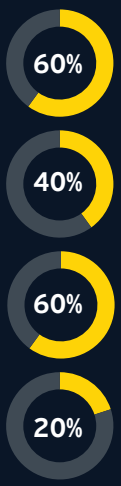
40% Cross-cultural competency and adaptability

60% International trade and logistics knowledge

40% Remote operation and telepresence skills

40% Global regulatory and compliance awareness

**Skill sets to be most in demand for future energy job roles**




Expertise in Renewable Energy Technologies

Proficiency in Energy Storage Solutions

Skills in Energy Data Analytics and AI

Knowledge of Environmental and Energy Policy

**Government incentives or subsidies can be/ have been most beneficial for technological advancements in the sector**


**How well do you think current educational curricula align with the skill requirements of the Energy sector**

**40%** Somewhat well

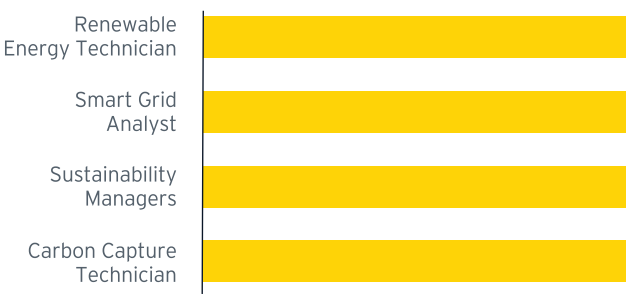
**60%** Neutral

The future of jobs in the energy sector will be shaped by the rapid adoption of AI, the transition to sustainable practices, and the increasing importance of international mobility. To harness these opportunities, both industry leaders and the government must work together to address the challenges of workforce development, technological integration and sustainability.

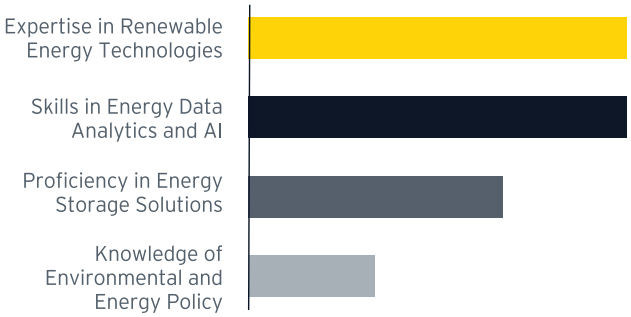
## 3.4.5
## Overall impact on job roles and skills in the sector

The energy sector in India is undergoing a significant transformation, driven by advancements in technology, a strong push towards sustainability, and evolving government policies. Primary and secondary research highlights a substantial shift in job roles towards renewable energy technologies, smart grid management, and sustainability-focused positions. Emerging roles such as Renewable Energy Technicians, Smart Grid Analysts, and Carbon Capture Technicians are gaining prominence, requiring specialized skills in AI, energy analytics, and environmental policy. This transition underscores the need for reskilling and upskilling programs to meet the sector's evolving demands.

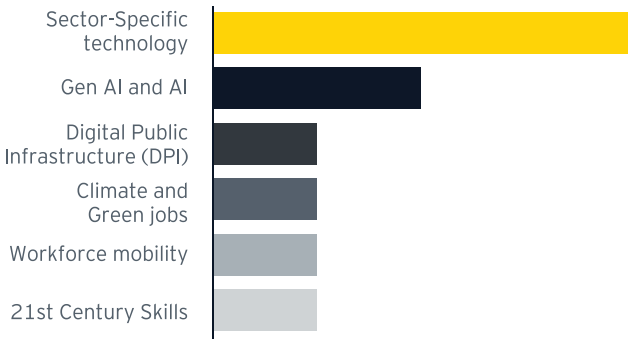
### Emerging job roles in energy sector




### Skill sets that will be most in demand for future energy job roles




### Areas skilling institutions need to focus on



# 3.5 FMCG

The Fast-Moving Consumer Goods (FMCG) sector in India is a cornerstone of the economy, playing a pivotal role in driving growth and embracing emerging technologies. As one of the largest sectors in the country, it is characterized by a diverse range of products including food and beverages, personal care, health care, household care and other consumables.

The sector is renowned for its resilience, often remaining buoyant even during economic downturns. The FMCG sector is witnessing a significant shift towards automation, data analytics, artificial intelligence, digital marketing and sustainable practices, adapting to the evolving consumer preferences and technological advancements. The adoption of these technologies is fostering a demand for skilled professionals adept in digital tools and data science. The convergence of technology and consumer goods is thus not only transforming the FMCG landscape in India but also acting as a catalyst for job creation across various skill levels and functions.

## 3.5.1 Macroeconomic trends

### A Key statistics

The FMCG (INFOGRAPHICS)

Market is expected to increase at a CAGR of 14.9% to reach US$220 billion by 2025, from US$110 billion in 2020[66]. As a cornerstone of India's economy, this sector significantly contributes 10% to the Gross Domestic Product (GDP).

Industry is expected to maintain a solid growth rate of 7-9% in 2024, driven by strong consumer demand[67].

Market, valued at $164 billion in 2023, is set to grow to US$1.09 trillion by 2032, reflecting a robust CAGR of 21.6%[1]. This positions India as the fourth largest FMCG market globally. India also ranks fifth in global manufacturing output, contributing 2.78% of the total.

Sector's diverse range includes a notable growth in the household and personal care segment, which increased from 32% in 2019 to 40% in 2020

Foreign investors are demonstrating substantial interest in the FMCG sector, with India attracting nearly US$991 billion in Foreign Direct Investment (FDI) from April 2000 to March 2024. In the most recent year, FDI inflows amounted to US$70.95 billion, including US$44.42 billion in equity investments. This influx of foreign capital plays a pivotal role in driving innovation and expanding growth within the sector. As per data released by Department for Promotion of Industry and Internal Trade (DPIIT), Maharashtra has emerged as the leading state for FDI during 2023-24, reflecting its favorable investment climate. The FMCG industry continues to be a vital component of India's economic development, drawing sustained investment and contributing significantly to national prosperity.

### B Employment scenario

The FMCG sector currently employs approximately 3 million individuals, representing about 5% of the nation's total factory employment[68]. The Consumer Goods and Services vertical alone represented approximately 0.65 lakh tech jobs in FY 2022, with projections indicating a 1.7-fold increase in the next five years. The market size for this vertical was INR12.30 lakh crores in FY 22 and is expected to reach INR23.70 lakh crores by FY 27[69]. This substantial employment contribution underscores the sector's critical role in providing livelihoods and supporting the broader economy.

> Looking forward, the total revenue of FMCG market is expected to grow at a CAGR of 27.9% through 2021-27, reaching nearly US$615.87 billion[70].

This projected growth not only reflects the sector's potential for expansion but also its ability to generate significant employment opportunities. The creation of these new jobs will be instrumental in accommodating the increasing workforce, enhancing economic stability, and fostering inclusive growth. The sector's expanding employment base is a testament to its dynamic nature and its crucial role in driving economic development in India. As the industry evolves, its impact on employment and economic growth is expected to strengthen, further establishing it as a cornerstone of the Indian economy.

## Key drivers of growth and government schemes

In the 2023-24 budget, the government demonstrated significant support for the food processing industry by allocating INR3,287.65 crores. This investment reflects the government's commitment to enhancing the sector's growth and development.

The Indian government has introduced several programs and policies to support the FMCG sector's growth. Key initiatives include:

- **Foreign Direct Investment (FDI):** The Indian government permits 100% FDI in food processing and single-brand retail, and 51% in multi-brand retail. These policies are designed to enhance employment, improve supply chains, and increase the visibility of FMCG brands in organized retail markets, thereby stimulating consumer spending and supporting new product launches.
- **Goods and Services Tax (GST):** The introduction of GST has streamlined tax rates for many FMCG products, reducing the overall tax burden. This reform modernizes logistics and pricing strategies, contributing to the affordability of essential FMCG items for consumers.
- **Rural development initiatives:** Given the significant contribution of rural markets to FMCG sales, the government has focused on rural welfare through infrastructure improvements and agricultural support. These initiatives aim to boost rural demand, which is essential for FMCG growth.
- **Gati Shakti and Amrit Kaal Vision 2047:** Aims to improve infrastructure and operational efficiency within the sector[71].
- **Production Linked Incentive (PLI) Scheme:** The Union government has approved a new Production Linked Incentive (PLI) scheme for the food processing sector with a budget allocation of INR109 billion (US$1.46 billion). This scheme, which provides incentives over six years until 2026-27, is intended to support sectoral growth.
- **Pradhan Mantri Kisan Sampada Yojana:** Enhances infrastructure for food processing.
- **Startup India Initiative:** Promotes entrepreneurship within the FMCG sector.

Government efforts are instrumental in advancing the FMCG industry in India, with substantial funding directed towards initiatives like the SETU project, which supports startups and innovation. Furthermore, an initial amount of INR1,000 crores (US$120.7 million) are being allocated to NITI Aayog for the SETU project. Additionally, programs such as the Pradhan Mantri Kisan SAMPADA Yojana and the PLI Scheme are pivotal for the sector's continued expansion. The strategic allocation of funds in the budget underscores the government's dedicated support for the industry's development, reinforcing its pivotal role in driving economic progress.

## 3.5.2 International benchmark

Some of the key international best practices in the FMCG sector are:

**Supply chain optimization:** Efficient supply chain management, including just-in-time inventory, accurate demand forecasting, and the use of technology for real-time visibility, is critical for reducing costs and ensuring timely delivery of products.

**Sustainability initiatives:** Implementing eco-friendly practices across the product lifecycle, such as sourcing sustainable raw materials, using recyclable packaging, and reducing energy consumption, is essential for meeting consumer expectations and regulatory requirements.

**Consumer-centric approach:** Understanding and anticipating consumer needs through market research and data analytics is key to developing products and marketing strategies that resonate with target audiences and foster brand loyalty.

**Innovation and R&D:** Continuous investment in research and development allows FMCG companies to innovate, adapt to changing consumer preferences, and maintain a competitive edge through new and improved products.

Digital transformation: Leveraging digital technologies for e-commerce, customer engagement, marketing, and operational efficiency helps companies to reach consumers effectively, gather valuable data, and streamline processes. Globally, FMCG leaders are thus adopting AI and Generative AI to enhance efficiency and consumer personalization. There is a growing demand for skills in data analytics, machine learning, and digital marketing professionals. Sustainable practices are gaining traction all over the world, with companies investing in green energy and resource management, creating new roles focused on sustainability. Training programs are increasingly being developed to upskill workforces in emerging technologies and sustainable practices, aligning with industry needs.

## 3.5.3 Sectoral trends

### Emerging technologies in the sector

The FMCG sector is rapidly adopting Industry 4.0 technologies to boost customer satisfaction, operational efficiency and innovation. Key technologies driving this transformation include Artificial Intelligence (AI), Big Data and Predictive Analysis, Digital Process Automation (DPA), and Cybersecurity.

AI is being leveraged for predictive analytics, enabling companies in the sector to accurately forecast demand and optimize production schedules, thus minimizing waste. Big Data allows FMCG companies to gain deep insights into consumer behavior, refining product

development and marketing strategies to enhance customer engagement and loyalty. Some notable use cases are mentioned below:

- Processes to streamline operations and improve customer engagement.
- Integrated digital processes to create a comprehensive product ecosystem for pet care, offering tailored recommendations based on health and behavioral data.
- Use of AI to analyse consumer data, including a skin analyser tool that uses AI to measure oxygen levels in facial skin[72].
- Use of AI for invitation-based online portal where consumers can provide real-time feedback on food innovations, which can be analyzed rapidly using AI technology

While AI and Generative AI significantly enhance supply chain efficiency, tailored sales, and product innovation, challenges such as data quality and a shortage of AI talent remain. The FMCG sector is also seeing a growing integration of Generative AI and advanced technologies in supply chain automation and predictive analytics. This trend is shaping recruitment strategies, emphasizing the need for tech-savvy professionals to drive efficiency and innovation[73].

The retail and consumer business unit, encompassing consumer goods and services, travel, logistics, and e-commerce, relies heavily on technology.

Key tech skills in the FMCG sector include Data Analytics, Digital Marketing, and E-commerce Platform Development. High-demand roles such as Data Analysts, Digital Marketers, and E-commerce Platform Developers are essential. Notably, Full stack Developers, UX Designers, and DevOps Engineers are seeing significant salary growth. The e-commerce vertical is anticipated to experience the highest growth in tech employment and market size, reflecting the ongoing digital transformation in the FMCG sector and the increasing need for tech talent.

### B Workforce trends

The FMCG sector is experiencing notable shifts in workforce dynamics, reflecting its evolving nature and the challenges in workforce development. There is a growing emphasis on candidates with a blend of technical and soft skills, including digital marketing, supply chain management, and research and development, alongside strong communication, leadership and problem-solving abilities[74].

Emerging roles such as supply chain sustainability analysts, digital marketing specialists, and data analysts are becoming more prevalent, highlighting the sector's focus on sustainability and digital transformation. Despite these advancements, challenges persist, including a shortage of skilled talent in digital technologies and sustainability. The rapid pace of technological change necessitates ongoing upskilling and reskilling, which can be resource intensive.

Workforce mobility is set to impact the FMCG job market, with professionals increasingly exploring opportunities across regions and companies. This mobility fosters a diverse and skilled workforce but poses challenges in talent retention and knowledge transfer. Companies that embrace flexible work arrangements and promote continuous learning are likely to attract and retain top talent, leveraging a broader talent pool through remote work.

The sector is projected to see moderate workforce growth, with 53% of employers planning to expand their workforce in the first half of FY 2024-25[75]. This growth is driven by the convergence of urban and rural markets, modern trade channels, rising disposable incomes, and expanded distribution networks.

## 3.5.4 Future of jobs- insights from industry leaders

### A Emerging job roles in the sector

The survey of the industry leaders in the FMCG sector indicates several new job roles are anticipated to emerge in the coming years:

**Data Scientist:** As companies increasingly rely on data-driven decision-making, 75% of the respondents believe that the demand for data scientists who can analyze and interpret large volumes of data will rise.

**AI and Robotics technician:** With the growing adoption of AI and automation, specialized roles in AI and robotics are expected to become more prevalent as per 75% of the respondents.

**Digital Marketing specialist:** 50% of the respondents agree that the expansion of digital platforms will drive demand for specialists in digital marketing to enhance online presence and customer engagement.

**Sustainability manager:** As per 25% of the respondents, as sustainability becomes a top priority, companies will need managers to oversee and implement eco-friendly practices.

**Supply chain analyst:** Optimizing supply chain operations, particularly with the integration of AI, will require more specialized analysts as per 25% of the respondents.

**Cybersecurity expert:** 25% of the respondents agree that the need for cybersecurity professionals will grow to protect sensitive information with increasing reliance on digital systems.

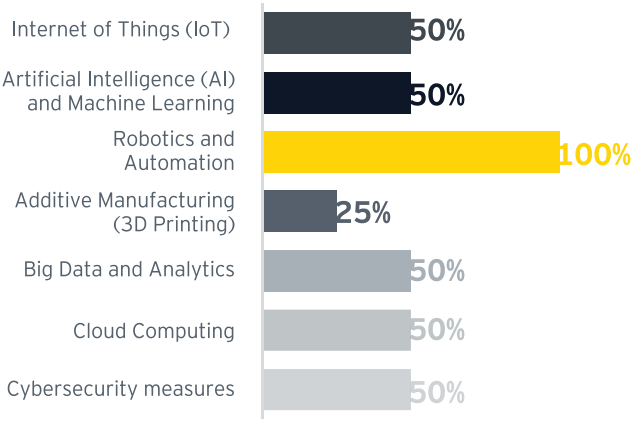
## B Impact of GenAI, AI, sector-specific technology, international mobility, DPI, climate, and green jobs on the job and skilling ecosystem

GenAI and AI integration: AI is expected to have a significant positive impact, with 75% of respondents anticipating major transformations in existing job roles, particularly in supply chain and logistics (75%) and production line work (50%).

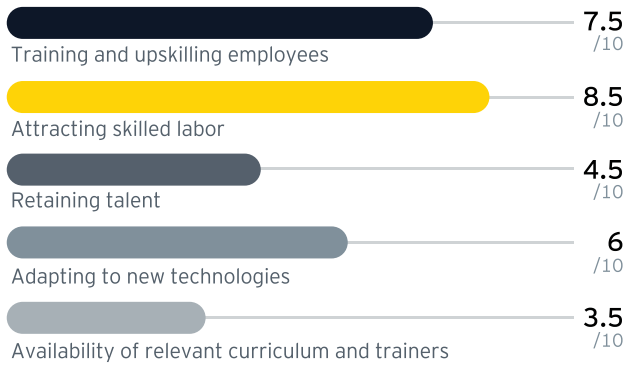
AI technologies are being employed in predictive analytics, supply chain optimization, quality control, and personalized marketing (50% each). This integration is driving the need for workforce reskilling and upskilling, as 50% of companies plan to focus on these areas.

- **Sector-specific technology:** The FMCG sector's adoption of Robotics and Automation (100%), IoT, AI/ML, Big Data, and Cloud Computing (50% each) is creating new opportunities and challenges. Companies will need to address technical complexity (75%) and data privacy concerns (75%) while investing in employee training to keep up with these technological advancements.
- **International mobility:** Skills related to cross-cultural competency and adaptability (75%) and international trade and logistics (75%) will be crucial as the workforce becomes more globally mobile.
- **Climate and green jobs:** With sustainability being a top priority (100%), roles related to sustainable business practices and green technologies will become essential. Challenges include economic feasibility (75%) and a lack of qualified candidates (50%) for these emerging green jobs.

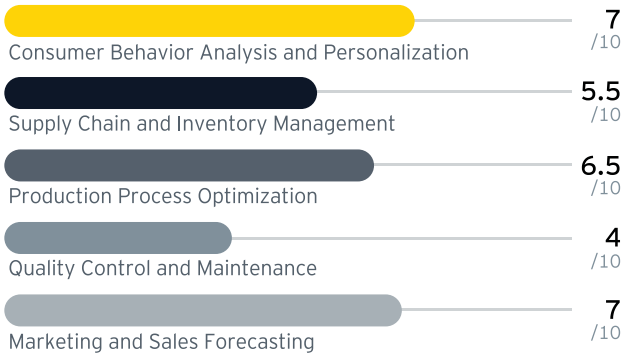
### Utilization of any of the Industry 4.0 technologies



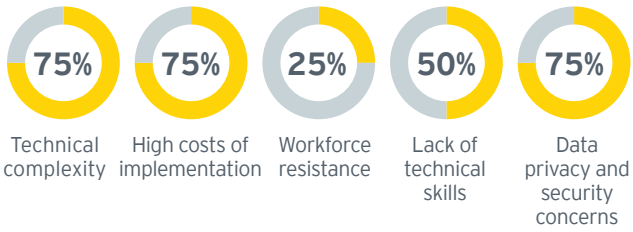

### Biggest challenge in workforce development




### Areas of FMCG sector where AI is expected to have the greatest impact




### Impact of adoption of AI had on job roles



### Anticipated challenges in integrating AI into existing FMCG sector

75% Transformation of existing job roles

25% Reduction in certain job roles

## C Suggested programmatic and policy interventions

### Industry initiatives

- **Government support for skilling:** Industry leaders unanimously agree (100%) that the government should play a supportive role in addressing skill gaps, partnering with the private sector to provide necessary training and education.
- **Sustainability incentives:** 80% of respondents find government incentives for adopting sustainable practices beneficial, but 67% see a need for more impactful incentives, particularly in green investments (75%).

### Government Interventions

- **Increased financial incentives:** Financial support for green investments (75%) and renewable FMCG (50%) is crucial to drive sustainability initiatives.
- **Support for gender diversity:** Providing childcare support services (50%) and offering upskilling and training opportunities (25%) are recommended to enhance gender diversity and inclusion.
- **Educational alignment:** Aligning educational curricula with industry requirements is critical, as 50% of respondents feel the current system does not meet the sector's needs.

This report outlines the expected evolution of job roles, the impact of technology and other factors on the FMCG sector, the regions likely to receive more funding, and the necessary interventions from both industry leaders and the government to prepare for future challenges. The focus is on leveraging existing strengths while addressing id

### Government incentives or subsidies can be/ have been most beneficial for technological advancements in the sector

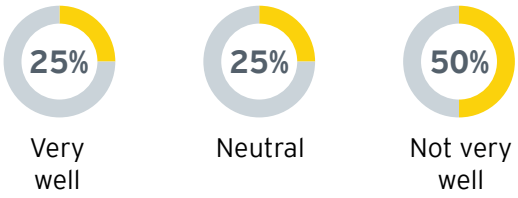
25% Tax credits for research and development

25% Grants for purchasing new equipment or software

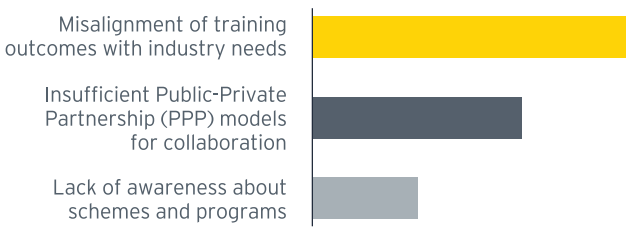
40% Subsidies for training employees in new technologies

80% Incentives for adopting sustainable practices

### How well do you think current educational curricula align with the skill requirements of the FMCG sector



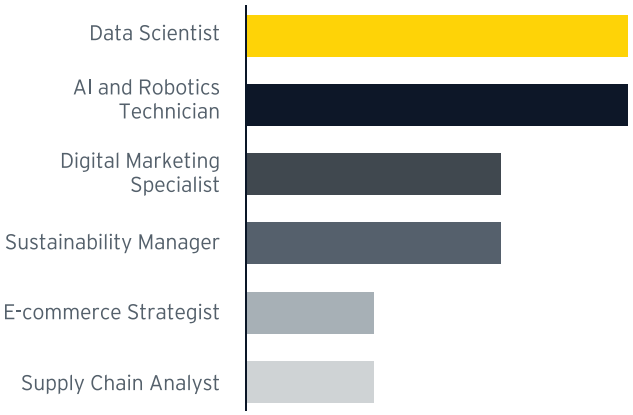

### Challenges FMCG companies face in collaborating with educational and skilling institutions



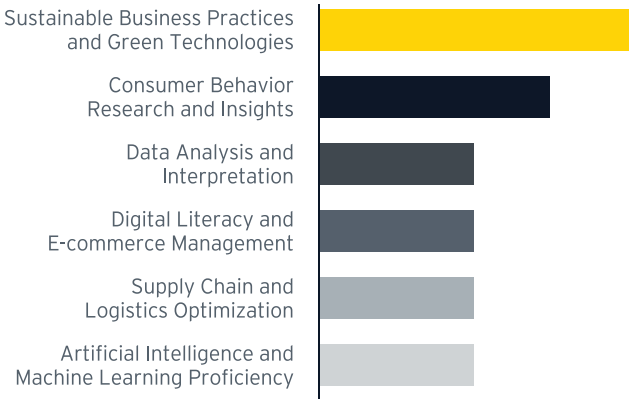
## 3.5.5
## Overall impact on job roles and skills in the sector

The FMCG sector's evolution is set to substantially impact job roles and the skills required. The rise of e-commerce and advancements in digital supply chain management are increasing the demand for expertise in digital marketing, e-commerce platforms, data analysis, logistics, and inventory management.

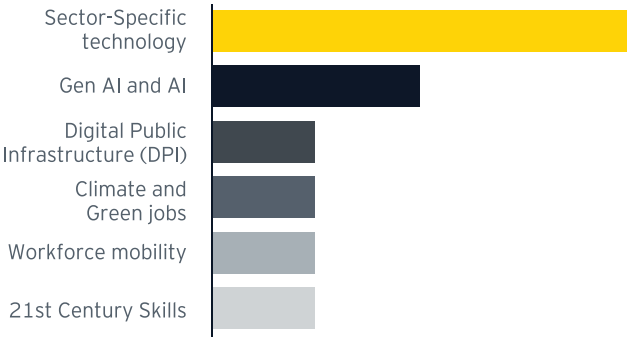
### Emerging job roles in FMCG sector




### Skill sets that will be most in demand for future FMCG job roles




### Areas skilling institutions need to focus on




With growing emphasis on sustainability and environmental impact, skills in green manufacturing, eco-friendly packaging, waste management and circular economy principles are becoming increasingly important. Furthermore, the integration of AI and automation into production processes is creating a heightened demand for workers skilled in robotics, automation, maintenance, data science and machine learning.

# 4

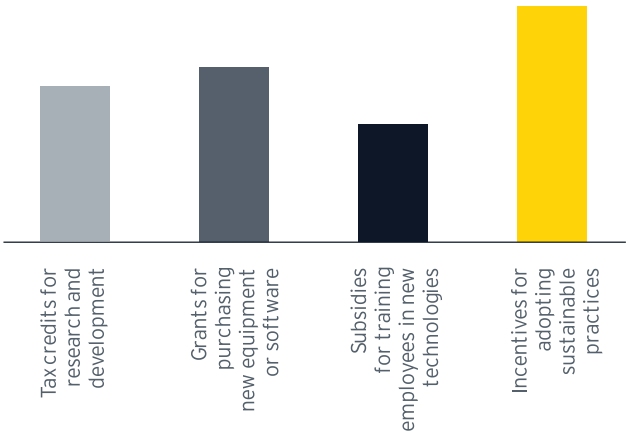
# Preparing for jobs of tomorrow

India's journey towards becoming a global economic powerhouse is deeply intertwined with the development of its workforce. As the demand for skilled professionals continues to grow, the challenge lies not just in imparting these skills but in creating a robust digital ecosystem that ensures their recognition, portability, and alignment with evolving industry needs.

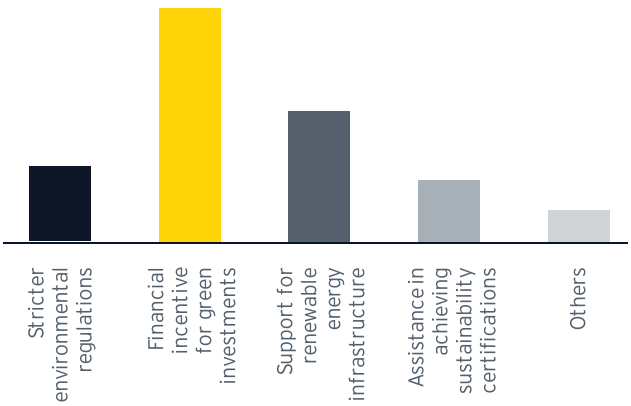
## 4.1 Preparing for jobs of tomorrow

One of the important lens in the study was to find the views of the industry on the role of government policies in skilling and employment ecosystem. As technological advancements are transforming business operations at an accelerated pace and climate concerns and international mobility taking precedence, adopting policy reforms becomes an inevitable aspect. Various government schemes are committed to youth development and skilling. However, the survey also reflected that there are gaps remaining in technology adoption by industry and availability of skilled manpower remains a huge challenge. Enumerated below are few suggestions derived from research which can assist policy makers to improve future investments in policy-

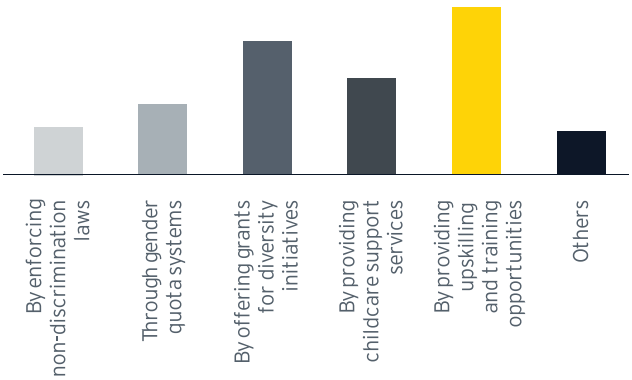
- 65% of the respondents found current government policies to be either very effective or somewhat effective in promoting technology adoption in their respective sectors.
- Respondents (48%) largely believed the government has been somewhat responsive to the evolving needs of their sector followed by neutral response.
- The government incentives or subsidies that can be/have been most beneficial for technological advancements in organizations have been incentives for adopting sustainable practices followed by grants for purchasing new equipment or software.




- Industry expects additional government support to encourage sustainability in the form of financial incentives for green investments and support for renewable energy infrastructure.



- Survey results also highlighted the need for improved communication and engagement from skilling institutions which could significantly boost industry-academia linkages.
- For better support gender diversity and inclusion, majority voted for a government policy which can provide upskilling and training opportunities for women followed by offering grants to organizations for implementing diversity initiatives.




- A clear mandate of 57% respondents agreed that the government should play a supportive role in partnership with the private sector rather than a lead or a minimal role. Suggestions included government's support in revamping basic infrastructure of ITIs and similar institutions so that basic training needs are met which can lead to enhanced associations with organizations.

## 4.2 Leveraging technology to build robust skilling ecosystem

In her budget speech 2024, Hon'bl Finance Minister proposed developing Digital Public Infrastructure applications at a population scale in the areas of credit, ecommerce, education, health law and justice, logistics, MSME service delivery and urban governance. DPI impetus aims to drive productivity gains, create business opportunities, and foster innovation within the private sector.

The survey provided insights that though there is a limited understanding of DPI/G in the industry, there is curiosity to know more on how it can be leveraged. With SIDH as the DPI enabling the skilling ecosystem, there is need to build more services to cater to a wider needs of the ecosystem. This section enumerates some of the building blocks that can have tremendous impact in the skilling and employment ecosystem.

## 4.2.1
## DPI/G as catalyst

The global trend is towards increasing development and deployment of DPG/Is to address various Sustainable Development Goals (SDGs). As of 2024, there are 162 DPGs in existence. (Source: https://digitalpublicgoods.net/registry/)

- **Developed countries:** The US has deployed over 30 and developed over 50 DPGs, addressing 15 SDGs. The UK has deployed 23 DPGs and developed 21 that meet all 17 SDGs.
- **Developing countries:** India and Kenya have deployed 47 and 37 DPGs respectively and developed 39 and 18 DPGs respectively. DPGs in both countries address 15 SDGs. South Africa has deployed 24 DPGs, and Argentina 21.

Some of the key building blocks of DPG/Is that can impact towards building a resilient, scalable and coherent skills and employment sectors are mentioned below:

## 4.2.2
## Centralized registry

A centralized registry aims to create a comprehensive database cataloguing the qualifications, certifications, and work experiences of skilled professionals across India. This initiative is designed to streamline the process of skill verification and recognition, ensuring that all relevant information is easily accessible in one place. Some of the registries can be labor registry, migrant workers registry, informal workers registry, MSME registry and others.

These registries can be integrated with each other and other systems to ensure uniqueness of records and accurate information and can have use cases, such as skilling and job assistance, insurance schemes, training and skilling, pensions, loans and women centric schemes.

### Benefits:

- **Efficiency:** Employers can quickly verify the credentials of potential employees, significantly reducing the time and effort required to identify qualified candidates. This streamlined process helps in faster hiring and better matching of skills to job requirements.
- **Transparency:** By maintaining a centralized and standardized database, the risk of fraudulent claims is minimized. Only genuinely skilled professionals are recognized, which enhances the credibility of the workforce.
- **Accessibility:** The registry provides a reliable source of information for employers, educational institutions, and government bodies. This accessibility ensures that all stakeholders can make informed decisions based on accurate data.

## 4.2.3
## Digital verifiable credentials/identity

A digital verifiable credential (DVC) identity, such as Aadhaar, is a secure and tamper-proof digital identity linked to an individual's skill profile. This identity serves as a unique identifier that can be used to authenticate and verify qualifications and certifications. This is perhaps the single most important building block.

Existing ecosystems are unable to issue digital credentials to various stakeholders which are simple, easy to manage and verify. Verifying qualifications is a difficult and time-consuming process. Paper certificates are easy to misplace or become damaged over time. Often, training providers, educational institutions, employers need to rely on the candidate to provide proof of their achievement. Digital certificates and badges simplify the process by offering one-click verification, time saving and being nearly impossible to tamper with.

### Benefits:

- **Authentication:** Employers and institutions can instantly verify the qualifications of individuals, ensuring that the credentials presented are genuine and valid.
- **Security:** The use of a secure digital identity reduces the risk of identity theft and fraudulent claims, protecting both individuals and organizations.
- **Efficiency:** The verification process is portable making it quicker and easier for employers to confirm the skills and qualifications of potential hires.

## 4.2.4
## Portable skills and identity

Various applications and systems can work with various state and central government initiatives to facilitate the recognition and transfer of skills and identities across regions and industries. This ensures that individuals can move freely and pursue job opportunities with reduced process hurdles.

One of the challenges in skilling and employment ecosystem is unavailability of data portability among different application, programs, computing environments or cloud services. Portability makes it possible for stakeholders to migrate data and applications between or among cloud service providers (CSPs). It will help the users know that their data is current and consistent, without having to modify the content on each service's site.

### Benefits:

- **Mobility:** Individuals can seek better job opportunities in different regions or industries without the need to re-verify their qualifications, promoting a more dynamic and flexible job market.
- **Efficiency:** The process of transferring qualifications is simplified, reducing administrative burdens and delays.
- **Inclusivity:** A more equitable job market is promoted, as individuals from diverse backgrounds can have their skills recognized and valued across different sectors.

### 4.2.5
## Skilling passport

A skilling passport can save cost of verification, is consent based, and trustable credentials proof of education, worth and reputation of a learner and employment seeker.

A digital identity that provides a clear and standardized presentation of an individual's qualifications, education, reputation and work experience

**Benefits:**

- **Standardization:** The skilling passport offers a standardized format for presenting qualifications, making it easier for employers to assess an individual's suitability for various roles.
- **Accessibility:** Employers can quickly and easily access an individual's complete skill profile, facilitating more informed hiring decisions.
- **Efficiency:** The job application process is simplified, as individuals can present a single, comprehensive document that highlights their skills and experiences.

### 4.2.6
## Learning system

In a constantly evolving dynamic world, skilling – reskilling – upskilling is a constant need. A learning system with industry led curriculum and educational institutions can provide access to a wide range of courses to learners and trainers anywhere anytime. This ensures continuous improvement and adaptability of skills.

**Benefits:**

- **Adaptability:** Individuals can stay relevant in a rapidly changing job market by continuously updating their skills to meet current and future industry demands.
- **Accessibility:** A diverse range of courses is made available, catering to various skill levels and career paths
- **Continuous learning:** The system encourages lifelong learning, promoting a culture of continuous improvement and professional development.

### 4.2.7
## Social protection

Social security systems play a vital role in offering a safety net for workers, fostering their welfare, and fostering a society that is more inclusive and equitable. Digitally transforming processes of benefit delivery improves identification of target beneficiaries, operational excellence and the right benefit reaching the right beneficiary at the right time.

**Benefits:**

- **Safety net:** Workers have access to essential benefits that provide a cushion against job loss, illness or other economic challenges.
- **Equity:** Benefits are efficiently distributed to the intended beneficiaries, ensuring that vulnerable workers receive the support they need.
- **Inclusivity:** The system protects all workers, including those in the informal sector, promoting a more inclusive and equitable workforce.

### 4.2.8
## Skills equivalency

Facilitating workforce mobility for skill mapping and qualification from one country to another is an important aspect. This building block would ensure that individuals can train and skill themselves with necessary competency both in terms of skills, education and cultural requirements can be met for a greater chance of success while seeking international mobility.

A use case can be equipping for a role of a driver in another country would require knowledge about obtaining a driver's license, language requirements, traffic rules, directions etc. A skills equivalency solution can help in identifying these requirements for various countries.

**Benefits:**

- **Ease of mobility:** Skill-gap assessment and training requirements for job fitment
- **Efficiency:** The time and effort required to acquire new skills are reduced, making it easier for individuals to adapt to requirements
- **Country Alignment:** The employment seeker is equipped with the skills needed for the specific requirements of the country

## 4.2.9
## AI- Assistant

AI as a Knowledge Assistant can help targeted beneficiaries such as residents, government officers, ecosystem partners, the authority and other relevant stakeholders to access, just in time, context relevant information from trusted sources.

### Benefits:

- **Efficiency:** Enhance efficiency in information dissemination and subsequently in processes, ensure accuracy and optimization of processes, build trust, and improve user experience and satisfaction
- **Speed:** Increased and accelerated enrolments/onboarding and adoption- enrolling institutions seamlessly without unnecessary and avoidable bottlenecks
- **Single interface:** Reduce turnaround time for issue addressal and unified interface for multiple sources and for multiple users

# 4.3
# Snapshot- Future of Jobs 3.0

This section summarises primary research findings on sectoral job roles and skills. The detailed findings have been shared in the previous section of the report.

**Emerging job roles in all 5 sectors**

| Manufacturing | Healthcare | Infrastructure | Energy | FMCG |
|---|---|---|---|---|
| - AI & Robotics technician | - Health Data Analyst | - AI and Machine Learning Specialists | - Renewable Energy Technicians | - Data Scientist |
| - Industrial Internet of Things (IIoT) | - Genomic Counselor | - Renewable Energy Technicians | - Smart Grid Analyst | - AI and Robotics Technician |
| - Sustainable Manufacturing Engineer | - Telemedicine Coordinator | - Sustainable Infrastructure Engineers | - Sustainability Managers | - Digital Marketing Specialist |
| - Digital Supply Chain Analyst | - Digital Health Specialist | - Smart City Planners | - Carbon Capture Technician | - Sustainability Manager |
| - Data Privacy and Cyber Security Manager | - AI healthcare Ethicist | - Warehousing operators & technicians | - Audit Manager | - E-commerce Strategist |
| - Maintenance Technicians | - Caregivers | - CNC machine operators | - Environment health safety specialist | - Computer operators |
| - Design Engineers | - Geriatric Caregivers | - Research & Development (R&D) | - Supply chain Analyst | - Supply Chain Analyst |
| - Welders | - Mental wellness experts | - Ground Liaison Officers | - Social Impact Manager | - Data Visualizer |
| - Digital Construction Engineers | - Energy Conservation-alists | | - Compliance Manager | - Data Engineers |
| | - Remote Patient Monitoring Specialists | | - Green Supply Managers | - Omni Channel Specialist |
| | | | - Sensitivity Analyst | |

## Top skills in all 5 sectors

**In addition to the skills required to meet the job roles listed above, the primary findings also list the below mentioned skills:*

### Manufacturing

- Robotics programming and maintenance
- Advanced analytics and data interpretation
- Internet of Things (IoT) and connectivity
- Advanced digital literacy
- Soft skills (e.g., problem-solving, communication)

### Healthcare

- Non tech skills like communication , empathy and problem solving
- Digital Literacy and Health Informatics
- AI and Machine Learning Proficiency
- Telehealth technology
- Genomic and Personalized Medicine Knowledge

### Infrastructure

- Expertise in sustainable design and green technologies
- Understanding of advanced materials and construction techniques
- Robotics and Automation

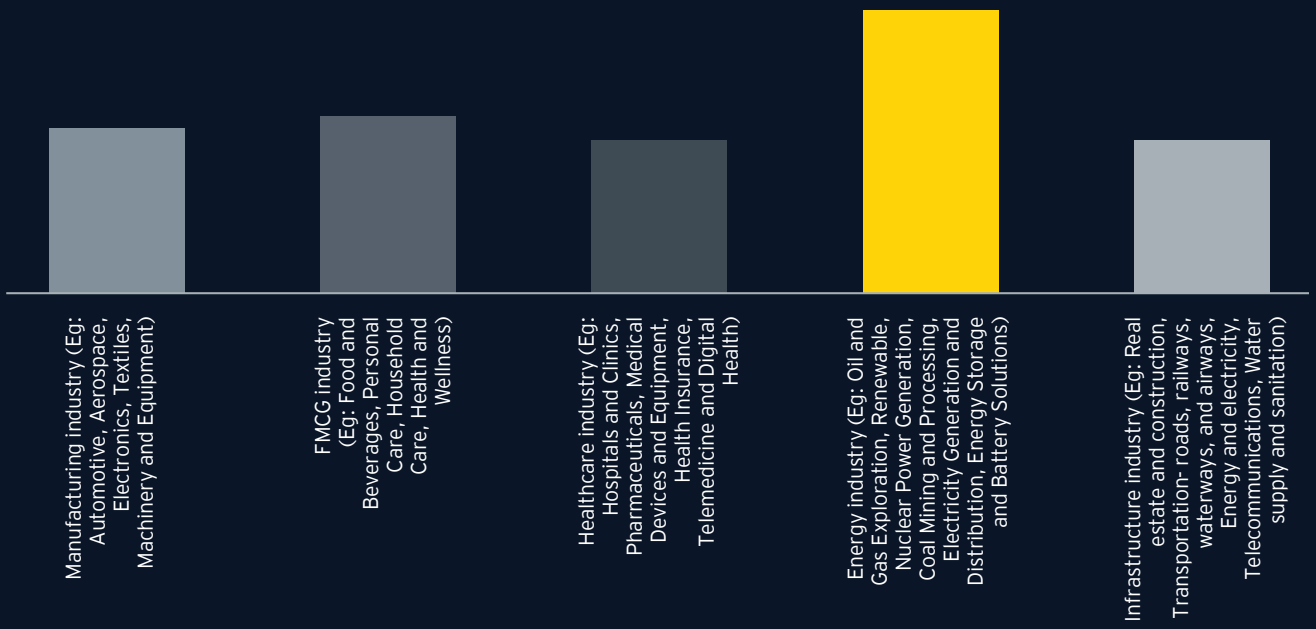
### Energy

- Expertise in Renewable Energy Technologies
- Skills in Energy Data Analytics and AI
- Proficiency in Energy Storage Solutions
- Knowledge of Environmental and Energy Policy

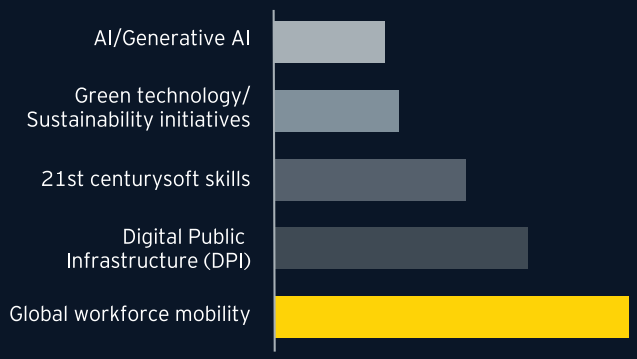
### FMCG

- Sustainable Business Practices and Green Technologies
- Consumer Behavior Research and Insights
- Data Analysis and Interpretation
- Digital Literacy and E-commerce Management
- Supply Chain and Logistics Optimization

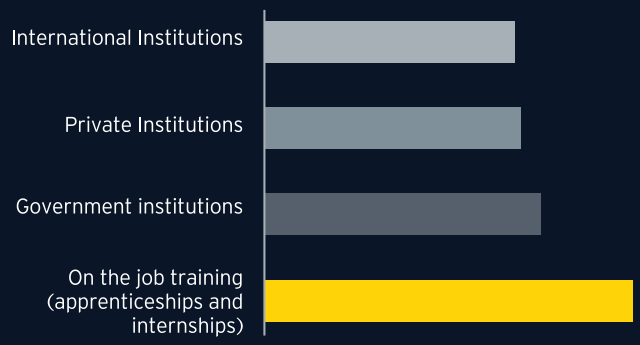
## **Learners:** Potential sector for career opportunities and growth



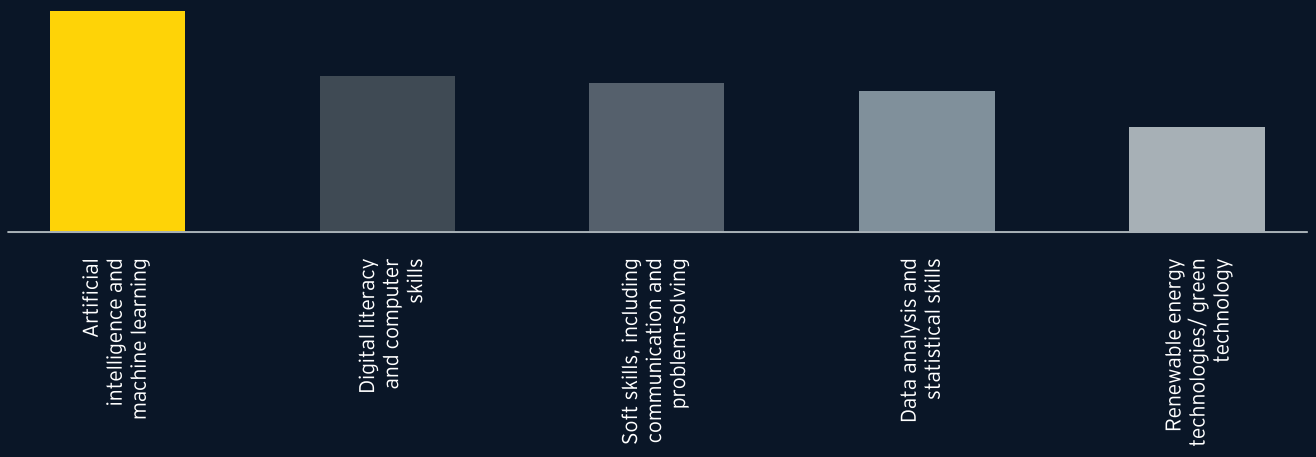

## **Learners:** Skills expected to significantly impact job market



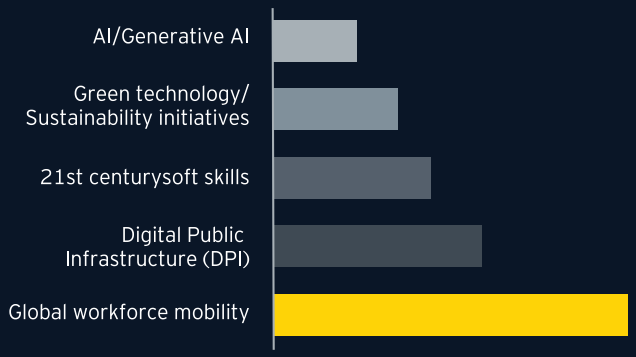

## **Learners:** Preferred mechanism for skilling



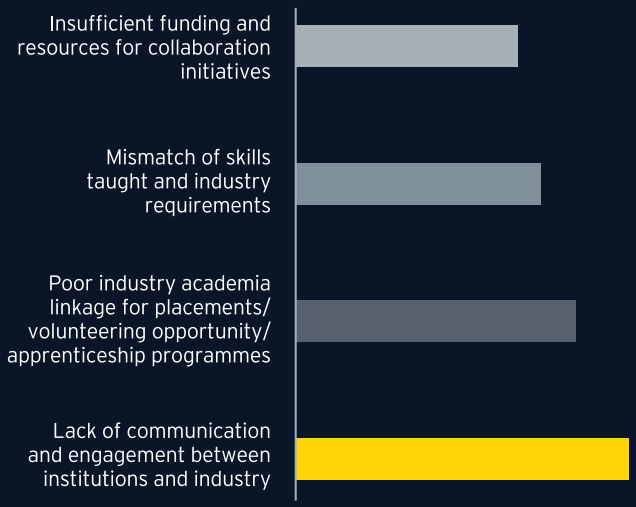

## **Trainers:** Skills expected to significantly impact job and skills market



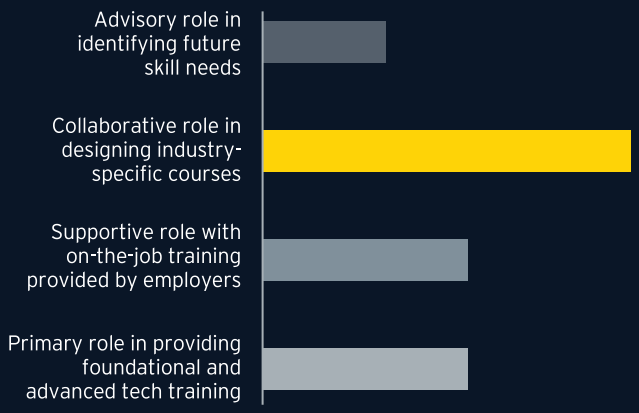
**Trainers: Trends most likely to impact communities, businesses and governments**




**Challenges trainers face in collaborating with industry associations**




**Industry expectation from skilling institutions for adoption of new technologies**




## Summary of findings and recommendations

Enlisted below is the summary of findings and recommendations:

01 Issue of workforce resistance to AI/GenAI adoption could be resolved by providing reskilling and upskilling training interventions

02 For AI integration, stronger collaboration between industry and academia is suggested for curriculum upgradation, apprenticeship/ internship opportunities and faculty trainings

03 Keen interest in understanding the dynamics of DPI and how it can be leveraged to improve the skilling and employment ecosystem

04 Need for skills for creating and filling green jobs can be met through sustainability practices

05 Trends of AI, green technology, digital and soft skills are picking up pace amongst learners as they are seen to have maximum impact on jobs of tomorrow and can be met through support from the government

06 Gaining cross-cultural competency and adaptability can be achieved through industry-skilling collaboration

07 Revamp of the basic infrastructure of ITIs and similar institutions by the government so that basic training needs are met leading to enhanced associations between them

# 4.4 Are you ready- Learner, Trainer, Employer

With reference to the framework mentioned in section 2.3, presented here is a summary of the results from our primary and secondary research highlighting the impact of the five lenses used in this report– Artificial Intelligence, DPI, climate, international mobility and Industry 4.0, on the sectors manufacturing, health, infrastructure, energy and FMCG vis-a-vis employer (industry), learner (in education, skilling-upskilling and re-skilling) and trainer (industry, private sector and government).

## Key Factors

**Artificial Intelligence**
- Generative AI
- Skills required for adoption of AI
- Cost of implementation

**DPI**
- Efficiency of sector specific DPI
- Skills required for implementation of DPI
- Sector specific Innovation

**Climate**
- Carbon Foot Print
- Skills required for implementation of climate specific requirements
- Environmental, social and governance

**International Mobility**
- Adoption of Digital platforms
- Sector Specific Skills
- Policies for Governance, Compliance, Investment etc

**Industry 4.0**
- Adoption of Digital platform
- 21st century skills
- Policies for Governance, Compliance, Investment etc

**Scale**
- No Impact
- Low Impact
- Moderate Impact
- High Impact
- Very High Impact

**Following analysis looks at the impact of key impact areas in each lens from maximum impact (1=100%,) followed by 25% reduction in each. The below framework helps to assess how each trend will impact Learners, Trainer and Employers.**

| Sector | Eco Play | Artificial Intelligence | | | DPI | | | Climate | | | Workforce Mobility | | | Industry 4.0 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GenAI | Skills | Cost | Efficiency | Skills | Innovation | CFP | Skills | ESG | Digital | Skills | Policy | Digital | 21st Century Skills | Policy |
| Manufacturing | Employer Employer | | | | | | | | | | | | | | | |
| | Learner | | | | | | | | | | | | | | | |
| | Trainer | | | | | | | | | | | | | | | |
| Health | Employer | | | | | | | | | | | | | | | |
| | Learner | | | | | | | | | | | | | | | |
| | Trainer | | | | | | | | | | | | | | | |
| Infrastructure | Employer | | | | | | | | | | | | | | | |
| | Learner | | | | | | | | | | | | | | | |
| | Trainer | | | | | | | | | | | | | | | |
| Energy | Employer | | | | | | | | | | | | | | | |
| | Learner | | | | | | | | | | | | | | | |
| | Trainer | | | | | | | | | | | | | | | |
| FMCG | Employer | | | | | | | | | | | | | | | |
| | Learner | | | | | | | | | | | | | | | |
| | Trainer | | | | | | | | | | | | | | | |

**The key learnings from assessing the impact of Artificial Intelligence (AI), DPI, Climate, International Mobility, and Industry 4.0 across various sectors for learners, trainers, and employers are as follows:**

## For learners

1. **Focus on high-demand skills:** The model above highlights the sectors and areas where specific skills, like AI adoption or environmental compliance, are in high demand. Learners would have to focus their education and reskilling efforts on the most impactful areas, ensuring their skills are relevant and valuable to employers.
2. **Proactive skill development:** Understanding the impact of emerging technologies (e.g., AI, Industry 4.0) and policy shifts (e.g., Climate and ESG) allows learners to be proactive in seeking certifications, courses, or training that align with future job requirements.
3. **Industry-specific insights:** The model shows that different sectors have varying needs. For example, while AI may have a high impact on Manufacturing, Climate and ESG requirements may be more critical in the Energy sector. Learners can tailor their skillsets accordingly.

## For trainers

1. **Alignment with industry needs:** Trainers can gain clarity on the areas where they need to focus their curriculum, such as digital platform adoption for Industry 4.0 or skills for DPI implementation. This alignment ensures that training programs remain relevant to industry demands.
2. **Customizable training programs:** Trainers will have to enabled to design sector-specific and role-specific training programs. For instance, they can develop tailored modules for sectors that need specialized skills in climate policy or AI adoption.
3. **Enhancing the scope of training:** Trainers can integrate multidisciplinary elements like governance, compliance, and innovation into their programs to provide holistic training, particularly in sectors with high impact scores like health or infrastructure.

## For employers

1. **Workforce planning and development:** Employers can use the insights to predict skill shortages in their sectors. For example, a high score in "Skills required for AI adoption" in Manufacturing signals a need for retraining or hiring AI specialists.
2. **Cost-benefit analysis:** Employers will have to understand the cost implications of adopting new technologies or complying with regulatory standards, enabling them to make informed decisions about investments in skills and technology.
3. **Compliance and sustainability:** Sectors like Energy and FMCG, where climate and ESG scores are high, can benefit from investing in sustainable practices and ensuring their workforce is equipped to handle compliance and governance challenges.

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## About FICCI Skill Development

Skill Development is the key to promote employability, competitiveness, and economic growth. As Indian industry and services grow and compete internationally, the availability of requisite skills - in terms of quantity, relevance and quality has become an urgent need. The speed and scale with which this skill deficit is bridged will be critical in determining India's competitiveness in global market. FICCI Skill Development is committed to work with the stakeholders, especially the industry, government, TVET institutions, Skill Universities, International development organizations and academia to create sustainable and scalable skills propositions which will benefit the youth of the country from all sections of society.

## Key areas of work

### Policy Advocacy

The Committee publishes a diverse array of industry reports, policy briefs, and papers that intricately capture the evolution and progress within the Vocational education sector. These include knowledge papers such as 'Future of Jobs- 2017, 2018 & 2024,' 'Skill India Reforms – 2023', 'Career Guidance & Counselling Framework in India-2021,' 'Apprenticeships in India-2019', 'High Quality Demand Driven Skilling in India - Electronic Manufacturing -2023', 'Skill Financing Models in India-2023' and 'Reimagining Vocational Education in India-2022'. Notably, these reports have significantly influenced the design of the National Education Policy (NEP) 2020. We have been consistently working with Ministry of Skill Development & Entrepreneurship, Ministry of Corporate Affairs, Ministry of Labor & Employment and other ministries in providing inputs and recommendations for effective formulation/ implementation of various flagship skill schemes in the country.

### Industry Engagements

The committee engages deeply with industry members on various areas of synergy. From Apprenticeship promotion Workshops to development of entrepreneurs through our traditional cluster development program, the committee ensures rich interactions and inclusion of industry in all our initiatives. We annually engage with the Youth through our World Youth Skills Days Celebrations and Career Guidance and Counselling workshops. The members of the committee represent FICCI at various national and international forums such as BRICS, World Skills Competitions, State Skill Summits and many more.

### Thought Leadership

The Skills committee collaborates with key stakeholders in the Indian government and industry, actively identifying opportunities and addressing the gaps. Through intensive consultations with a diverse array of stakeholders, this collaborative effort unfolds across various conferences, discussions, events, and forums. Brimming with shared wisdom and expertise, these engagements have played significant role in propelling the skills development sector forward in India.

### Global Skills Summit

The Committee hosts the Annual Global Skills Summit which is a gathering attended by all the important stakeholders on the Indian TVET & Industry ecosystem. Established in 2007, the summit is a global forum for discussions on the transformation of the skilling landscape, changing nature of jobs, promoting & collaborating with the stakeholders of the sector. Since its inception, the summit has also drawn thousands of participants, including sector experts, policymakers, academician and Industry experts, converging on a common platform to shape the future of skilling in India.

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## FICCI

Established in 1927, Federation of Indian Chambers of Commerce & Industry is the largest and oldest apex business organization in India. A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. FICCI has direct membership of over 3000 corporate, including SMEs and MNCs, as well as public sectors and more than 500 chambers of commerce and business associations, and an indirect membership of companies from regional chambers of commerce. FICCI espouses the shared vision of Indian businesses and speaks directly and indirectly for over 250,000 business units. FICCI maintains the lead as the proactive business solution provider through research, interactions at the highest political level and global networking.

FICCI works closely with the government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialized services and global linkages. It also provides a platform for sector specific consensus building and networking. FICCI has a national network with 20 states. Partnerships with 77 countries across the world carry forward our initiatives in inclusive development, which encompass health, education, livelihood, governance and skill development.

FICCI serves as the first port of call for Indian industry and the international business community. Our presence is in regions such as Africa, Arab, Israel, Asia Pacific, East Asia, Europe, Latin America, the Caribbean, North America, South Asia, etc. FICCI is also involved with diaspora engagement, forum of parliamentarians, Commonwealth of Independent States (CIS), multilateral, international policy, and strategy.

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