

EMBRACING
**NEW WAYS
OF WORK**

PREPARING THE HUMAN CAPITAL
OF THE FUTURE



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Preparing The Human Capital of the Future

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FOREWORD

Rapidly advancing technologies have accelerated changes in industries and created broad ranges of new enterprises of the future. Existing skill sets will quickly become obsolete, and job profiles must be redesigned. Upskilling and reskilling have become key words in human capital development. Nurturing the ability to adapt at all levels will allow individuals, organizations, and nations to thrive along with technological progress and the creation of new industries.

Countries around the world may adopt different positions and have distinct attitudes toward the industries of the future, but all must adapt to develop new forms of competitive advantage in human capital. Initiatives should be in place to meet both the opportunities and threats associated with industries of the future. The APO conducted research in eight member countries on how governments and industries should nurture human capital to ensure that they can thrive in the current and future scenarios.

The results suggest that governments and public agencies should review, revamp, and refresh policies to strengthen the basic pillars of human capital. This includes restructuring to emphasize advanced technologies, renovating education and training systems, building the foundations for digital skills, enhancing government-industry partnerships, and incentivizing lifelong learning. It also requires major changes in how businesses view and manage talent. To capitalize on new opportunities, enterprises can no longer be passive consumers of ready-made human capital but need to make future workforce strategies central to their growth. Multisectoral partnerships rather than competition for available human capital is one scalable solution to these challenges.

The APO thanks all contributors for their inputs and commitment to the research. It is expected that this volume will be useful for the formulation of government policies and new business approaches to human capital development, allowing enterprises to stay relevant and productive as they transition to the industries of the future in coming years. It is hoped that the analyses and their implications will contribute to ensuring workforce future-readiness and employment inclusiveness throughout the Asia-Pacific.

Dr. AKP Mochtan
Secretary-General
Tokyo
October 2021

CHAPTER 3

INDIA

INDUSTRIES OF THE FUTURE AND ITS HUMAN RESOURCES

The new wave of linking 'education to work', resultant from emerging labor market needs, evidences of higher salaries (income elasticity of higher education is higher than all other levels of education), and better-quality jobs with rising 'skills hierarchy' from primary to tertiary levels [1–4], has been evident in global education literature in the past decade. The labor market has seen a wide ranging transformation from the first industrial revolution of mechanization (first age in 1780s) to electrification (second age of 1870) to automation (third age) to today's Industry 4.0 age of digitization. Industry is foreseen to move towards the 5.0 revolution of personalization where human-centric production is customized with greater cooperation between man and machine. The pace of industrial revolution 4.0 (Industry 4.0) has been unprecedented for both employers and suppliers of labor (human resources), challenged by the conundrum of 'skills deficit'. Issues and means of automation, digitalization, big data management, environment sustainability are redefining the existing nature of work technology in both traditional and emerging industries of the future. The described Industry 4.0 consists of four business industries projected for explosive growth - artificial intelligence (AI), robotics, machine learning, and blockchain. Another more important element needs to be added, that is coworking spaces aimed at cost efficiency and environmental sustainability. How these can be linked to the general production processes in major industrial sectors is what India is focused on.

Developing human resource for this new-age industrial transformation is a long-term, dynamic, and continuous process of skilling, de-skilling, and re-skilling for sustainable employability [5]. Highly educated and specialized human resource to forge new innovations in production technologies and spearhead the new 'knowledge economy' are the needs of the future. These put India on its toes to review, rethink, and reorient its education, vocational training, and labor market policies in aligning to Industry 4.0 and 5.0 transformations.

OVERVIEW ON NATIONAL POLICIES AND INITIATIVES IN HUMAN CAPITAL DEVELOPMENT

India today is one of the fastest growing economies with the growth rate of GDP ranging from 7%–9% in the last two decades (Annex 1). The average annual GDP growth rate increased from 5.57% in 1991–2000 to 7.59% in 2001–10, and climbed further to 8.2% in 2016–17 before it started decelerating. It reduced to 4.8% in the first half of 2019–20, amid a weak environment for global manufacturing, trade, and demand [6]. However, India is still ranked among other countries with relatively good growth in recent times.

While the macroeconomic picture is good (Annex 1), there has not been a corresponding improvement in the human development global ranking. Despite macro level improvement in several human development and social indicators (Annex 2), as reported in the UNDP Human Development Reports (HDR), India remained in the low human development (HD) category throughout the 1990s. Improvement was seen when it moved to medium category in 2002. India's composite Human Development Index

(HDI) score has shown continuous improvement from 0.439 in 1990 to 0.554 in 2012 and further to 0.647 in 2018. But the HDI global ranking from 132 in 1999 went down to 136 in 2012 and showed a marked improvement in 2017 at 130 to 129 in 2018. With 1.34% average annual HDI growth, India is also among the fastest improving countries.

The employment scenario however does not reflect the positive improvements with its high rates of unemployment and jobless growth in recent years. Further, in contrast to the GDP structure, the majority of the population is occupied in agriculture and its allied activities, and not services (Annex 3). The numbers do show a marked preference for occupations in the service sector and entrepreneurship, particularly among educated youth. It is in line with the government's policy to turn India into a 'knowledge superpower' in the coming years with emphasis on technology-led innovation, entrepreneurship, and R&D. Future projections reveal that 60% increments in jobs would be in the service sector. The workforce too is projected to increase by 27% to reach approximately 600 million by 2022 [7], making India the youngest economy with a vast human resource base, in contrast with many other aging economies of the world.

While the job situation in India is challenging, the global scenario also reveals that youth unemployment is also high and on the rise. According to ILO estimates, an additional 280 million jobs need to be created to close the global employment gap by the end of this decade. Nearly half of the new entrants to the labor market will come from Asia. The Boston Consultancy Group's study in 2007 had clearly indicated that by 2020 while India will have a surplus of 56 million working people, the rest of the world will encounter a shortage of 47 million working people. Thus the employment and employability of the educated youth will remain an important policy concern and a major challenge in the coming years for India. Two major trends shall determine the future jobs in the country:

i) Spin-off effect

Preparedness to make the best of outsourcing and offshoring by advanced economies that have already adopted exponential technologies (AI, robotics, IoT, machine learning, analytics, social media, design, cloud computing, 3D printing, animation, etc.) in a big way. India has a huge potential to benefit both ways - by exporting certain services and by importing the customers for others. Remote servicing to individuals may include telemedicine, e-learning, and personal privacy services (providing server space to individuals for record maintenance). Services to the corporate sector may include IT consulting, software application development, knowledge networking, other IT-enabled services (data analysis, digital media, content development), CAD/CAM design, animation, bioinformatics, other R&D services across verticals (semiconductor technology, drug research, legal/advisory services), to name a few. On the customer import end, medical, spiritual, and adventure tourism has already started attracting foreigners in large numbers. Other potential areas are higher education for developed and developing countries, training courses revolving around India's heritage, such as Ayurveda, local cuisine, yoga as well as services like nursing homes and retirement services [8–9].

ii) Ignition effect

The ignition effect is the result of the increasing adoption of exponential technologies by the Indian industry. The Indian government identified 20 high growth sectors that are expected to provide employment in the coming years. These are auto and automotive; building and construction materials; building and construction; real estate services; electronics and IT hardware; education and skill development services; food processing; gems and jewelry; healthcare; textiles; leather and leather goods; organized retail; tourism and hospitality; transportation and logistics; media and entertainment; banking, financial services and insurance (BFSI); chemicals and pharmaceuticals; furniture and furnishings; IT and information technology-enabled services (ITeS).

Make in India [10], Digital India [11], and Skill India [12] are three important initiatives to orient the Indian economy towards Industry 4.0. While the first is geared toward strengthening India's manufacturing base with specific emphasis on micro, small, and medium enterprises (MSME) sector, the second initiative targets transforming technologies to create digitally empowered society and knowledge economy. The third looks into preparing future ready workforce. ICT-enabled infrastructure, digitally equipped industrialization and urbanization, e-governance and service delivery, digital literacy, ICT skills, innovation, R&D, and ease of doing business are pivotal elements of these initiatives.

Background of Study

India is today the youngest country in the world with a growing proportion of people in the age group of 25–50 who are constantly in search of white collar jobs. The talk of the youth is white, blue, and gold collar jobs. As per the Indian census [13], the youth (15–24 years) in India constituted one-fifth (19.1%) of India's total population. By 2020, India's share of youth is 34.33% in total population [14]. But, the industry has been rather disappointed with the quality of graduates emerging from its education system.

Although, graduate employability is a worldwide rising concern, the challenges of skill development and education advancement in countries like India are all the more complex given its large population, vast geographical, cultural, social, and gender diversities. With the gradual withdrawal of the public sector in generating new employment, increasing privatization, and globalization, these diversities severely limit the chances of gainful employment - be it paid employment or self-employment. The emerging new job responsibilities of a 'knowledge society' then puts tremendous pressure and renewed impetus to lifelong learning and development of future skills, and competencies in the country. Thus the daunting question remains - is India able to exploit the arising opportunities given its huge human resource and being one of the largest higher education sectors in the world?

Graduate Employability - The Challenge in India

A slide in India's global ranking in the fifth pillar of Global Competitiveness Index (GCI) pertaining to higher education and training, from 55 in 2007–08 to 85 in 2010–11, is a testimony to India's challenge of future human resource development. The fifth pillar is the index that focuses on higher education and training, measuring secondary and tertiary enrollment rates, quality of education as evaluated by the business community, and the extent of staff training for ensuring a constant upgrading of workers' skills [5]. India slipped down 10 places to be ranked 68th in the annual GCI 2019 and is ranked much lower in the skills of future workforce indicator at 114 out of 141 [15].

Some challenging issues in terms of preparing human resource for future industry can be highlighted as follows:

- i) Excessive dependence on nonformal system of vocational training

While the demand for professional courses is increasing, its size is extremely limited as revealed by the ratio of professional to nonprofessional education enrolment being 1:3. According to the Periodic Labor Force Survey (PLFS) 2017–18 [16], only 13.53% of the workforce in the productive age group of 15–59 years has received training (2.26% formal vocational/technical training and 11.27% informal training). A large section among informally trained workers, about 55.9% received it either through self-learning (28.66%), or hereditary (27.24%), and about 38.51% have received it on the job. While the demand for professional/technical courses is increasing, it is extremely limited - the ratio of professional and nonprofessional education enrolment being 1:3.

ii) Percentage of educated job seekers is increasing

While the number of educated job seekers is rising, only a miniscule percentage of them are getting placed. The figure for illiterate workers continuously decreased from 57.5% in 1983 to 48.5% in 1993–94 and 44.1% in 1999–2000 to a further down of 38.8% in 2004–05 with a corresponding increase in the educated workers. Not only the headcount but the percentage of educated job seekers to total job-seekers have increased from 70.7% in 2000 to 76.5% in 2009. Among the educated job seekers, only the percentage of higher education graduates have witnessed the greatest increase in the past few years [5]. Of those who have registered with the employment exchange, less than 5% are getting placed.

iii) Phenomenon of jobless growth - threatening educated youth

As per the latest report of the government of India, India has witnessed the lowest jobs in the last 45 years with unemployment figures increasing to 6%–7.8% in urban areas and 5.3% in rural areas in 2017–18 [16].

TABLE 3.1

UNEMPLOYMENT AMONG THE EDUCATED YOUTH

All India	Unemployment Rate (in %)			
	1983–84	1993–94	2004–05	2017–18
Illiterate	0.41	0.49	0.36	1.32
Literate & up to Primary	1.86	1.20	1.64	3.35
Middle	6.12	2.76	3.86	6.34
Secondary	11.09	3.50	6.15	7.32
Higher Secondary	-	5.75	7.80	12.29
Diploma/Certificate Course	-	8.66	11.41	20.63
Graduate	8.94	9.01	9.78	18.90
Postgraduate & above	-	8.78	9.06	16.70

Source: Author’s estimation using National Sample Survey (NSS) various rounds unit level data

In fact, the rate of unemployment escalates with increasing levels of education. The unemployment rates among those with diploma or certificate levels of education are also high. Unemployment rate is also higher among the educated female.

iv) Increasing skills challenge in new domains

Of the 500 million to be skilled by 2020 in India, 25% or 125 million are at the college level [5] who are likely to face the new industry in the immediate future. Educating and skilling this huge mass of job seekers in new knowledge and skill domains will be a twofold challenge for the Indian higher education sector. First, motivating and training the youth for other sectors promising growth, and second, frequent upgrading and updating of skill delivery in response to the highly dynamic, volatile, technology savvy industry. Generating employment for high-skilled finance professionals, including fund managers and support service providers, such as custodians, fund specialists, fund accountants, fund administrators, risk managers, research analytics professionals, and tax advisors is one of the identified areas.

Initiatives to Meet the Needs of Future Industries

This study explores the national strategies that are put in place to meet the skill needs for the future industry by classifying the initiatives taken at policy, systemic, and institutional levels to prepare future work-ready graduates. It also looks into the role and scope of the national agencies in achieving this objective and the initiatives made to identify and define future skill needs, including determining the push/pull approach toward the Indian workforce development and its gaps.

National Agencies in Developing National Strategies for Future Skills

The national approach in preparing the future workforce is multipronged in nature. Under the overarching umbrella of making India a 'knowledge superpower', the National Skills Policy provides guidelines for skilling the Indian youth. A four-pronged approach has been adopted to bring in the major stakeholders:

- i) Ministerial engagement by way of defining the pathways and launching schemes.
- ii) Revamping the higher education sector to greater industry-oriented teaching, learning, and training.
- iii) Involving corporates and the industry sector to take proactive, not supportive roles, in creating skilled human resource.
- iv) Reaching out to international agencies/bodies and NGO sector to fill in the gaps and support in upgrading the capacity to train the youth workforce of the future.

Tracing Economic Development and Workforce Policies

India's growth is unique in that it has defied the widely accepted economic development model, which is shifting from agriculture to industry and then services. The Indian economy bypassed the industrial sector and moved directly from agriculture to services that contributes about 75% of India's GDP and has been the major contributor to its growth in the past decade. The service sector grew at 8.1% in 2017–18, in tandem with the GDP growth. The significance of the services sector in the Indian economy has continued to increase, with the sector now accounting for around 55% of gross value added (GVA) and GVA growth, 66% of total FDI inflows into India, and about 38% of total exports [17]. In fact, since the late 1990s, the service sector has emerged as a major contributor to exports.

With the increasing importance of knowledge process outsourcing (KPOs), it is bound to go up the value chain. The focus is on creating jobs and growth by specializing in network products in order to raise its export market share to about 3.5% by 2025 and 6% by 2030 as well as create 40 million well-paid jobs by 2025 and 80 million by 2030.

India's aspiration is to become a USD5 trillion economy by 2025 by targeting to increase exports of network products with three-pronged approach: specialization at large scale in labor-intensive sectors, especially network products; laser-like focus on enabling assembling operations at mammoth scale in network products; and increase exports primarily to markets in rich countries [17].

Revamping Workforce Policies

Workforce policies are revamped at multiple levels in preparing India to become a human resource pool of skilled workers for expanding knowledge economy. They are divided into three components - skill policies and initiatives, revamping education, and international engagement.

- i) Skill policies and initiatives
 - a) Ministerial engagement at the national level and the states' provincial levels

With the aim of making India the 'skill capital of the world', an all-encompassing comprehensive and inclusive National Policy on Skill Development (NPSD) was launched in 2009, and replaced by the National Policy on Skill Development and Entrepreneurship in 2015 [18]. The vision statement of the new policy is "To create an ecosystem of empowerment by skilling on a large scale at speed with high standards and to promote a culture of innovation-based entrepreneurship which can generate wealth and employment so as to ensure sustainable livelihoods for all citizens in the country." The policy aims to enable effective coordination between different ministries, the center and the states, and public as well as private providers to create institutional mechanism for research, development, quality assurance, examination and certification, affiliation and accreditation, and coordination of skill development across the country. The policy also promotes institution-based skill development including ITI/technical and vocational institutions/polytechnics/professional colleges. Sector-specific Skills Councils have been created for each of the 20 high growth sectors identified by the government.

Realizing the need for a more focused approach, the Ministry of Skill Development and Entrepreneurship was established in 2014. The launch of the National Skill Development Mission in 2015 further strengthened the approach by converging, coordinating, implementing, and monitoring skilling activities across India through a high-powered decision-making framework. A three-tier institutional structure consisting of PM's National Governing Council, SDE steering committee, and Mission Directorate with new bodies National Skill Development Agency (NSDA)/National Skill Development Corporation (NSDC) were put in place.

The new policy also has two distinct components - skill and entrepreneurship. Skill component focuses on placing India onto the trajectory of high aspirational value for occupational and employability skills. Major elements include integrating skill development closely with formal education; promoting industry engagement and apprenticeship; and operationalizing quality assurance and leveraging technology.

Entrepreneurship component aims to promote an entrepreneurial culture and support neoentrepreneurship. Major elements include: integration of entrepreneurship education as a part of formal/skill education; fostering innovation-driven and social enterprises; easing business climate, credit support, market linkages, etc.

Other unique features of the new policy include:

- Inclusion - Special focus is envisaged for women, geographically/socially marginalized and deprived communities to promote equitable skilling opportunities
- Separate unique fund - A separate fund 'The National Skill Development Fund' was set up by the government in 2009 exclusively for skill development in the country. Funds from government and nongovernment sectors, donors, and contributors are consolidated and managed as a public trust
- Scalability - The government took steps to establish a scalable model to train 500 million people in vocational skills by 2022. NSDC [19], in one of the biggest initiatives under PPP, brought together 17 ministries/departments and industrial associations (Federation of Indian Chamber and Commerce (FICCI), Confederation of Indian Industry (CII), Associated Chambers of Commerce (ASSOCHAM)) in a massive skills enhancement drive. NSDC is a not-

for-profit company set up by the Ministry of Finance under Section 25 of the Companies Act with the government owning 49% and the balance by the private sector. The NSDC is mandated to foster the creation of large, high quality for-profit vocational institutions and training initiatives; provide support systems for quality assurance, information systems, and train-the-trainer academies directly or through partnerships with training providers. Partners could range from universities/colleges/nonformal training providers/corporate houses/SMEs/civil society organizations. 38 Staff Selection Commissions (SSCs) created 2,147 qualification packs with 5,684 unique National Occupational Standards. NSDC has developed a robust network of training partners to date - 302 funded, 115 nonfunded, and 13 innovation partners, along with 38 operational Sector Skill Councils [20]

b) Creation of the National Skills Qualifications Framework 2013 (NSQF)

NSQF is a competency-based framework that is defined as learning outcomes in terms of knowledge, skills, and aptitude (employability skills) from levels I (entry level qualification) to X (highest level qualification). The interesting feature of the framework is, in addition to highlighting the professional skills for each level, it also includes soft and interpersonal skills as core skills. It is important to note that the NSQF levels are not related to years of study but by broad categories of competencies in professional knowledge, professional skill, core skill, and responsibility [21].

c) Development of sector-specific placement portal

In order to support and ensure that trained and skilled youth get employed, the Sector Skill Councils developed their own placement portal and mobile apps. The objective is to provide a 360-degree interface between candidates and training partners with recruitment firms and potential employers.

d) Other initiatives by various ministries

Currently, over 40 skill development programs (SDPs) are being implemented by over 20 ministries and departments. They are involved in providing sector-specific skills training in their own institutions via formal degree/diploma programs as well as nonformal short-term programs. In addition to the Ministry of Human Resource Development (MHRD) and the Ministry of Labour investing in skill development through formal institutions, many other ministries, such as the Ministry of Rural Development, Ministry of Micro, Small and Medium Enterprises, Ministry of Tourism & Culture, Ministry of Health & Family Planning, Ministry of Agriculture and several others have their own establishments (Annex 4).

Several challenges and shortcomings can however be identified in terms of quality, capacity, training infrastructure, manpower, and more importantly, common standards and coordination.

e) State initiatives

In line with the central ministries, several state governments have also established separate departments and supporting bodies in a similar framework. One worth highlighting is the Andhra Pradesh State Skill Development Corporation (APSSDC) as it stood at number one position among the top 10 states of the country in terms of employability in 2018 [7]. Among many other initiatives, the APSSDC also organizes SAP course training for MBA (Master of Business Administration), MCA (Master of Computer Applications), MSC (Master of Science), and M.Com (Master of Commerce) graduates based on the need for such high-end specialized skills to be combined with postgraduate qualifications in different disciplines [22].

ii) Revamping education toward skill development

Under the overarching umbrella of the MHRD, several attempts have been made to integrate skills delivery in education programs, particularly in the higher education sector in recent years. Two factors are responsible for increasing the importance of college education among the youth. One is with the burgeoning middle class in India, the youth's aspirations ride high in seeking higher education. The other factor is employers prefer to recruit graduates with a minimum undergraduate degree in roles that can be done by the less educated. Employers find the latter to be very poor in the much desired soft skills of communication, team work, reasoning, etc. Further, there is growing evidence that those with a minimum of undergraduate degree have greater possibility to sustain and grow in their careers.

The initiatives in the education sector can be classified under four broad areas:

a) Building a continuum for skills delivery

A 'sector-wide approach' and visible measures to address the issue of employability skills by investing in infrastructural development, teacher training, faculty, and curriculum development. Specific efforts were made to integrate elements of skills delivery from elementary to higher levels of education. Emphasis on developing basic and life skills (basic numeracy and language, value-based education, financial literacy at elementary level); renewed impetus to large-scale vocational schools at secondary level; expansion of technical and vocational education; and rejuvenation of huge network of existing universities are all geared toward making industry-ready and future-ready workforce.

b) Reorienting higher education

Several initiatives to make higher education responsive to the new needs of labor market are under implementation. These may be underlined as follows:

- Higher education reforms - All-encompassing changes by way of curriculum to examination reforms to teaching learning practices were initiated. Most universities adopted semester system and comprehensive continuous evaluation (CCE) based on attendance, ex-curricular participation, assignments and presentations, group work, etc., including some compulsory courses on general, value-based subjects, such as environmental science, foundation courses, and English language. These were made compulsory at the undergraduate level with the aim to provide enabling environment in developing soft skills

The Education Quality Upgradation and Inclusion Programme (EQUIP) looks into transforming India's higher education system by implementing strategic interventions over the next five years (2019–24). It specifies promoting research/innovation ecosystem, substantially improving employability and entrepreneurship of students, and enhancing use of education technology. The formulation of National Higher Education Qualifications Framework (NHEQF), the revision of Learning Outcome-based Curriculum Framework (LOCF) in 100 courses, and the introduction of four months of mandatory internship at undergraduate level in all courses are major highlights [23]

- Strengthening industry-academia linkages by way of starting market-oriented courses, compulsory internships, short-term real-life work projects, industrial visits, interaction with industry experts, etc. are being promoted

- Additional on-campus support - In addition to these job-specific specialized education, universities and colleges provided some additional support by offering, among others, career counselling and guidance, placement, equal opportunity, special schemes, remedial classes, etc. for the minority, women, and other underprivileged groups. The objective is to provide them guidance and training in English communication, computer skills as well as preparation for entrance tests to higher levels of education/research and government jobs. The schemes were formulated to address the diverse socioeconomic challenges and geographic backgrounds of the heterogeneous population of students (non-creamy, underprivileged backgrounds) who attend college. The purpose is to provide equity of access and placement opportunities through availability of appropriate institutional support. Unfortunately, the implementation of these schemes remained ineffective due to lack of effort and interest. In the absence of active guidance and use of modern methods required to quickly retrieve and circulate information details for the benefit of all concerned, these schemes became almost nonfunctional in the majority of public colleges and institutions. In contrast, the private institutions spend a lot of time and energy in maintaining placement cells for pre-preparation and on-campus recruitment of students
- Boost to higher education vocationalization - The two-apex level regulatory authorities of general academic and professional technical education - University Grants Commission (UGC) and All India Council for Technical Education (AICTE) - have introduced new schemes and strengthened the existing ones to incorporate elements of skill delivery under the new NSQF. The Scheme of Career Orientation to Education/Career Oriented Program/Career Oriented Courses in universities and colleges were offered with the aim to provide knowledge, skills, and aptitude for gainful employment in the wage sector in general, and self-employment in particular, to undergraduate degree holders, and are merged with the recent vocationalization drive

UGC and AICTE launched a good scheme of community colleges and B.Voc (Bachelor of Vocation) as well as Kaushal Kendra (model training centers). Guided by the aim to develop a synergistic relationship between community, community colleges, and the job market, UGC and AICTE approved community colleges to offer “low cost high quality education locally, that encompasses both traditional skill development as well as traditional coursework, thereby providing opportunities to the learners to move directly to employment sector or to move to higher education sector. It offers a flexible and open education system which also caters to community-based lifelong learning needs”. Allowing for certification at various levels of NSQF, the offered courses require a knowledge-skill mix with the duration determined by the local industry needs. The target group are students currently pursuing higher education and keen to enter the workforce at the earliest opportunity. A minimal scholarship is available to these students. In order to ensure a local connect, universities/colleges preferred to host the community colleges which have proximity to local industry partners. A similar attempt was made by AICTE by opening community colleges that offered engineering/technical courses in engineering colleges. Financial assistance up to a maximum limit of INR5 million per course may be provided by UGC for guest faculty, training/capacity building/skill upgradation, curriculum development, basic infrastructure creation, including laboratory, workshop facilities, consumables, and learner scholarships

c) Setting up skill universities

The idea of opening skill universities was mooted in 2015 against the backdrop of niche skills required for human resource to be productively engaged in the fourth industrial revolution. The courses and programs of skill universities will focus on practical training rather than classroom study. This is to close the gap where the majority of contemporary institutions of higher learning are perceived to be disconnected from the requirements of employers.

d) Setting up centers of excellence (CoE) with industry support

Several CoE have gotten into MoUs with companies across diverse sectors, such as automotive, industrial automation, renewable energy, and aerospace & defense. The CoE create an integrated skill development platform with benchmarked technical education curriculum, focusing on Industry 4.0, automation, mechatronics, and IOT infrastructure, as listed in Annex 5 [24–26]. The Ministry of Electronics and Information Technology collaborated with many premier higher education institutions in setting up CoE in the IT sector. The aim is to provide infrastructure, resources, coaching/mentorship, technology support, and funding to emerging start-ups.

iii) International collaborations

India is approaching the international community for collaborative ventures in the areas of vocational education and skills training - USA, UK, Germany, Australia, Canada, France, and many more. Different modes are used to enter into such collaborations for sector-specific trainings, internships, training of trainers, design of training programs, curricula development, etc. The country choices are based on their local industry/domain expertise and employment potential for Indian youth. These modes include:

- G2G mode - In order to make it more systematic, long term, and dedicated partnerships
- Through NSDC - In order to provide more sector specific focused approach by involving SSCs
- Through DGT (Director General of Training) - With a focus on vocational training at low- and middle-level occupations and jobs

Policies Pertaining to Industrialization and Workforce Development Alignment

i) Enabling programmatic and policy initiatives for Industry 4.0 in India

Globally, the Industry 4.0 market is expected to reach USD214 billion by 2023 [27]. India today has the second largest Internet users base with 462 million subscribers and the sixth largest manufacturing sector. It is one of the most sought-after IT outsourcing destinations with an expected net worth of USD350 billion by 2025, and the IT services sector [28] that houses some of the world's largest IT companies. The sector, targeted to contribute 25% of GDP by 2025 from the present base of 16%, can act as a major catalyst in adopting Industry 4.0 for the manufacturing sector, which traditionally formed India's major production base. India is expected to command nearly 20% of the global IoT market, which is estimated to reach INR19.5 trillion by 2023 [29].

The IoT market in India is expected to grow by 28% CAGR (compound annual growth rate) from 2016 to 2020 and big data analytics at a CAGR of 26% by 2025, thereby increasing India's share in the global market to 32% [30]. AI and machine learning are likely to contribute USD1 trillion to the Indian economy by 2035 [28].

Major steps are taken by the government to promote the adoption of Industry 4.0, namely the National Manufacturing Policy (2017) that targets the adoption of advanced manufacturing and process networking technologies [31]; national program on AI; CoE on IT for Industry 4.0; and the Mission on Cyber-Physical Systems [32–33] to aid 'smart cities', 'smart factories', 'smart industrial corridors', and 'smart start-ups'. While India has the advantage in leveraging the opportunities of

Industry 4.0, the gen-next workforce must first be well prepared and well equipped with digital and cross-functional soft skills.

ii) Industry role in skilling workforce

In addition to in-house orientation and on-the-job trainings, the industry, public, and private domains have stepped up to join the skilling brigade through three modes:

Mode 1: Voluntarily entering into collaborations with universities/colleges or by own initiatives. Big MNCs and industrial groups (Samsung, Siemens India, PepsiCo, Tata, Google, E&Y, to name a few) also provide internship to students during their course of study or by opening labs/incubation centers to train and promote research in required domains. However, such opportunities are available only for few students from highly reputed educational institutions and mostly from engineering and management courses.

Mode 2: Through NSDC initiative, industries are coming forth for tripartite arrangements for faculty/teaching as well as training support.

Mode 3: CSR funds made available from the government's mandate for all corporates to spend at least 2% of their profits on social activities under its CSR clause. Many public-listed companies invested funds into education but not per se for specific high value skills training. It is only recently that with the NSDC initiation, companies have started specific training programs in collaboration with higher education institutions. However, the private sector still requires motivation to come forward in a big way. See Annex 6 for industry activities.

Defining Future Skills-work of National Institutions, Unions, and Employers' Organizations

Identifying Skill Needs

Although multiple agencies have been engaged in identifying skill gaps and incremental skill requirements, the majority rely on employer/employee surveys. These include reports published by big corporations, which are based on their in-house talent deficit experience (Accenture, Cisco), market research and consultancy organizations (PwC, Deloitte, EY, etc), international organizations (British Council, World Bank), industrial organizations (CII, FICCI, All India Management Association/AIMA), public teaching and research bodies (National Institute of Educational Planning and Administration/NIEPA, National Council of Applied Economic Research/NCAER), and national regulatory authorities (AICTE, UGC). Most reports are derived as joint endeavors and publications, and these are usually sporadic efforts. It is only recently that the government initiated systematic survey through the NSDC to identify the sectoral and geographical spread of incremental skill requirements across 24 high priority sectors. Between 2017–22, a second round of this extensive primary survey was held. These Human Resource Requirement Reports were commissioned to not just assess the skill demands in specific sectors but 'also highlight key job roles, map the available supply side infrastructure, and suggest actionable recommendations for the stakeholders in the system' [34].

Multiple Agencies in Skills Training

There are multiple agencies, ranging from government (central government, provincial, and state governments) to private and civil society organizations representing both push and pull approach. Some such examples may be classified as below:

- Government initiatives (NSDC, SSC)
- Educational institutions'/colleges'/universities' initiatives
- Public-sector initiatives (SEBI)
- Industry-sector initiatives (MSME, IT/ITES)
- Corporate initiatives (TATA, CISCO)
- For-profit entrepreneur initiatives (Training academies/institutes - NIIT)
- Nonprofit initiatives

Push or Pull Approach?

It can thus be seen that India's approach is two-pronged. While the industry is exerting the pull approach for human resource with new skillsets, the government and institutions are pushing to forge ahead the Skill India drive. A large number of skill training institutions are also active in both formal and informal modes with emphasis on formal modes of training.

POLICY RECOMMENDATIONS

Indian skills training and higher education landscape is wide and diverse, simultaneously making it exciting yet challenging. Future job-oriented education in India is very limited in size (available only to the elite and well-off segment of society), space (urban centers and limited disciplines) as well as structure (curriculum, teaching-learning methodology). Teaching faculty is neither ready nor trained to take up the additional responsibility of introducing effective job-oriented courses that lead to making meaningful industry-academia linkages. Infrastructure has become obsolete or insufficient for making internationally competitive desirous changes. Lack of convergence between higher education and the skill ecosystem is on a high degree. Today, higher education contributes only 4% in offering skills training while MSDE contributes 58% [23]. But, MSDE has not been involved in the higher education system and caters largely to low-end skills training. It is vital for the higher education sector to gear up and take lead in high order skills training for the new industry.

There is a silver lining. Industries that are poised for higher growth in the future are also higher on the employability index for the Indian youth [8]. Given its demographic advantage, the global industry is looking at India with great hopes in order to tap into its future manpower. In today's borderless economy, India can reap the benefit if the human resource edge is harnessed properly. India has a huge potential to benefit in two ways - by exporting certain services and importing the customers for some other sectors. The flexi model of the future industry intertwined with the Internet and exponential technologies is knocking on the doors for four types of major changes in the coming workspaces. In this, India has already embarked on a four-pronged approach of Skill India Mission, Start-up Initiative, Make in India drive, and service sector export enhancement.

The pressing issue now is on the scalability of high-end research facility and quality education/training aligned to future industry needs. As of today, there is too much on the platter to manage efficiently and effectively. It is important to identify the country's comparative advantage and focus on limited areas for high-end niche skilled human resource on one end, and low and middle order skilled human resource for the larger mass.

The complexity not only involves multiple stakeholders' active engagement and proactive initiatives, but also external factors that are not within the direct control of any sector, education, nor industry, such as overall economic growth, funds, job market conditions, and societal perception. Hence, it is important for all major stakeholders to actively and collaboratively engage with the student community. While higher education has to play a pivotal role in establishing and strengthening the four-pronged connectivity with the industry, society, alumni, and international bodies at local, national, and global levels, it is also a shared responsibility of all stakeholders and likely beneficiaries.

Initiatives need to be made and policies oriented to make the initiatives possible at multiple levels and by multiple stakeholders. Few that may be highlighted based on the analysis include:

- i) Government to develop a robust labor management information system, online employer counseling, etc. to avoid confusion, overlap, contradiction of such information by various organizations.
- ii) Policies directed at the industry to institutionalize and incentivize engagements with the academia to specially have clear guidelines in their CSR charter.
- iii) Policy guidelines and support to higher education to play a pivotal role in strengthening future workforce capacities. It may thus be important to provide additional manpower and create such offices in the higher education institutions that may be more technically proficient in instituting additional task of employability building, career guidance, and placement support. Tapping alumni resources is another avenue. Public provisioning of career development facilities on campus for preplacement preparation and training support is also needed for holistic development.
- iv) Strengthening research, innovation, and entrepreneurship education are additional areas that require attention.
- v) Easing international collaborations in education, training, and production.
- vi) Policies directed at constant reskilling and up-skilling in order to sustain young workers in the industry (sustainable employability).
- vii) Developing means to generate funds from various sources.

The disconnect between the three major stakeholders of education-workplace network, i.e., employers, education providers, and students is at the root cause of skills deficit and talent shortages. Policies that facilitate greater interaction and joint/collaborative functioning to prepare human resource are required. The integration of human resources and highly sophisticated machine-based production technologies for customized human centric solutions is the imperative need.

ANNEX 1. SNAPSHOT OF INDIAN ECONOMY

Year/Item	2015–16	2016–17	2017–18	2018–19	2019–20
GDP growth (at constant prices)	8.0	8.2	7.2	6.8*	7.0**
Forex reserves (in USD billion)	360.2	370.0	424.5	412.9	461.2***
Fiscal deficit (% of GDP)	3.9	3.5	3.5	3.4	3.3
Service sector growth (%)	9.2	8.4	8.1	7.5	6.9**
Inflation CPI-C (%)	4.9	4.5	3.6	3.7	4.1*
Inflation WPI (%)	-3.7	1.7	3.0	4.7	1.5*
Agriculture, forestry, & fishing	7.6	6.3	5.0	2.9*	2.8*
Industrial growth	8.8	5.6	5.9	6.9*	2.0*

Source: Press Information Bureau, Economic Survey, Inflation data from Department for Promotion of Industry & Internal Trade (DPIIT), NSSO
Note: *provisional, ** projected, *** as on 10 January 2020

ANNEX 2. HUMAN DEVELOPMENT INDICATORS

Year/Item	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HDI	0.565	0.571	0.581	0.59	0.6	0.607	0.618	0.627	0.637	0.643	0.64
GDI	*	*	0.785	0.788	0.796	0.809	0.816	0.817	0.825	0.827	0.829
Expected years of schooling	10.5	10.4	10.8	11.3	11.5	11.6	11.9	12	12.3	12.3	12.3
Mean years of schooling	5.2	5.3	5.4	5.3	5.5	5.8	6	6.2	6.4	6.5	6.5
Life expectancy at birth	65.8	66.2	66.7	67.1	67.5	67.9	68.3	68.6	68.9	69.2	69.4
Infant mortality rate (per 1,000 live births)	*	*	45.3	43.2	41.1	39.1	37.2	35.3	33.6	32	*
Health expenditure (% of GDP)	*	*	3.3	3.2	3.3	3.7	3.6	3.6	3.7	*	*

Source: <http://hdr.undp.org/en/data>
Note: * Data not available

ANNEX 3. SECTORAL EDUCATION AND EMPLOYMENT SCENARIO

Item	2007	2011	2014	2015	2016	2017	2018
School enrolment (% gross)							
a. Primary	110.02	108.32	107.86	108.49	114.54	112.96	-
b. Secondary	57.28	66.25	74.14	73.87	75.09	73.48	75.16
c. Tertiary	13.13	22.76	25.43	26.77	26.83	27.44	28.06
Employment (% age of total employment)							
a. Agriculture	53.86	48.96	46.07	45.56	45.12	44.52	43.86
b. Services	25.69	27.52	29.55	30.10	30.59	31.00	31.45
c. Industry	20.45	23.52	24.38	24.34	24.29	24.48	24.69
Employment to population ratio (15+)	55.30	51.82	50.80	50.76	50.71	50.72	50.60
Gross savings (% of GNI)	37.17	35.44	33.87	32.83	32.06	31.53	31.26
Gross capital formation (% of GDP)	41.93	39.59	34.27	32.12	30.21	30.94	31.31

Source: World Bank

ANNEX 4. OTHER MINISTERIAL INITIATIVES

Ministry of Labour and Employment focuses on improving the landscape of low/middle level skill building by upgrading select secondary schools and turning industrial training institutes (ITIs) into institutes of excellence, and others placed in public-private partnership (PPP) mode; setting up new ITIs in underserved regions in PPP mode; and in industrial clusters/special economic zone on a demand-led basis.

Ministry of Rural Development proposes to set up institutes to specially train rural youth for entrepreneurial set-ups via RUDSETIs (Rural Development Self Employment Training institute). 600 RUDSETIs are established - one in each district - in the 12th Five Year Plan with state governments providing land, and fulfilling 75% of the capital cost while banks plug in the remaining 25% of funding. As rural India has been facing the extreme brunt of jobless growth in post-liberalization era, this initiative comes as a new ray of hope for the rural educated youth.

Joint-ministry initiative - Ministries of Information Technology, Small and Medium Enterprises, and Rural Development and Textile set up a virtual Skill Development Resource Network linking 50,000 skill development centers (SDCs) in collaboration with enterprises, industry associations, and NASSCOM (National Association of Software and Service Companies). The objective of the joint supervision initiative is to train approximately 200 persons per center per year via training capsules of 8–12-weeks duration. The trainees would also be supported for placement post-training through Employment Melas (Fairs).

ANNEX 5. PROMINENT FEATURES OF THE VOCATIONALIZATION SCHEMES

The planned schemes would allow for vocational education in a pyramidal structure starting from a minimum of Diploma to Advanced Diploma, B.Voc., and further studies at postgraduate and research levels. The purpose is to provide threefold services focusing on skills for employability, developing entrepreneurship, and acting as centers of excellence through critical innovative research for skill development in specialized areas. These centers would also act as interuniversity, intersectoral university-industry, higher education system, and industrial sector coordination facilitators.

Under these schemes, students can pursue bachelor's degree (Bachelor of Vocation/B.Voc.) as part of their college/university education, and also allowed multiple exits, such as Diploma/Advanced Diploma under the NSQF along with broad based general education. The courses are designed to incorporate specific job roles and their National Occupational Standards (NOSs). The course curriculum would have a greater component to skill based vocational education (60%) and general education at 40% in a 60% credit-based semester system. The courses are redesigned to include more credits for practical training. These courses run parallel to the conventional B.A., B.Comm, and B.Sc. degrees, and are interdisciplinary in nature. Students will have the freedom to diversify into various fields, not necessarily related with their core discipline, for e.g., a science student could simultaneously pursue a course in Event Management, and student of Arts have the option to pursue a course in Science Journalism, etc. (UGC annual report). During the 12th Five Year Plan, 793 courses were approved for the next five years to 522 institutions (516 colleges + 6 universities) for the introduction of Career Oriented Courses.

Although the institutions have been provided complete autonomy in identifying the courses to be offered, some indicative courses have been proposed by UGC by way of common guidelines, as depicted in the following:

B. Voc Indicative Courses (Stream wise)

Science Stream: Information and Computer Technology, Refrigeration, Biotechnology, Hospital Waste Disposal Management, Sericulture, etc.

Social Sciences and Humanities Streams: Courses could be of interdisciplinary in nature, namely Applied Sociology, Applied Psychology, Tourism, Fashion Designing, Translation Proficiency, Television, and Video Production.

Commerce Stream: Insurance, Banking, e-Commerce World Trade, Foreign Exchange Trade, Retailing, etc.

The new framework provides for seamless movement from vocational to university education starting with level 1 certification from grade IX to university education. Moving from level 1 to level 7, the new framework ends with a bachelor's degree (college undergraduate at the 7th level). Beyond the levels of 8, 9, and 10 are the postgraduate and doctoral degrees. Multiple pathways have been created for exit and entry at different levels to allow for movement from education to work and vice versa (vertical mobility) as also between vocational and academic education (horizontal mobility). The new framework also allows for Recognition of Prior Learning (RPL) by family and other informal routes. With assessment of prior learning a candidate can progress toward a community skill diploma in a community college/polytechnic in a special flexible curriculum, as determined by UGC and AICTE from time to time.

ANNEX 6. FEW PRIVATE-SECTOR INITIATIVES

Siemens SITRAIN India Main Training Centre

Siemens' Kharghar training center of India conducts trainings for fresh Siemens GTE (Graduate Trainee Engineers) and is also extended to the college/university for third and final year college students to be trained in the advanced areas of Electricals & Automation.

Source: http://www.siemens.co.in/en/about_us/index/our_business_segments/automation_drives/sitrain_training/training-centres.html

Samsung Technical School

Samsung has signed up with the Department of Technical Education (DTE) and the Ministry of Micro, Small and Medium Enterprises (MSME) to set up Samsung Technical Schools across government's Industrial Training Institutes (ITI) and Tool Rooms to provide postschool technical training to students by way of Advanced Repair and Industrial Skills Enhancement (ARISE) training program. They are designed to impart hands-on, trade-specified training to students, including soft skill courses and on-the-job training at Samsung manufacturing facilities and authorized service centers. The Samsung Technical School also undertakes a 'Guru Shiksha' program, to train teachers of these institutes in Samsung products. The company runs e-learning Centers (STeP) with the Smile Foundation for underprivileged youth living in urban slums and peripheral rural areas, training them in basic computers and retail sales management skills along with proficiency in spoken and written English. Through STeP, Samsung reached out to over 720 youth across six centers located across the country. Samsung actively supported the eLearning program from 2009 to 2012.

Source: <http://www.samsung.com/in/aboutsamsung/samsungelectronics/india/corporate-citizenship/employability.html>

TATA Skilling Initiative - LIFE SKILLS for INDIA

TATA group is a large industrial group and they train thousands of youth across India through their Tata skilling initiative in a multitude of sectors - hospitality, aerospace, automobile, business process outsourcing (BPO), power, etc., through their own companies. The aim is to create local trained manpower to serve in their own plants. Most of the trainees are either ITI graduates or school dropouts. However for certain trades and services, they also target higher education graduates.

Tata Consultancy Services (TCS) trains unemployed graduates to work in Business Process Services (BPS). Through this program, training is offered in areas like English communication, corporate etiquette, and IT competency. Since 2010, the company has trained over 37,000 youth, of which about 15,000 belong to underprivileged, noncreamy communities. Not only do they train but also employ the deserving ones. About 2,700 trainees are employed with TCS-BPS (Tata Consultancy Services/TCS) today. Drawing inspiration from the success of the BPS Employability Program, TCS launched a new initiative in 2014 for students in prefinal year of four engineering colleges in Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra. These students received training through a specially designed 200-hour module on IT skills.

In another collaborative program with National Skills Development Corporation (NSDC) named project 'Udaan', they offer a 14-week training program to improve employability of Kashmiri youth (Jammu & Kashmir in India is a northern state with conflict and extremist affected region with difficult terrain) since 2011. TCS has also set up a faculty development program to enhance the capability of the faculty. About 100 teachers from ITIs in eight states were trained and certified by TCS. Through another TCS programme 'Insight', the company promotes team building, leadership, communication, and presentation skills to Class 12 students.

Source: <http://www.tata.com/sustainability/articlesinside/Life-skills-for-India>

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