

# EMBRACING NEW WAYS OF WORK

PREPARING THE HUMAN CAPITAL  
OF THE FUTURE



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The Asian Productivity Organization (APO) is an intergovernmental organization committed to improving productivity in the Asia-Pacific region. Established in 1961, the APO contributes to the sustainable socioeconomic development of the region through policy advisory services, acting as a think tank, and undertaking smart initiatives in the industry, agriculture, service, and public sectors. The APO is shaping the future of the region by assisting member countries in formulating national strategies for enhanced productivity and through a range of institutional capacity building efforts, including research and centers of excellence in member countries.

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# FOREWORD

**R**apidly 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



# EXECUTIVE SUMMARY

**T**he World Development Report (WDR) 2019 on the Changing Nature of Work [1] studies how the nature of work is changing as a result of advances in technology today. Fears that robots will take away jobs from people have dominated the discussion over the future of work, but the WDR 2019 finds that on balance this appears to be unfounded. Work is constantly reshaped by technological progress. Firms adopt new ways of production, markets expand, and societies evolve. Overall, technology brings opportunity, creates new jobs, increases productivity, and delivers effective public services. Firms can grow rapidly thanks to digital transformation, expanding their boundaries and reshaping traditional production patterns. The rise of the digital platform firm means that technological effects reach more people faster than ever.

Technology is changing the skills that employers seek. Workers need to be better at complex problem-solving, teamwork, and adaptability. Digital technology is also revolutionizing how people work and the terms on which they work. Even in advanced economies, short-term work, often found through online platforms, is posing similar challenges to those faced by the world's informal workers.

This report analyzes some of these changes and considers how governments and industries can best respond. Investing in human capital must be a priority for governments and industries in order for workers to build the skills in demand in the labor market. In addition, governments need to enhance social protection and extend it to the society, irrespective of the terms on which they work. This report offers a suggestion as to how governments can mobilize additional revenues by increasing the tax base and also funding its citizens to upgrade themselves in tandem with the developments of the fourth industrial revolution (Industry 4.0).

Industries of the future significantly differ from those today due to the boom of advanced technology as well as the spring of Industry 4.0. Faced with opportunities and challenges of these changes, each nation around the world has to adapt, and then, create its own new competitive advantages toward human capital development (HCD). This is clearly the situation for all eight participating member countries - all are clearly aware and have on a national, state, or sectoral level, put in place initiatives to harness both the opportunities and threats of Industry 4.0.

The Asia-Pacific region has grown to become one of the most attractive economies with fast economic growth, stable society, and a relatively young labor force. The Human Development Index prepared by the World Bank has shown clearly that the year-on-year growth from the period 2010 to 2018, all eight participating member countries in this research project has registered positive growth, reflecting among others, the importance of education in contributing to a better life for all its citizens.

Over the last 10 years, the eight participating member countries' workforce has developed dramatically to reshape its economy towards knowledge-based and an increasingly digitalized economy. The common pillars of HCD

policies are based on (i) industries restructuring; (ii) education and training; and (iii) collaboration between higher education institutions (HEIs), training and vocational education (TVEs), and their stakeholders. However, while good progress has been registered for the participating countries, there is still much room for improvement, as indicated under recommendations of this report.

To stay ahead of the disruptions and the opportunities provided by Industry 4.0 and beyond, there is a further need to intensify the transformation by reviewing and developing national strategies on HCD. The eight participating countries need to take stock of where they are now, and look critically at what lies ahead to strengthen the pillars of HCD, including: (i) to restructure and encourage the development of advanced-technology industries; (ii) to revamp education and training system aligned to industries of the future and the aspirations of the workforce; and (iii) collaborations between government and industries, where the industries take the lead as responsible employers and to incentivize learning and growth of the workforce.

To strengthen human capital formation, industries, and HEIs with TVEs need a more critical review of their efforts by focusing on and intensifying the following: (i) improving the capabilities and capacities of their human resources, especially instructors and lecturers, by equipping them with both academic and practical knowledge, skills, and attitudes in the area of teaching and curriculum development; (ii) developing new programs in collaboration relevant to industries of the future; and (iii) strengthening the relationship among HEIs, TVEs, and industries through training, consulting, and internship opportunities.

## CHAPTER 1

# INDUSTRIES OF THE FUTURE – A SITUATION ANALYSIS

### Research Methodology

The purpose of this multicountry research paper on ‘Embracing New Ways of Work: Preparing the Human Capital of the Future’ is to establish a common understanding and to share an overview of:

- The industries of the future and its requirements toward skills and qualifications of HCD to ensure workforce readiness
- Strategic approach to national policies for HCD to enhance the qualifications of labor for the industries of the future
- Policy implications for national strategies on HCD for the industries of the future in selected APO member countries

The main research question centers on whether the current initiatives of governmental and related institutions are appropriately designed to meet the industries of the future. In providing an informed response to this question, the following research areas were included:

- National agencies involved in developing national strategies for future skills
- Tracing the economic development of the country and the alignment of such policies to workforce policies
- Current policies pertaining to industrialization and the alignment to the development of the workforce
- Attempts to define future skills - work of national institutions, unions, and employers’ organizations, mechanisms
- Push or pull approach

This research aims to look into whether past efforts of national strategy in developing human resources for industries have brought about better outcomes in living standards and employment. These observations can then be synthesized into policy recommendations from the collective efforts of the member countries participating in this research to better ensure that current efforts in developing human resources for industries of the future can result in higher employment and living standards for the workforce.

There are altogether eight participating member countries to this research - Republic of China (ROC), India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, and Vietnam.

### Data Sources

This research lends itself to the use of secondary data sources from government, economic reports, and related agencies pertaining to the utilization of the workforce.

Secondary data means data that are already available, i.e., they refer to the data which have been collected, collated, and analyzed by someone else. When the research utilizes secondary data, various sources can be looked into from where data can be obtained. Secondary data may either be published data or unpublished data. Usually published data are available in: (i) various publications of the central, state, and local governments; (ii) various publications of foreign governments or of international bodies and their subsidiary organizations; (iii) technical and trade journals; (iv) books, magazines, and newspapers; (v) reports and publications of various associations connected with business and industry, banks, stock exchanges, etc.; (vi) reports prepared by research scholars, universities, economists, etc. in different fields; and (vii) public records and statistics, historical documents, and other sources of published information.

However, application of appropriate set of criteria to select secondary data to be used in the research plays an important role in terms of increasing the levels of research validity and reliability. These criteria include, but not limited to date of publication, credential of the author, reliability of the source, quality of discussions, depth of analyses, and the extent of contribution of the text to the development of the research area, etc.

The most significant challenge facing this research is whether the most appropriate data sets can be obtained from credible and reliable sources. Whether national policies pay dividends is very much dependent on looking at past policies, its successes, and thereafter extrapolating the policy-making processes and decisions into the future. Given that today's environment is much more challenging - volatile, uncertain, complex, and ambiguous - can yesterday's success bring with it success into the future.

The presentations of participating member countries during the meeting held in November 2019 were crucial in guiding the overall research activities and plans. The collective agreement on the common approach and methodology of research helps the chief expert and all national experts to agree on a common approach and methodology for conducting the research on 'Embracing New Ways of Work' as well as ways to address difficulties that may occur during the project.

This research study aims to look into whether past efforts of national strategy in developing human resources for industries has brought about better outcomes in living standards and employment. The Human Development Index (HDI) was used as a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. The study reviews previous policies related to human resource development (HRD) in the participating member countries and the result of these efforts. The participating member countries reviewed whether there are national strategies in place to meet the challenges of the industries of the future and programs targeted at the workforce and the education system to ensure a ready supply of talents to take advantage of the opportunities created by these national programs.

Data on structural unemployment should be a useful proxy on how quickly an economy is able to respond to changes in competency requirements as nations restructure and transform itself toward Industry 4.0.

This process both clarifies the gap between requirement of the industries in the future and the capacity of human resource of the participating member countries to meet the workforce ready requirements and to identify gaps, and if any, national policies needed to close the gap.

Based on these findings, the national experts will suggest some recommendations for their respective governments and institutions, both public and private, to develop human resources toward the demand of Industry 4.0.



## Key Findings

The Human Capital Index (HCI) [2] is a report prepared by the World Bank. The index measures which countries are best in mobilizing the economic and professional potential of its citizens. It also measures how much capital each country loses through lack of education and health. The index was first published in October 2018 and ranked 157 countries. The HCI ranges between 0 and 1 with 1 meaning maximum potential is reached. It is designed to highlight how improvements in the current health and education outcomes shape the productivity of the next generation of workers, assuming that children born today experience over the next 18 years the educational opportunities and health risks that children in this age range currently face. The HCI for the eight participating member countries are as tabulated in Table 1.1.

**TABLE 1.1**

### HUMAN CAPITAL INDEX (% OF POTENTIAL REACHED)

Country	Score (% of potential reached)
India	0.44
Indonesia	0.53
Malaysia	0.62
Pakistan	0.39
Philippines	0.55
ROC	Not available
Singapore	0.88
Vietnam	0.67

**Source:** World Bank, 2018

The HDI [3] was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. The HDI can also be used to question national policy choices, asking how two countries with the same level of GNI per capita can end up with different human development outcomes. These contrasts can stimulate debate on government policy priorities.

The HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. Eight participating member countries are tabulated in Table 1.2.

Both the HCI and HDI are useful measures of national strategies and initiatives toward human capital formation and development. Both indexes considered strategies and initiatives directed at the formative years of education and lay the foundation for its citizens to acquire the knowledge, skills, and attributes required of a future economy and its extension, the industries of the future.

TABLE 1.2

## HUMAN DEVELOPMENT INDEX - AVERAGE ANNUAL HDI GROWTH 2010–18 (%)

Country	HDI, 2018	Average Annual HDI Growth 2010–18 (%)
India	0.647	1.34
Indonesia	0.707	0.74
Malaysia	0.804	0.49
Pakistan	0.560	0.85
Philippines	0.712	0.73
ROC	0.907*	Not available
Singapore	0.935	0.35
Vietnam	0.693	0.74

Source: United Nations Development Program

HCI provides a snapshot of the potential ahead for the eight participating member countries in developing their human capital. This index can be tracked over time in tandem with the national strategies toward human capital formation and development.

HDI is another such index. Fortunately, all eight participating member countries have registered positive average annual growth rates from 2010–18, reflecting the efforts put in by their respective governments to better prepare the workforce for the industries of the future.

### Industries of the Future and Requirements Toward National Strategy

#### Republic of China (ROC)

Facing the challenges of Industry 4.0, the government of ROC considers three major impacts on the human resources; changes in demographic trends, changes in working environments and conditions, and impacts on work and skills. The trend of Industry 4.0 has a profound impact on national HRD. In the future, the development of robotics, AI, the IoT and service innovation, and job opportunities for human-robot collaboration will significantly increase.

In managing the new global trend of escalating trade and economic conflicts, and the industrial transformation caused by the Industry 4.0, the ROC government has strived to build a new economic model for sustainable development based on the core values of innovation, employment, and equitable distribution. The two major strategies of the ROC government policy are accelerating investments and implementing structural reforms. In this new model for economic development, innovation will provide the momentum for growth while job creation is the priority and goal. These are also carried out alongside equitable distribution of resources and environmental sustainability.

#### India

Developing human resource for this new age industrial transformation is a long-term dynamic and continuous process of skilling, deskilling, and reskilling for sustainable employability. There is a need to review, rethink, and reorient its education, vocational training, and labor market policies to the industries of the future to bring about a highly educated and super specialized human resources to forge new innovations in production technologies and spearhead the new “knowledge economy”.

The new wave of linking ‘education to work’ has been quite evident in the education system. Automation, digitalization, big data management, and environment sustainability are redefining the existing nature of work technology in both traditional and emerging industries of the future. India looks at linking them to the general production processes in major industrial sectors as a requirement toward national strategy.

### Indonesia

The government took the lead by putting in place the Grand Design of National Industry Development. In early 2019, the Ministry of Industry announced 10 national industry priorities, composed of six primary industries (food; pharmaceutical, cosmetics, and medical equipment; textile, leather, footwear, and miscellaneous industry; transportation; electronics and telematics; and energy), supporting industries (capital goods, support material, and industry services); and upstream industries (agro-upstream; basic metal and minerals nonmetal; oil and gas basic, and coal).

The absence of collective action within and across industries, especially in setting up the industry transformation map was a concern. Setting up industry transformation requires active roles of ‘the triple helix’ - the government, business associations, and academics, where the government takes the leadership role. This has yet to materialize.

Indonesia still suffers from a lack of concerted effort and action across companies and industries. National competitiveness has yet to be a common concern for the players. The further the country is from global competitiveness effort, the more distant it is from nationally initiated innovation at the industry level. This, therefore, may hinder the industry from foreseeing its future transformation map.

### Malaysia

The Malaysian government has introduced a number of initiatives and policies to upgrade domestic industries and local human capital to embrace Industry 4.0. It is expected to introduce rapid and large changes to the current economic landscape, especially the labor market. It is estimated that more than 50% of current jobs are at high risk of being replaced by automation. For this reason, the government, through various ministries and agencies, has laid out several masterplans and policy packages related to industry upgrading and HCD, for example the National Industry 4WRD Policy, National e-Commerce Roadmap, National Big Data Analytics Framework, and expansion of Technical and Vocational Education and Training (TVET). These policies aim to ensure that the advancement of the industry is aligned with the development of human capital so that labor issues, such as mismatch and shortage, can be minimized.

Amid these welcome initiatives, the current and future workforce still lack awareness of Industry 4.0. A recent survey involving 560 respondents revealed that students and graduates do not fully understand what Industry 4.0 entails. They feel unprepared to join the Industry 4.0 workforce, and there is a perception that tertiary education may not be doing enough to prepare students for the workplace. Adjusting the labor force to new jobs and industrial environment would thus require tremendous efforts from educational institutions, training providers, the industry, and the government.

### Pakistan

Industry 4.0 is the current trend of automation and data exchange in manufacturing technologies. Pakistan recognizes that many jobs today, and many more in the near future, will require specific skills, a combination of technological know-how, problem-solving, critical thinking as well as soft skills, such as perseverance, collaboration, and empathy. The changing industrial dynamics will require the government to invest in HRD through policy reforms.

In such critical situation, education and training providers need to be aware of the potential future requirements of the labor market to ensure that the trainings offered to individuals will make them competitive in the future. It is a harsh reality that machines will replace many jobs in the future in order to raise productivity. The technological innovations will continue to accelerate and affect every part of our lives.

### Philippines

The Philippines is less prepared for the disruptions and uncertainties that characterize Industry 4.0. The lack of sophistication of the country’s export portfolio is an indication of the quality of skills the country’s workforce currently has, leaving the Philippines to face with an enormous task of reskilling and upskilling its people.

Given these existing issues and emerging developments, questions on the requisite skills and how to best develop the human resources in the country to harness the opportunities resulting from ICT advancements come to the fore. The Philippines Development Plan (PDP) 2017–2022 has acknowledged the importance of preparing the youth, given the present ICT advancements that are shaping the world of work in the future.

The PDP 2017–2022 has recognized that future skills and forward-looking questions on the development of human resources are not at the forefront of the current conversation due to the preoccupation of the government with issues, such as economic stability. Thus unlike advanced economies, the Philippines has no one national agency that oversee future skills.

### Singapore

Investment in human capital through education and training has been at the heart of Singapore's progress, and has helped Singaporeans develop and maximize their potential. By enabling a highly skilled and competitive workforce, it has allowed Singaporeans to secure better jobs, higher incomes, and enjoy higher standards of living.

As part of the coordinated Industry 4.0 strategy, the Singapore government has earmarked significant time and investment into R&D projects, developing industry transformation maps and strengthening the workforce's skill sets to move the industry toward quicker adoption.

The city-state indeed has an ideal mix of ingredients - rich knowledge base, sophisticated smart nation infrastructure, precision engineering, creative and technical design capabilities - to help manufacturers transition from a value-add model to a value creation model. In fact, Singapore's strong combination of infrastructure and government policy resulted in it being the top-ranked country in the Economist Intelligence Unit's 2016 Asian Digital Transformation Index.

### Vietnam

As the world experiences Industrial 4.0 with many opportunities and challenges for national development, the overall goal for Vietnam's HRD strategy for the period of 2011–20 was to make its human resources the most important foundation to sustain the development of the country, to internationally integrate and to stabilize society, and to raise the level of competitiveness of Vietnam's human resources on par with the advanced economies of the ASEAN region.

However, the challenges for Vietnam in the industries of the future include changing employment structure that causes unemployment among low-skilled labor groups, thereby creating pressure in social inequality. These challenges may impede the country's attempts to take advantage of the benefits of the Industry 4.0.

### The National Policies on Human Capital Development (HCD)

The following highlights the overview of national policies on HCD to enhance the qualifications of labor for the industries of the future across participating member countries:

#### ROC

The Ministry of Education and the Ministry of Science and Technology are responsible for the program to nurture talent and boost employment. The Ministry of Education proposed a plan to optimize the implementation environment of technical vocational schools. The plan featured four major strategies:

- i) To nurture talent as the foundation of forward-looking infrastructure development. Given this goal as well as in response to Industry 4.0, the Ministry of Education has planned for technological, vocational colleges, and universities to optimize their environments for Job Ready Skills Programs.
- ii) To establish Master Training Centers to provide teachers' education, enhance students' professional, technical, and operational ability as well as cultivate technical professionals who can serve as instructors.



- iii) To cultivate talent in a quasi-industrial environment. Courses related to the industrial environment will be planned in order to provide a hands-on environment for students' internship, offer training to students and teachers as to strengthen their technical competence, and their connection to industries as well as cultivate diverse talent with employability to bridge the academia-industry gap.
- iv) To make available a whole range of fundamental equipment and facilities for education and internship in response to new curriculum guidelines.

To promote entrepreneurship in youth, employment, and international industry-academia research cooperation activities, the Ministry of Science and Technology has supported the innovation and entrepreneurship ecosystem to further integrate with the international community. For the cultivation of young talent and the promotion of employment, four key international programs were planned:

- i) The 'Promote International Industry-academia Alliance Program' sets up an international-level industrial contact center in the school to assist domestic academic research and innovation facilities to link up with leading global technology supply chains.
- ii) The 'Young Technology Innovation and Entrepreneurship Base Construction Programs' bring in international accelerators, venture capitalists, and potential new venture teams to create international technology entrepreneurship settlements.
- iii) The Key Industry High-level Talent Training and Employment Programs' promote PhD students into the industrial workplace through the cooperation of think tanks, academic institutions and businesses.
- iv) The 'Young Scholar Development Program', the 'Einstein Planting Program', and the Columbus Program' are promoted to provide young researchers with long-term and sufficient resources to cultivate a new generation of scientific research.

### India

The national approach to preparing future workforce is of a multipronged 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 was adopted to bring in major stakeholders, as follows:

- i) Ministerial engagement by way of defining the pathways and launching schemes

With the aim to making India the "skill capital of the world", an all-encompassing comprehensive and inclusive National Policy on Skill Development and Entrepreneurship was launched in 2015. The vision statement of this policy was "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 aimed to enable effective coordination between different ministries, the Center and the States, and public and private providers to create institutional mechanism for R&D, quality assurance, examination and certification, affiliation and accreditation, and coordination of skill development across the country.

This policy had two distinct components - skill and entrepreneurship. The focus of the skill component was to put India onto the trajectory of high aspirational value for occupational and employability skills. Major elements included integrating skill development closely with formal education; promoting industry engagement and apprenticeship; operationalize quality assurance and leverage technology.

The entrepreneurship component's aim was to promote an entrepreneurial culture and support neo-entrepreneurship. Major elements included 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.

- ii) Revamping the higher education sector to greater industry-oriented teaching, learning, and training

Under the overarching umbrella of the Ministry of Human Resource Development (MHRD), several attempts have been made to integrate skills delivery in education programs, particularly in the higher education sector in recent years. A sector-wide approach and measures to address the issue of employability skills by investing in infrastructural development, teacher training, faculty and curriculum development is visible. Specific efforts have been made to integrate elements of skills delivery right from elementary to higher level 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 vocationalist at secondary level; expansion of technical and vocational education, rejuvenation of huge network of existing universities - are geared toward making industry-ready and future-ready workforce.

- iii) Involving corporate houses and industry sector in taking proactive and not merely a supportive role in creating skilled human resource

The private sector has stepped up to join the skilling brigade through three modes. The first is by voluntarily entering into collaborations with universities/colleges by providing internship, opening labs/incubation centers to train, and promote research in required domains. The second is through National Skill Development Corporation (NSDC) initiatives where industries are coming forth for tripartite arrangements for faculty/teaching as well as training support. The third and final mode is on the government of India mandating all corporate entities to spend at least 2% of their profits on social activities under its Corporate Social Responsibility (CSR) clause. With NSDC initiation, several companies have started specific training programs in collaboration with HEIs.

- iv) Reaching out to international agencies/bodies and NGO sector to fill in the gaps and support in upgrading the capacities to train the youth workforce for future

India is approaching the international community for collaborative ventures in the area of vocational education and skills training (USA, UK, Germany, Australia, Canada, France, and many more). Different modes are being 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 the Indian youth.

### Indonesia

According to the Indonesia Mid-Term Development Plan 2020–2024, the Indonesian government aims at improving the quality of human capital, boosting national competitiveness, and shifting national development program from natural- to human resource-based economy. Clearly, this aim requires for coherent and concerted actions by all national agencies involved.

In 2016, a series of discussions on TVET, mainly supported by the Indonesian Chamber of Commerce (KADIN) and the Ministry of Manpower, was initiated. The Minister of Manpower also established a National Committee of Vocational Training (KPVN). KPVN consists of vocational triple helix ‘plus’ - representatives of industries, government, academics, union leader, and NGOs. The Ministry of Manpower’s primary objective was to focus on TVET in addressing labor shortage and mismatch through a three-pronged approach of skilling, upskilling, and reskilling.

Another equally relevant ministry in human capital supply is the Ministry of National Education. The foundation for national education reform was introduced in 2003, requiring schools, educators, and

education staff to be accredited and certified. In relation to vocational education, the government emphasizes comprehensive and detailed fundamental soft and technical competencies.

The Ministry of Manpower with the full support from KPVN designed Indonesia Skilled Card (Kartu Indonesia Terampil). The card allowed the holder to obtain training support and facilities from the government. This was mainly to address the challenges of skill mismatch and shortage through ‘triple skilling’, namely skilling, upskilling, and reskilling, in the face of Industry 4.0. This was meant to improve national productivity by funding and providing training that fitted with current and future industry demand.

Despite the increasing enthusiasm across different national agencies, this development entails some concerning issues as these organizations tend to individually embark on their own self-initiated TVET programs. A huge concern surfaced as many of the programs were not in coordination with the users, namely the relevant industries. In other words, the demand side has not well fulfilled by the supply on offer. This certainly hinders the achievement of the ultimate national goals in employment and national competitiveness.

### Malaysia

Malaysia is committed to ensure that the development of human capital is in line with the goal of being a high-income nation. Several ministries, including the Ministry of Human Resources, Ministry of Higher Education, and Ministry of Rural and Regional Development are responsible to steer HCD policies toward that goal.

In Malaysia, Industry 4.0 is mainly concentrated on manufacturing. The Ministry of International Trade and Industry (MITI) in its Industry 4.0 policy emphasizes on “making better things while making things better”. In essence, the policy ‘Industry4WRD’ outlines 13 broad strategies for Malaysia to embark on a journey that will transform the manufacturing industry landscape over the next decade. MITI believes that this journey toward Industry 4.0 adoption is anchored on three shift factors: people, process, and technology. The government’s role in the whole transformation process is as an enabler, as such, this policy is aimed at ensuring the adoption of Industry 4.0 technologies is done as seamlessly as possible, and that those technologies are equally accessible to SMEs.

The government aims to boost support for TVET and STEM education programs, aligned with the skills demanded by industry, in part by increasing funding for vocational education and training program and into tertiary education curricula. In 2018, Malaysia established the Critical Occupation List (COL) as a guideline to plan for future skills.

### Pakistan

In Pakistan, a number of federal and provincial agencies are working to meet the human resource needs of industries of the future.

The Ministry of Science and Technology introduced the ‘National Science, Technology and Innovation Policy’ in 2012 with the principal objectives that encompass socioeconomic development, HRD, R&D infrastructure, promotion of science, technology, and innovation (STI) in the society, and science and technology (S&T) management system. The policy envisages achieving security, prosperity, and social cohesion of Pakistan through equitable and sustainable socioeconomic progress using science, technology, and innovation as central pillars of development in all sectors of economic activity.

The country’s S&T Policy emphasizes on the development of human resources as the most important aspect of science and technology policy, as without an adequate number of well-trained scientific and technical manpower at all levels (i.e., researchers and technicians), any investment in buildings and equipment would be counterproductive.

Technology has been a key driver of success for many countries of the world. Pakistan is still dependent on traditional industries and manufacturing techniques due to lack of R&D and latest technology. A

key challenge for Pakistan is to ensure the selective acquisition of developed technology, in a way that results in both efficient production and a gradual increase in domestic technological capabilities.

To cope with this challenge, the Technology Upgradation and Skill Development Company (TUSDEC) therefore drafted the 'Industrial Technology Acquisition Policy' to benchmark, acquire, assimilate, and improve the technology used in various industrial sectors across Pakistan. This national level policy proposed various interventions including Technology Upgradation Fund (TUF), joint ventures (JVs), establishment of regional ITPO offices, technology upgradation centers (TUCs), Skill Development Centers (SDCs), and Technology Incubation Centers (TICs). The approval and implementation of the policy will expand TUSDEC's horizon to upgrade Pakistan's industrial technology in the long run.

The Provincial Government of Punjab developed Punjab Growth Strategy 2018 with an aim to develop a secure, economically vibrant, industrialized, knowledge-based, and prosperous province where every citizen can expect to lead a fulfilling life. Punjab Growth Strategy aims to overcome the key challenges including an underutilized manufacturing capacity and stagnant exports; low productivity of physical and human capital; unemployment, under-employment and skills shortages; slow progress on achieving the Millennium Development Goals (MDGs); and a difficult security situation.

### Philippines

The Philippines Development Plan (PDP) 2017–2022 has acknowledged the importance of preparing the youth given the present ICT advancements that are shaping the world of work in the future. While this is the case, the PDP 2017–2022 has recognized that future skills and forward-looking questions on the development of human resources are not at the forefront of the current conversation due to the preoccupation of the government with specific issues, such as economic stability. There are recent roadmaps that lay out priority areas and strategic actions toward innovation, productivity, and employment that the government agencies, industries, and the academia can collaborate in.

One such roadmap is the Inclusive Filipinnovation and Entrepreneurship strategy. The focus is on integrating innovation with entrepreneurship and building an entrepreneurship ecosystem. Central to this roadmap is the role of market-oriented policy research on the promotion and diffusion of R&D investments. The players in the entrepreneurship ecosystem include universities, industries, small and medium enterprises, and key government agencies, such as the Department of Trade and Industry (DTI), Department of Science and Technology (DOST), Commission on Higher Education (CHED), Department of Agriculture (DA), Technical Education and Skills Development Authority (TESDA), and Department of ICT (DICT).

The roadmap has identified the following government-led strategies; (i) development of human capital toward innovation and entrepreneurship; (ii) strengthening of government-academia-industry linkages; (iii) creating an enabling program and policy environment to accelerate innovation; (iv) development of entrepreneurship culture and support programs for micro, small, and medium enterprises (MSMEs); (v) creation of funding and finance programs to incentivize innovation; and (vi) development of industry clusters. In 2019, the Philippine Innovation Act and the Innovative Startup Act were approved, which provide for the innovation fund of USD20 million.

On the education front, the basic education system in the Philippines was revised from 10 to 12 years. The intent is to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare students for tertiary education, mid-level skills development, employment, and entrepreneurship.

### Singapore

In Singapore, the policy infrastructure for HCD is characterized by two distinct features: a tripartite approach that is based on cooperation among employers, unions, and government; and a multiagency approach involving all relevant government institutions. The tripartite relationship ensures that there is agreement over strategies and necessary steps required for national HRD strategies. This approach



is in line with the recommendations of the ILA, where the best representatives from government, labor, and employers should be involved in national policies decision-making.

The Committee on Future Economy (CFE) said that amid a challenging global environment, Singapore's people and companies have many opportunities to innovate, deepen their skills and capabilities, and stay relevant to the world in coming up with a blueprint for economic growth.

The CFE outlined seven strategies for Singapore to stay ahead in a challenging global economy. These recommendations were aimed to help the country stay open and connected, ensure its people acquire skills for future jobs, and help companies scale up through innovation and transformation.

The seven strategies to take Singapore forward are:

i) Deepen and diversify international connections

Singapore should boost trade and investment by developing specific bilateral initiatives, working closely with multilateral institutions, such as the World Bank, and helping its people and companies gain a better understanding of overseas markets.

ii) Acquire and utilize deep skills

Companies should play a bigger role in developing their workers. Both the private and public sectors should also move toward hiring and promoting workers based on their skills, instead of just academic grades.

iii) Strengthen enterprise capabilities to innovate and scale up

To promote innovation, the committee recommends strengthening the intellectual property (IP) ecosystem, supporting entrepreneurs carving out new business opportunities, and raising the profile of local start-ups. It also called for more targeted help for enterprises with potential to expand.

iv) Build strong digital capabilities

The committee recommends building up expertise in cybersecurity and data analytics, which are high-potential growth industries. To do so, it suggested that the government to partner key industry players to train data scientists, use National Service to develop skills in cybersecurity as well as attract and anchor vanguard technology firms in niche cybersecurity segments.

v) Develop a vibrant and connected city of opportunity

Singapore should strengthen its status as a global aviation and shipping hub, create more economic activities in the region, and enhance its digital connectivity.

vi) Develop and implement industry transformation maps

These industry-specific roadmaps should continue to be customized to suit the needs of each industry. Further, they should be grouped into clusters so that the transformation of one industry can have a positive spillover effect on the others.

vii) Partner one another to enable growth and innovation

The government should foster an environment to support innovation and risk taking in the private and public sectors. Trade associations, in turn, have to play their role in industry development by identifying areas that the government can support. Unions should help workers prepare for jobs of the future.

### Vietnam

The labor force in the agriculture, fishery, and forestry sectors still account for a large proportion of industries in Vietnam (approximately 50%) while those needed for industries of the future, such as information and communication, professional, and scientific activities are still at a very low rate.

As such, Vietnam has introduced a number of policies for developing industrial human resources, including orientation of industrial HRD policies for institutions; education and training of human resources; welfare policy changes; and building and developing a team of entrepreneurs and workers in the new era.

Vietnam's readiness to participate in Industry 4.0 according to international assessments is still low. In order to effectively take advantage of the opportunities provided by Industry 4.0, there is a need to develop the digital economy based on science and technology, innovation, and high-quality manpower. The focus on HRD includes: innovating content in education and training programs, having policies to support retraining, and forming an open learning network.

With the motto that "Education is a leading national policy", Vietnam established its national policies for educational development. Specifically, the Vocational Training Development Strategy aims to ensure that vocational training will meet the needs of the labor market in terms of both quality and quantity comparable to the developed countries in the ASEAN region and the world.

## Recommendations

### Overview

Industry 4.0 refers to the convergence of a set of disruptive technologies that will transform our world in the coming decades. It is characterized by the marriage of physical and digital technologies, such as analytics, artificial intelligence (AI), cognitive computing, and the Internet of Things (IoT), which promises to bring forth an era of hyperautomation and increased productivity.

The implications of accelerating disruptive change to industries of the future are far-reaching, even daunting, for employment and skills. The rapidly advancing technologies driving Industry 4.0 are bringing about social and economic adjustments rapidly in an environment of unparalleled global connectivity and demographic change. It is a time of great opportunity, but also risk. The rapid adjustment to the new reality and the opportunities it offers is possible, provided there is concerted effort by all stakeholders. For government, it will entail innovating within education and labor-related policymaking, requiring a skills evolution of its own. For the education and training sector, it will mean vast new business opportunities as it provides new services to individuals, entrepreneurs, large corporations, and the public sector.

For businesses to capitalize on new opportunities, they will need to place the spotlight on talent development and future workforce strategy. Firms can no longer be passive consumers of ready-made human capital. They require a new mindset to meet their talent needs and optimize social outcomes. This entails several major changes in how business views and manages talent, both immediately and in the longer term.

### Governments and Public Bodies

One observation throughout the eight participating member countries pertains to the role of the government to review, revamp, and/or refresh policies to strengthen pillars of HCD, including: (i) to restructure industries toward encouraging the development of advanced-technology industries, (ii) to remodel education and training system that is based on the requirement of the future of industries and the demand of workforce, (iii) collaborations between government and industries, where the industries take the lead as responsible employers and to incentivize learning and growth of the workforce.

All the participating member countries are advancing toward Industry 4.0, albeit at a slower pace for some. The relevant governmental agencies need to develop and/or review their respective national policy for Industry 4.0 to help advance the countries' businesses and factories. This will ideally help the local industries to increase productivity, efficiency, quality, and to also develop new skills and talent. It is a slow process for many of the participating member countries as they face many challenges, such as the lack of awareness and understanding of Industry 4.0 and also the lack of standards and skillsets, and for some, financial resources.

### Educational Policies

#### i) Revamping education systems

By one popular estimate, 65% of children entering primary schools today will ultimately work in new job types and functions that currently don't yet exist. Technological trends, such as Industry 4.0 will create many new cross-functional roles for which employees will need both technical and social, and analytical skills. Most existing education systems at all levels provide highly siloed training and continue a number of 20th century practices that are hindering progress on today's talent and labor market issues.

Two such legacy issues are burdening the formal education systems worldwide. One is the dichotomy between Humanities and Sciences and applied and pure training. The other is the prestige premium attached to tertiary-certified forms of education, rather than the actual content of learning. Businesses should work closely with governments, education providers, and others to imagine what a true 21st century curriculum might look like.

For instance, schools should promote digital literacy and a concerted effort should be made to attract students to science, technology, engineering, arts, and mathematics subjects.

#### ii) Cross-disciplinary education

Solutions to current and future problems are being discovered through the convergence of technology, from nanotechnology to AI to genomics. There is a case for developing models that will allow for the acquisition of cross-disciplinary qualifications.

The real issue that faces us is that we need to educate current and future employees to meet the needs of the technology-driven tomorrow. We need to teach them not to become or want to be employed as mindless drones and armies of workers doing the same simple, repetitive tasks, day in and day out. We need to teach everyone on ways to think creatively, approach and solve problems, find knowledge, and spend enough time on every student.

#### iii) Collaborations with employers

Cooperation between industry and education is expected to be crucial for developing a dynamic, appropriately skilled workforce. This collaborative approach is currently conceived in two ways: public-private partnerships and cross industry partnerships among employers. The first suggests partnerships between business, public institutions, and the education sector, preferably derived from leadership within these areas. The second involves the forming of partnership arrangements between multiple employers from one, or multiple, industries in order to leverage their collective knowledge and expertise.

To cater to the need of the industries of the future, industries, should collaborate with higher education, technical, and vocational institutions on: (i) improving capacities of their human resources, especially instructors and lecturers, by equipping both academic and practical knowledge, skills, and attitudes; (ii) developing new programs toward the requirement of new

industries; and (iii) strengthening the relationship between these institutions and industries through training, consulting, and internship programs.

iv) Building the foundations of digital skills

Industry 4.0 is built upon the digital revolution where technology and people are connected. The digital revolution is driven by data, opening up extraordinary access to information for everyone about how we live, how we work, and what we consume. The OECD considers that the future requirements for ICT will continue to increase, and workers will increasingly need general and professional ICT skills to complete tasks at work. In the future, digital skills will be vital. Without training and knowledge in digital skills, large numbers of workers will be ill-equipped to take on many jobs. The governments of the respective countries can create a structure for digital skills standards and further plan corresponding training courses to nurture different types of talent needed by industries and build future competitiveness of talent to meet the challenges of Industry 4.0.

**Labor Market Policies**

i) Incentivizing lifelong learning

The dwindling future population share of today's youth cohort in many aging economies, such as Singapore and the ROC implies that simply reforming current education systems to better equip today's students to meet future skills requirements - as worthwhile and daunting as that task is - is not going to be enough to remain competitive. Aging countries won't just need lifelong learning, they will need wholesale reskilling of existing workforces throughout their life cycle. The same can be said for countries with a relatively young population.

Governments and businesses have many opportunities to collaborate more to ensure that individuals have the time, motivation, and means to seek retraining opportunities. For example, Singapore has since the 1980s, introduced a skills development levy (a form of payroll tax) to support the training initiatives of companies. At the company-level, technology can be continuously leveraged to upskill and reskill employees. As part of the 'Future Economy' and 'Skills Future' initiatives, the Singapore government has also introduced an individual fund for its citizens to take up training and development courses in support of the industry transformation map for industries of the future. The key focus is employability and not employment security.

The capacity to attain and apply new knowledge, and use new technologies will be the focus of the future. As both knowledge and technologies risk rapid obsolescence, and tasks become susceptible to automation, human skills required by the market and society will constantly shift. In this environment, it is crucial to have systems that support and enable people to retrain, rather than learn how to do one job very well.

ii) Technological unemployment and Industry 4.0

The problem is not that companies want to use robots to help them produce faster, cheaper, and more efficiently. The problem lies in that, as a society, we have become accustomed to the idea that there are jobs which are repetitive, boring, require no skill, and so simple that just about anybody can do them, including robots. But what about jobs that require creativity, skill, flexibility, and knowledge? Fortunately, such jobs will continue to increase in number. The current challenge is that labor market policies need to address ways for the technology divide to be bridged quickly.

Technological changes have always acted as employment destroyers and employment generators. In order to deal with the tsunami of new technologies, governments need a comprehensive project for analyzing, mapping, and policy designing of jobs and occupations that Industry 4.0 might have positive and/or negative effects. Educational and vocational training needs are to be remodeled and upgraded with planned and diligent effort by governmental and nongovernmental

stakeholders. Above all, flowing with change with care, caution, and wisdom will create more wealth and harmony to the respective participating member countries.

### Private Sectors

#### i) Reinventing the HR function

As business leaders begin to consider proactive adaptation to a new talent landscape, they need to manage skills disruption as an urgent concern. They must understand that talent is no longer a long-term issue that can be solved with tried-and-tested approaches of the past or by instantly replacing existing workers. Instead, as the rate of skills change accelerates across both old and new roles in all industries, dynamic and innovative skill-building and talent management approaches become increasingly urgent. Thus the HR function is rapidly becoming more strategic - one that employs new kinds of analytical tools to spot talent trends and skills gaps, and provides insights that can help organizations align their business, innovation, and talent management to maximize available opportunities to capitalize on transformational trends.

#### ii) Cross-industry and public-private collaboration

Given the complexity of the changes needed, businesses must realize that collaboration on talent issues, rather than competition, is no longer a nice-to-have but rather a necessary strategy. Businesses should work with industry partners to develop a clearer view on future skills and employment needs, pooling resources where appropriate to maximize benefits, and work more closely with governments to map a future view of skill demand versus supply. Resources should then be put into place to upskill those out of work to fill high priority employment gaps. Such multisector partnerships and collaboration, when they leverage the expertise of each partner in a complementary manner, are indispensable components of implementing scalable solutions to jobs and skills challenges. While a single business can form one-to-one partnerships for its own talent needs, partnerships between multiple businesses, educational institutions, and accreditation providers can result in an overall increase in the quality of the talent pool, at lower costs, and with greater social benefits. Businesses also need to engage with governments on strategically redeploying redundant skills between sectors, addressing cost concerns, and social stability.

#### iii) Skills for collaboration

Rather than focusing on individual performance, organizations are more than ever trying to develop a culture where the most valuable employees are those who can collaborate and share information to improve efficiency and achieve organizational goals. The trends of rapid change in markets and technologies, and of multiple generations in the workforce at the same time, trigger the need for collaboration. As organizations become increasingly dynamic and horizontally structured, this need for collaboration impacts all types of roles. For example, IT employees must now engage with a set of cross-functional colleagues, business partners, vendors, and customers.

## CHAPTER 2

# REPUBLIC OF CHINA

### Industries of the Future and Its Human Resources

A new wave of industrial revolution has emerged with the advent of the Internet of Things (IoT), which has allowed for the integration and creation of novel industrial applications integrating various technologies. This transformation, which is part of the game-changing Industry 4.0 or the fourth industrial revolution, is creating a web of interconnected systems that communicate, analyze, and use information to drive further intelligent actions.

Every country in the world is facing the Industry 4.0 revolution. The Industry 4.0 trend arrives with the development of the next generation of cloud, artificial intelligence (AI), edge computing, broadband technology, drones, and robots. The wave of automation, intelligence, and digitalization leads innovations in various business models, prompting the manufacturing industry to transform into a service-oriented technology, which brings about a positive growth rate of value-adds and productivity.

The future industrial development needs the power of innovation and customization, not the standardization of production and consumption of the past. These new digital technology applications are used in all walks of life. Every industry has started and integrated its digital technology development, resulting to changes in the business model.

Facing Industry 4.0 challenges, the government of Republic of China (ROC) considers three major impacts on its human resources: changes in demographic trends, changes in working environments and conditions, and impacts on work and skills. First, by 2027, ROC will face the disappearance of its demographic dividend, thus limiting the growth of potential labor supply in the future. In 2030, the ROC's elderly population will account for nearly a quarter of its total population, which is expected to drive the rise of elder care service industry and the business opportunities that come with it.

Second are the coming changes in work environments and conditions mainly including changes in workers' values, diversified occupational patterns, and the development of skills verification benchmarks. With the development of AI and robots, the existing working hours system will undergo major changes and replaced by flexible working hours. The convenience afforded by IT can make it unnecessary for employees to work in the office. In the future, employees need more flexible working modes and hours to cope with changes in new work patterns.

The third and last, higher automation is set to challenge most routine work tasks carried out by human resource, such as office and administrative assistants, production and mechanical operators, assemblers, and other intermediate technical occupations. Besides, the opportunities for new complementing technologies will increase rapidly. On the other hand, new job opportunities emerge, such as IoT engineers, robot designers, and data scientists.

The trend of Industry 4.0 has a profound impact on national human resource development (HRD). In the future, under the development of robotics, AI, IoT, and service innovation, job opportunities for human-robot collaboration will increase significantly.

The number of field workers in manufacturing for using wearable devices will increase; in addition, the corresponding tasks will be based on the process and results of data analysis, and on business

models to make final decisions. In terms of future job skills and capacity, it is important to possess the ability of innovation, critical thinking, computational thinking, application integration of digital tools, and human-machine collaboration.

## Overview of National Policies and Initiatives in Human Capital Development

In the past 60 years of development, ROC has successfully transformed itself from an agricultural economy into a major player in the global ICT industry and one of the fastest growing economies in the world. Benefiting from the efforts of both the private and public sectors, and armed with an appropriate economic development strategy, the ROC economy grew rapidly. Price levels have stabilized and income is equally distributed, creating what the world calls as the “Taiwan experience”.

The ROC is one of few countries in the world able to achieve both strong economic growth and steady price levels. With the exception of the two oil crises, ROC’s price levels have remained stable without significant fluctuations since the 1960s.

In 2017, 22 ROC products ranked among the top three in the world market, and five products ranked number one - semiconductor foundry, IC packaging and testing, green algae, high-end bicycles, and fiber glass cloth. ROC has continued to play a decisive role in global science and tech supply chains.

Facing the new global trend of escalating trade and economic conflicts, and the industrial transformation caused by Industry 4.0, the ROC government has strived to build a new economic model for sustainable development based on the core values of “innovation, employment, and equitable distribution”. The two major strategies of the ROC government policy are “accelerating investments” and “implementing structural reforms”. In this new model for economic development, innovation will provide the momentum for growth while job creation is the priority and goal. These are to be carried out alongside equitable distribution of resources and environmental sustainability.

With regards to strengthening investments in the trend of Industry 4.0, the ROC government launched the 5+2 Innovative Industries Plan along with the Forward-looking Infrastructure Development Program to accelerate industrial innovation and reshape the ROC’s global competitiveness in the future. In an ongoing effort to build infrastructure for national development in the next 30 years, the ROC government is actively making a comprehensive plan to expand infrastructure investment.

Seeking to advance the transformation and upgrade ROC's industries and add new momentum to economic growth, the government - in line with its core principles of innovation, employment, and equitable distribution - made a number of policy adjustments concerning the overall national development. This includes the 5+2 Innovative Industries Plan, which will serve as the central driver of the nation's industrial growth and forge a new model for sustainable development in the future.

The plan covers seven industries and projects: Smart Machinery, Asia Silicon Valley, Green Energy, Biomedicine, National Defense and Aerospace, New Agriculture, and the Circular Economy. The focus on these areas is expected to move ROC forward from contract manufacturing to a new commercial model centered on high value-added businesses, services, and solutions. This shift will stimulate innovation, boost industries' competitiveness, and increase corporate profitability while simultaneously raise wages, create jobs, and bring more balanced development to all regions of the country.

The Forward-looking Infrastructure Development Program includes funding for eight categories: (i) railway projects to provide safe and fast transportation; (ii) water environments to build resilience against climate change; (iii) green energy infrastructure to foster environmental sustainability; (iv) digital infrastructure to create a smart and connected nation; (v) urban and rural projects to balance regional development; (vi) child care facilities to reverse declining birth rates; (vii) infrastructure to



ensure food safety, and (viii) human resources infrastructure to nurture talent and boost employment. Human resources infrastructure is centered on creating the ROC's international benchmarking entrepreneurial settlements.

By attracting international talent to work in the ROC, it promotes progressive youth entrepreneurship, employment, and international industry-academia cooperation and exchange activities to assist the innovation and entrepreneurship ecosystem to further communicate with the international community.

The Human Development Index (HDI), published by the UN, is a good measure for HRD. Although ROC's HDI index is not collected and calculated in the UN's report, the ROC government agency, Directorate General of Budget, Accounting, and Statistics (DGBAS), tries to collect and calculate the data and create a simulated HDI value, as if under the HDI structure of UN.

As shown in Table 2.1, ROC's HDI has shown a trend of stable increases in recent years. Among the performance of these indices in Table 2.1, life expectancy at birth and gross national income (GNI) per capita have the most significant increase. Between 1995 and 2017, the ROC's HDI value increased from 0.854 to 0.907 and the life expectancy at birth increased from 74.5 years to 80.4 years, an increase of 5.9 years. Compared with the performance of HDI of other countries in the world, in 2017, the index of life expectancy at birth of the ROC is 80.4 years and HDI value is 0.907. This shows that the ROC's HRD has continued to improve and upgrade in recent years.

TABLE 2.1

## ROC'S HDI TRENDS

Year	Life Expectancy at Birth (years)	Mean Years of Schooling (years)	Expected Years of Schooling* (years)	GNI per Capita (PPP USD)	HDI Value
1995	74.5	8.1	-	-	0.854
2000	76.5	9.3	-	-	0.890
2005	77.4	10.6	15.6	33,315	0.846
2010	79.2	11.3	16.2	40,627	0.873
2015	80.2	11.9	16.6	45,547	0.885
2016	80.0	12.0	16.6	46,054	0.903
2017	80.4	12.1	16.6	47,144	0.907

Source: DGBAS [1]

Note: \*Minimum number of compulsory education in ROC is nine years.

## Background of Study

The primary purpose of this study is to understand the current HRD in ROC and its future direction of HRD policies in response to Industry 4.0. From the perspective of national development, the ROC government has realized the importance of human resources and developed the Forward-looking Infrastructure Development Program to build the necessary infrastructure for human resources training and strive to achieve its economic growth, promote entrepreneurship and employment among young people, and nurture outstanding talent in the future.

Under the HRD policy framework, the National Development Council (NDC) has integrated future human resources surveys which are published by government ministries in order to understand the talent types and qualitative information of ROC's human resource needs. In short, ROC has laid an important foundation for the formulation of future industrial human resources policy.

In view of the current human resources policy formulation, the government issued the Forward-looking Infrastructure Development Program as an overall policy structure and has conducted detailed study and analysis of future human resource needs of key industries for the next one to three years.

### Initiatives to Meet the Needs of Future Industries

Various initiatives by the government and related institutions have been designed to fulfill the needs of industries of the future.

#### National Agencies in Developing National Strategies for Future Skills

Human resources form the foundation for ROC's growth and international competitiveness. To meet the nation's development needs over the next three decades, the ROC government has set aside a special budget of TWD17.4 billion (USD562.9 million) under the Forward-looking Infrastructure Development Program to build necessary infrastructure for human resources training. Both the Ministry of Education and the Ministry of Science and Technology are responsible for the program to nurture talent and boost employment. They will optimize the implementation environment of vocational and technical schools, promote international industry-academia cooperation, and nurture young scholars.

The Ministry of Education has also proposed a plan to optimize the implementation environment of technical vocational schools. The plan will have four major strategies:

i) To nurture talent as the foundation of forward-looking infrastructure development

Given this goal as well as in response to the trend of innovative Industry 4.0 development for boosting ROC's productive capacity, the Ministry of Education has budgeted TWD8 billion as subsidies for technological and vocational colleges and universities to optimize their environments for Job Ready Skills Programs. The Programs are aimed at nurturing talent for the various missions of the Forward-looking Infrastructure Development Program; keeping up with industrial upgrading; creating an educational system that carries out knowledge-action integration, and achieve a win-win situation for the academia and industry; and cultivating technical and vocational talent with cross-disciplinary skills who are competent in the area of international industrial development.

ii) To establish Master Training Centers

In line with the development of ROC's key innovative industries and through the collaboration of schools and corporate bodies, centers are to be established to provide train the trainer programs, enhance students' professional, technical, and operational abilities as well as cultivate technical professionals who can serve as instructors.

iii) To cultivate talent in a quasi-industrial environment

A quasi-industrial environment is to be set up by simulating the actual industrial environment. Courses related to the industrial environment will be planned in order to provide a practical hands-on environment for students' internship, offer training to students and teachers to strengthen their technical competence and their connection to industries as well as cultivate diverse talent with employability. These are in the hope of bridging the academia-industry gap and lowering employee training costs.

iv) To make available a whole range of fundamental equipment and facilities for education and internship in response to new curriculum guidelines

This is to make up for, in annual progression, the shortage of equipment for education and internship in technical high schools in accordance to their equipment installation standards; manage the existing equipment and facilities, and purchase new ones following the assessment of the schools' performance in implementing hands-on courses.

Along with these strategies, the Ministry of Science and Technology too has supported the innovation and entrepreneurship ecosystem to further integrate with the international community to promote entrepreneurship in youth, employment, and international industry-academia research cooperation activities in the ROC. For the cultivation of young talent and the promotion of employment, four key international programs were planned:

- i) The Promote International Industry-academia Alliance Program sets up an international-level industrial contact center in the school to assist domestic academic research and innovation facilities to link up with leading global technology supply chains.
- ii) The Young Technology Innovation and Entrepreneurship Base Construction Programs bring in international accelerators, venture capitalists, and potential new venture teams to create international technology entrepreneurship settlements.
- iii) The Key Industry High-level Talent Training and Employment Programs promote PhD students into the industrial workplace through the cooperation of think tanks, academic institutions, and businesses.
- iv) The Young Scholar Development Program, Einstein Planting Program, and the Columbus Program are promoted to provide young researchers with long-term and sufficient resources to cultivate a new generation of scientific research.

Further, ROC's industrial human resources policies are applied by relevant ministries as their experience and knowledge would make the implementation better and more impactful. On the division of policy planning, the central authority - the Executive Yuan, mainly establishes the overall long-term industrial development direction while the future industrial human resources planning and estimation is delegated to the relevant ministries and related units.

The 5+2 Innovative Industries Plan refers to seven development plans proposed by the government to transform ROC's economic and industrial structures. As shown in Table 2.2, most of the industrial human resources policies are planned by the Industrial Development Bureau, Ministry of Economic Affairs (IDB), including Smart Machinery, Green Energy, Asia Silicon Valley, and Circular Economy. In addition, national defense and aerospace industry is planned by the Ministry of National Defense, biomedicine by the Ministry of Science and Technology, and new agriculture by the Council of Agriculture.

**TABLE 2.2**

**LIST OF 5+2 INNOVATIVE INDUSTRIES PLAN IN ROC**

Sector	Industry	Lead Agency
Smart machinery		IDB
National defense and aerospace	National defense aviation Aviation Shipbuilding	Ministry of National Defense
Green energy	Offshore wind power Solar power	IDB
	IC design Communication	IDB
Asia Silicon Valley	Data service Digital printing	IDB
Circular economy		IDB
Biomedicine		Ministry of Science and Technology
New agriculture	Livestock technology facilities and equipment Poultry technology facility equipment Organic agriculture Multiprocessing technology Smart farming fishery Smart agricultural machinery	Council of Agriculture

Source: NDC [2]

### Tracing Economic Development and Workforce Policies

In the 1960s, the focus of ROC's industrial development shifted to labor-intensive, export-oriented industries to take advantage of inexpensive labor force and expand into international markets. In 1966, the ROC also established the first Export Processing Zone. Boosted by the thriving world economy, its exports grew rapidly and gradually became the engine of the country's overall economic growth.

The ROC government actively promoted the Ten New Major Construction Projects in the 1970s. In addition to improving its infrastructure, such as railroads, airports, seaports, and electric power supply, the government also actively developed import substitution industries for intermediate goods and capital-intensive industries, such as chemicals and steel. With its strategy in place, ROC effectively reduced its dependence on foreign intermediate goods and elevated its industrial upgrade forward at a rapid pace.

While the ROC's economic development turned to labor-intensive manufacturing industries, the manufacturing sector needed a large number of workers, resulting in significantly higher wages for the manufacturing sector than those in agriculture. Therefore, agricultural workers gradually switched to the manufacturing sector, and the labor force grew rapidly.

In the early 1980s, driven by a successful foreign trade strategy, the ROC's trade surplus continued to expand, and the government adopted a program of economic liberalization and globalization as the focus of its new economic development policy looked into rectifying trade imbalances through the effective working of market mechanisms. At the same time, ROC began to utilize its abundant capital to develop capital- and technology-intensive industries, such as electric power, IT, and machinery.

By the end of the 1980s, the demand for labor from the manufacturing sector experienced breakneck growth and a severe labor shortage ensued. The reason was that exports of labor-intensive manufacturing products were affected by rising wages and product costs, leading to their declining competitiveness. Therefore, the ROC government began to formulate strategic industry policies to emphasize capital-intensive and technology-intensive industries instead of labor-intensive industries. The manufacturing workforce upgraded their skills through employee training to meet the needs of the manufacturing industry.

In 1995, ROC-made IT products - monitors, motherboards, and scanners - accounted for over 50% of the global market. ROC's IT hardware products leapt to number three in the world ranking, making ROC an indispensable part of the global high-tech industry supply chain. The ROC government actively pushed forward the Asia Pacific Regional Operations Center Development Plan to develop the ROC into a manufacturing, transshipment, and professional services operations center.

In the 2000s, the ROC government began to expound the three major concepts of 'knowledge economy', 'sustainable environment', and 'just society'. In addition to aggressively investing in human resources, research and innovation, and the living environment, the ROC government also developed the semiconductor, image display, biotechnology, and digital content industries in order to raise the capabilities of industrial innovation and the quality of life.

On strengthening investments, the 5+2 Innovative Industries Plan along with the Digital Country and Innovative Economic Development Program were launched to accelerate industrial innovation and reshape ROC's global competitiveness. The Forward-Looking Infrastructure Development Program was actively promoted, laying the foundations for national development and striving to meet the manpower requirements of new industries, technologies, and lifestyles over the next three decades, thus building the infrastructure necessary for human resources training. Five main projects were implemented with the aim of attracting foreign professionals to work in the ROC, promoting entrepreneurship and employment among young people, encouraging transnational cooperation among industry, academia, and researchers, and internationalizing ROC's innovation and entrepreneurship ecosystem.

i) Improve the practical learning environment at vocational schools

Establish industrial training bases for bright students, build factories that simulate industry, and create interdisciplinary internship environments. These strategies will help form a technical and vocational personnel training system to meet society's needs.

ii) Promote international industry-academia alliances

Directly match education to industry needs, strengthen cooperation between participating enterprises and school research teams, and build cooperative platforms for bringing alliance research results to the market. The goal of this project is to establish 20 forward-looking technology alliances in three years.

iii) Create technology innovation and entrepreneurial bases for young people

Create a world-class tech start-up cluster by attracting international business accelerators, venture capitalists, and high-potential innovative teams to the ROC, and encouraging their interactions with domestic teams. The objective is to have 100 teams set up at the ROC Tech Arena innovation base each year.

iv) Train and employ high-level professionals in targeted industries

Encourage research institutes and academic research organizations to engage in cooperative projects with private companies, with the aim of training and placing 1,000 PhD-level personnel in industrial positions in four years.

v) Nurture young scholars

Provide young researchers with sufficient long-term resources under the Einstein Program and the Columbus Program for the purpose of cultivating 180 to 240 outstanding young researchers from the ROC and abroad in three years.

**Policies Pertaining to Industrialization and Workforce Development Alignment**

For ROC's businesses and society, many global economic trends are already visible today and point toward forthcoming changes. These will have significant impact on ROC industries and human resources over the long term.

i) Issues faced

- Talent retention: Relative insufficiency of development opportunities within the ROC, stagnation of wage growth, and countries competing to poach talent
- Talent recruitment: Wages are not internationally competitive, countries are competing with each other to recruit talent, complexity of laws and regulations makes residency difficult, and the living environment needs improving
- Talent cultivation: There is a gap between learning and application, and inadequate cultivation of future industry talent in digital and smart applications

ii) Four main strategies for talent retention

- Amending the Income Tax Act to reduce the highest rate of individual income tax from 45% to 40%, and to provide for the profits of sole proprietorships and partnerships to be directly taxed as personal income, without the need to calculate and pay profit-seeking enterprise income tax
- Amending the Statute for Industrial Innovation to liberalize the taxation of stock-based compensation, up to TWD5 million as calculated at current price in the year of receipt,

allowing the recipient at the time of transfer, to opt for it to be taxed at whichever is the lower of the market price at the time of transfer or the market price at the time of receipt

- Amending the Statute for Industrial Innovation to liberalize the taxation of technology shares (shares received for investment of technology), changing from allowing deferral of taxation for five years to allowing deferral to the actual time of transfer, so as to aid the development of start-ups
- Amending the Statute for Industrial Innovation to provide for individual angel investor whose investment in a single start-up reaches TWD1 million can deduct up to 50% of the amount invested from their taxable personal income, with deduction up to a limit of TWD3 million per year

iii) Five major strategies for talent recruitment

- Promoting the Act for the Recruitment and Employment of Foreign Professionals: Relaxing work, visa, and residency regulations; issuing the 4-in-1 Employment Gold Card (incorporating work permit, resident visa, alien resident certificate, and reentry permit; relaxing regulations on stay and residency of parents, spouses, and children, and providing retirement, health insurance, and tax benefits)
- Pushing forward the New Economic Immigration Act: Relaxing the job qualification requirements and conditions for the employment of foreign professionals to boost their recruitment and making it easier for overseas workers to work, reside, and settle in the ROC
- Extending the period allowed for overseas Chinese and foreign students to remain in the ROC to seek employment after graduation, doubling it from six months to one year
- Making it easier for multinational corporations to post staff to ROC for work or training, with the aim of establishing bilateral talent exchange with New Southbound Policy countries
- Increasing the establishment of bilingual experimental classes in public senior high, junior high, and elementary schools, and special classes in senior high schools and below for the children of talent recruited from abroad

iv) Five main strategies for talent cultivation

- Strengthening industry-academia linkage: Refining talent cultivation to better match the needs of specific industries, and increasing enrollment quotas for the relevant school departments
- Industries initiating mutual assistance in pre-training talent: Encouraging industries to invest resources and collaborate with schools in cultivating talent for their particular needs, with full policy and regulatory support from the government
- 1,000 young elite in smart technology: Using universities and juridical entities as cultivators, and encouraging enterprises to set up AI R&D centers in the ROC, cultivating at least 1,000 high-caliber researchers in smart technologies by 2021
- 10,000 pioneers in smart applications: Cultivating smart technology application skills in university students who are pursuing cross-disciplinary studies, to speed up the cultivation of enterprise personnel with ability to use technological tools, and providing members of society with second-specialty training, for the cultivation of at least 5,000 people a year skilled in the practical application of smart technologies
- Talent transformation program: Encouraging schools to establish second-specialty or skill upgrading courses, to help members of the labor force enter innovative industries

### Defining Future Skills by National Institutions, Unions, and Employers' Organizations

Human resources are critical to industrial development and its long-term competitiveness. In order to meet the future talent requirements for the country's industrial development and assist in industrial innovation, upgrading, and transformation, in October 2010 and in accordance with Article 17 of the Statute for Industrial Innovation, the Executive Yuan designated the NDC as a specialized agency and established a coordination and integration mechanism to promote future industrial HRD.

The ROC government reviewed the requirements of future talent of key industries to promote the development of key future industries, and since 2011, the NDC has successively coordinated nine ministries for this purpose, including the Ministries of the Interior, National Defense, Economic Affairs, Transportation and Communications, Health and Welfare, Culture, Science and Technology, the Council of Agriculture, and the Financial Supervisory Commission.

In 2017, the ROC government selected the 5+2 innovative industries as its main focus and the relevant ministries coordinated the study of future talent requirements of key industries.

ROC's future industrial planning and related talent and skills requirements have been tracked by the relevant ministries, rolled out annually, and are coordinated by the NDC. The ministries have also identified and analyzed 18 related industries. Each industrial analysis includes four main areas: current talent requirements, results of quantitative estimation of the needs for talent in the future, condition of occupations and causes of talent shortage, and the qualitative information of talent shortage. After completing the analysis, the ministries share the challenges that face the industries. In order to align the research results with actual industrial talent requirements, the ministries invite experts from related fields and industrial associations to share their insights and opinions, and then provide the policy recommendations for future talent requirements of key industries.

According to NDC reports [2], 5+2 innovative industries require a multitude of talents in the next one to three years. On the whole, Industry 4.0 affects the development trend of the IoT and expands the scope of industrial application development. The 5+2 innovative industries largely require talent and skills in science and engineering, followed by information and communications.

For some specific 5+2 innovative industries, there will be some differences in talent requirements. For example, the data service industry requires data scientists and application data analysts; for the biomedical industry, specific talents will be required for legal staff, regulatory inspectors, and intellectual patent staffers.

In view of the needs of ROC's future industrial development, its current policy directions, and labor market conditions, Taiwan Institute of Economic Research's (TIER) research [3] shows six major categories of job skills that are required by industries, namely communication, creativity, problem solving, transnational worker/language ability, technical, and information (see Table 2.3).

The future skills requirements of the industries emphasizes the importance of hard/soft integration. In recent years, digital technology trends have been dominated by software development, as such creating a high demand for software talent. Therefore, under the premise of hard/soft integration, it is bound to expand the requirements for related hardware talent. ROC's existing industries development is based on hardware applications, but for the future development of the country, hard/soft integration will be a critical ability requirement in the future.

With rapid changes in technology trends, the skill requirements to use information will gradually increase, especially for operators. Under the trend of robots replacing humans, the requirements for technical capabilities will vary with types of industrial development and developmental stages, placing even more emphasis on industrial domain knowledge. The existing professional work has increased requirements for communication and problem-solving skills. In addition, under the industry cross-domain integration business model, the importance of soft skills and interdisciplinary skills increases, especially for system integration professionals. With the future of cross-industry development, for



highly professional workers, the requirements on interpersonal communication and problem-solving soft skills will rise.

### Push or Pull Approach?

Human resource is the cornerstone of national development. ROC faces a rapidly changing economic environment and global competition, and its HRD policy is aimed at industrial changes, domestic market needs, and the conditions of the overall labor environment. The government has implemented resources integration of its companies, universities, and research institutions to set the direction of its human resources policy. This optimizes implementation at vocational and technical schools, promotes international industry-academia cooperation, and nurtures young scholars.

To supply the types of talent with experience and skills training required by various industries for their workforce in the future, industrial authorities planned frameworks for the development of major future industrial talent. The authorities have also carried out practical operations through national training units and private training institutions to offer guidance for employees who wish to upgrade their skills and referral information on emerging job opportunities for those who want to switch jobs.

**TABLE 2.3**

### FUTURE DEMAND FOR SKILLS OF ROC'S CROSS INDUSTRIES

Skill Type	Skill Classification	Skill Description
Communication	Soft skill/Interdisciplinary skill	Establish/maintain interpersonal relationships, build teamwork, resolve conflicts and negotiate with others, communicate externally with people outside the organization and internally communicate with superiors, colleagues and/or subordinates (inspire, guide, coordinate, and deliver messages, provide advice, help)
Creativity		Create possibilities for specific situations/products
Problem solving ability		Propose complex/practical problem-solving capabilities
Transnational worker/Language ability		Multinational working environment and cultural adaptability/international language ability
Technical	Hard skill	Skills required for mechanical equipment maintenance and product service evaluation
Information		Use digital technology, tools for information/data evaluation and analysis

**Source:** Taiwan Institute of Economic Research [3]

## Policy Recommendations

Based on the above preliminary research, ROC will face population aging in the 2030s, resulting in problems of insufficient labor force and the value of working. Under the trend of Industry 4.0, the government will adjust its economic structure and industrial upgrading, and develop new industries for the growth of the country. By attracting foreign professionals to ROC, promoting entrepreneurship and employment among young people, encouraging transnational cooperation among industries, academia, and researchers, and internationalizing innovation and entrepreneurship ecosystem, the ROC's human resources policy is focused on talent retention, talent recruitment, and talent cultivation.

This study has two recommendations:

- i) Establishing classes for specialized talent in attracting and nurturing domestic and foreign professionals

Under the trend of Industry 4.0, the development of science and technology advances rapidly. Talents in semiconductor, smart machinery, AI applications, and in related fields will remain in high demand. All industry associations in ROC jointly invest in training talents with schools, allowing local industrial clusters to work with local vocational colleges and universities to promote customized industrial-academia collaborations to solve the urgent needs of the industries.

- ii) Building the foundations of digital skills standards and strengthening worker skills

Industry 4.0 is built on digital revolution where technology and people are connected. Digital revolution is driven by data, opening up extraordinary access to information for everyone on the way we live, work, and consume. The OECD considers that the future requirements for ICT technology will continue to increase, and workers will increasingly need general and professional ICT skills to complete tasks at work [4]. In the future, digital skills will be vital. Without training and knowledge in digital skills, large numbers of workers will be ill-equipped to take on many jobs of the future. The ROC government can create a structure for digital skills standards and plan corresponding training courses to nurture different types of talent needed by industries and build future competitiveness of talent to meet the challenge of Industry 4.0.

## 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](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>

## CHAPTER 4

# INDONESIA

### **Industries of the Future, Human Resources, and Building the Ecosystem**

Employment and the quality of human capital in Indonesia are currently facing serious challenges from many fronts. One prevalent issue, among others, is severe skills mismatch. According to ILO [1], this indicates a mismatch between the skills on offer by workers against the requirements of employers or industries. Mismatches could include skills shortage, skills gaps, and, vertical and horizontal mismatches. The prevalence of such mismatch is a serious issue as it could lead to high inefficiency and threaten potential productivity at all levels. Allen [2], for example, calculated occupation mismatch in Indonesia was at more than 50%. The root cause, asserted Allen [2] and ILO [1], is poor technical and vocational education and training (TVET) infrastructure which encompasses the lack of quality teachers, in-company training provisions, inflexible curriculum, and weak industry alignment.

The assertion is in line with the results of the national accreditation on education and training institutions. Only 1.4% of the higher education institutions received grade A accreditation [3]. Till early 2019, about 56% of them were not even accredited [4]. At primary and secondary school levels, only 25% of them received accreditation of grade A. The scenario is similar, based on the assessments of training institutions provided by both the government (central and local) as well as the private sector. Data from the Ministry of Manpower reveals that only 70 out of 298 government training institutions received ‘good’ in their assessments in 2016 [5]. Similar performance is observed in the private providers.

The pressure has been intensified by low quality human resource and investment climate in the country. The potential of Indonesian youth could be seen from the Program for International Student Assessment (PISA) score published by OECD [6], showing Indonesia performs far below the OECD average score. A slightly increasing trend is evident in the performance indicator for science. In maths and reading, the curves are declining. The report also highlights that school infrastructures, shortage of staff number, and certification are problematic. It is consistent with the latest Human Development Index (HDI) [7] where Indonesia ranks 111 of 189 countries and territories in 2019. Despite a slight increase from the previous year, the country still has serious concerns in the three main indicators, namely a long and healthy life, access to knowledge, and a decent standard of living. The report also shows a significant number of youth aged 15–24 are not in school or employment (21.4%), vulnerable employment is at 47.3%, and youth unemployment at 15.8%. This occurs despite the prediction of growth of productive population of 15–64 years old, which is about 0.6%–0.9% from 2020–30 [8]. There is a need for urgent intervention, with measures to secure the jobs of the future for Indonesian youth.

In order to create massive number of decent jobs for the growing population and increasing new job seekers, Indonesia must build an aggressive and conducive investment climate. The future employment will offer opportunities as new jobs will be created. However, caution should be heeded too as many jobs will become obsolete as well. Unfortunately, the existing investment condition is not particularly encouraging. The World Bank [9] revealed that despite the unchanging rank of Indonesia in Ease of Doing Business in 2019 compared to the previous year (73 of 129 countries), its competitiveness rank substantially decreased from 45 to 50 during the same period. One indicator that is crucially unattractive is the inflexibility of employment regulation and redundancy cost.

These existing challenges have given further pressure to the urgency of improving the nation's productivity. As contended by Landmann [10], productivity growth is deemed to be the primary engine of boosting this performance along with employment and income distribution. Further, with strong labor market in place, a country's competitiveness will ultimately follow suit [11]. To this extent, the government needs to ensure that productivity growth, which is still below some neighboring countries, [4] could be built upon a solid ecosystem as well as the aim to achieve global competitiveness.

Two main challenges in developing human capital in Indonesia stem from internal and external pressures. The external pressure is mainly from the impact of Industrial Revolution 4.0's (Industry 4.0) massive wave in having to create new ways of doing business, change of competitiveness' landscapes, and different demands for human capital characteristics. ILO [1] predicts that around 56% of current jobs is at high risk. The World Bank [12] is equally concerned that the country has to go on a much higher speed to keep up with the acceleration of innovation in the industry.

Meanwhile, the internal pressure is associated with severe skills mismatch, employment conditions, weak existing TVET systems and infrastructure, and lack of concerted policy action in achieving global competitiveness. Taking these challenges together, Indonesia's long-reliant, people-intensive as well as growing capital-intensive sectors are under threat. Nevertheless, as argued by Landmann [10], the latter which is deemed to be the prime driver of productivity growth is increasingly challenged by mass occupation destruction. To this extent, industry transformation is therefore imperative. It is important to note that the approach should be a demand-driven one. Yet, whether the industry has prepared for this new avenue and the speed the government pushing toward it is unknown. In addition, facing a rather high unemployment rate, persistent skills mismatch and shortage, and even unskilled labor, the Indonesian government has embarked on some TVET programs. The effectiveness remains to be seen and this is also a crucial issue to be addressed.

This background leads to the construction of the research question - how to build Indonesia's national human capital? To begin with, developing Indonesia's human capital strategy is concerned with demand and supply as well as their alignments. For demand, the first thing is to identify the extent the industry actions are concerted within and across industries, or if they are fragmented. For supply, it is to look into the extent to which regulations and initiatives are integrated and targeted at improving productivity. The third issue is on how well supply and demand are well aligned under a solid and comprehensive TVET ecosystem. To understand further, the subsequent sections provide a review on the industry of the future, followed with an overview of the human capital development in Indonesia that highlights the current employment and TVET situation. The discussion continues with the extent to which national agencies are dealing with the human capital issue. The paper concludes with some policy recommendation.

Developing a human capital strategy begins with elaborating its demand by identifying types and competency requirements of the needed jobs. This is mainly driven by industries which are increasingly requiring higher competencies to address their strategic goals, especially in the globally integrated era and the prevalence of Industry 4.0.

Indonesia has embarked on the journey and its early implementation phase. The Ministry of Industry took the lead by constructing the Grand Design of National Industry Development [13], as directed by Government Regulation No.14/2015. In early 2019, the Ministry of Industry announced 10 national industry priorities, composed of six primary industries (food; pharmaceutical, cosmetics, and medical equipment; textile, leather, footwear, and miscellaneous industry; transportation; electronics and telematics; and energy), supporting industries (capital goods, support material, and industry services); and upstream industries (agro-upstream; basic metal and minerals nonmetal; oil and gas basic, and coal).

The next issue is related to the absence of collective action within and across the industries, especially in setting up the industry transformation map. Two nongovernment bodies organizing the industries are the Indonesian Chamber of Commerce (KADIN) and the Indonesian Employers Association



(APINDO). The members of KADIN comprise business associations, and APINDO is the home of individual corporations. The primary focus of these organizations is to enhance the nation's competitiveness. Setting up industry transformation requires active roles of the 'triple helix' - the government, business associations, and academics, where the government takes the leadership role. Relevant ministries are expected to regulate and ensure fair competition while academics look into advancing research for the industry of the future and translate it into teaching curriculum. Business associations, however, are not only expected to channel and translate the dynamics of global competition into the transformation map, but in many cases in Indonesia, have taken over as the prime driver of the effort.

A research by the National Committee of Vocational Training (KPVN) [14] discovers the factors that determine the effective interplay of these parties. The manufacturing sector (automotive subsector), which is largely exposed to global competition, oversees the industry transformation map laid out by the three parties of the helix. In this subsector, the business association is solid and strongly supported by the major industry players. Inevitably, the relevant ministry is driven toward taking a more active role. The retail sector, however, shows a stark difference. Its exposure to global dynamics, though less prevalent compared to the automotive industry, is insufficient in creating the urgency of having a transformation pathway. The relevant ministry and the retail business association should make concrete effort to strengthen the industry while aiming at building a transformation map.

Agriculture is another primary sector that lacks competitiveness due to the absence of industry transformation. The onset of COVID-19 outbreak in early 2020, for example, resulted in the country suffering from a severe scarcity of some primary agricultural products. It is important to note that this situation - driven by the lack of competitiveness - occurred without the intervention of Industry 4.0. It could be argued that massive government campaign of 'food security' for all was largely unaddressed. The effectiveness of the grand design of a greater national food security and absence of strong human capital in the sector may be responsible for the inadequate and weak agricultural sector.

Reflecting on these circumstances, a high official who is actively involved in both KADIN and APINDO underlines that most companies are more concerned with their own businesses. Competition is perceived to be between individual companies or within a single industry at most. That national competitiveness as a top priority seems to be a distant idea for them. If this worrying situation continues, two consequences await. First, industries may slowly lose their competitiveness globally. Second, productivity is viewed as an isolated issue that lies within the boundary of an individual company. Unfortunately, there has been a common inadequate assumption that national productivity is a sum of productivity of individual companies/industries.

The evidence of weak industries in Indonesia is well recorded. One lesson could be learned from the perspective of global value chain. ADB [15] reports that Indonesia could only maintain limited importance and contribution within its own domain. In manufacturing, for example, Armstrong and Rahardja [16], and ADB [15] assert that Indonesia is an outsider to global production network. This is different compared to the bigger roles played by Vietnam and PR China in the chain. ADB [8] further underlines that the country prefers to play safe within the bilateral arrangement, although at the cost of engaging in high value-added commodity to trade. Without this avenue, technology transfer and innovation may also be limited. This shows that the sector is weak due perhaps to the absence of government initiatives and incentives for global competitiveness. And stated by the World Bank [12], increased speed to catch up with innovation is a must.

If future skills are to be accommodated and nurtured, the incorporation of technology is imperative. Research by ADB [15] shows an interesting interplay among occupation, technology acquisition, and income level. The research decomposes occupation into routine and nonroutine cognitive occupations. In manufacturing, for example, the report highlights that nonroutine cognitive occupation has increased by 110% while routine cognitive occupation contracted by 36%. In terms of income level, the former group enjoys 86% of change while the latter group only experiences 53% of increase. As such, knowledge workers are more appreciated, especially in creating a value add in the industry.

From the overview of the national industry transformation, Indonesia still suffers from lack of concerted action across companies and industries. National competitiveness is another common concern for the players. The further out the country is from efforts of global competitiveness, the more distant it is from nationally initiated innovation at the industry level. This, therefore, may hinder the industry from foreseeing the future transformation map of the industry.

## Overview of National Policies and Initiatives in Human Capital Development

This subsection shifts the discussion to demand strategy. Setting up a national strategy on future skills contemplates the increasing challenges in labor dynamics and employment. Against the backdrop of Industry 4.0 and the COVID-19 pandemic, Indonesia's issues are employment shift, minimum wage, workers migration, unemployment and poverty, and demographic dividend for its more than 265 million people.

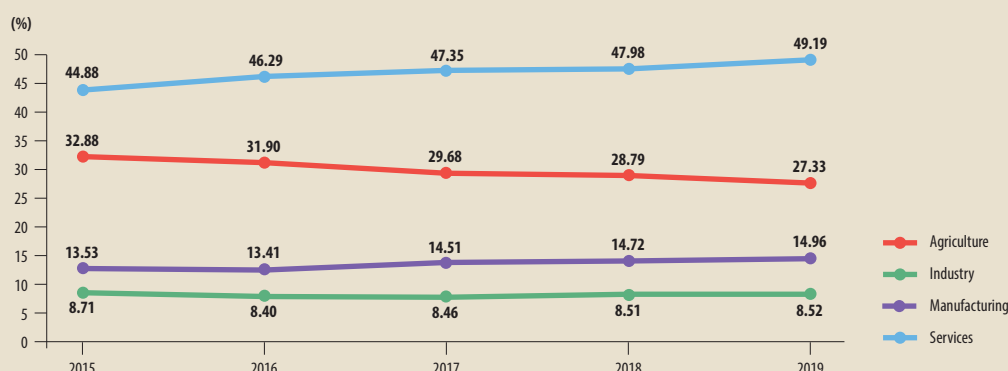
### Employment Conditions in Indonesia

The employment condition by sector is worth noting. As seen on Figure 4.1, employment creation over the course of 2015–19 increased by over 4% in the services sector. The manufacturing and industry sectors, however, had stubbornly hovered around 14% and 8%, respectively. The agricultural sector, meanwhile, witnessed a significant decline in employment absorption, from 32% to just about 27% of total employment. From the relatively low-productivity agricultural sector, employment has moved to the higher value-added industry and services sector, a condition shared by other developing economies in the region [11, 16]. Ginting et al. [11] also emphasizes that there is a strong divide involving the more educated and newer generation who significantly moves to the higher added-value jobs in the industry and services sector, which leaves the older generation in the much less productive job of agriculture. This emerging group though faces its own set of challenges - dealing with massive traffic congestion, limited and less affordable accommodation for new income earners, which may offset the capability to reach optimum contribution to the development of talent pool. It is further argued that in the absence of massive and rapid labor market development targeted toward future skills and higher productivity, hence 'better' jobs are hard to achieve.

Workers' migration to higher paid sectors or regions is closely associated with the minimum wage policy. According to Law No.13/2003, the fixing of minimum wage is set at the local/regional level, where previously was the responsibility of the Local Wage Council that comprises trade unions, the government, and employers. Ginting et al. [11] asserts that minimum wage had increased at a greater pace, particularly between 2013–15. Consequently, the ratio of minimum wage to average wage peaked at 83% in 2015. It was argued that it was the result of the underdeveloped system of collective bargaining. A reform on minimum wage fixing was introduced in 2015 with the objective to provide greater business certainty. However, the unions opposed this policy initially as they suddenly lost their channels and public exposure to push their normative rights. This reform is like two sides of a coin. On the one side, it discouraged the annual 'hype' in approaching the minimum wage fixing period, such as street rallies and demonstrations. On the other, with the elimination of these channels, the concerns of labor unions may not be fully accommodated. Despite this, the country continues to witness an increase in minimum wage. The minimum wage for 2020, for example, records an increase of 8.51% compared to that of the previous year. Ginting et al. correctly warns that this reform should not merely aim at increasing minimum wage, but directed toward creating a more equitable income distribution. This is particularly true as a large percentage of Indonesian workers are still in the low-income earning bracket.

FIGURE 4.1

## EMPLOYMENT BY PRIMARY OCCUPATIONAL FIELD (AUGUST ROUND, IN PERCENTAGE)



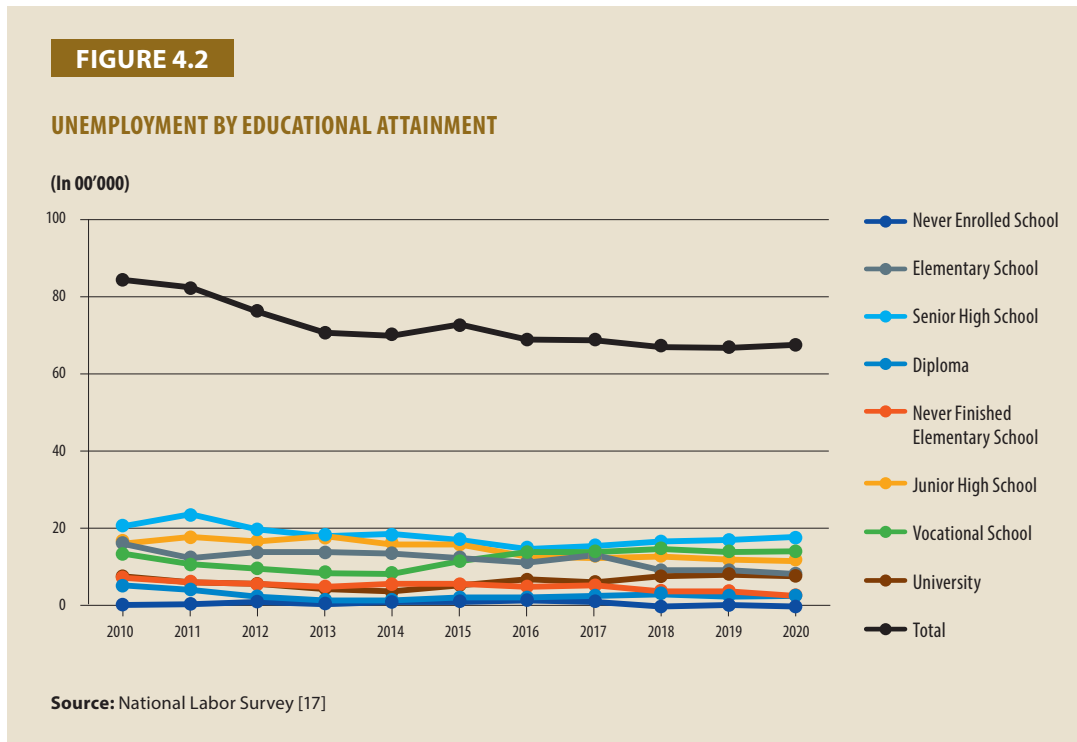
Source: National Labor Survey [17]

Workers' mobility or migration is another essential issue. The Mid-Term Development Plan 2020–2024 [18] underlines that the gap of economic sources has created unbalanced workers mobility among regions in the country. The trend in several big cities particularly in the already overpopulated Java island, such as Jakarta, is an increase of net migration. This scenario is in stark contrast with the eastern regions of Indonesia. The challenge is then to ensure a balance and equitable productivity growth across the nation, preferably by empowering local workers.

On the unemployment front, the country has not progressed much. According to the latest data [17], open unemployment is largely dominated by senior high school graduates at close to 45%. Nevertheless, Figure 4.2 shows a decreasing trend of unemployment among high school graduates which unfortunately is in contradiction with the vocational school graduates. Meanwhile, those with vocational education (both high school and diploma levels) who supposedly possess higher employability occupy as much as 24% of total unemployment. This indicates that there is skill mismatch between what is being offered and what the industry requires. According to ILO [19], youth unemployment rate in Indonesia in 2018 is 15.8%, well above the Asia-Pacific record of 10.2%. The calculation on unemployment is also a concern. The estimation made by ILO [19] is opposite to the optimism of Manning and Pratomo [20] who praised the decreasing unemployment rate of 2007–16. ILO [19] argues that the figure of 4.4%, or 5.8 million people will slightly increase to 4.5% or 6 million in 2020. This predication remains valid, until the COVID-19 pandemic hit the country.

Indonesia's large population poses another challenge - the demographic dividend. Bappenas [21] estimated that there will be about 237 million productive population (15–64 years old) in 2030–40, bringing with it an advantage and disadvantage. If the government is able to provide sufficient quality jobs, then this group could become a powerful engine of economic growth. Failure to create job for this group, nonetheless, may lead to serious social problems and economic downturn.

The disadvantage escalates as the COVID-19 pandemic results in serious impact to the population. The economy growth which had gone down to 5.02% in 2019 is estimated to worsen in the coming period. The Minister of Finance announced that the country is expecting a growth as low as minus 0.4% in 2020, if the condition persists. This is consistent with Furman's [22] prediction that the "economy toll on workers" is about to surface as industries not only start to reduce their production and slow down the operation, but also shut down.



As for the employment issue, the country experiences a sudden massive number of layoffs due to company closures and continuously shrinking opportunities for new employment. This began since the unfolding of COVID-19 in early 2020 and likely lead to a global recession. The Ministry of Manpower announced that as of 20 April 2020, the number of workers laid off was around 2.04 million, comprising 1.54 million and 538,000 from the formal and informal sectors, respectively [23]. The Ministry of Finance's figures were more daunting in estimating a further five million new unemployment due to the pandemic [24]. Inevitably, the marginal group who live under the poverty line is impacted. According to Indonesia Statistics [25], the previously high record of 9.22% of the population living in poverty at the end of 2019 [19] might increase by 1%–3% due to the pandemic. The situation appears bleaker, as shown in the distribution of poverty data, that two of the largest provinces in Java (West and Central Java) make up close to 30% of total poverty.

Although the recent development has created a new supply of available employees, government regulations and implementations in producing human capital seem incompatible with the increasing demands of Industry 4.0. The challenge heightens as the pandemic unfolds, forcing more unemployed people and those in distressing situations into the poverty threshold.

#### Current TVET in Indonesia

In the Indonesian context, TVET and human capital development are not new ideas. Numerous regulations on them have been passed. Two major regulations are the existing Law on Employment and Government Regulation on National Vocational Training System. In addition to these, there are several other crucial sectoral regulations. The draft of Omnibus Law has also attracted massive public scrutiny, yet the outcome may take time to emerge.

At the macro level, the Law on Employment No.13/2003 is the most prominent regulation, though is considered outdated. Many of the clauses no longer fit with the current and future trends of employment and industry demand. Many attempts have been made to revamp them but are met with resistance and rejection from involved parties. The drafted new law resulted in many street rallies that targeted the issues of severance pay and employment relation status. The draft is now on the list to be reviewed by the parliament.

A technical yet crucial regulation regarding human capital development is the Government Regulation No.31/2006 on National Vocational Training System. The basic tenet of the regulation is to build demand-driven competencies and in accordance to the national competency standards. Although it has been stipulated more than 10 years ago, it has only now received massive spotlight. The main weakness, however, is its lack of unitary alignment with industries. One of the issues is in terms of funding the TVET activities. The regulation only acknowledges funding provided by the government. This inevitably creates a closer linkage with the public sector but yet, risks any public-private partnership (PPP) initiatives.

Another equally critical issue concerns the national certification standard. The expansion and updates of the standards are not progressing in tandem with the transformation of the industries, especially driven by global pressure and Industry 4.0. An example expressed by a member of Association of Indonesian Retailers (APRINDO) who had been involved in nearly two years of drafting the National Occupational Standard of the sector found the regulation to be obsolete at the onset of its official launch in 2018. A study by KVPN [14] also discovers that the National Work Competency Standard 2014 does not yet accommodate the future of work. The only technology-related occupation is telemarketing. This standard is currently used for training provision conducted by both private and public training institutions.

As of July 2020, Indonesia has implemented close to 800 National Work Competency Standards [26]. In terms of numbers, it receives appreciation. The question is more of the compatibility of these standards with the demand of existing and future skills. As previously indicated, not all sectors have laid out their industry transformation map. Thus it may frustrate the development of future competency requirements. This is a clear example of how the current speed of the process and the content of the qualification are unable to keep up with the industry of the future.

Regulations to improve the delivery as well as the agency to improve national productivity have been introduced. In order to advocate a more effectual in-company training, the government passed the Minister of Manpower Decree No.36/2016 on Apprenticeship, where it regulates the output of the intervention and does not measure the outcomes. Another major regulation concerning labor productivity enhancement is the Presidential Regulation No.50/2005 on National Productivity Agency. The regulation focuses on the criteria and representation of the members but it lacks performance indicators and targets.

As presented earlier, the unemployment figure is largely contributed by vocational school and diploma graduates that indicates serious skill mismatch. The effort to build TVET ecosystem is in place but it is only partial and unsustainable.

In short, it is fair to mention that Indonesia is not lacking on the number and variety of regulations to enhance TVET nor the content to the institutional framework. Nevertheless, the regulations are not well integrated and have no clear ultimate outcome on national productivity. As a result, the implementation is considered piecemeal and fragmented at best.

### **National Agencies in Developing Human Capital in Indonesia**

According to the Indonesia Mid-Term Development Plan 2020–2024 [18], the government aims at improving the quality of human capital, boosting national competitiveness, and shifting the national development program from natural- to human resource-based economy. Clearly, this goal requires for coherent and concerted actions by all national agencies involved. But the TVET program is received half-heartedly.

In 2016, KADIN, the Ministry of Manpower, and the Coordinating Ministry of Economic Affairs initiated a series of discussions on TVET. This technical ministry, Ministry of Manpower, is in charge of directing the development of the country's human resource and has initiated some significant measures, such as introducing policies as well as setting up an ad hoc body. This was well before TVET became a national buzzword. KADIN also proposed a national vocational committee under the

President. While waiting for any political will to push TVET into brighter light, the Minister of Manpower established KPVN, an appreciated policy breakthrough. KPVN is composed of vocational triple helix 'plus' - representatives of industries, government, academics, union leaders, and NGOs. Manning and Pratomo [19] recognized how the pragmatic yet effectual policies have resulted in, for example, the decrease of unemployment.

The Minister of Manpower's prime purpose focusing on TVET is to address labor shortage and mismatch through a three-pronged skilling, upskilling, and reskilling. The proposed policies, among others, were unemployment benefits, skill development fund, and preemployment training. The first two were slow to realize. The pressure then increased and the Presidential Staff Office began to monitor the program although the executing agency remains at the Ministry of Manpower.

Another important ministry that plays a significant role in the supply of human capital is the Ministry of Education and Culture. The foundation for national education reform was introduced in 2003 with the passing of Law No.20/2003 on National Education System. This Law stipulates the obligation of schools, educators, and education staff to be accredited and certified. In relation to vocational education, the government passed the Minister of Education and Culture Regulation No.34/2018 on National Standard of Vocational Schools which emphasizes on the fundamental soft and technical competencies comprehensively and in detail. The relatively low educational level - poor education system and school attainment - contributed to the high operational risks in Indonesia [27]. Prior to this, the Ministry embarked on a demand-driven program and system in 2017. In other words, previously produced school graduates were rejected by industries. The skills mismatch may be due to the fact that the graduates did not possess the knowledge of updated technology or the job they had skills for have become obsolete. The frustration can be partly directed to complex bureaucracy surrounding the system (e.g., in setting up a more relaxed and industry-aligned curriculum). Further, if apprenticeship was in place, it was not designed as part of the value chain of the relevant company. The participants were merely involved in peripheral and low value-added jobs. Therefore, graduating from this program has not equipped students with the required skills demanded by industry. In May 2020, the Ministry installed a new Directorate General who oversees specifically vocational schools. The effectiveness of the new structure and policy products are yet to be seen.

In 2019, the Ministry of Manpower with the full support from KPVN, nearly completed the design of Indonesia Skilled Card (Kartu Indonesia Terampil). The card allowed the holder to obtain training supports and facilities from the government. This was mainly to address the challenges of skill mismatch and shortage through triple skilling in the face of Industry 4.0. The ultimate goal is lifelong learning. In other words, it was supposed to be a systematic measure to improve national productivity by funding and providing training that match current and future industry demand. The source of fund had been sought after and a set of alternative funding institutions was studied by the team.

The program was then transformed into a preemployment card program and taken directly under the Coordinating Ministry of Economic Affairs. Immediately after the Project Management Office and the program were launched in February 2020, they were faced with the COVID-19 pandemic. The program remains in place, but with nearly no modification despite the increasing tension in the employment condition. It now targets the pandemic-related layoffs although other applicants can also get accepted into the program. A large amount of the state budget of more than USD1.3 million was allocated but only about 25% was used for training voucher provision. This measure is met with much resistance as direct cash support is more desirable under the current condition. Further, in terms of content, although many training topics are on offer, they should be more specifically constructed to match industry needs.

Despite the increasing enthusiasm across different national agencies, this development entails some issues of concern as organizations tend to embark on their individual self-initiated TVET programs. One of the biggest concerns is that many of the programs are not in coordination with the users, namely the relevant industries. In other words, demand has not been fulfilled by the supply on offer. This increases the cost of addressing the ultimate national goals of employment and competitiveness.



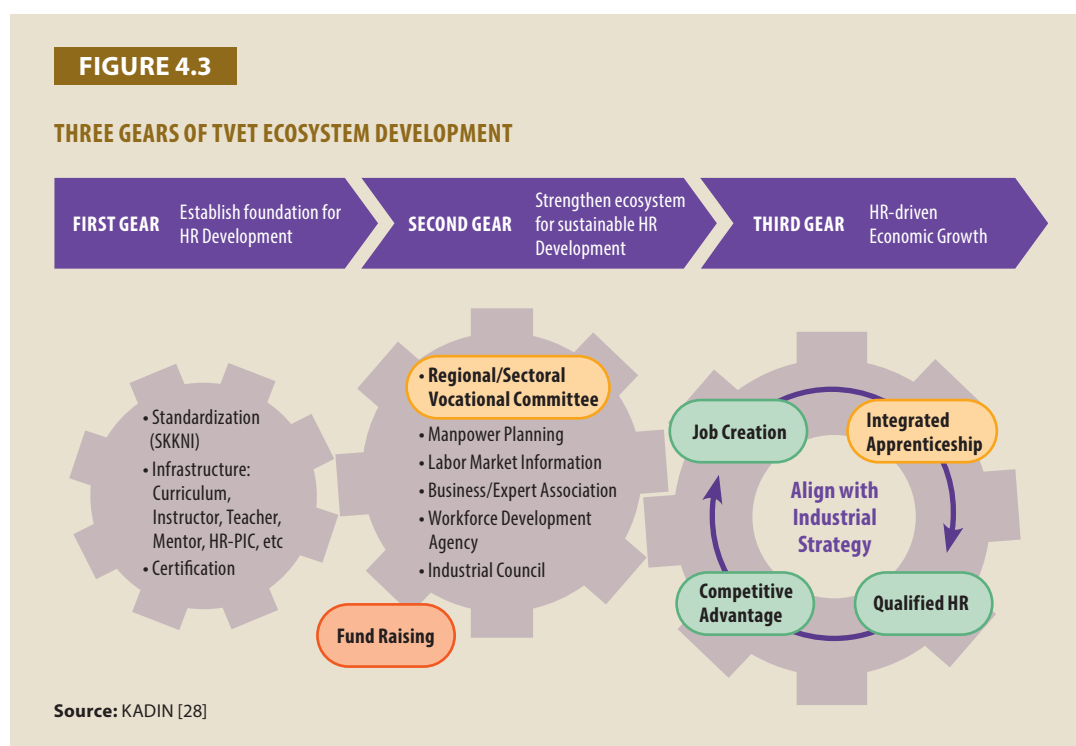
## Policy Recommendations

In order to respond to the main question of how to build Indonesia's national human capital strategy, the previous sections have addressed the subquestions and set the contextual scenario to the issues. This section recommends the development of KADIN-designed TVET ecosystem that also looks into institutional building. Funding sources for the program are suggested as well.

### Ecosystem Development

The issue of human resource strategy on demand and supply can be captured into a TVET ecosystem. It requires an entirely different mindset to manage the current fragmented practices of TVET system in Indonesia. The purpose of building an ecosystem is to pave the way of achieving sustainable human resource-driven economic growth at the macro level and increasing employability at the individual level. It therefore involves a holistic and comprehensive view of building national human capital by aligning its supply with demand. As for the individual worker, the benefit is increased employability which concurrently adjust with industry demand.

Representing the industry, KADIN's ultimate goal of enhancing industry competitiveness and that of industry transformation map is imperative. It claims that the goal is made possible through continuously developing competent and productive workers. Further, the increasing tension in the national employment condition contributed by the ongoing unemployment, mismatch, potential demographic dividend, and the recently pandemic-triggered employment issues, calls for the urgent need to provide sufficient, good quality jobs. For this purpose, KADIN has initiated the three gears of TVET ecosystem development framework in 2018 (see Figure 4.3) which remains relevant despite the recent additional tension.





The ecosystem development ideally begins with the ultimate goal in mind - national competitiveness. As such, although the implementation begins from the ‘first gear’, the purpose must fully incorporate the ‘third gear’. This metaphor of gears displays that the third gear cannot turn unless the first gear rolls into the second gear and the subsequent third. The broad goal of the third gear is sustainable human resource-driven economic growth and increasing employability. This resonates with the World Bank’s [15] strong emphasis that investment in human capital has to be well aligned with the changing nature of work. This gear itself is composed of a dynamic loop initiated by increasing competitiveness. It leads to better job creation, provision of integrated apprenticeship, and then the building of qualified human resource. All have to be nested within the industry strategy. This gear can only take place if the basic components of ecosystem for sustainable human resource development (the second gear) are also aligned.

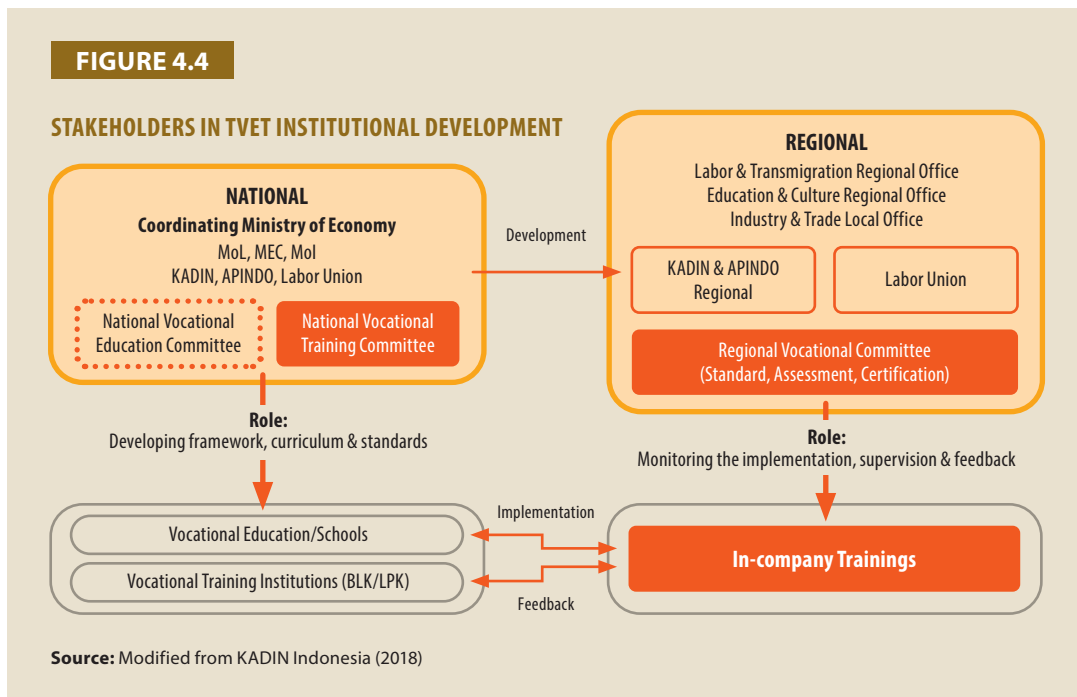
The second gear is an active interplay among planning, accurate and real-time labor market information as well as robust participation of associations, development agencies, and industry councils. It also highlights the importance of building a local vocational committee (further elaborated in the following section). The second gear also targets strengthening the ecosystem that was initiated in the first gear. To fully support the second gear, the foundation for human resource development is therefore imperative. All technical yet crucial matters must be properly installed, especially in the areas of competency standard and curriculum, TVET infrastructure, professional certification, and professional HR practitioners at company levels. The framework shows the aspiration to shorten the distance between worker providers (schools, universities, and training providers) and the industry.

Funding is another important issue that greases the gears to keep rolling in the long run. TVET development is a long process that accommodates short- and mid-term goals. To guarantee this endeavor, the issue of funding (see Figure 4.3) is specifically addressed toward the end of this chapter.

This framework should be read in a comprehensive perspective. All national agencies involved have to transform their mindset that every effort should be directed to the ultimate goal. The bureaucratic constraints may be the first big challenge. Nevertheless, such a framework has been supported by the Ministry of Manpower, at least during the previous Presidential Cabinet. This was shown by the allocation of resource for KPVN of the Ministry of Manpower (vocational training committee) to immediately embark on the program and replicate it at the regional level.

The model has been piloted for the purpose of validation and refinement. The pilot project was a joint initiative between KADIN and the national automotive industry, undertaken in three regions at the outskirts of Jakarta province. The learning factory took place at Toyota facilities. The approach toward the local government leaders was firstly initiated to gain access to schools and other relevant systems. Simultaneously, the local KADIN and APINDO were also involved from the beginning in order to build ownership. The feedback from the pilot project was concurrently used to the refinement of the framework.

Lessons from the pilot project are very fruitful as it provides a road map as well as identify the necessary institutional support. The project has triggered an understanding that such model shall not be imposed top-down from the central government. This is particularly relevant as Indonesia applies regional autonomy since 1999 where workers-related issues are delegated to the regional level (provincial, municipal, and city levels) as part of their mandatory affairs. More importantly, this regional autonomy mechanism is to acknowledge that local endowment and development priorities might differ and hence require different approach. The three-gears framework is generic and can be used as a guideline in enhancing local TVET ecosystem. At the conclusion of the previous cabinet, KPVN and KADIN have established about five local vocational training committees. Their positions are still fragile as they are institutionally strong.



### Institutional Development

The policy recommendation for institutional development is related to the three-gear framework. It is not only imperative that all agencies and infrastructures in every gear have close involvement since the initiation stage, but this endeavor should ascend from a totally different mindset.

At the national level, institutional development ideally entails the full involvement of relevant government agencies, such as Coordinating Ministry of Economy, Ministry of Manpower, Ministry of Education and Culture, and Ministry of Industry. Worker representatives should also participate. This institutional framework can be replicated at the regional level and involve local stakeholders. In line with the earlier suggestions, the success of TVET ecosystem in Indonesia rests on its strong regional institutional footholds. Fundamentally, serious efforts must be deployed to assist local vocational committees. Their roles are crucial as they will be in charge of building appropriate in-company trainings through hands-on monitoring, supervision, and feedback. In turn, the role of the central organizations will only be in developing the national framework, curriculum, and standards.

Equally crucial is the transformation of mindsets. Thus far, developing and building the TVET system have always been piecemeal and fragmented. Building a new TVET institution must now begin with the ending. This way, movement from one gear to another will always be guided by the purpose in mind.

### TVET Funding

As shown in Figure 4.3, for TVET to achieve sustainable human resource-driven economic growth in Indonesia, it requires an ecosystem funding. According to KADIN and APINDO [29], the funding scheme is aimed at preparing school graduates with special and required competencies, support lifelong learning endeavor, and provide a sense of security for both voluntary and nonvoluntary turnover workers. The last target is particularly interesting. As asserted by Miftahudin [29], Indonesian workers are less engaged to voluntary turnover at the expense of broadening their competencies set as there is no financial protection if they embark on new jobs through reskilling. As a result, the lifelong learning goal may be compromised. This may hinder the nation's enrichment of the human capital pool. If organised continuously, individual workers can increase their employability and the nation will reach sustainable competitiveness.

For source of funds, it can be sought from the contribution of individual workers, companies, and the government. To enhance workers engagement to the program, a contribution from the individual workers and companies could be pursued. The mechanism can be similar to that of the social security card currently in place. Workers should have the right to withdraw from the subscription if reasonable excuse can be provided, such as job termination or enrolling to any tippie skilling activity. The government just needs to endorse a list of recommended training programs and providers, and directly channel the funds to the training providers of choice. Funding from the government is required to secure the self-enhancement institutional building of TVET ecosystem, and can be allocated from the state budget. It should be kept in mind that ecosystem funding is separate from different funding mindset the government currently has. The final beneficiaries should be the workers. Both government and private training providers should be in a full market competition to attract participants. To achieve that, they need to be fully transformed. Another strategy is to allow workers to independently select the program and provider of choice.

## CHAPTER 5

# MALAYSIA

### Industries of the Future and Its Human Resources

Malaysia's economy has seen consistent growth for more than 20 years since the Asian financial crisis. The trend is expected to continue in 2020 with a GDP growth of 4.8% to MYR1,493.8 billion and a GNI per capita of MYR47,155 [1]. Additionally, its economy has been in full employment for more than two decades and its labor force is largely skilled and educated. This upward trend should enable the country to reach its goal of becoming a high-income nation within the coming years.

The road toward this goal, however, may not be entirely smooth. The fourth industrial revolution (Industry 4.0) is expected to introduce rapid and large changes to the current economic landscape, especially in the labor market. It is estimated that more than 50% of current jobs are at high risk of being replaced by automation; four out of five of them are semi-skilled [2]. This is a big concern, given that most of the local labor force are semi-skilled. Jobs created by future industries will also require higher skills while manual and nonroutine tasks will be substituted by technology. New jobs, yet to exist, will also emerge. The World Economic Forum (WEF) predicts that 64% of today's primary school children will work in jobs that have not yet existed [3].

Therefore, the government has introduced a number of initiatives and policies to upgrade domestic industries and local human capital to embrace Industry 4.0. Preparing for this next stage of revolution is of utmost importance to ensure that Malaysia can maintain its competitive advantage among global and regional economies. For this reason, the government, through various ministries and agencies, has laid out several masterplans and policy packages related to industry upgrading and human capital development. These include the National Industry 4WRD Policy, National e-Commerce Roadmap, National Big Data Analytics Framework, and expansion of technical and vocational education and training (TVET). In addition, the government has made available up to MYR1 billion worth of investment for high technology, manufacturing, creative, and new economic sectors [4]. These policies are aimed to ensure that the advancement of the industry is aligned with the development of human capital so that labor issues, such as mismatch and shortages can be minimized.

Amid these initiatives, the current and future workforce still lacks awareness of Industry 4.0. A recent survey involving 560 respondents revealed that students and graduates do not fully understand Industry 4.0 and feel unprepared to join the workforce. There is also the perception that tertiary education may not be doing enough to prepare students for the workplace. Adjusting the labor force to new jobs and industrial environment will require tremendous effort from educational institutions, training providers, the industry, and the government [5].

### Overview of National Policies and Initiatives in Human Capital Development

Human capital development is a key factor in stimulating and creating a sustainable economic growth. The readiness of high-skilled workforce is crucial to support the economic transition to knowledge-, technology-, and innovation-intensive activities. To realize the country's aspirations, four key policies have been developed:

First, improving labor market efficiency to accelerate economic growth. This is accomplished by moving workers to high-skilled jobs to improve labor productivity and wages. Existing industries will be encouraged to move up the value chain by investing in high value-added activities that require skilled workers. The Productivity-Linked Wage System (PLWS) will also be more strongly enforced. Wage gaps will also be reduced to improve equity, as marked by labor income share.

Second, transforming TVET to meet industry demand. The Malaysian government has identified TVET as a key tool to produce future workforce with relevant skills. With digital disruptions and Industry 4.0, TVET will be critical in preparing the skills and manpower that the industries need. Emerging technologies are expected to revolutionize TVET jobs and create more high-value opportunities. Guided by the National Master Plan on Technical and Vocational Education and Training launched by the Institute of Labour Market Information and Analysis (ILMIA), the responsible agencies have proposed selective programs that are in line with emerging technologies and will help graduates to be Industry 4.0 ready. The system is modeled after Germany and Japan. The former, especially, has managed to align skills enhancement and training with industry needs.

The government aims to strengthen the governance of TVET and enhance the quality and delivery of its programs to improve graduate employability. The latter is done by enabling industry-led programs to reduce skills mismatch, strengthen TVET curriculum, mainstream the National Dual Training System (NDTS), and develop high quality instructors. TVET will also be rebranded to increase its attractiveness and will be promoted as a pathway of choice. Technologists will be recognized as professionals, and TVET programs will have clearer career pathways.

Third, bolstering lifelong learning for skills enhancement. Employees must be upskilled to stimulate productivity and smooth transition to Industry 4.0. The government plans to accomplish this by expanding the coverage of the Human Resources Development Fund (HRDF) Act, improving training for employees of small and medium enterprises (SME), enhancing industry-based programs to upskill employees through the Malaysian Meister Program (MMP), promoting alternative accreditation for lifelong learning, and supporting pre-employment training through the Future Workers Training (FWT) scheme.

Skills enhancement is not only reserved for workers but also entrepreneurs and communities. The government is committed to develop entrepreneurial excellence and enriching communities through lifelong learning. More effective training programs for entrepreneurs and communities will be introduced to accomplish this aim.

Fourth, improving the quality of education to promote better student outcomes and institutional excellence. The Ministry of Education (MOE) and Ministry of Higher Education (MOHE) are committed to enhance access and quality to improve student outcomes. The former introduced the Malaysia Education Blueprint (Preschool to Post-Secondary Education) 2013-2025, which aims to strengthen governance and stakeholder partnerships for better school support, raise the quality of graduates and programs, and strengthen research. The latter introduced the Malaysia Education Blueprint (Higher Education) 2015–2025, which aims to strengthen the governance and financial sustainability of institutions of higher education to promote institutional excellence.

The government realizes that human capital development begins at school, thus planned for students to be exposed and equipped with skills relevant to Industry 4.0. The MOHE has introduced several initiatives to equip higher education students with future-proof skills. These include 2u2i (two years @ university + two years @ industry), CEO@Faculty Programme, iCGPA (integrated cumulative grade point average), Malaysia MOOCs (massive open online courses), Accreditation of Prior Experiential Learning (APEL), Gap Year, Malaysia English Assessment (MEA), and MyE-Portfolio [6].

2u2i is a program that aims to boost students' employability through enhanced industry exposure. Students take up university courses for two years before gaining experience in the industry for another two. Aside from 2u2i, there are three other types of structured programs (see Table 5.1). As this program is still in trial, it is offered only by a few universities (see Annex 1). Likewise, its impact has

yet to be assessed. Another similar program is Gap Year, which allows students to take two semesters off their formal education to pursue personal growth. Though offered options, students are encouraged to join the program after completing their first academic year. It enables them to reflect and contemplate on their life purposes, careers, and roles in the society profoundly.

**TABLE 5.1****2U2I PROGRAM**

Duration of Study	Model	Definition
4 years	2u2i	Two years in university and two years in industry
	3u1i	Three years in university and one year in industry
3 years	2u1i	Two years in university and one year in industry
2.5 years	1.5u1i	One-half years in university and one year in industry

Source: MOHE [7]

There are also inbound programs, such as the CEO@Faculty Programme. In this program, CEOs commit more than 30 hours a year to provide mentorship to university students and lecturers, and guide universities on matters relating to curriculum development as to ensure its relevance to current industry practices and needs.

Some of these policies and initiatives have resulted in positive outcomes. Policies introduced in the previous Malaysia Plan (11th Malaysia Plan/MP) have increased labor productivity from MYR84,114 per worker in 2015 to MYR91,972 in 2018, representing an average annual growth of 3% (11th MP Mid-term Review (MTR) target: 3.2%). The number of skilled workers increased from 3.6 million in 2015 (25.5% of total workforce) to 4.0 million in 2018 (27.2% of total workforce). The National Wage Index, which tracks changes in salaries, has also been published while the Minimum Wages Order was also enforced. Labor income share is also expected to increase from 34.8% in 2015 to 38% in 2020. To promote labor productivity, Malaysia has introduced the Malaysia Productivity Blueprint (MPB) on 8 May 2017 [2].

**TABLE 5.2****HDI FOR MALAYSIA**

Year	Life Expectancy at Birth	Expected Years on Schooling	Mean Years of Schooling	GNI per Capita (2011 PPS/USD)	HDI Value
1990	70.9	9.7	6.5	10,175	0.644
1995	71.8	10.2	7.6	13,997	0.683
2000	72.6	11.9	8.6	15,071	0.724
2005	73.6	12.7	7.6	17,757	0.732
2010	74.5	13.0	9.8	20,374	0.773
2015	75.5	13.5	10.2	24,703	0.797
2016	75.6	13.7	10.2	25,394	0.801
2017	75.8	13.5	10.2	26,555	0.802
2018	76.0	13.5	10.2	27,227	0.804

Source: United Nations Development Programme (UNDP), 2019 [8]



The human development index (HDI) is a summary measure for assessing long-term progress in three basic dimensions of human development, encompassing long and healthy life, access to knowledge, and a decent standard of living.

As Table 5.2 shows, Malaysia's HDI has been improving throughout the years. From 1990 to 2018, the HDI value has increased by 24.8% from 0.644 to 0.804. All indicators have also consistently increased. The country's human capital index (HCI) in 2018 was 0.62. The improvements to the HDI are the result of Malaysia's commitment to increase its education level, skills, and quality of life of its people.

### Background of Study

The objective of this country paper is to examine past policies introduced by the federal government in preparing the workforce for industries of the future. It also assesses the degree to which these initiatives have been able to produce workers with relevant skills. These assessments are then synthesized into policy recommendations to ensure that the labor force of Malaysia remains employable, driving economic growth, and reducing social divide.

Based on the Economic Planning Unit's (EPU) study [2], Malaysia is currently facing several labor issues that, if further exacerbated, would weaken the capabilities of the country and its human capital ability to cope with Industry 4.0. They include:

i) Future of work

More than 50% of all current jobs in Malaysia are at high risk of being taken over by automation in the next two decades. About 26% of the Malaysian working population is self-employed. The gig economy is expected to grow further as technology advances. Malaysia also aims to boost the green technology sector, targeting a revenue of MYR180 billion and creating more than 200,000 green jobs by 2030.

ii) Emerging technology

About 20% of semiskilled workers in Malaysia are at high risk of displacement due to automation in the first wave of Industry 4.0. According to the World Bank, only about 33% (2015) of employees in Malaysia were offered training opportunities, which was among the lowest in ASEAN. Organizations, especially SMEs, have limited funds to upskill and reskill their workers in Industry 4.0-related areas.

iii) Mismatch

Youth unemployment rate in Malaysia is at 10%. About 28% of the unemployed individuals are diploma or degree holders. Employers in Malaysia are citing the lack of practical and industry skills among graduates as a key contributor to low starting salary.

iv) Aging workforce

The total fertility rate in 2017 was 1.9%, a 0.1% decrease from 2016 and half the rate of 1960. The working age population in 2018 was 65.8% of the total and is expected to decrease to 63.6% in 2029, when Malaysia reaches the status of aging nation. By 2030, the number of people aged 60 and above will increase by 70%.

v) Women participation

About 45% of working age women are outside the labor force. The labor force participation rate (LFPR) of Malaysian women was 54.7% in 2017, or 20.4% behind the OECD average (68.7%). Women outside the labor force with semi-skilled qualifications and above (SPM and above) stands at around 53%, compared to men at only 48%.

## vi) Wages and productivity

Malaysian workers are paid 33% lower compared to developed nations for the same productivity output. The labor income share was only 35.2% in 2017, 2.8 percentage points behind the 2020 target of 38%. As of 2018, 72% of workers were not covered by the PLWS.

## vii) Foreign workers

Almost five out of 10 low-skilled jobs are occupied by foreign workers, indicating Malaysia's overreliance on them. Employment Passes for Expatriate Category III have been misused to hire low-skilled workers. The shortage of local workers in plantation, agriculture, and other sectors in rural areas is a major driver of hiring low-skilled foreign workers.

## viii) Data management

There is a long time gap between data compilation and production of statistics, leading to slow policy response. In addition, there is a lack of data integration and inputs from the private sector, which limits the production of more meaningful insights.

## ix) Decent work

The pool of gig workers is growing faster than the formal employment sector, and they are facing job and financial insecurity and almost nonexistent social security protection.

### Initiatives to Meet the Needs of Future Industries

#### National Agencies in Developing National Strategies for Future Skills

Malaysia is committed to ensure that the development of human capital is in line with the goal of being a high-income nation. Several ministries, such as the Ministry of Human Resources, Ministry of Higher Education, and Ministry of Rural and Regional Development are responsible in steering human capital development policies toward that goal. The ministries, agencies, and training providers involved in developing national strategies for future skills are presented in Annex 2.

#### Tracing Economic Development and Workforce Policies

Throughout its history, Malaysia has twice restructured its economy - first from agriculture to manufacturing, then from manufacturing to services. Now, the country aims to build its economy on knowledge-based services. Each of this structural shift has been accompanied with relevant human capital development policies, allowing Malaysian workers to transition to new industries. For example, during the first shift, many rural Malaysians moved to semi-skilled jobs in urban factories, which contributed to the nation's economic growth. Additionally, the education system has rapidly expanded, allowing local workers to become increasingly skilled and educated.

As Malaysia prepares for Industry 4.0 and develops its knowledge- and innovation-based industries, it has introduced several policies to help workers fulfill their future needs. The government identified future skills that are projected to be in high demand called the Critical Occupations List (COL) and upskilling opportunities initiated by TalentCorp, the Department of Skills Development, and the Ministry of Human Resources (MOHR) to help current workers upgrade their skills. These agencies also run return-to-work programs for women outside of the workforce. Most women workers quit their formal careers for a number of reasons, such as marriage and childbirth only to never return for fear that their skills have become outdated. All these initiatives are aimed to prepare and fulfill the labor demand of Industry 4.0 and to reduce dependency on imported workers, skilled or unskilled.

#### Policies Pertaining to Industrialization and Workforce Development Alignment

In Malaysia, Industry 4.0 is mainly concentrated on the manufacturing industry. Driven by several factors, such as changes in the global economic order, specifically the rise of China, the rate of technology advancement and its convergence, and knowledge and skills for the future, the Ministry of

International Trade and Industry (MITI) in their Industry 4.0 policy emphasized on “making better things while making things better”.

This policy, Industry4WRD, in essence, outlines 13 broad strategies for Malaysia to embark on a journey that will transform the manufacturing industry landscape over the next decade [9]. MITI believes that this journey towards Industry 4.0 adoption is anchored on three shift factors: people, process, and technology. Many leading manufacturing firms have started to adopt and implement smart manufacturing solutions where advanced hardware is now combined with advanced software, sensors, and data analytics. This move has resulted in smarter products, processes, and more closely connected customers and suppliers along the firms’ value chains. The government plays the role of an enabler in the transformation process. Thus Industry4WRD is aimed at ensuring the adoption of Industry 4.0 technologies is done seamlessly and that the technologies are equally accessible to SMEs.

It is vital then that the skills of the future supply pool, specifically in the manufacturing sector, are aligned with the skills demanded by the industry. Therefore, the focus on TVET and STEM (science, technology, engineering, and mathematics) education will be prioritized to ensure a continuous supply of highly qualified talent pool. Structured industrial training programs by the industry and academia can bridge the gap between classroom modules and skills required in the working environment.

The government aims to boost support for TVET and STEM education programs in part by increasing funding for vocational education and training programs. Next is to integrate the theories and practices of Industry 4.0 into tertiary education curricula, including structuring industry placement opportunities. As the manufacturing sector is the main platform to embrace Industry 4.0, it is essential to promote the sector to overcome negative public perception and attract both skilled labor and university graduates. In addition, enhancing and increasing the capacity and capability of educators, trainers, and instructors in manufacturing-related education sectors are also important. By doing so, the number of TVET and STEM students are expected to increase, providing continuous supply of Industry 4.0 talent for the manufacturing industry. However, graduates must also be equipped with relevant and practical Industry 4.0 skills. Inevitably, the industry-academia collaboration must be strengthened further.

In 2018, Malaysia established the COL as a guideline to plan for future skills (see Annex 3). There are altogether 59 occupations, most of which are in the managerial and professional groups. This is in line with Malaysia’s objective to increase the number of high-skilled workers in the future. Some semi-skilled jobs like chef, baker, tailor, and receptionist are expected to remain in high demand. The list, however, is a little discrepant from World Economic Forum’s (WEF) list of future jobs. For example, data analysts and scientists are not included in the COL.

#### Push or Pull Approach?

To ensure future-proof human capital, the government has implemented both push and pull approaches. An example of the push approach is the Returning Expert Programme (REP). This program encourages Malaysian professionals abroad to bring home invaluable experiences, skillsets, knowledge, and intercultural abilities that they have gained overseas to help create a world-class workforce in Malaysia. Returning Malaysian talents are offered attractive living and financial incentives to help them settle in quickly and seamlessly. As of June 2019, a total of 3,399 Malaysians came back home. Their return is expected to induce innovation in the industry and produce knowledge spillover effects to the existing workforce. The government has also introduced the implementation of national minimum wage of MYR1,100. To track wage changes, the ILMIA developed the National Wage Index for six main economic sectors - agriculture, mining & quarrying, manufacturing, construction, services, and government sector. Apart from these, to attract high-skilled foreign talents, three categories of expat permits called Employment Pass (EP) were developed - EP1 (MYR10,000), EP2 (MYR5,000–10,000), and EP3 (MYR3,000–5,000) [2]. EP provides workers with an employment contract that last up to 60 months and allows them to live and work legally in the country.

Some examples of the pull approach include the Scholarship Talent Attraction and Retention (STAR) and Talent Acceleration in the Public Service (TAPS) under the supervision of the Public Service

Department (JPA). The government also encourages more industry participation for NDTs, which allows Malaysians gain more work experience. Others include skill preparation programs, such as the intensification of TVET, 2u2i, Gap Year, and similar MOE and MOHE initiatives.

## Policy Recommendations

Based on the discussions above, three broad policy recommendations are recommended - skill preparation, upskilling and reskilling, and inclusive initiatives.

For the first strategy of skill preparation, it is necessary for Malaysia to enhance a national talent action plan for the future of work. It should also carry out forward-thinking scenario planning for the labor market as well as a national talent analytics platform to acquire and analyze information about the quality and ability of the Malaysian workforce to meet the demands of the evolving marketplaces.

The government also needs to ensure that regulatory frameworks are comprehensive, leaving little loophole for exploitation. Industry-academia collaboration must also be intensified to narrow the skill gap between graduates and industry requirements. Education policies should be enhanced to raise the level and quality of skills of the workforce. The competencies of TVET trainers should also be improved. Industries should also be given incentives to train students and academics to support the transition to knowledge economy.

The second strategy is upskilling and reskilling to cope with emerging technologies. The government should ensure continuous competency of trainers, up-to-date curriculum, and high availability of infrastructure. Reskilling and upskilling should be a seamless process. The country can also provide a sustainable funding mechanism to support upskilling. Proper programs could increase the employability of trained Malaysians.

The third strategy is developing an inclusive skill enhancement ecosystem. The government should introduce policies on the digitalization of workforce for senior citizens, the disabled, and marginalized communities. Low-skilled workers are more likely to be replaced by automation, and so they must also be reskilled and upskilled so that they continue working.

## Challenges and Critical Success Factors

As listed in the National Policy of Industry 4.0 [9], MITI has identified several issues and challenges that industries face in embracing Industry 4. Most prominently is the lack of awareness on the impact of and need for Industry 4.0 technologies, both in terms of opportunities and business model disruption, especially among SMEs. The digital adoption rate among SMEs is still low (around 20%); likewise, less than 50% of manufacturing firms employ automation in their processes. This may stem from the costly adoption of new technologies and processes, and the firms' unwillingness to invest in them. Consequently, these firms stand to lose their customers, whose expectations and demands for product customization and faster delivery are becoming more intense. Unless they are made aware of the extra benefits from their procurement, this figure will climb at a slow pace. However, Malaysia lacks a centralized and easily accessible information platform to help firms understand best practices and relevant use cases. A platform like this can increase the industry's awareness on the importance of preparing for Industry 4.0.

Most manufacturing firms have also been strategically shortsighted. They have little understanding of required future skills and readiness of the industry, much less their own readiness to embark on Industry 4.0 transformation. But the blame does not fall entirely on the industry as the current labor supply has not been able to provide talents with Industry 4.0 skills and knowledge.

Industry 4.0 does not always bring opportunities. There are also threats and weaknesses, such as the increased exposure to cyber threats that comes with higher connectivity and new technologies, especially with internet of things (IoT). The ownership of intellectual properties (IPs) may also be a source of dispute due to interconnectivity and information sharing along the supply chain. Improvements to the firms' processes may also not be effective, considering the lack of integrated and digital approaches to data gathering along manufacturing and supply chains.

To cope with these challenges, MITI recommends that upskilling and reskilling in existing and future labor pool are made the cornerstone of Malaysia's transformation. SMEs should be involved in pushing forward a holistic step up in labor productivity across the economy. Significant evolution in innovation capabilities and collaborative platforms is essential to foster the development of and access to cost-effective technologies that address specific sector needs. Focused funding support is also needed to kick-start the adoption and complement private sector investments. Finally, a good digital infrastructure is required to enable reliable and secure Industry 4.0 operations.

TVET meanwhile can help supply skilled workers to the future industries but will have to overcome at least six broad challenges [10] in order to accomplish this goal.

First is the lack of a coordinating body. TVET is offered by seven ministries and 17 agencies, each with their own agenda. There is no common coordinating body to link the various stakeholders in the TVET ecosystem. This prevents the agencies from effectively collaborating and sharing information with one another. As a result, the programs offered across TVET institutions may be inconsistent or offer duplications, wasting public resources, and producing ineffective outcomes. Graduates with similar skill names may have entirely different skill levels and skill sets. Robust and standardized TVET governance should therefore be a priority.

Second is its rigid operational model. Collaboration between TVET institutions is uncommon because resource and information sharing is not competitive. Public TVET institutions have limited autonomy in making decisions pertaining to staffing arrangements (e.g., hiring part-time instructors) as they are organized centrally by their respective agencies. Sharing of instructors across institutions under different ministries is also restricted. This has resulted in limited flexibility for public TVET institutions in adapting to students and local market requirements. The TVET model should thus be more relaxed.

Third is the poor quality of instructors. Almost one-third of TVET instructors have less than a year's industry experience prior to teaching. Almost 50% of TVET instructors have less than a month of industry attachment, which itself is not part of the instructors' KPIs for promotion. This may have caused the quality of TVET graduates to be barely at or below the industry standard, as suggested by more than 65% interviewed by ILMIA.

Fourth is the difficulty in transferring credit hours across different TVET programs because they are accredited by different accreditation bodies (i.e., Department of Skills Development (DSD) and Malaysian Qualifications Agency (MQA)). This has resulted in different learning outcomes and curriculum standards across the TVET ecosystem.

Fifth is the dependency on public funding. Most funding for public TVET institutions is provided by the Ministry of Finance (MoF) and EPU. Only a limited number of institutions generate revenue from sources outside the government.

Sixth is its negative stigma and poor branding. TVET is seen negatively as it is perceived to cater for students with average or below average academic capabilities. This is further exacerbated by the poor quality of its graduates. Most industry players have also raised concerns about the poor technical and soft skills, and work attitude of TVET graduates. Graduates also earn low wages because most of them are in low- and semi-skilled occupations. Most firms also observe no correlation between TVET qualifications and higher productivity or better quality of work.

## Annex 1. Universities Offering 2U2I Programme

University	2u2i Programmes
University of Malaya	<ul style="list-style-type: none"> <li>• Bachelor of Media Studies</li> <li>• Bachelor of Computer Science (Data Science)</li> </ul>
Universiti Putra Malaysia	<ul style="list-style-type: none"> <li>• Bachelor of Science in Plantation Management</li> </ul>
Universiti Kebangsaan Malaysia	<ul style="list-style-type: none"> <li>• Bachelor of Science with Honours (Biotechnology with Management)</li> <li>• Bachelor of Science with Honours (Oleo chemical)</li> <li>• Bachelor of Science with Honours (Bioinformatics)</li> <li>• Bachelor of Science with Honours (Chemistry)</li> <li>• Bachelor of Science with Honours (Food Science with Business Management)</li> <li>• Bachelor of Science with Honours (Chemical Technology)</li> <li>• Bachelor of Science with Honours (Environmental Science)</li> <li>• Bachelor of Science in Liberal Studies</li> </ul>
Universiti Teknologi Malaysia	<ul style="list-style-type: none"> <li>• Bachelor of Computer Science (Data Engineering)</li> </ul>
Universiti Teknologi MARA	<ul style="list-style-type: none"> <li>• Bachelor of Animation (Hons) 2D Animation Production</li> <li>• Bachelor of Animation (Hons) 3D Animation Production</li> <li>• Bachelor of Creative Industry Management (Hons) Film Production</li> <li>• Bachelor of Creative Industry Management (Hons) Art Management</li> <li>• Bachelor of Film (Hons) Film Directing</li> <li>• Bachelor of Film (Hons) Cinematography</li> <li>• Bachelor of Writing (Hons) Creative Writing</li> <li>• Bachelor of Writing (Hons) Screen Writing</li> <li>• Bachelor of Theater (Hons) Theater Production</li> <li>• Bachelor of Theater (Hons) Scenography</li> <li>• Bachelor of Mass Communications (Hons) Broadcasting</li> <li>• Bachelor of Creative Game Design (Hons)</li> <li>• Bachelor of Digital Marketing (Hons)</li> </ul>
Universiti Pertahanan Nasional Malaysia	<ul style="list-style-type: none"> <li>• Bachelor of Aviation</li> </ul>
Universiti Tun Hussein Onn Malaysia	<ul style="list-style-type: none"> <li>• Bachelor of Aeronautical Engineering Technology (Aircraft Maintenance) with Honours</li> <li>• Bachelor of Aeronautical Engineering Technology (Professional Piloting) with Honours</li> </ul>
Universiti Malaysia Terengganu	<ul style="list-style-type: none"> <li>• Bachelor of Accounting</li> </ul>
Universiti Sultan Zainal Abidin	<ul style="list-style-type: none"> <li>• Bachelor of Science (Animal Production and Health) with Honours</li> </ul>

Source: MOHE [7]



## Annex 2. Ministries, Agencies, and Training Providers Responsible for National Policies for Future Skills

Ministry	Agency	Training Provider
Ministry of Human Resource	TalentCorp	
	Institute of Labour Market Information and Analysis (ILMIA)	
	Department of Occupational Safety and Health (DOSH)	National Institute of Occupational Safety and Health (NIOSH)
	Manpower Department (JTM)	Institut Latihan JTM, Institut Latihan Perindustrian (ILP), Pusat Latihan Teknologi Tinggi (ADTEC)
	Department of Skills Development (DSD)	Centre for Instructor and Advanced Skill Training (CIAST) Japan-Malaysia Technical Institute (JMTI)
Ministry of Education	Department of Higher Education	Public Universities Private Universities and Colleges
	Department of Polytechnic and Community College Education	Polytechnics, Community Colleges, Vocational Colleges
Ministry of Rural & Regional Development	Majlis Amanah Rakyat (MARA)	Universiti Kuala Lumpur, Giat MARA, Institut Kemahiran MARA (IKM), Kolej Kemahiran Tinggi MARA (KKTM) German-Malaysian Institute (GMI)
Ministry of Youth and Sport		Institut Kemahiran Belia Negara (IKBN), Institut Kemahiran Tinggi Belia Negara (IKTBN)
Ministry of Work	Construction Industry Development Board (CIDB)	Akademi Binaan Malaysia (ABM)

Source: ILMIA, 2018 [10]

### Annex 3. Critical Occupations List (COL)

No.	Occupation	No.	Occupation
1	Managing Director and Chief Executive	31	Financial and Investment Adviser
2	Finance Manager	32	Financial Analyst
3	Human Resource Manager	33	Advertising and Marketing Professional
4	Policy and Planning Manager	34	Systems Analyst
5	Business Service Manager	35	Software Developer
6	Business Services and Administration Manager Not Elsewhere Classified	36	Applications Programmer
7	Sales and Marketing Manager	37	Software and Applications Developer and Analyst Not Elsewhere Classified
8	Advertising and Public Relations Manager	38	Systems Administrator
9	Research and Development Manager	39	Computer Network Professional
10	Manufacturing Manager	40	Database and Network Professional Not Elsewhere Classified
11	Construction Manager	41	Civil Engineering Technician
12	Information and Communications Technology (ICT) Manager	42	Electrical Engineering Technician
13	Chemist	43	Mechanical Engineering Technician
14	Geologist and Geophysicist	44	Physical and Engineering Science Technician Not Elsewhere Classified
15	Mathematician, Actuary, and Statistician	45	Manufacturing Supervisor
16	Industrial and Production Engineer	46	Others Supervisor Not Elsewhere Classified
17	Civil Engineer	47	Commercial Sales Agent
18	Mechanical Engineer	48	Chef
19	Chemical Engineer	49	Receptionist
20	Mining Engineer, Metallurgist, and Related Professional	50	Welder and Flame Cutter
21	Engineering Professional (Excluding Electrotechnology) Not Elsewhere Classified	51	Agricultural and Industrial Machinery Mechanic and Repairer
22	Electrical Engineer	52	Electrical Mechanic and Fitter
23	Electronic Engineer	53	Bakers, Pastry, Pasta and Confectionery Maker
24	Graphic and Multimedia Designer	54	Tailor, Dressmaker, Furrier and Hatter
25	Aircraft Pilot and Related Professional	55	Rubber Products Machine Operator
26	Manufacturing Professional	56	Steam Engine and Boiler Operator
27	Environmental and Occupational Health and Hygiene Professional	57	Stationary Plant and Machine Operator Not Elsewhere Classified
28	University and Higher Education Professional Teacher	58	Heavy Truck and Lorry Drive
29	Early Childhood Educator	59	Mobile Farm and Forestry Plant Operator
30	Accountant		

Source: ILMIA, 2019 [11]

## Annex 4. Key Statistics

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Population ('000)	28,588.6	29,062.0	29,510.0	30,213.7	30,708.5	31,186.1	31,633.5	32,022.6	32,382.3
Labor force ('000)	12,303.9	12,740.7	13,221.7	13,980.5	14,263.6	14,518.0	14,667.8	14,980.1	15,280.3
Labor force participation rate (%)	63.7	64.5	65.6	67.3	67.3	67.9	67.7	68.0	68.3
Unemployment rate (%)	3.3	3.1	3.0	3.1	2.9	3.1	3.4	3.4	3.3
Labor force with Degree ('000)	1,196.7	1,262.8	1,352.0	1,396.9	1,592.1	1,740.4	1,829.0	1,941.1	2,002.8
Labor force with Diploma and Certificate ('000)	1,275.9	1,414.5	1,400.8	1,538.7	1,678.1	1,798.2	1,774.7	1,836.1	1,936.1
Labor force with Secondary school ('000)	6,627.5	6,894.2	7,193.8	7,581.5	7,771.7	7,754.8	8,054.5	8,372.8	8,493.5
Labor force with Primary school ('000)	1,582.7	1,635.1	1,736.0	1,913.7	1,802.9	1,885.6	1,810.1	1,719.0	1,765.6
Mean Gross monthly income (MYR)	1,936	1,959	2,052	2,186	2,377	2,487	2,657	2,879	3,087
GDP per capita at Current Prices MYR (Million)	28,733	31,372	32,913	33,714	36,030	37,739	39,505	42,834	44,679
Customer Price Index	100.00	103.20	104.90	107.10	110.50	112.80	115.20	119.50	121.10

Source: DOSM [12]

## CHAPTER 6

# PAKISTAN

### Industries of the Future and Its Human Resources

Centuries ago, most of the countries around the world were mainly dependent on agriculture and natural resources. With the passage of time, these countries discovered these natural resources can be manufactured into value-added products. This realization led to the introduction of value-added manufacturing processes through use of modern technologies. The first industrial revolution began in the eighteenth century through the use of steam power and mechanization of production. Steam power was already known at that time but its use for industrial purposes increased productivity. The second industrial revolution began in the nineteenth century through the discovery of electricity and assembly line production at a significantly faster pace and lower cost. The third industrial revolution introduced partially automated devices, including computers and memory-programmable controls. With the introduction of these technologies, most countries have moved to a fully automated production process with lesser or without human assistance. Many industries introduced robots that performed programmed sequences themselves [1].

The fourth industrial revolution also known as Industry 4.0 is the current trend of automation and data exchange in manufacturing technologies. Industry 4.0 introduced key technological developments, including cloud computing, Internet of things (IoT), and cyber-physical systems. The technological developments aimed at integrating cyber and physical manufacturing processes, enabling machinery and objects, like sensors and mobile phones to communicate while allowing humans to work out solutions and creating a bond that simplifies all connected smart devices, and the Smart Factory which deals with both physical and virtual systems. Industry 4.0 has revolutionized the global industrial landscape with the introduction of cutting-edge technologies, including mobile Internet, automation of knowledge work, IoT, cloud technology, advanced robotics, next-generation genomics, autonomous and near-autonomous vehicles, energy storage, 3D printing, advanced materials, advanced oil and gas exploration and recovery, and renewable energy [1].

Many countries have developed their economies by effectively utilizing these smart technologies in order to create opportunities to enhance overall industrial productivity. However, there are some developing and underdeveloped countries that have failed to meet the requirements of Industry 4.0. These countries need to understand that many jobs of today and tomorrow will require specific skills - a combination of technological know-how, problem-solving, and critical thinking as well as soft skills, such as perseverance, collaboration, and empathy. The changing industrial dynamics will require governments to invest in human resource development (HRD) through policy reforms. In such critical situation, education and training providers need to be aware and informed of the potential future requirements of the labor market to ensure that individuals are adequately trained with the required skills to be competitive in the future. The hardest activities to automate in the short term are those involving expertise in decision-making, planning, human interaction, or creative work. In a world of rapidly changing economic environment and globalization, these technologies will lead the future industries. It is a harsh reality that machines will replace many jobs in the future in order to raise productivity. The technological innovations continue to accelerate and affect every part of our lives.

This research paper includes a detailed review of Pakistan's current policies and initiatives as to identify skills, employability gaps, and potential in key sectors of the economy in order to develop the workforce of future industries. Policy recommendations are also proposed to tackle unemployment and increasing social divide that cause economic growth challenges.

## Overview on National Policies and Initiatives in Human Capital Development

Pakistan is a developing country with a GDP growth rate of 3.3% and population of about 212 million, according to Economic Survey of Pakistan 2018–19. The country has abundant natural and human resources, but the government of Pakistan must invest more effectively in the education and healthcare of its people. As per the Human Capital Index (HCI) of the World Bank, the country produced a very low score of 0.39. HCI shows the percentage of potential reached [2]. Pakistan also ranks low at 134 out of 157 countries and it is even lower than other South Asian countries, including Afghanistan. The HCI reflects the productivity of the future worker and the possibility of his potential with good health and complete, high quality education. The components of HCI and ranking of Pakistan in year 2018 is shown in Table 6.1.

**TABLE 6.1**

### PAKISTAN'S HCI RANKING AND SCORES OF VARIOUS INDICATORS

Country	Probability of Surviving to Age 5	Expected Years of School	Harmonized Test Score	Learning Adjusted Years of School	Fraction of Kids Under 5 Not Stunted	Adult Survival Rate	Human Capital Index (HCI)
Pakistan	0.93	8.8	339	4.8	0.55	0.84	0.39

**Source:** HCI 2018 World Bank [2]

Similarly, Human Development Index (HDI) is also a key tool developed by the United Nations Development Programme (UNDP) to analyze and measure governments' efforts for human development [3]. Table 6.2 highlights time series analysis of Pakistan's HDI trends.

**TABLE 6.2**

### PAKISTAN'S HDI VALUE AND SCORES OF VARIOUS INDICATORS

Year	Life Expectancy at Birth	Expected Years of Schooling	Mean Years of Schooling	GNI per Capita (2011 PPS/USD)	HDI Value
1990	60.1	4.6	2.3	3,195	0.404
1995	61.5	5.0	2.8	3,361	0.428
2000	62.8	5.4	3.3	3,358	0.449
2005	64.0	6.5	4.5	3,938	0.499
2010	65.3	7.5	4.7	4,227	0.524
2015	66.6	8.2	5.1	4,727	0.550
2016	66.8	8.6	5.1	4,891	0.556
2017	66.9	8.5	5.2	5,033	0.558
2018	67.1	8.5	5.2	5,190	0.560

**Source:** Human Development Report 2018, UNDP Pakistan [3]

The data in Table 6.2 indicates that Pakistan is putting more effort for human development by improving the socioeconomic facilities for the common people. The country achieved a HDI value of 0.560 that shifts the nation to medium human development category. As per HDI 2018 rankings, Pakistan's position was at 152 out of 189 countries and territories of the world [3]. The country is continuously improving all its key human development indicators, including life expectancy, expected years of schooling, mean years of schooling, and GNI per capita.

### Background of Study

Low skill levels of the country's labor force for future industries is a major constraint in achieving economic growth and eliminating poverty in Pakistan [4].

In this modern era of industrialization and increasing global competitiveness among countries, Pakistan is still lagging due to long-term socioeconomic challenges. The country has not been able to respond adequately to the future challenges unfolding in the wake of Industry 4.0. The biggest challenge lies with the government, legislators/policy makers, the private sector, and academia to build the capacity to cope with the requirements of the fast-approaching intelligent age. The world is moving toward Industry 4.0 but Pakistan's industrial sector is still focused on manufacturing and processing industry, and there are huge technological and skill gaps which are hindering the progress.

Pakistan ranks low in the Global Competitiveness Index, ranking 111 in technology readiness and 128 in labor market efficiency out of 137 countries [5]. The country is facing slow growth rates of output and exports due to small levels of investment, technical inefficiencies, and low R&D, resulting in lower productivity and uncompetitive Pakistani products. Low skill level in the labor force is also a major constraint in achieving economic growth and eliminating poverty in Pakistan. Table 6.3 provides a summary of Pakistan's ranking in comparison with other Asian and developed countries as to understand its higher education and training standards as well as labor market efficiency.

**TABLE 6.3**

### GLOBAL COMPETITIVENESS INDEX - PAKISTAN'S COMPARISON WITH VARIOUS COUNTRIES (SELECTIVE RANKING OF 137 COUNTRIES, SCORE OF 7)

Country	GCI Rank	Innovation		Technological Readiness		Higher Education and Training		Labor Market Efficiency	
		Rank	Score	Rank	Score	Rank	Score	Rank	Score
Switzerland	1	1	5.8	2	6.4	5	6.1	1	5.9
Singapore	3	9	5.3	14	6.1	1	6.3	2	5.8
Japan	9	8	5.4	15	6.0	23	5.4	22	4.8
Malaysia	23	22	4.7	46	4.9	45	4.9	26	4.7
ROK	26	18	4.8	29	5.6	25	5.3	73	4.2
PR China	27	28	4.1	73	4.2	47	4.8	38	4.5
Turkey	53	69	3.3	62	4.4	48	4.8	127	3.4
India	40	29	4.1	107	3.1	75	4.3	75	4.1
Bangladesh	99	114	2.8	120	2.8	117	3.1	118	3.6
Pakistan	115	60	3.4	111	3.0	120	3.0	128	3.4

**Source:** Global Competitiveness Index 2017–2018 [5]

As per the global competitiveness report, various countries developed their economies by adopting industrial revolutions strategies and the latest technological developments. Due to its low technological base, Pakistan's industrial sector share is very low in GDP when compared to various developing countries which consequently result in having a very limited share in the global exports. Pakistan's industrial sector is mainly focused on the following key subsectors:

- i)   Engineering
  - Machinery manufacturers
  - Electrical and electronic products manufacturers
  - Ships and boats manufacturers
  - Medical and surgical manufacturers
  - Plastic industry
- ii)   Mines and minerals
- iii)   Construction
- iv)   Automobile
- v)   Agriculture and agrofood processing
- vi)   Organic and inorganic chemicals manufacturing
- vii)   Technical textile
- viii)   Pharmaceuticals

Pakistan needs to focus on its key and potential economic sectors that will positively support sustainable industrial development. Currently, its economy is still dependent on traditional industries and will be left further behind in Industry 4.0 revolution due to limited research, technological, and skill gaps. However, the government has put in effort toward increasing job security and employability of the local workforce [4–5].

### **Initiatives to Meet the Needs of Future Industries**

#### **National Agencies in Developing National Strategies for Future Skills**

In Pakistan, a number of federal and provincial agencies are working to meet the human resource needs of future industries. They include [6]:

- Ministry of Planning and Development
- Ministry of Science and Technology
- Ministry of Information Technology and Telecommunication
- Ministry of Federal Education and Professional Training
- Ministry of Industries and Production
- Ministry of Commerce and Textile Industry
- Ministry of National Food Security and Research
- Ministry of Energy
- Technology Upgradation & Skill Development Company (TUSDEC)
- National Vocational and Technical Training Commission (NAVTTTC)
- Technical Education and Vocational Training Authority (TEVTA)
- Punjab Skill Development Fund (PSDF)



- Benazir Bhutto Shaheed Youth Skill Development Program (BBSYDP)
- Skill Development Council (SDC)

The details of these public-sector agencies and institutions working under various ministries are provided in Annex 1.

### Tracing Economic Development and Workforce Policies

Pakistan is recognized as a high-potential economy, but it faces intense political, social, and economical challenges. The economy is dependent mainly on three key sectors - agriculture, industrial, and services. Agriculture contributes 18.5%, industrial is 20.3% while the services sector stands at 61.1% which is the largest GDP contributor to the economy. In 2018–19, Pakistan's experienced only 0.9% growth rates in agriculture, 1.4% for industry, and 4.7% for services due to formidable macroeconomic challenges faced by the country [4].

Notwithstanding, Pakistan needs to put extra effort to utilize its human capital positively as 64% of its total population is below 30 years age [7]. The country is among one of the most resource-rich countries but it urgently requires coordinated and coherent policy actions to harness the potential of economic growth and development. However, it still falls behind in efficient planning and solid measures to develop and utilize its human capital. If the population continues to remain unutilized due to non-provision of basic facilities and unsustainable livelihood opportunities, it may lead to serious social and economic issues that will stunt growth, like poverty, unemployment, gender inequality, and most importantly, terrorism [8].

Simultaneously, Pakistan will also not be able to exploit or sustain its competitive advantage in an increasingly competitive global market if it continues to neglect investments in human capital and effective usage of latest technologies. It is a well-established fact that more than half of the economic growth in developed countries are due to technological capabilities.

### Policies Pertaining to Industrialization and Workforce Development Alignment

Major policies, strategies, and initiatives that Pakistan emphasizes on the human capital development and industrialization in key economic sectors are [9]:

- Draft National SME Policy 2019
- National Science, Technology, and Innovation (ST&I) Policy 2012
- Science, Technology & Innovation Strategy 2014–18
- Punjab Growth Strategy 2018 - Pakistan
- Establishing Industry-specific Center of Excellence
- Digital Pakistan Policy
- Draft Industrial Technology Acquisition Policy

#### i) Draft National SME Policy 2019 [10]

Currently, the SMEs sector contributes 40% to the GDP and provides employment to 80% nonagriculture labor. The current growth of SME sector is 8% in manufacturing, 10% in exports, and 10% in services.

In order to enhance the share of SMEs sector in Pakistan and develop strong industrial base, the Small & Medium Enterprises Development Authority (SMEDA) drew up the Draft National SME Policy 2019 in consultation with the Ministry of Industries and Production [10]. The policy involved detailed dialogues with relevant stakeholders and obtained input/feedback of board members, Federation of Pakistan Chambers of Commerce & Industry (FPCCI), and other various

chambers of commerce and industry. A number of consultation sessions were organized which helped to gain valuable input and recommendations as well as engagement of stakeholders for SMEs growth in Pakistan.

The goals of the policy is to develop a uniformed definition of SMEs based on annual sales turnover. Skills and human resource were identified as one component to address the constraints of supply to SMEs. SMEDA was tasked to coordinate with different committees and councils such as Skill Development Council and Pakistan Skills Partnership Initiative, to voice the needs and concerns of SMEs in terms of human resources for SMEs [10].

ii) National Science, Technology, and Innovation (ST&I) Policy 2012 [9]

The Ministry of Science and Technology introduced the National Science, Technology, and Innovation Policy in 2012 with the principal aim and objectives of socioeconomic development, human resource development, R&D infrastructure, promotion of science, technology, and innovation (ST&I) in society, and science and technology (S&T) management systems. The policy envisages achieving security, prosperity, and social cohesion in Pakistan through equitable and sustainable socioeconomic progress using ST&I as central pillars of development in all sectors of economic activity.

S&T policy emphasizes on the development of human resources as without an adequate number of well-trained scientific and technical manpower at all levels (i.e., researchers and technicians), any investment in buildings and equipment would be counterproductive. The key trends impacting ST&I in Pakistan include:

- **Technology**      Technological gaps - low technology base
- **Financing**      Lack of access to finance due to limited lending programs
- **Marketing**      Lack of information to market players
- **HRD**              Integrated skilled workforce as per modern technology
- **Regulatory**      Impediments in government rules
- **Low Q & P**      Uncompetitiveness

iii) Science, Technology, & Innovation Strategy 2014–18 [9]

The government of Pakistan developed Science, Technology, and Innovation Strategy 2014–18 to shift towards a realistic and fast-moving S&T strategy. It aims to address the key challenges faced by Pakistan in the field of energy, water, food security, health, unemployment, and export enhancement through:

- Rapid human capital development to meet the country's current and future human resource demands
- Improve communication, coordination, and collaboration among S&T, ICT, and other sectors of socioeconomic development
- Support emerging technologies through R&D, commercialization of R&D results, exploring innovative solutions, and establishing new firms
- Ensure acquisition of emerging technologies, i.e., biotechnology, nanotechnology, renewable energy technologies, and fuel cell to gain world class expertise and global competitiveness
- Promote indigenous technology development, innovation, and entrepreneurship through establishing network of innovation incubators, holistic technology clusters, and technology fund

- Establish S&T think tanks to support policy research
- Enhance R&D expenditure by up to 2% of GDP by 2018
- Create one million employment opportunities in five years to support economic growth

iv) Punjab Growth Strategy 2018 - Pakistan [11]

The provincial government of Punjab developed Punjab Growth Strategy 2018 with an aim to develop a secure, economically vibrant, industrialized, knowledge-based, and prosperous province where every citizen can expect to lead a fulfilling life. Punjab Growth Strategy aims to overcome the key challenges, including an underutilized manufacturing capacity and stagnant exports; low productivity of physical and human capital; unemployment, underemployment, and skills shortages; slow progress on achieving the Millennium Development Goals (MDGs); and a difficult security situation.

The Punjab provincial government outlined the following objectives to help achieve its vision of economic growth by 2018:

- Economic growth rate of 8%
- Increasing annual private sector investment to USD17.5 billion
- One million jobs creation every year
- Skill training to two million youth
- Increasing exports by 15% every year
- Achieving MDGs and targeted SDGs (Sustainable Development Goals)

v) Establishing Industry-specific Center of Excellence [6]

Most public-sector technical and vocational institutes tend to not specialize in training for a particular economic sector, but offer a range of generic courses, which do not always correspond to the diversity of actual economic activities. There are however, examples of some public-sector specialist training institutes, such as the Construction Technology Training Institute, Islamabad. Though no formal evaluation has been carried out, the performance of such institutions is perceived to be higher in terms of quality of training and employability of trainees. Institutions such as these can run the risk of becoming isolated islands of excellence. Therefore, it is important to ensure that they play a dynamic role in upgrading skills development for their sector across the country.

vi) Digital Pakistan Policy [12]

The Digital Pakistan Policy was developed and introduced by the Ministry of IT & Telecom following the emerging role of ICT in industrial, social, agricultural, and other sectors. It has become the need of the hour to digitize processes to resolve socioeconomic issues and capitalize on digital transformation. Pakistan focused “to become a knowledge-based economy through accelerated digitization ecosystem”. The aim of this policy is to adopt the latest technologies emerging with Industry 4.0.

vii) Draft Industrial Technology Acquisition Policy 2018–23 [13]

Pakistan is still dependent on traditional industries and manufacturing techniques due to lack of R&D and latest technology. A key challenge for Pakistan is to ensure the selective acquisition of developed technology results in both efficient production and a gradual increase in domestic technological capabilities.

To cope with this challenge, TUSDEC drafted 'Industrial Technology Acquisition Policy' to benchmark, acquire, assimilate, and improve the technology used in various industrial sectors in Pakistan. This national level policy proposed various interventions, including technology upgradation fund (TUF), joint ventures (JVs), establishment of regional investment and trade promotion offices (ITPOs), technology upgradation centers (TUCs), skill development centers (SDCs), and technology incubation centers (TICs) [13]. The approval and implementation of the policy will expand TUSDEC's horizon to upgrade Pakistan's industrial technology in the long run.

### **Defining Future Skills by National Institutions, Unions, and Employers' Organizations**

In most developed countries, industrial revolution was supported by government through different interventions implemented to elevate and excel the performance of local industries and make their contribution significant to the economy. A key approach adopted by these countries was to enhance the share of industrial sector through import substitution and supply of adept manpower to the local industries. Apart from that, key factors such as changes in technology, emergence of global markets for products and services, international competition, attracting foreign direct investment, and new forms of business organization and productions that have created a demand for new, diversified, industry-relevant skills, and knowledge have all led to industrial development [14].

Over the past few years, the government of Pakistan has prioritized in skill development for positive engagement of youth and to support economic growth and development. Still, the national policies need to be formulated based on evidence-based research supported by political will and financial investments to cater to the needs of fast-moving economy. The following are a number of key initiatives of national institutions, unions, and employers' organization to address the current and future skill development needs:

- Revival of Engineering Development Board (EDB)
- Benchmarking activity of surgical and cutlery sector of Pakistan
- Establishment of Leather Craft Development Company
- Approval of footwear cluster development
- Establishment of Agro Food Processing Center, Multan
- Establishment of Red Chilli Processing Center, Kunri, Sindh
- National Strategic Programme for Acquisition of Industrial Technology (NSPAIT)
- Sports Industries Development Centre, Sialkot (SIDC)

A number of bodies, such as chambers of commerce and industry, unions, and employer organizations also work together actively in achieving this aim. However very little focus has been paid to the development of human resources for industries of the future.

- Federation of Pakistan Chambers of Commerce & Industry (FPCCI)
- Chambers of Commerce & Industry across major cities of Pakistan
- All Pakistan Trade Union Federation
- Employers' Federation of Pakistan (EFP)
- Pakistan Workers Federation (PWF)
- All Pakistan Textile Mills Association (APTMA)
- Pakistan Worker Confederation

In addition to the above, there are some key strategic initiatives launched by the government of Pakistan to address the current and future skill development needs of local industry.

#### Prime Minister Kamyab Jawan - National Youth Development Program [6]

As part of the prime minister's vision of creating 10 million jobs, the government of Pakistan initiated an innovative project 'Kamyab Jawan-National Youth Development Program' which involves various schemes to support productive engagement of youth, skill development, job creation, and entrepreneurship development. The program includes several key schemes:

- i) Prime Minister's Youth Entrepreneurship Scheme (Yes!)
- ii) Skills for all strategy as catalyst for technical and vocational education and training (TVET) sector development
  - Training for 50,000 youth in high-tech/end-technologies in various areas, such as advanced electronics, 3D printing, artificial intelligence (AI), augmented reality, blockchain, intelligent vehicles, robotics, and mechatronics - to enable capture share of workforce in international job market
  - Traditional skill development training for 50,000 youth from less developed areas in conventional sectors, such as construction, hospitality, manufacturing, textile, and domestic skills for women
  - National employment exchange as a technology-based platform that enables integration and alignment of demand and supply
  - 75 smart tech labs for distance learning
  - Incubation centers in TVET Center to support Startup Pakistan movement
  - Establishing Pakistan National Accreditation Council
  - Accreditation of 2,000 TVET institutes
  - 70 labs/workshops in madrassa(s)
  - Master training of TVET teachers to acquire knowledge about the latest technologies
  - Development of 200 TVET qualifications for international recognition and increase employment prospects of skilled workers
  - Apprenticeship training of 25,000 youth
  - International accreditation and joint degree programs to develop skills as per international standards
  - 10 country-specific facilitation centers for the high flux of Pakistanis in the international market workers in Gulf Cooperation Council (GCC) countries, etc.
  - Recognition of prior learning of 50,000 youth who have requisite competencies/skills required but lack certificate to find suitable jobs
- iii) Green Youth Movement
- iv) Prime Minister's National Internship Program
- v) Startup Pakistan for Empowering the Generation Next
- vi) Youth Engagement Platform Jawan Markaz Initiative

### National Education Policy 2017–2025 [6]

Pakistan recognizes education as a fundamental right and the responsibility of the state. Thus the government designed the ‘National Education Policy 2017–2025’ with the mission to provide free and compulsory education to all children aged 5–16. One of the key components of the policy is TVET. The government proposed the following key provisions for promotion of technical and vocational education:

- Introduction of competency-based training and assessment system
- Private sector engagement for planning and management of TVET and upgradation of TVET institutions with latest tools and equipment
- Identification and introduction of emerging trades and technologies to enhance women participation in TVET training
- Introduction of technical and vocational courses in general school education; operationalization of National Qualification Framework
- Training of trainers (TOT) of TVET teachers
- Capacity development of technical teacher training institutions
- Creation of database of TVET at district, provincial, and national levels
- Introduction of income generating skills training in adult literacy centers and selected nonformal schools

### TVET Policy [6]

In order to develop technical and vocational education framework in Pakistan, the delegation of the European Union to Pakistan funded a long-term TVET Reform Support Programme (TRSP). The program was designed to implement the National Skills Strategy in the country. One of the key objectives of the program was the development of TVET Policy to facilitate the federal and provincial governments to efficiently follow the National Skills Strategy. The National TVET Policy introduced a new planning system adopted by the NAVTTC and provincial TEVTAs; the design of a management information system (MIS); capacity enhancement of public TVET system; training of trainers (TOT) for TVET instructors; and a fund to stimulate innovative training and dual training programs to encourage employers and TVET providers to work together.

The program also revived the TVET structure through the introduction of competency-based training and the development of a National Vocational Qualifications Framework. The National TVET Policy is positively adopted by both federal and provincial governments in order to ensure standards and quality assurance. The implementation and management of the TVET systems is primarily a function of provincial administrations but strong working relations between national and provincial TVET bodies need to improve. There is also a need to replace the hierarchical approach with a more collaborative and consultative style of working. The TVET policy aims to develop a structured system to allocate training funds as per the geographical needs of territories and provinces so that resources and TVET facilities can be fairly distributed and inequality can be addressed.

### Skilling Pakistan: The National Skills Strategy [6]

NAVTTC is the country's apex body to provide policy direction, regulation, and coordination to the TVET sector. To fulfill the vision of a developed, industrialized, just, and prosperous nation through rapid and sustainable development, the present government pay special attention to strengthen TVET activities. To achieve sustained economic and social development, remain globally competitive, and be able to respond to changes in technology and work patterns, the Pakistan government made skills development a political priority. The National Skills Strategy 2009–2013 (NSS), for the first time in the nation's history, sets a direction in this regard with the following three objectives:

- Provision of relevant skills for industrial and economic development
- Improving access, equity, and employability
- Assuring quality

The National Skills Strategy of Pakistan proposed a paradigm shift from curricula-based education to competency-based training. The strategy proposed a framework to create a high-quality skills development system that ensures inclusion and employability, responsive to the changing demands of the local and global economy, and helps promote and sustain social and economic development. It provides the basis of cooperation between industry, training providers, the government, and other stakeholders. The strategy outlined five key reforms to deliver positively by:

- Introducing competency-based training
- Establishing industry-specific center of excellence
- Increasing the role of the private sector
- Reforming the apprenticeship system
- Encouraging entrepreneurship

#### Push or Pull Approach?

The 21st century is embracing a new global economy dominated by emerging technologies. This is the knowledge-based economy (KBE) and the key to this economy is skilled manpower. They should have the knowledge and skills to assimilate new and rapidly evolving technologies. Skilled workforce has greatly helped almost all developed Asian countries in their industrial growth in the past three to four decades. Japan, Singapore, Republic of Korea (ROK), Republic of China, Thailand, and Malaysia are among few classic examples of recent era where the mainstay of industrial growth, poverty alleviation, and employment generation was on their skilled and knowledge-based work force. In reality, these countries are exporting the skills of their people. Trained workforce in a country plays a pivotal role in remaining competitive in emerging global economy and significantly contribute in poverty reduction.

In Pakistan, skills development programs are mainly offered by public-sector institutions and these services are hardly offered by private-sector institutions. Even then, public-sector institutes merely offer market-driven skills development programs. These institutes offer programs mainly in the civil trades, electrical, and mechanical. With the emerging new technologies, there is a strong need to conduct a comprehensive skills development identification survey in order to cater to the needs of developing human resource for industries of the future. There is severe shortage of skilled manpower and to fill the demand supply gap, the country desperately needs sector-specific skills development institutes (SDIs). A number of SDIs, which were established to provide skill development support to relevant clusters, have become either defunct or underutilized due to various reasons, including management issues, obsolete technology, and HR constraints.

The analysis of local skill development identifies the following concerns and suggestions regarding the need of future skills in Pakistan:

- Skills-development need identification
- Competency-based curriculum development
- Lack in sector-specific SDIs
- Revival of defunct/underutilized training institutes
- Relocation of training institutes
- On-the-job training



- Rural enterprise development training
- Lack in coordination between SDIs and policy institutes
- Skills development as a competitive tool as outlined by the World Trade Organization

## Policy Recommendations

The research study helped to conduct detailed analysis of global future industries and comparative analysis of Pakistan. The researcher reviewed national policies and initiatives on human capital development in Pakistan and analyzed the success factors. The current initiatives of government and related institutions were studied related to the industries of the future and skill development needs of the economy. These analyses are the basis of following key recommendation for successful human resource development while keeping in mind the needs of future industries of Pakistan.

- The government of Pakistan may assume the role of facilitator rather than service provider
- The government of Pakistan should develop a forum to support coordination between federal ministries/divisions/organizations as well as provinces/stakeholders to streamline policies and programs, review progress and propose change in government policies to encourage local manufacturing, export of high technology products, and facilitate foreign investments in the latest technology-oriented industries
- A handsome allocation of funds for Public Sector Development Programme (PSDP) projects aligned with industrial and skill development is required. This will enable Pakistan to mobilize its resources in transitioning to a strong technology in order to develop its local industries and support human capital development
- The government should promote and support acquisition of latest technologies, including AI, biotechnology, nanotechnology, and other emerging technologies that can revive the key economic sectors of Pakistan
- Support technical human resource development through ‘blended learning’ involving the use of massive open courses at school, college, and university level. This should be introduced in coordination with the relevant ministries/organizations
- The government should facilitate local industries to shift from traditional to latest technology-oriented industries through changes in taxes and duties. This will improve the share of local manufacturing, exports, and industrial competitiveness of Pakistan
- A major national R&D fund may be established with support from the provinces and federal government. The fund should support continuous R&D to identify latest skills, technologies, and innovative ideas for industrial development and human development
- The concept of sector-specific skill development centers should be promoted to address the workforce requirements and skill development needs of each economic sector. Currently established training facilities should be relocated to local industrial clusters
- The participation of rural population should be ensured through rural enterprise development. The government should launch skill development programs in rural areas to improve contribution of rural population in the national economy
- There should be a strong linkage between industry, academia, and training institutes. This is important as the academia can conduct continuous research to identify the future industries and their skill needs. The industry to be involved in designing the curriculum as per their needs and facilitate on-job training for trainees. Training institutes to offer need-based programs and ensure training quality as per employment standards

## Annex 1. National Agencies in Pakistan

Ministry of Planning and Development	<ul style="list-style-type: none"> <li>• Planning Commission of Pakistan</li> <li>• Pakistan Institute of Development Economics</li> <li>• Pakistan Planning and Management Institute</li> <li>• National Fertilizer Development Centre</li> </ul>
Ministry of Science and Technology	<ul style="list-style-type: none"> <li>• National Institute of Electronics</li> <li>• National University of Sciences and Technology</li> <li>• Pakistan Council for Renewable Energy Technologies</li> <li>• Pakistan Council for Science and Technology</li> <li>• National Commission for Science and Technology</li> <li>• Pakistan Council of Scientific and Industrial Research</li> <li>• Pakistan Engineering Council</li> <li>• Pakistan National Accreditation Council</li> <li>• Pakistan Science Foundation</li> <li>• Pakistan Scientific and Technological Information Center</li> <li>• Pakistan Standards and Quality Control Authority</li> </ul>
Ministry of Information Technology and Telecommunication	<ul style="list-style-type: none"> <li>• Ignite National Technology Fund</li> <li>• National Information Technology Board</li> <li>• Virtual University of Pakistan</li> </ul>
Ministry of Federal Education and Professional Training	<ul style="list-style-type: none"> <li>• Academy of Educational Planning and Management</li> <li>• Directorate General of Special Education and Social Welfare</li> <li>• Higher Education Commission of Pakistan</li> <li>• National Commission for Human Development</li> <li>• Pakistan Human Development Fund</li> <li>• National Education Assessment System</li> <li>• National Education Foundation</li> <li>• National Institute of Science and Technical Education</li> <li>• National Training Bureau</li> <li>• National Vocational and Technical Training Commission</li> <li>• Pakistan Manpower Institute</li> <li>• Pakistan National Commission for UNESCO</li> <li>• Private Educational Institution Regulatory Authority</li> </ul>
Ministry of Industries and Production	<ul style="list-style-type: none"> <li>• Engineering Development Board</li> <li>• Technology Upgradation and Skill Development Company</li> <li>• Export Processing Zone Authority</li> <li>• National Fertilizer Corporation</li> <li>• National Industrial Parks Development and Management Company</li> <li>• National Productivity Organization</li> <li>• Pakistan Engineering Company</li> <li>• Pakistan Gems and Jewellery Development Company</li> <li>• Pakistan Hunting and Sporting Arms Development Company</li> <li>• Pakistan Industrial Development Corporation</li> <li>• Pakistan Industrial Technical Assistance Centre</li> <li>• Pakistan Institute of Management</li> <li>• Pakistan Machine Tool Factory</li> <li>• Small and Medium Enterprise Development Authority</li> <li>• Pakistan Stone Development Company</li> </ul>
Ministry of Commerce and Textile Industry	<ul style="list-style-type: none"> <li>• Directorate General of Trade Organizations</li> <li>• Export Development Fund</li> <li>• National Textile University</li> <li>• Pakistan Cotton Standards Institute</li> <li>• Pakistan Horticulture Development and Export Company</li> <li>• Pakistan Institute of Fashion and Design</li> <li>• Pakistan Institute of Trade and Development</li> <li>• Trade Development Authority of Pakistan</li> </ul>
Ministry of National Food Security and Research	<ul style="list-style-type: none"> <li>• Fisheries Development Board</li> <li>• Livestock and Dairy Development Board</li> <li>• National Veterinary Lab</li> <li>• Pakistan Agricultural Research Council</li> <li>• National Agricultural Research Centre</li> <li>• Pakistan Oilseed Development Board</li> </ul>
Ministry of Energy	<ul style="list-style-type: none"> <li>• Alternative Energy Development Board</li> <li>• Central Power Purchasing Agency</li> <li>• Hydrocarbon Development Institute of Pakistan</li> <li>• Pakistan Mineral Development Corporation</li> </ul>

## CHAPTER 7

# PHILIPPINES

### Industries of the Future and Its Human Resources

As the world ushers into the fourth industrial revolution (Industry 4.0), developments in information, communication, and technology (ICT) have presented countries abundant opportunities to grab and substantial challenges to grapple with. Products become outdated and obsolete (e.g., analog cameras, radio reception apparatus) while new ones emerge (e.g., smartphones with digital cameras, compact storage devices). Firms have gone bankrupt (e.g., Kodak) while others flourish (e.g., Netflix, Grab, and Upwork). Given these, fears of a jobless economy have never been stronger even while evidence shows that disruptions brought by the advancements in ICT present opportunities to the labor market. For example, new technologies, such as automated teller machines have automated tasks. Yet, work in the banking sector remains abundant [1].

The Philippines, unlike its advanced Asian neighbors like Malaysia and Singapore is less prepared for the disruptions and uncertainties that characterize Industry 4.0. In fact, the Philippines is identified as a legacy country or a country with a strong production base that is at risk in the future due to weaker performance across the drivers of production - technology and innovation, human capital, global trade and investment, institutional framework, sustainable resources, and demand environment [2]. This means that the Philippines is among those that have low levels of readiness to adapt to the needs of future industries.

If the sophistication of a country's export portfolio is an indication of the quality of skills its workforce currently has, then the Philippines is faced with an enormous task of reskilling and upskilling its people. Evidence suggests that the sophistication of the country's export portfolio barely improved from 1995 to 2014, which can be attributed to the high concentration of its exports in integrated circuits and parts/accessories of data processing equipment [3]. Integrated circuits accounted for around 32% of the country's total export basket in the early 2000s which accounts for 17% of the country total exports in 2014.

Given these existing issues and emerging developments, the question that comes to the fore is this - identifying requisite skills and how to best develop its human resources so that the country can harness the opportunities of ICT advancements. The need for the development of nonroutine cognitive abilities and critical thinking/analytical reasoning have long been recognized as essential. Due to the increasing demand for jobs that involve abstract and complex cognitive tasks, the labor force essentially need to be computationally adept, be able to solve complex problems, and manage cognitive loads. New media literacy also needs strengthening due to the increasing demand for digital animation and sophisticated gaming.

Recent evidence in the Philippines, however, indicates that local firms continue to value socioemotional skills, or those that relate to individual behavior, personality, attitude, and mindset [4]. This is consistent with earlier studies that there is a need to augment learnability (the ability to learn) and adaptability (ability to navigate unforeseen events) as well [5], and improve attitudes toward learning in developing curiosity, creativity, and resilience. As such, there is a need to invest in people-centered skills due to the concomitant increase in the demand for other services. Most of these other services require personal interactions with clients, such as teaching/advising, negotiating, and managing [6]

and nurture cross-cultural competency given the rise in telemigration, in which workers all over the globe are increasingly likely to collaborate to finish tasks. It is also important to nurture the ability to work across disciplines.

## Overview on National Policies and Initiatives in Human Capital Development

The Philippines is classified as a lower middle-income country by the World Bank. Nevertheless, the Philippine economy has experienced GDP growth of above 6% since 2012. It has grown by 6.2% in 2018, although this is slightly lower than its 2017 growth at 6.7%. This positive outlook is expected to continue in 2019.

While this is the case, the country is still faced by several challenges in achieving inclusive growth. First, although the poverty incidence among families is declining, it is still high at 16.6% in 2018 (see Annex 1). Ironically, it is higher among the employed population than the unemployed population. In addition, evidence also shows that 9 out of 10 households experience chronic poverty [7–8]. As early as 2009, experts already recognized that chronic poverty is a major constraint in achieving high levels of sustained growth [9]. It is further confirmed as the 2018 WEF Inclusive Development Index shows that the country lacks progress on inclusion indicators, such as income and wealth equality. The twin problems of poverty and noninclusive growth are compounded even more by problems brought about by climate change [10–12].

Second, even though gender parity has been achieved in education, many issues remain in other areas, including women's low labor market participation. In 1990, women's labor force participation rate in the Philippines is 47% (see Annex 1). This has increased by a mere 4 percentage points by 2018. Third, around 29% of the total wage and salary workers are engaged in precarious work (see Annex 1).

This seeming lack of inclusiveness can be partly attributed to the state of human capital development in the country. In the span of three decades, its human development index (HDI) increased by a mere 12.2 percentage points, which puts the country 106th out of 190 countries in 2018. The Philippines lagged behind Malaysia (61st), Singapore (9th), and Thailand (77th). Table 7.1 shows that the country has seen substantial improvements in the components of HDI, the most notable of which is the increase in the gross national income per capita by 141%. The mean years of schooling from 1990 to 2018 has increased by 3.2 years and the life expectancy by 5.3 years.

Looking into the 2018 World Bank's human capital index (HCI)<sup>1</sup>, the Philippines ranks 84th out of 157 countries. Its HCI score indicates that a child born today in the Philippines, who receives health care and education, can only be 55% productive (relative to a child who receives full health care and education) by age 18. In Asia, the Philippines' HCI is similar to that of Indonesia. While Filipino children can complete 12.8 years of preprimary, primary, and secondary school by age 18, these translate to only 8.4 years when adjusted for a measure of education quality or a learning gap of 4.4 years. This education deficit is reflected in the 2018 Programme for International Student Assessment (PISA), in which the Philippines' performance in reading, mathematics, and science is one of the lowest. The PISA results also indicate a clear income class divide, with students from advantageous socioeconomic backgrounds outperforming those from the disadvantaged ones.

In addition, the country's workforce lacks skills that are considered indispensable by firms and businesses. This can be seen in the increase of firms in the Philippines that reported difficulty in finding workers with reasonable work ethics that possess appropriate interpersonal and communications skills by 30% and 67%, respectively [4]. The fact that most firms provide workers' training in soft skills more than cognitive skills is an indication that the country's educational system has yet to cater to the skills needed by the labor market.

<sup>1</sup> An index that is designed to capture the amount of human capital a child born today could expect to attain by age 18 [13].

TABLE 7.1

## PHILIPPINES' HUMAN DEVELOPMENT INDEX TRENDS BASED ON CONSISTENT TIME SERIES DATA AND NEW GOALPOSTS

Year	Mean Years of Schooling	Expected Years of Schooling	Life Expectancy at Birth	GNI per Capita (2011 PPS/USD)	HDI Value
1990	6.6	10.8	66.4	3,965	0.59
1995	7.1	10.8	68.2	4,102	0.607
2000	7.6	11.4	68.8	4,972	0.631
2005	8.7	11.5	69.1	5,674	0.656
2010	8.9	11.7	69.8	6,737	0.672
2015	9.3	12.8	70.6	8,290	0.702
2018	9.4	12.7	71.1	9,540	0.712

**Source:** United Nations Development Programme (UNDP) [13] - purchasing power parity (PPP)

### Background of Study

While the Philippines has continued to experience economic growth since 2012, achieving inclusive growth remains elusive. This can partly be attributed to the state of human capital and skills development in the country, which is reflected in various metrics, such as the HDI, HCI, and the 2018 PISA. Even the sentiments of firms and businesses in the country indicate a serious gap in the skills of the country's workforce. Thus understanding the past and current policies in matching skills developed by education and demanded by local firms and businesses can help in acquiring, forming, and strengthening the requisite skills for future industries. In turn, this can help in attaining inclusive growth in the Philippines and the Filipino's long-term aspirations for the country to be a middle-class society as embedded in the AmBisyon Natin<sup>2</sup> 2040.

### Initiatives to Meet the Needs of Future Industries

#### National Agencies in Developing National Strategies for Future Skills

On 11 October 2016, the National Economic and Development Authority (NEDA), the agency responsible for economic development and planning, launched the AmBisyon Natin 2040, which embodies the long-term aspirations of Filipinos for themselves and the country. Its vision includes transforming the Philippine society into a predominantly middle-class society and eradicate poverty and hunger by 2040. Since then, the AmBisyon Natin 2040 has been the basis of national plans and research agenda of think tanks. One of the most important plans anchored to the AmBisyon Natin 2040 is the Philippine Development Plan (PDP) 2017–2022. The PDP is a guide to policy formulation and implementation that provides the foundation for a more inclusive growth, a high-trust resilient society, and a globally competitive knowledge economy. It has three pillars: (i) *Malasakit* (enhancing the social fabric); (ii) *Pagbabago* (inequality reducing transformation); and (iii) *Patuloy na Pag-unlad* (increasing growth potential).

PDP 2017–2022 has acknowledged the importance of preparing the youth given the present ICT advancements that are shaping the world of work in the future. It also recognizes that future skills and forward-looking questions on the development of human resources are not at the forefront of the current conversation due to the preoccupation of the government with issues such as economic stability. Thus unlike advanced economies like Singapore, the Philippines has no one national agency to oversee future skills. However, there are roadmaps that identify priority areas and strategic actions toward innovation, productivity, and employment that government agencies, industries, and the academe can collaborate in.

<sup>2</sup> Can be translated as "Our Ambition".

One such roadmap is the Inclusive Filipinnovation and Entrepreneurship roadmap that focuses on integrating innovation with entrepreneurship and building an entrepreneurship ecosystem. Central to this roadmap is the role of market-oriented policy research on promotion and diffusion of R&D investments. The players in the entrepreneurship ecosystem include universities, industries, small and medium enterprises (SMEs), and key government agencies, such as the Department of Trade and Industry (DTI), Department of Science and Technology (DOST), Commission on Higher Education (CHED), Department of Agriculture (DA), Technical Education and Skills Development Authority (TESDA), and Department of ICT (DICT). The roadmap has identified the following government-led strategies:

- Development of human capital toward innovation and entrepreneurship
- Strengthen government-academe-industry linkages
- Create an enabling program and policy environment to accelerate innovation
- Develop entrepreneurship culture and support programs for MSMEs
- Create funding and finance programs to incentivize innovation
- Develop industry clusters [15]

In 2019, the Philippine Innovation Act and the Innovative Startup Act were approved, which provide for the innovation fund of USD20 million. Another roadmap is the Industry 4.0 Skills Roadmap that aims to prepare the Filipino workforce for future industries which was completed in 2020. The DTI, Department of Labor and Employment (DOLE), and TESDA signed a memorandum of agreement to identify the requisite skills of priority industries (carried out by the Inclusive Innovation Industrial Strategy (I<sup>3</sup>S) and to develop training programs for these skills.

In addition to these roadmaps, DOLE has initiatives that address the prevailing mismatch in the skills demand and supply. In 2009, DOLE initiated a labor market signaling study known as “Project JobsFit: The DOLE 2020 Vision”. Its objective was to provide a comprehensive environmental scan for the purpose of generating labor market signaling outputs. In 2014, the “JobsFit Labor Market Information Report: 2013–2020” was published and this report was used in the development of the Industry Career Guide for 11 key and four emerging industries that were identified as Key Employment Generators<sup>3</sup> [16]. Due to the increasing need to assess how the country’s workforce fare with respect to the 21st Century Skills, DOLE conducted the Philippine Talent Map Initiative (PTMI) to assess the skills and competencies of the country’s workforce and examine the current trends and issues that the academe and industry face regarding workforce development<sup>4</sup>. Results of the 2017 PTMI indicated the need to improve skills related to team work, decision-making, planning and organizing, and creative problem solving [16].

From the education perspective, the system in the Philippines has shifted from a 10-year basic education to 12 years through the Enhanced Basic Education Program Act of 2013. In this new system, basic education covers kindergarten and 12 years of basic education<sup>5</sup> (hence the popular K-12 tag) to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship<sup>6</sup>. The K-12 aims to strengthen early childhood education, ensure that the curriculum is relevant to learners, build

<sup>3</sup> These include IT-BPM; wholesale and retail trade; transport and logistics; manufacturing; construction; agribusiness; banking and finance; hotel, restaurant, and tourism; education; and health and wellness.

<sup>4</sup> [https://talentmap.ph/?page\\_id=1718](https://talentmap.ph/?page_id=1718)

<sup>5</sup> Basic education includes six years of primary education, four years of junior high school, and two years of senior high school.

<sup>6</sup> Taken from <https://ched.gov.ph/k-12-project-management-unit/>.



proficiency through language, ensure integrated and seamless learning through spiral progression, and nurture the 21st century skills through skills in ICT, learning and innovation, effective communication, and life and career. In addition, it offers three tracks: (i) academic consisting of three strands, namely, business, accountancy, management (BAM), humanities, education, social sciences (HESS), and science, technology, engineering, mathematics (STEM); (ii) Technical-Vocational-Livelihood education; and (iii) Sports and Arts<sup>7</sup>. K-12 is a collaboration of various government agencies - Department of Education (DepEd), CHED, and DOLE, and the academe and the industry. Among others, these stakeholders work together in curriculum development, teacher training, and career counselling.

#### Tracing Economic Development and Workforce Policies

History indicates that as early as 1913, the Philippines was able to catch up with the leaders of industrialization when it entered the 5% industrial growth club<sup>8</sup> and had continued doing so even during the interwar years of 1920–38 [17]. In 1949, in response to the balance of payment (BOP) crisis, the country had adopted an import substitution strategy (ISI) alongside imposing controls on imports and foreign exchange [18–19]. During this period, import-substituting goods, such as textiles, paper and plastic products, and electric appliances had expanded. The ISI industries grew rapidly and by early 1960s, World Bank hailed the country as second to Japan in the industrialization process [19]. Although the controls were lifted in the 1960s, it was replaced by high tariff rates and a long list of restricted imports [20]. The Board of Investment (BOI), through the Investment Incentive Act of 1967, was established to centralize the process of assigning industrial priorities and administer available incentives to local and foreign enterprises [18].

In 1972, the ISI was replaced by export-oriented industrialization (EOI) strategy to address unemployment and the recurring balance of payment issues due to the country's dependence on imports [19]. The Export Incentives Act of 1970 was enacted to refocus local industries toward nontraditional manufactured exports and several measures, such as establishment of an export processing zone (EPZ), simplification of export documentation and procedures, and direct incentive to employment through a wage subsidy, had expanded the growth of the manufacturing sector from 3.7% to 14.8% in 1973 [18]. However, this was stalled by the oil crisis and the recession experienced by the Western world in the early 1970s.

The Philippines was said to conform to the industrialization convergence pattern until it deviated<sup>9</sup> from its path in 1982. There were several explanations for this deviation. First, the country experienced a financial crisis in 1983–86. It led to the moratorium on debt payments in 1984, which together with the implementation of the International Monetary Fund (IMF) conditions, resulted in the decline in total output and employment, especially in the industrial sector. The country had also experienced political crises from 1984–91 (from the Marcos to the Aquino administrations), which unfortunately coincided with the influx of direct investments to Southeast Asia from Japan, Republic of China (ROC), and Hong Kong. Evidence showed that the volume of foreign direct investments (FDI) from these countries that entered Thailand during the period of 1987–91 had been estimated at USD24 billion compared to the USD1.6 billion that entered the Philippines [21]. Second, in relation to human capital, the Philippines had started deploying workers abroad in 1983. While this helped the country resolve the issues in foreign exchange, it potentially contributed to the appreciation of the Philippine peso and eventually hurt the country's tradable sector. The failure to carry out measures to stimulate the export sector early on, such as exchange rate depreciation [22] and to implement a genuine agrarian reform [23] had also contributed to the country's failed industrialization efforts.

<sup>7</sup> Taken from <https://www.officialgazette.gov.ph/k-12/>.

<sup>8</sup> Japan 1899, PR China 1900, the Philippines 1913, ROC 1914, Republic of Korea 1921, and India 1929.

<sup>9</sup> The succeeding discussion in this paragraph are adapted from "Deviant behavior: A century of Philippine industrialization" [17].



Alongside these issues, complementary programs for human capital and skills development had been markedly missing and the country had seen little efforts toward innovation and skills upgrading. ISI and the succeeding EOI had focused in generating employment and attracting investments through export promotion, export incentives, and ease of doing business. Due to incentives in place, multinational firms producing garments, footwear, and toy and fashion accessories set up shop in the EPZs, which became an enclave of export-oriented economy with limited domestic linkages and limited job creation [24]. These investments focused only on segments of their global production and had no programs to deepen and upgrade production in the country [19]. Multinational firms that invested in the country had activities that were mostly related to the lower portion of the value chain (e.g., sewing, assembly). In turn, these investments had generated work that had low value-added as well. The EOI program also ignored the potential role of local entrepreneurial and industrial classes in the country's export and industrialization efforts, which were key elements in the success of East Asian nations in industrialization [24]. Japan and Republic of Korea, for example, had homegrown export champions that had become global brands.

On structural transformation, the country moved from the agricultural sector to services without industrialization and agricultural modernization. For a country that had shown great promise in industrialization, it deviated from that path and turned to services in the early 1980s [17]. These are reflected in aggregate data. In 2018, the contribution of the agricultural sector to GDP was barely above 10% and it registered a mere 0.9% growth while employing over a quarter of the country's total employment, indicating issues in the sector's productivity. From 1991–2018, the industry sector's contribution to total employment was between 15%–18%. From around 31% GDP contribution in 1960 which rose to 38% in 1984, the figure declined to its 1960 level in 2018. Contrarily, the services sector accounted for the largest portion of employment and value added at around 60%<sup>10</sup>.

To a great extent, the inadequacy of the country's workforce in terms of skills and human capital is reflected in its current export basket [25–26]. The product range of integrated circuits and parts/accessories of data processing equipment [3] 1995–2014, which had little improvement and low sophistication index, accounted for around 32% of the country's total exports in the early 2000s. It still accounted for 17% of the country's total exports in 2014.

### Policies Pertaining to Industrialization and Workforce Development Alignment

In 2012, DTI-BOI took a proactive role in steering the country's industrialization through its Investment Priorities Plan (IPP) that promotes the New Industrial Policy (NIP)<sup>11</sup>. NIP's objective is to transform the manufacturing industry into a globally competitive industry, supported by backward and forward linkages to create decent jobs and promote sustainable and comprehensive growth. In addition, the Manufacturing Resurgence Program (MRP) is identified as a priority program under the National Budget Memorandum No. 118. It is designed to revitalize the manufacturing sector and targeted to account for 30% of the total value added and generate 15% of total employment through the implementation of the Manufacturing Industry Roadmap [27]. MRP is also touted to generate jobs and a vehicle toward high-value added activities [28].

The succeeding IPPs build on the 2012 IPP by targeting broad sectors, such as manufacturing, agribusiness and fishery, services, and infrastructure and logistics as well as activities like energy, housing, hospitals, and PPP projects. Sectoral roadmaps have been crafted to guide policies in achieving the objectives of both the IPP and MRP. Table 7.2 shows the sectoral objectives are geared toward industrialization, the advancement of agro-processing, and the development of the services sector through skills and HR development.

<sup>10</sup> Based on the World Bank World Development Indicators.

<sup>11</sup> The discussion in this section closely follows Bayudan-Dacuycuy and Serafica [3].

TABLE 7.2

**MANUFACTURING INDUSTRY, AGRO-PROCESSING, AND SERVICES ROADMAPS FOR STRUCTURAL TRANSFORMATION, JOB CREATION, AND POVERTY REDUCTION**

Short run: 2014–17	Medium run: 2018–21	Long run: 2022–25	Updates
<b>Manufacturing</b>			
<ul style="list-style-type: none"> <li>- Maintain competitiveness of industries with comparative advantage</li> <li>- Strengthen emerging products</li> <li>- Rebuild existing capacity of industries</li> </ul> <p>Target sectors: Automotive, electronics, food, garments, motorcycle, shipbuilding, chemicals, and allied or support industries</p>	<ul style="list-style-type: none"> <li>- Shift to high value-added activities</li> <li>- Investments in upstream or core sectors</li> <li>- Link and integrate industries within the economy</li> </ul> <p>Target sectors: Iron and steel and other metals industry as well as in parts and components</p>	<ul style="list-style-type: none"> <li>- Globally competitive manufacturing industry with strong forward and backward linkages</li> <li>- Hub for regional and global production networks</li> </ul>	<ul style="list-style-type: none"> <li>- CARS Program</li> <li>- Aerospace</li> <li>- Shipbuilding: Support package for Roll-on Roll-off Maritime Industrial Parks</li> <li>- Eco-public Utility</li> <li>- Vehicle modernization: support for local platform and bodybuilding manufacturers</li> </ul>
<b>Agribusiness and fishery</b>			
<ul style="list-style-type: none"> <li>- Strengthen agro-processing</li> </ul> <p>Target sectors: Rubber, coconut, mangoes, coffee, banana, and other high-value crops</p>	<ul style="list-style-type: none"> <li>- Strengthen supply chains further</li> <li>- Upgrade commodity clusters</li> </ul>	<ul style="list-style-type: none"> <li>- Deepen participation in global value chain</li> <li>- Philippines as agribusiness regional hub</li> </ul>	<ul style="list-style-type: none"> <li>- Convergence among stakeholders in cacao, coffee, rubber clusters</li> <li>- Ongoing roadmap in fruits and nuts cluster</li> </ul>
<b>Services</b>			
<ul style="list-style-type: none"> <li>- Focus on labor-intensive sectors (tourism, construction, ship repair, maintenance, repair and overhaul of aircraft) and infrastructure investments</li> <li>- Move up IT-BPM global value chain</li> </ul>	<ul style="list-style-type: none"> <li>- Focus on education, design, R&amp;D, finance, infrastructure</li> <li>- Engineering &amp; services embedded in manufacturing</li> <li>- HRD and skills training, innovation ecosystem</li> <li>- Inclusive Innovation Center</li> </ul>	<ul style="list-style-type: none"> <li>- Upgrade services especially manufacturing related services</li> <li>- Philippines as a regional services hub</li> </ul>	<ul style="list-style-type: none"> <li>- IT-BPM: Roadmap 2018)</li> <li>- Logistics and infrastructure construction: Build Build Build program</li> </ul>

**Source:** Compiled by Bayudan-Dacuycuy and Serafica [3] based on Aldaba [27, 29].

Note: IT-BPM-Information Technology-Business Process Management); CARS (Comprehensive Automotive Resurgence Strategy)

Consistent with pillar 2 Pagbabago (chapter 9 of PDP: Expanding Economic Opportunities in Industry and Services) and pillar 3 Patuloy na Pag-unlad (chapter 14 of PDP: Vigorously Advancing Science, Technology, and Innovation (STI)), the government's industrial policy has evolved from MRP to the more comprehensive approach by incorporating stronger linkages with services and agriculture (the Comprehensive National Industrial Strategy (CNIS)) [3]. The CNIS aims to promote domestic industries in both the local and global markets and looks into trade policy investment promotion, skills training and human resource development (HRD), enhancement of policies related to innovation, R&D, and MSMEs. The CNIS has identified five priority areas, encompassing manufacturing, infrastructure and logistics, tourism, agribusiness, and IT-BPM-KPO (IT-BPM-Knowledge Process Outsourcing).

The DTI-BOI initiated the NIP called the Inclusive Innovation Industrial Strategy (I<sup>3</sup>S), aiming to develop globally competitive and innovative sectors with strong linkages to domestic and global value chains [28]. Central to I<sup>3</sup>S is innovation, which is aligned with the country's effort to advance science and technology (S&T) to enhance competition and productivity.

I³S has identified 12 priority industries, with the aim of strengthening agro-processing industries, developing labor-intensive sectors, and addressing issues, such as innovation and climate change. These are: (i) auto and auto parts; (ii) electronic manufacturing services; (iii) semiconductor manufacturing services; (iv) aerospace parts and aircraft maintenance/repair/overhaul; (v) chemicals; (vi) shipbuilding and ship-repair; (vii) furniture, garments, and creative industries; (viii) iron and steel, tool and die; (ix) agribusiness; (x) IT-BPM and e-Commerce; (xi) transport and logistics; and (xii) tourism (see Annex 2).

These industries were selected based on a discovery process that assessed the industries' strengths, weaknesses, and growth opportunities as well as their contribution to objectives that are crucial for economic transformation, such as (i) technology upgrading; (ii) promoting innovation; (iii) closing the infrastructure gap; (iv) addressing regional imbalance; (v) generating more and better jobs; (vi) sustainability; (vii) creating spillover and multiplier effects; and (viii) strengthening supply and value chain linkages [28].

One of the early, successful I³S initiatives is the Comprehensive Automotive Resurgence Strategy (CARS) program. The program is aimed to attract new investments in the automotive industry and help in the country's vision of becoming a regional automotive manufacturing hub. It provides tax and fiscal incentives to car manufacturers to bring in investments related with the manufacture of whole body large plastic parts and other strategic parts that are not locally produced yet. In exchange, a participating car manufacturer (PCM) will produce 200,000 units of the enrolled model in the span of six years and the BOI requires the local production of body shell and large plastic parts. There are two PCMs enrolled in the program: Toyota for Vios and Mitsubishi for Mirage. To ensure quality and adherence to technical standards, Toyota requires local suppliers to sign technical assistance agreements with the automaker's suppliers in Thailand<sup>12</sup>.

The I3S has five major pillars and has identified several strategic actions in collaboration with the industries, other government agencies, and the academe (see Table 7.3). Unlike the ISI in the late 1940s and the earlier EOI, the current industrialization policy's focus on innovation, productivity, and competitiveness have implications on human resources (pillars 1, 3, and 5) and pillars that are explicitly designed to address skills, training, and HRD (pillars 2 and 4).

### Defining Future Skills

The discussion of future skills in the Philippines is still at its infancy. In fact, the PDP 2017–2022 has recognized that future skills and forward-looking questions on the development of human resources are not at the forefront of the current conversation. However, stakeholders have recognized the need for reskilling and upskilling in order to be more productive and competitive. For example, the IT-Business Process Association of the Philippines (IT-BPAP) has recognized the need to shift to high value-added jobs and is working with DICT in crafting a transformational program that can improve skills and generate jobs in the IT-BPM sector. In a Senate hearing in February 2020, the IT-BPAP president explained that a game changer for the business process sector is a national talent upskilling program, which can be patterned after the Talent Corp in Malaysia and SkillsFuture in Singapore. The IT-BPAP shared that such an initiative is estimated to cost PHP8 billion per year and can generate a revenue of USD20,000/worker/year in the next three years. The IT-BPAP, in collaboration with the DICT, is mounting a scaled pilot of the said program with an initial investment of PHP200 million.

<sup>12</sup> <https://www.bworldonline.com/toyota-motors-parts-suppliers-registered-cars-program/>

TABLE 7.3

PILLARS AND STRATEGIC ACTIONS OF THE I<sup>3</sup>S

Pillars	Strategic Actions
1. Build new industries, clusters, and agglomeration	<ul style="list-style-type: none"> <li>• Address gaps and linkages in industry supply and value chains</li> <li>• Expand the domestic market base to allow industries to attain economies of scale and realize their export potential</li> <li>• Pursue green policies in industries to make them more competitive, innovative, environment friendly, and climate smart</li> <li>• Implement aggressive promotion and marketing programs to attract more FDIs especially those that would bring in new technologies</li> <li>• Address market failures by providing fiscal incentives that are well-targeted, performance-based, and time bound</li> <li>• Create industry clusters to address agglomeration, economies of scale, and coordination issues</li> <li>• Promote the establishment of domestic ecozones that would allow activities catering to both domestic and export markets</li> </ul>
2. Build capacity human resource	<ul style="list-style-type: none"> <li>• Design HRD and training programs to improve skills and establish tie-ups with universities and training institutions</li> </ul>
3. Develop and promote the growth of MSMEs	<ul style="list-style-type: none"> <li>• Support SME development by boosting their growth and profitability through the 7Ms: mindset, mastery, mentoring, money, machine, market, and models, and programs focusing on establishment of common service facilities; improving access to finance, technology, and skilled workers; linking MSMEs with large domestic enterprises and multinationals; promote inter-firm and academe collaboration; efficient storage and logistics (handling, cold storage)</li> </ul>
4. Cultivate innovation and entrepreneurship	<ul style="list-style-type: none"> <li>• Establish an inclusive innovation and entrepreneurship ecosystem that would link academe, industry, and government; strengthen industry-academe collaboration focusing on market-oriented research; revise engineering curricula, particularly manufacturing, engineering, and work related to industries; equip universities to carry out research relevant to industries, intellectual property protection, R&amp;D incentives (tax credit, accelerated depreciation); and shared facilities for rapid prototyping and demonstration</li> </ul>
5. Improve ease of doing business and investment environment	<ul style="list-style-type: none"> <li>• Continue to strengthen our institutional and regulatory framework by addressing corruption and smuggling, and eliminate bureaucratic red tape by streamlining and automating government procedures and regulations</li> <li>• Establish a single mechanism for coordinating business registration, application for permits and licenses, and investment promotion with local government units and other national government agencies</li> <li>• Continue the big bang infrastructure investment to cover not only the building of physical infrastructure like roads but also power and logistics as well as modern and efficient air and sea infrastructure</li> </ul>

Source: DTI [28]

## Policy Recommendations

## Implement Additional Initiatives to Achieve DTI's Visions for the Priority Sectors

The industrial sector left out by the Philippines in its earlier efforts toward economic development is important as it missed out on the most amount of learning and innovation [30]. Its development can lead to the advancement of agricultural and services sectors as sophisticated and high value-adding industrial goods are likely to have high services content. Industrialization can also spur the development of agro-processed goods, which have higher sophistication content relative to agricultural primary goods [3]. In contrast with the earlier industrialization strategies, the DTI's NIP is comprehensive as it includes the development of 12 priority industries in the agriculture, industry, and services sectors. I3S has laid down strategic actions to develop not only new industries, but entrepreneurship and human capital as well, where most of these require further enhancements, as the following:

- i) Draft a plan that prepares the automotive industry beyond the 6-year CARS program

Among the priority sectors, plans for the automotive industry rolled out early. Toyota announced in 2016 an investment plan to comply with the CARS program, including the installation of a plastic injection facility in Toyota's Santa Rosa plant, the expansion of its press-parts facility and the introduction of new hemming technology<sup>13</sup>. In addition, local auto parts suppliers have signed technical assistance agreements with Toyota's suppliers in Thailand.

Beyond employment generation, these initiatives offer learning opportunities that can lead to innovation and backward and forward linkages if there is transfer and diffusion of knowledge. Thus plans beyond the 6-year program should be in place. This includes ensuring that, while the CARS program is ongoing, local participants are learning but more importantly, this learning is shared with the bigger community of local suppliers of automotive parts. This means that TESDA understands these new technologies and be able to provide the trainings in the near future.

- ii) Replicate the CARS initiatives in other priority sectors

The priority sectors in CARS initiatives include electrical and electronics, steel, and chemicals. The provision of fiscal incentives should be in place to the extent that the country needs to learn new technologies. Similar to the recommendations pertaining to the CARS program, it is important that initiatives on transfer and diffusion of knowledge are also in place. This entails concerted effort among government agencies to bring together stakeholders so that learning takes place in the bigger community. Support on how this learning can lead into product and process innovations is also important. This means providing incentives for start-ups to innovate and putting up facilities and learning spaces where stakeholders can collaborate. A good avenue is funds from the Innovation Start-up Act.

- iii) Leverage on technological innovations to address the pressing needs of the agricultural sector

One of the aims of the I<sup>3</sup>S is to transform the agricultural sector into agribusiness. The DTI focuses on high value crops, such as rubber, coconut, mangoes, and coffee, and it is looking to transform the country into an agribusiness hub in the long run. However, there are some issues that pose substantial barriers if they remain unresolved. One such problem is the imperfect information that results in credit rationing in the agricultural sector. While credit rationing is a problem present in all sectors, it is more pronounced in the agricultural sector due to the risks<sup>14</sup> associated with agricultural finance. These risks interweave with issues on inadequate collateral, the lack of understanding of formal lending entities on the activities and needs of the agricultural sector, and the general weakness of institutions to secure property rights. To address this, there is a need to design a system that systematically brings together all actors in the agricultural value chain. One way of doing this is to innovate on how various services are linked, such as replicating the electronic tender system in India [31]. This system goes beyond tender/auction/payment systems since it has added features that give farmers the option to store their produce in accredited warehouses and use the warehouse receipt as a security to their bank loan. Records of historical transactions have helped lending entities in the development of appropriate financial products and services.

In addition, there is the apparent lack of production facilities in the Philippines that will enable the transformation of harvested agricultural goods into manufactured goods. Production facilities should be built in strategic locations and integrated into the value chain.

<sup>13</sup> <https://businessmirror.com.ph/2017/10/18/toyota-investment-in-governments-cars-program-hits-p5-24-billion/>.

<sup>14</sup> Production risk (such as high variability in production and the sector's vulnerability to weather events and to climate change) and market risks (such as the unpredictability of prices at the time of harvest).

### Develop an Ecosystem for Skills and Talent Development

The skills needed by industries are evolving. For example, the IT-BPM, a sector that has been consistent in revenue and employment generation, is identified as a sector that is at risk due to ICT developments. The Philippines is one of the top destinations of business process outsourcing (BPO) companies due to the pool of English-speaking, skilled, and low-cost workers [32]. However, these advantages may no longer be adequate as the industry adapts to the advancements in cloud computing, software automation, and knowledge process outsourcing [32]. In addition, ICT developments have paved the way for digital labor platforms that are providing alternative work arrangements. Currently, the Philippines which accounts for 19% of the total global online workforce, is third behind the USA and India, and first when the population and total labor force are accounted for [33]. However, based on the ILO Online Labor Index, the Philippines accounts for around 11% of the global clerical and data services workforce, 2% of the global workforce in creative media, professional services, and another 2% in writing/translating. These brings to the fore the need to take the issue of reskilling and upskilling seriously.

Central to the attainment of the innovation-competition-productivity objectives of I³S are the skills of the workforce, without which the benefits from investment promotion will not be fully maximized. In the short run, attracting high value-adding FDIs is a good strategy for learning but in the long run, firms should seek to do business in the country because of the value that its workforce brings into their investments. Currently, the country has low level readiness to the future of production due to its weak performance in human capital development, technology and innovation, and institutions [2]. Thus it is important to focus on reskilling and upskilling the country's large production base. Without concrete plans toward skills development, the country will not be able to compete in terms of complexity and will eventually experience shrinking shares in the global value chain. Given these considerations, there is a need to explore the following:

- i) Craft a national competency framework to align the capabilities and skills of the country's workforce with that of the priority sectors

This should be spearheaded by a council, composed of key government agencies, such as the DTI, DICT, CHED, DOLE, and TESDA that will manage the coordination of various stakeholders (such as public and private academic institutions, training institutes, labor unions, industry representatives) in order to identify the skills and competencies needed to produce more complex products and services. This framework should be used by training institutes and service providers as an input to their training programs and by public and private academic institutions as an input to their curriculum development.

- ii) Set-up a digital platform that brings together demanders and suppliers of skills

There should be enough training providers for the vast array of required skills and the best way to do this is to strengthen the partnership with private service providers. As actors in the skills ecosystem grow, a system is necessary for the government to compile feedback, data, and information on the demand and supply of skills as to develop better programs and services. This can be done through a government digital platform that brings together accredited training providers (private and public) and individuals seeking to upgrade their skills. Skill seekers need to register and be assigned a unique identification number, used every time for training. A feedback mechanism should be in place from service providers to the state once skill seekers complete their training program. By doing this, the state, training providers, and the industry will be able to track and analyze trends and patterns related to the specific skill set. This can help in updating the national competency framework and developing the skills ecosystem further (e.g., identifying other actors and additional programs, development of marketing strategies).

- iii) Ensure that the curriculum of the higher education system adapts to the needs of the industry

In a Senate public hearing in February 2020, the assistant vice president of the University of the Philippines (UP) for Curriculum informed that the university is rigid in terms of how it crafts its



curriculum programs. This presents a challenge to the development of human capital since UP is a premier academic institution and should be at the forefront of providing education and training that are forward-looking and attuned to the needs of the future industries. This rigidity is less of a challenge in some big private academic institutions that offer more innovative courses designed to keep up with the needs of future work. For example, De La Salle University is expanding its campus near the Laguna Technopark where manufacturing giants are located. The campus is envisioned to be a key resource for scientific and technological advancements in the country<sup>15</sup>. Thus it has multidisciplinary facility that will use high precision equipment for experiments and laboratory works<sup>16</sup>.

## Address Pressing Issues in the Basic Education System

### Improve the Competencies of Basic Education Teachers

In light of several challenges presented by the K-12 program, the basic education teachers should improve and update their competencies. The K-12 program has the following features:

- The use of mother tongue-based multilingual education (MTBLE) in which children are taught in their mother tongue until they reach grade 3
- Teaching in spiral progression rather than in specialized track (e.g., biology is taught in the second year, chemistry in the third year, physics in fourth year)

The MTBLE implies that technical terms, especially in science and mathematics, should be translated into the local language/dialect. This proves to be a challenge as the DepEd has yet to compile a comprehensive translation. More importantly, the spiral progression puts into question the readiness of the teachers themselves to effectively implement the program as they adapt to the different tools and methods that a full science or mathematics curriculum requires. These, and the fact that learning has shifted from being teacher-centered (e.g., provision of knowledge) to student-centered (e.g., demonstration of critical thinking, implementation of differentiated learning), stresses the need of additional trainings to teachers.

### Review the Effectiveness of Basic Education Curriculum

This comes at the heels of the country's dismal performance in the 2019 PISA, where the Philippines has joined the PISA testing only recently. It would have been more informative if an assessment like this was available prior to major reforms in the system like the K-12. Despite this, the PISA results clearly show that there are serious gaps and issues that need to be addressed. Determining what these are and implementing changes accordingly are of paramount importance.

### Improving the Delivery of Social Services

A few other issues need to be addressed as it affects human capital development. Thus the delivery of social services to the country's potential human resource and talents need to be improved drastically.

### Address the Stunting of Children

Stunting in children has adverse effects in future outcomes, such as poor cognition and low productivity. Unfortunately, stunting remains a big issue in the Philippines, with 37 in 100 children aged 12–23 months old (36.6%) being affected by stunting in 2018 [33]. Good health and nutrition programs and services related to the First 1000 Days initiative need to be implemented and delivered. Early interventions are more effective and less costly than those administered later in life.

<sup>15</sup> <https://www.dlsu.edu.ph/laguna-campus/facilities/>.

<sup>16</sup> <https://www.dlsu.edu.ph/laguna-campus/facilities/>.



In addition, the conditional cash transfer program (4Ps) is designed to tackle human development early and the role of the local government units is critical in ensuring that all poor people are enrolled in the program. Local government units need to ensure that their constituents are advised on Listahanan (the National Household Targeting System used in identifying poor households) and that all relevant documents required by the program is available. This can be done by ensuring that live births are recorded at the local registry and helping families in going through the process of delayed registration [33].

#### **Address Teenage Pregnancy**

Teenage pregnancy has become a national issue due to its increasing number each year. This has significant implications in the country's human capital development as these teenagers miss the opportunity of attending school. Teenage pregnancy is likely to aggravate issues on stunting since teenagers have yet to understand the responsibilities of pregnancy and motherhood. The curriculum in the basic education can be revised to integrate a more comprehensive discussion of puberty, sex education, family, and work.

## Annex 1. Poverty, Education, and Labor Market in the Philippines

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Source
<b>GDP per capita* (in PHP)</b>	58,556	58,199	61,570	62,751	65,337	68,751	71,741	74,833	78,682	82,593	86,370	PSA
<b>Unemployment rate (%)</b>	7.40	7.50	7.40	7.00	7.00	7.10	6.60	6.30	5.40	5.7	5.30	PSA
<b>Vulnerable employment** (%)</b>	26.10	25.10	26.90	27.10	30.40	32.20	30.00	30.70	30.70	28.50	28.70	PSA
<b>Labor Force Participation rate (%)</b>												PSA
Overall	63.60	64.00	64.10	64.60	64.20	63.90	64.60	63.70	63.50	61.20	60.90	
Male	78.80	78.60	78.50	79.00	78.50	78.10	78.60	77.30	77.60	76.20	75.10	
Female	48.60	49.40	49.70	50.40	50.00	49.90	50.70	50.10	49.30	46.20	46.60	
<b>School enrollment***</b>												WB-WDI
Tertiary (% gross)	29.16	28.49	29.56	30.80	31.21	33.52	35.63			35.48		
Secondary (% gross)	81.96	84.12					86.97	87.85	88.46	86.16		
Primary (% gross)	105.81	107.76					113.05	112.25	110.17	107.51		
Preprimary (% gross)	45.76	53.49						100.05	95.17	80.69		
<b>Median age (years)</b>			23.40					24.3				PSA
<b>Average real daily basic pay**** (in PHP)</b>												PSA
Overall	326	326	331	327	334	340	346	354	370	372	378	
Private Household	144	141	144	143	147	152	152	159	169	180	186	
Private Establishment	315	314	318	309	313	318	323	332	351	353	358	
Government/Government Corporation	523	531	543	575	611	628	639	638	654	626	628	
Family-operated Activity	245	281	241	253	248	218	248	261	246	250	288	
<b>Gini Coefficient</b>		46.30			46.50			44.40				WB-WDI
<b>Poverty incidence (%)</b>												PSA
Population		26.30			25.20			23.32			16.64	PSA
Families		20.48			19.66			17.89			12.07	
<b>Poverty incidence (%)</b>												PSA
Employed Population		22.80			21.90			18.00				
Unemployed Population		16.80			18.70			16.40				

Notes: Philippine Statistics Authority (PSA); World Bank World Development Indicators (WB-WDI)

\*Constant 2000 Prices, \*\*Share of wage and salary workers in precarious work to the total wage and salary workers \*\*\*Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. \*\*\*\*In 2012 prices.

## Annex 2. Future Industries and Focus Areas

Industry	Focus
	Auto electronics, CARS program, public utility vehicle modernization
Auto and auto parts	CARS Program: The program focuses on developing parts manufacturing particularly large body shell and plastic assemblies, common parts, strategic parts that are not yet manufactured in the country, and shared facilities [28]
Electronic manufacturing services	Auto electronics, medical devices, telecommunications equipment, power storage, civil aviation/aerospace
Semiconductor manufacturing service	Integrated circuit (IC) design
Aerospace parts and aircraft maintenance, repair, overhaul	
Chemicals	Petrochemicals, acyclic alcohols and derivatives, metallic salts and peroxy salts of inorganic acids, cyclic hydrocarbons, oleo chemicals
Shipbuilding and ship repair	Roll-on roll-off (RORO) as well as small- and medium-sized vessels
Furniture, garments, creative industries	Manufacturing and design
Iron and steel, tool and die	
Agribusiness	Rubber, coconut, mangoes, coffee, banana, and other high value crops
Construction	Roads, railways, bridges, ports, airports, and low-cost housing
IT-BPM and E-Commerce	Higher earning more complex nonvocal services BPO, KPO in medical, financial, and legal services; game development; engineering services outsourcing (ESO), software development, shared services
Transport and logistics	Land, air, & water transport, warehousing, support facilities or transport
Tourism	

**Source:** DTI [28]

## CHAPTER 8

# SINGAPORE

### Industries of the Future and Its Human Resources

Investment in human capital through education and training has been at the heart of Singapore's progress. It also helped Singaporeans develop and maximize their potential. By enabling a highly skilled and competitive workforce, it has allowed Singaporeans to secure better jobs, higher incomes, and enjoy higher standards of living.

Long viewed as a key pillar of Singapore's growth, manufacturing accounts for nearly a fifth of the nation's GDP. Singapore's manufacturing base has been gearing up to adopt the Industry 4.0 model, to enable digitalization and automation of its processes, and enhancing its efficiency and long-term competitiveness on the global stage. This new-age approach allows for high-level integration of information, communication, and systems by connecting multiple devices and machines at every step of the manufacturing process.

As part of the coordinated Industry 4.0 strategy [1], the Singapore government has allocated significant time and money for investment into R&D projects, developing industry transformation maps, and strengthening the workforce's skill sets to move the industry toward quicker adoption.

The city-state has an ideal mix of ingredients - rich knowledge base, sophisticated smart nation infrastructure, precision engineering, and creative and technical design capabilities - to help manufacturers transition from a value-add model to a value creation model. In fact, Singapore's strong combination of infrastructure and government policy resulted in it being the top-ranked country in the Economist Intelligence Unit's 2016 Asian Digital Transformation Index.

As companies adopt Industry 4.0 technologies, new processes will be adopted and new roles will emerge. These changes will require capabilities that are likely alien to traditional industries, such as data-mining and machine-intelligence expertise, with some implications on employment for some segment of the workforce.

### Overview on National Policies and Initiatives in Human Capital Development

Singapore is a high-income economy with a GDP of USD58,248 per capita, as of 2018. The GDP per capita in Singapore is equivalent to 461% of the world's average. The country provides one of the world's most business-friendly regulatory environment for local entrepreneurs and is ranked among the world's most competitive economies [2].

Human resources have been identified as one of the most important strategic capital for Singapore. A small country with little by way of natural resources, Singapore has become one of the most developed countries in Asia primarily due to its strong emphasis on developing human resources and for continuously making significant investments in its human capital.

In the recent World Bank Human Capital Index (HCI), Singapore ranks the best country in the world in human capital development out of 157 countries. This means that a child born today in Singapore will be 88% as productive when she grows up, enjoying complete education and full health. Together

with strong financial support from the government, the country continues to strengthen the nimbleness and flexibility of its workforce by providing continuing education, such as the SkillsFuture initiative. Government spending on continuing education will nearly double, to more than SGD1 billion yearly.

SkillsFuture is a national movement to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points. Through this movement, the skills, passion, and contributions of every individual will drive Singapore's next phase of development toward an advanced economy and inclusive society [3].

The tripartite SkillsFuture Council, led by the deputy prime minister, coordinates and drives a national effort to help Singaporeans develop skills relevant to the future, and build a future based on the mastery of skills in every job. SkillsFuture encapsulates the impetus for Singapore to move forward as an advanced economy and society. Individuals go beyond competence to attain expertise and mastery of skills, motivated not just by current demands of their job but a dedication to excellence and passion in each individual's own area of strength and interest. It also embodies the spirit of lifelong learning, respect for skills in every job, and celebrating the skills and growth of every individual, no matter their background, age, or qualifications.

Four key areas of focus under the SkillsFuture Council are:

- Helping individuals make well-informed choices in education, training, and careers
- Developing an integrated, high quality system of education and training that responds to constantly evolving industry needs
- Promoting employer recognition and career development based on skills and mastery
- Fostering a culture that supports and celebrates lifelong learning

So far, with SkillsFuture the government has been able to build up the skills of tens of thousands of Singaporeans, and helped them be more productive and employable. But with new challenges even a high-HCI economy like Singapore must continuously adapt and this is why investing in people will remain a key priority for the government. The importance of this was underscored by the prime minister in his National Day Message (2019) declaring that the government will continue to “invest heavily” in Singaporeans, to enable every citizen to achieve their potential. The Singaporean government has also been preparing its workforce for the new jobs and skills that will be demanded in the future.

The Human Development Index (HDI) is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living.

Singapore's HDI value for 2017 is 0.932 - which put the country in the very high human development category - positioning it at 9 out of 189 countries and territories. Between 1990 and 2017, Singapore's HDI value increased from 0.718 to 0.932, an increase of 29.8%. Table 8.1 reviews Singapore's progress in each of the HDI indicators. Between 1990 and 2017, Singapore's life expectancy at birth increased by 7.2 years, mean years of schooling increased by 5.7 years, and expected years of schooling increased by 5.6 years. Singapore's GNI per capita increased by about 142.7% between 1990 and 2017 [4].

TABLE 8.1

## SINGAPORE'S HDI TRENDS BASED ON CONSISTENT TIME SERIES DATA AND NEW GOALPOSTS

Year	Life Expectancy at Birth	Expected Years of Schooling	Mean Years of Schooling	GNI per Capita (2011 PPS/USD)	HDI Value
1990	76.0	10.6	5.8	33,996	0.718
1995	77.4	11.6	7.3	45,228	0.773
2000	78.3	12.7	8.9	51,367	0.819
2005	80.2	13.9	10.5	57,709	0.868
2010	81.9	15.2	11.2	71,681	0.909
2015	82.8	16.1	11.5	78,742	0.929
2016	83.0	16.1	11.5	78,427	0.930
2017	83.2	16.2	11.5	82,503	0.932

Source: [http://hdr.undp.org/sites/all/themes/hdr\\_theme/country-notes/SGP.pdf](http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/SGP.pdf).

A key consideration in the government's human capital development policy in the past 10 years has been to help local workers adjust to the changing needs in the market so that they can remain "employable" over a longer period. This involves identifying industries that are seen to be sustainable over the long run and then providing workers with the necessary skill sets to stay employed within them. The improvement to the HCI and HDI index over the years serve Singapore well in that the workforce is enabled to stay employable.

### Background of Study

This research aims to look into past efforts of national strategy in developing human resources for industries that resulted better living standards and employment. These observations can then be synthesized into policy recommendations to better ensure that current efforts in developing human resources for future industries produce higher employment and living standards for the workforce.

### Initiatives to Meet the Needs of Future Industries

#### National Agencies in Developing National Strategies for Future Skills

In Singapore, the policy infrastructure for HCD is characterized by two distinct features: a tripartite approach, based on cooperation among employers, unions, and government, and a multiagency approach involving all relevant government institutions.

The tripartite relationship ensures that there is agreement over strategies and necessary steps required for national human resource development (HRD) strategies. The policy of worker training and retraining to upgrade them with skills for the economic restructuring in the early 1980s was possible only with the acceptance and cooperation of the unions. This approach is in line with the recommendations of the ILO - where the best representatives from government, labor, and employers should be involved in national policies decision makings.

One good example of this tripartite approach dated back to the aftermath of the subprime crisis coming out of the USA resulting in a worldwide recession. The prime minister of Singapore established the Economic Strategies Committee (ESC) in May 2009 to develop strategies for Singapore to maximize the country's opportunities in this new world environment, build its capabilities, and make the best use of resources to achieve inclusive growth [5].

Members of the ESC were drawn from the government, labor movement, and the private sector. Eight subcommittees and several working groups were formed to study various strategic areas. The ESC engaged widely and benefited from the diverse views and suggestions from companies, business chambers and associations, universities and think tanks, and members of the public. In total, more than 1,000 people participated in generating the ideas leading to the key recommendations.

One of the key themes that cut across the report looks at the importance of developing the workforce. What this amounts to is a major investment in people - an investment that would require a partnership in the broadest sense between the government, people, and businesses. The government will have to provide strong support, both for workers and businesses, provided everyone plays their part. The initiatives will have to take place on various levels - national, sectoral, enterprise, and individual citizens. It must be a comprehensive approach to invest in skills, capabilities, and expertise.

Singapore already has a solid education system, from preprimary up to the tertiary level, where opportunities are being broadened. At the national level, there is an outstanding system for continuous education and training. The next major investment is in investing in working adults throughout their careers. Every level, every profession, every skill can and must be upgraded. (See Annex 4 for an example of a partnership between IHLs and businesses.)

Companies have to play their role too as they have a key responsibility - to invest in their people. For example, Hamilton Sundstrand in the aerospace industry has the Employee Scholar Program. Here, any company employee can choose to take any course leading to a diploma, a bachelor's degree, or a master's degree in any field and the company will sponsor the employee for the course. They began in 2005 and now have 82 employees who have taken up their scholarships - 23 diplomas, 36 bachelor's degrees, and 23 master's degrees. The company spent SGD1.7 million. Employees are more satisfied, more motivated, and armed with higher skills and proficiencies.

Every individual too has to take the initiative. Everyone has to be responsible for upgrading their own skills, taking their talents to the maximum, and developing mastery. Not just competency, but mastery of what they are doing. However, employers have to recognize that at the end of the day, productivity is about motivation. People need to be rewarded fairly. They also need to be motivated. Motivating employees is critical as focus should not just be in investing in technologies and equipment and the processes.

### Tracing Economic Development and Workforce Policies

During the colonial times, Singapore's economy was centered on entrepôt trade. But this economic activity offered little prospect for job expansion in the postcolonial period. The separation from the Federation of Malaysia in 1965 and the withdrawal of the British in 1968 further aggravated the unemployment situation. The most feasible solution to Singapore's economic and unemployment woes was to embark on a comprehensive program of industrialization, with a focus on labor intensive industries. Unfortunately, Singapore had no industrial tradition. The majority of its working population was in trade and services. Therefore, the country had no expertise or easily adaptable skills. Moreover, without a hinterland and neighbors who would trade with it, Singapore was forced to look for opportunities well beyond its borders to spearhead its industrial development.

By 1972, just seven years after independence, one-quarter of Singapore's manufacturing firms were either foreign-owned or joint venture companies, and both the USA and Japan were major investors. As a result of Singapore's steady climate, favorable investment conditions, and the rapid expansion of the world economy from 1965 to 1972, the country's GDP experienced annual double-digit growth.

In the early days of its economic development, the efforts at HRD were directed at manpower development, general education, technical education, and training. As it moved from investment-driven economic growth to that which is driven by innovation in the 21st century, together with its emphasis on regionalization and globalization of businesses, the government has embarked on more sophisticated HRD strategies which are continuously revised and adjusted in conjunction with other national strategic economic policies. Singapore is thus a unique case that exemplifies the benefits of national HRD policies and strategies.

In the decades after independence, Singapore rapidly developed from a low-income country to high-income. GDP growth in the city-state has been among the world's highest, at an average of 7.7% since independence and topping 9.2% in the first 25 years.



In the 1960s, the city-state of Singapore was an undeveloped country with a GDP per capita of less than USD320. Today, it is one of the world's fastest growing economies. Its GDP per capita has risen to an incredible USD60,000, making it one of the strongest economies in the world. For a small country with few natural resources, Singapore's economic ascension is nothing short of remarkable. By embracing globalization, free market capitalism, education, and pragmatic policies, the country has been able to overcome its geographical disadvantages and become a leader in global commerce.

After rapid industrialization in the 1960s catapulted the island nation's development trajectory, manufacturing became the main driver of growth. In the early 1970s, Singapore reached full employment and joined the ranks of Hong Kong, Republic of Korea, and Republic of China a decade later as Asia's newly industrializing countries. The manufacturing and services sectors remain the twin pillars of Singapore's high value-added economy.

As foreign investment money poured in, Singapore began focusing on developing its human resources in addition to its infrastructure. The country set up many technical schools and paid international corporations to train their unskilled workers in IT, petrochemicals, and electronics. The Skills Development Fund Levy Act was introduced to fund these trainings, which is a tax on payroll. For those who could not get industrial jobs, the government encouraged these workers to find jobs in the services sector, such as tourism and transportation. The strategy of having multinationals educate their workforce paid great dividends for the country. In the 1970s, Singapore was primarily exporting textiles, garments, and basic electronics. By the 1990s, they were engaging in wafer fabrication, logistics, biotech research, pharmaceuticals, integrated circuit design, and aerospace engineering.

The country's economic overall growth was 3.2% in 2018. Value-added manufacturing, particularly in electronics and precision engineering sectors, remain key drivers of growth. It included the services sector too, particularly the information and communications industries, which grew 6.0% year-on-year and the finance and insurance industries, which grew 5.9% year-on-year. Economic growth was expected to be moderate in 2019, with the government forecasting a range of 1.5% to 3.5%, projecting the rate to be slightly below the middle of the forecast range.

### **Policies Pertaining to Industrialization and Workforce Development Alignment**

The Committee on Future Economy (CFE) said that amid a challenging global environment, Singapore's people and companies have many opportunities to innovate, deepen their skills and capabilities, and stay relevant to the world, in coming up with a blueprint for economic growth.

In its 109-page report released on February 2017, the CFE noted the USA and Europe continue to have innovative companies and people, and many Asian markets have strong potential that Singapore companies are well poised to tap into. The sectors to look into include finance, hub services, logistics, urban solutions, healthcare, the digital economy, and advanced manufacturing.

The report was produced after the 30-member committee, cochaired by the finance and trade and industry ministers, spent a year talking to over 9,000 workers, unions, companies, trade bodies, and others.

The CFE outlined seven strategies for Singapore to stay ahead in a challenging global economy. These recommendations were aimed to help the country to stay open and connected, ensure its people acquire skills for future jobs, and help companies scale up through innovation and transformation.

The seven strategies to take Singapore forward are [6]:

#### **i) Deepen and diversify international connections**

Singapore should boost trade and investment by developing specific bilateral initiatives, working closely with multilateral institutions, such as the World Bank, and helping its people and companies gain better understanding of the overseas markets.

The committee also recommended forming a Global Innovation Alliance that will link Singaporean tertiary institutions and companies with overseas partners to promote innovation.

It cited the example of Block 71 in San Francisco, which supports local start-ups that want to enter the USA technology market and also provides a gateway for USA companies to enter Singapore and Southeast Asia markets.

ii) Acquire and utilize deep skills

Companies should play a bigger role in developing their workers. Both the private and public sectors should also move toward hiring and promoting workers based on their skills, instead of just academic grades.

The national Jobs Bank and other schemes that help match workers to new jobs should be improved.

More study and training programs should be rolled out so workers can pick up new skills. For instance, the Singapore Institute of Technology already offers a work-study program that allows its students to develop specialist skills in their chosen field while learning.

iii) Strengthen enterprise capabilities to innovate and scale up

To promote innovation, the committee recommends strengthening the intellectual property (IP) ecosystem, supporting entrepreneurs carving out new business opportunities, and raising the profile of local start-ups.

Simpler regulation and incentive schemes should be rolled out to encourage greater investment in start-ups as well.

It also called for more targeted help for enterprises with potential to expand. For example, Fong's Engineering - a precision engineering company - has seen its year-on-year revenue jump by 15% to 20%, and is expanding into China.

iv) Build strong digital capabilities

The committee recommended building up expertise in cybersecurity and data analytics, which are high potential growth industries. To do so, it suggested that the government partners key industry players to train data scientists, use the National Service (compulsory service in the uniformed services) to develop skills in cybersecurity as well as attract and anchor vanguard technology firms in niche cybersecurity segments.

It also urged the authorities to come up with flexible regulations to enable the adoption of technology, and help small and medium-sized enterprises (SMEs) adopt digital technologies. The committee also recommended the creation of a dedicated program office to collect and facilitate data usage. More data should be shared with the private sector, such as through the revamped Data.gov.sg.

v) Develop a vibrant and connected city of opportunity

Singapore should strengthen its status as a global aviation and shipping hub, to create more economic activities in the region, and enhance its digital connectivity.

It should also create multiple economic clusters of innovation, such as the Jurong Lake District and Punggol, and form more partnerships with private firms.

The committee recommended that the government partners the private sector to transform Orchard Road into a shopping and lifestyle destination.

vi) Develop and implement industry transformation maps

These industry-specific roadmaps should continue to be customized to suit the needs of each industry. Further, they should be grouped into clusters so that the transformation of one industry can have a positive spillover effect on the others.

The government should also be alert to changing industry configurations.

The roadmaps should map out the opportunities in industries with good growth prospects.

They should also provide strategies to help industries that require large numbers of low-skilled workers to increase productivity and upgrade jobs. For instance, IT retailer Challenger has moved its traditional brick-and-mortar retail business into e-commerce.

vii) Partner one another to enable growth and innovation

The government should foster an environment to support innovation and risk taking in the private and public sectors, the committee said.

It called for a review of Singapore's tax system, based on two principles: "First, Singapore's tax system should remain broad-based, progressive and fair, even as revenues are raised over time to meet rising domestic needs. Second, Singapore's tax system must remain competitive and pro-growth."

Trade associations have their part to play in industry development, for instance, by identifying areas that the government can support. Unions should help workers prepare for jobs of the future.

The committee cited how the Singapore Manufacturing Federation has partnered the Enterprise Europe Network and International Enterprise (IE) Singapore with its Intellectual Property Intermediary to form a center that helps Singaporean manufacturers access technological expertise and partnership opportunities in Europe. More than 500 Singapore companies have registered with the center.

### Defining Future Skills by National Institutions, Unions, and Employers' Organizations

To achieve maximum synergies in the industry transformation over the next few years, the government announced the SGD4.5b Industry Transformation Program at Budget 2016. The program will integrate different restructuring efforts, taking a targeted and industry-focused approach to address issues and deepen partnerships between government, firms, industries, trade associations and chambers.

Externally, Singapore faces challenging economic conditions, rising competition, and disruption from technological advances. Domestically, land and manpower constraints grow more pressing. The government will continue its support at the enterprise and worker level. However, there is a need to look more intensively into industry-centered strategy in a more systematic and coordinated way.

The integrated approach is necessary as:

- i) Increasingly complex challenges will require crosscutting solutions from multiple agencies and stakeholders working together.
- ii) Singapore needs to develop strategies that can upgrade a significant proportion of the industry, to move the productivity and innovation needle.
- iii) The country needs industry itself, both the corporates and unions/workers, to take ownership of the transformation effort and sustain it.

Under the program, there will be Industry Transformation Maps (ITMs) developed for 23 industries under six clusters. Together, they cover over 80% of Singapore's GDP.

The Council for Skills, Innovation and Productivity (CSIP) will take overall responsibility for the implementation of the ITMs. To do so, the CSIP has set up six cluster subcommittees - Manufacturing, Built Environment, Trade & Connectivity, Essential Domestic Services, Modern Services, and Lifestyle. They will be supported by 2 horizontals - promoting ICT adoption and skills development across the economy. Each of the subcommittees will oversee a group of ITMs within the same broad cluster of industries.

**TABLE 8.2**
**LIST OF ITM CLUSTERS AND INDUSTRIES**

S/N	Cluster	Sector	Lead Agency
1.	Manufacturing	Energy & Chemicals	Economic Development Board (EDB)
2.		Precision Engineering	EDB
3.		Marine & Offshore	EDB
4.		Aerospace	EDB
5.		Electronics	EDB
6.	Built Environment	Construction	Building Construction Authority
7.		Real Estate	Council of Estate Agents
8.		Cleaning	National Environment Agency
9.		Security	Ministry of Home Affairs
10.	Trade & Connectivity	Logistics	EDB
11.		Air Transport	Civil Aviation Authority Singapore
12.		Sea Transport	Marine Port Authority
13.		Land Transport	Land Transport Authority
14.		Wholesale Trade	ES
15.	Essential Domestic Services	Healthcare	Ministry of Health
16.		Education	Ministry of Education
17.	Professional Services	Professional Services	EDB
18.		ICT and Media	Ministry of Communications and Information
19.		Financial Services	Monetary Authority of Singapore
20.	Lifestyle	Food Services	Enterprise Singapore (ES)
21.		Retail	ES
22.		Hotels	Singapore Tourism Board
23.		Food Manufacturing	ES

For tight coordination and accountability within the government, an agency will assume overall responsibility for each ITM, and coordinate among agencies and with the tripartite partners. Similarly, at the cluster level, there will be one government agency taking the lead.

Each ITM will be tailored to the needs of the industry. In developing these ITMs, the government will thoroughly examine the industry landscape, the future trends and needs to set out a suite of initiatives to systematically raise productivity, develop skills, drive innovation, and promote internationalization in catalyzing transformation and achieve the vision of each industry. These will be refined over time to ensure relevancy.

Each ITM will consist of a growth and competitiveness plan, supported by four pillars:

- *Productivity* - Strategies to support companies especially the SMEs to move to higher value-added activities and raise operational efficiency
- *Jobs and Skills* - Investing in the people, to equip them with deep skills in supporting the shift to greater value creation
- *Innovation* - Strategies to leverage R&D to develop new products and services
- *Trade and Internationalization* - Supporting companies in expanding to overseas markets

The ITMs will also address the government's role as facilitator and enabler of industry upgrading, for example, by creating a regulatory environment that is conducive to innovative business models, or setting national standards to promote technology adoption.

Industry transformation requires deep partnerships between large and small companies, public research institutions, education and training providers as well as trade associations and chambers (TACs), unions, individuals, and the government. Each will bring an important perspective. Hence the ITM will involve everyone working together to address the salient issues in the medium to longer term for our sectors.

#### Push or Pull Approach?

Singapore has always been known for its pragmatic approach to development, focusing on finding or creating "solutions which work", according to Prime Minister Lee Hsien Loong. A key component of this approach is foresight - predicting scenarios and preparing for these.

Knowing that continuous learning and development is required to ensure the local workforce has the capabilities to overcome future challenges, Singapore launched SkillsFuture in October 2014, to promote lifelong learning culture in the community. But what else can be done to develop Singapore's talent and ensure that SG100 milestones are met?

The Singapore government is already focusing on growing local talent by increasing spending on continuous education and training to over SGD1.5 million on average per year from present to 2020, according to "Singapore Budget 2015 - Developing Our People" report.

Development across ages and job levels is essential to equip the workforce with the necessary skills and knowledge to manage future challenges. Focus should be specifically placed on developing the next generation of leadership with the capabilities to seamlessly take the place of the current workforce and address Singapore's future needs.

To ensure that talent development is an achievable priority, everyone in the community ranging from the government, employers, industry, and even individuals must play their part. While it is great to see the Singapore government proactively introducing initiatives to encourage lifelong learning and upgrading of skills, industry, management of companies, and individuals need to ramp up their participation.

Singapore has shown commitment in obtaining deeper involvement from industry partners through initiatives that look into strengthening collaborations between industry unions, institutions, and associations to identify future areas where skills are lacking and establishing mentoring programs to help develop relevant skills in these areas.

The government and business managers play a large part in providing programs and facilitating skills development but to a large extent, the onus is on the individual to commit to their own continuous learning.

Executives should be taking advantage of the government's incentives and corporate opportunities to further develop skills in their entire workforce, from frontline sales people to the 'C-Suite' leadership

team. For example, Singapore Technologies Engineering (ST Engineering) and YCH Group have signed a memorandum of understanding (MoU) with the Singapore Workforce Development Agency (WDA) to collaborate in various SkillsFuture initiatives, such as SkillsFuture Credit and the SkillsFuture Earn & Learn Programme to support employees if they wish to master their skills and further develop their careers.

### Fostering Learning and Development Culture

It is equally important that companies create an encouraging environment and provide opportunities for employees to take a more active role in their own learning. Structured career paths should be built to enable employees to be prepared for the promotions and leadership roles, and can be achieved by establishing “learning journeys”, which includes rungs for experience, exposure, and education, including formal and informal training and development [7].

In conjunction with structured training programs, younger staff also need exposure to various on-the-job experience. To provide less formal learning opportunities, leaders can assign special projects to more junior staff, allowing them to step outside their routine work and gain new knowledge and skills in other roles. However, opportunities for growth should not be limited to just younger employees. Development of more senior staff and executives to identify new ways of driving business operations should also be a priority, as their experience is vital in guiding the next generation forward.

Managers at all levels need to be involved in cultivating a thriving learning and development culture in a company. For example, small group leadership or management best practices sessions can be conducted by respected senior staff to share the company’s values, culture, and guiding principles to other members of the team.

More personalized talent development through mentoring and coaching should also be offered to those with strong potential and interest in developing their career. The personal touch provided by middle managers in sharing their own personal experiences and working closely with junior colleagues can be an effective way of developing bright talent through engaging them in discussions and activities in more natural/everyday work settings.

While Singapore can celebrate the prosperous economy it has developed over the last 50 years, it can also look forward and think of ways to help future generations build upon past success and continue to thrive in an increasingly competitive world. To do this, business leaders will need to improve key skills to be innovative, risk takers, strategic thinkers, and agile in change. Continuous learning, across all levels, is a key element to building solid competencies among Singapore’s workforce and will prepare the country well to tackle future challenges. The next 50 years of learning, growth, and accountability in striving to better itself would be an interesting journey.

## Policy Recommendations

It is stated upfront in the overview to this report that as companies embrace Industry 4.0 technologies, new processes will be adopted and new roles will emerge. These changes will require new capabilities with some implications on employment for some segment of the workforce.

The most vulnerable group in Singapore’s economy were families in the lowest earning 10%, whose household incomes had declined over the decade. A labor economist at the Lee Kuan Yew School, estimated that the real median wages of the top 20% of employed residents rose 27% while those in the lowest 20% suffered a decline of about 8% between 1997 and 2010. Experts agreed that the government’s liberal immigration policies had the effect of pushing wages lower. Between 1998 and 2010, foreigners accounted for 50% of the increase in employment. Low-wage workers were struggling to find a foothold in a postindustrialized economy in a globalized world. Such families were “running on empty”, as they faced rising prices on diminishing incomes. This was despite a higher percentage of lower income families now surviving on dual incomes compared to 10 years ago.



Such trends showed the increasing challenges to income mobility and were worrying for the generation aged 30 to 39 years struggling to establish careers. The demographic profile shows 43% had tertiary education in 2018 compared to only 19% of the same age cohort in 2000. This “new competitive landscape” was further accentuated by increasing competition from foreigners and permanent residents (PRs), given the dramatic increase in the percentage of PRs in the same age group. In 2010, one out of three residents was a PR. Even highly educated professionals might face anxiety about any “fair chance” not only to move up the income ladder but also to give their children a similar level of intergenerational mobility their generation had received. Given such challenges, the government should pay heed to highly educated younger Singaporeans, now that education was no longer a sure route to financial stability. This is especially emphasized for the government and its enterprises, in gearing up for industries of the future requiring a much higher level of competencies, this group will fall further behind.

### Changing Face of Unemployment

Examining unemployment trends over the last two decades, there was a rising share of those with diplomas or degrees among the unemployed and a rising share of professionals, managers, executives, and technicians (PMETs) among retrenched workers. The share of older workers among the unemployed, especially those aged 50 years and above, had also increased in the last decade, with consistently low reemployment rates among the retrenched. While there is a need to move toward industries of the future, there is also an imminent need to address employability. Failing which, the social divide could widen as workers who can fit in with the industries of the future, require a much higher level of competencies and will be able to earn more, leaving the less able behind.

While it still remains early to speculate on employment conditions with the adoption of Industry 4.0 globally, it is safe to say that workers will need to acquire different or an all-new set of skills. This may help employment rates go up but it will also alienate a big sector of workers. The sector of workers whose work is perhaps repetitive will face a challenge in keeping up with the industry. Different forms of education must be introduced, but it still doesn't solve the problem for the older-in-age workers.

### Limits to Inclusive Growth in a New Economy

While the goal of ‘inclusive growth’ was evident in Singapore, with transfer schemes, such as the Workfare Income Supplement Scheme to low wage workers and other schemes to assist low income families, more measures would be necessary to help them with the income gap at large. Economic growth was likely to be much lower than in previous years while rising prices in healthcare, transport, and housing raised inflationary pressures that could well come with success in transforming the economy in meeting the challenges of the future.

Such transfer schemes are dependent on how much tax revenues are available. The manufacturing sector, once an essential “pillar of growth” now “bearing the brunt of economic restructuring pains”, having declined from 26% of GDP in 2001 to just under 20% in 2018. This ‘hollowing out’ could well continue with manufacturing dwindling further to around 15%–20% of GDP, amid hiring uncertainties and rising costs. With lower growth anticipated, tax revenues would decline and limit the government's fiscal flexibility as well as affecting policies aimed at promoting inclusive growth in the future.

The Singapore government will likely find it increasingly more challenging in the future to rely on foreign workers and new immigrants to augment Singapore's human capital stock and change its human capital profile. The liberal foreign worker and immigration policy has been seen by many as contributing to a number of social, political, and economic woes, such as widening income inequality, rising social tensions among the new and old residents, and the loss of social cohesion, etc. Despite the government's efforts to convince Singaporeans to be receptive to new arrivals and to integrate them, political pressure for tightening the foreign labor inflows is likely to persist. The government will face increasingly greater pressure to upgrade the local workforce and increase their productivity and hence wages. This will also entail encouraging companies to increase their investment in new technology and production structures.



While the above mention are indeed concerns at the work and societal level, the solutions could be found in the seven broad strategies as listed above to develop human resources for future industries. Nonetheless, however good these strategies are, there will always be pockets in the population who will fall through the gap. Specific rather than broad-based solutions can be crafted to address these [8].

## Annex 1 - The Skills Framework

### What is it?

The Skills Framework is an integral component of the Industry Transformation Maps and it is cocreated by employers, industry associations, education institutions, unions, and government for the Singapore workforce. The Skills Framework provides key information on sector, career pathways, occupations/job roles as well as existing and emerging skills required for the occupations/job roles. It also provides a list of training programs for skills upgrading and mastery.

The Skills Framework aims to create a common skills language for individuals, employers, and training providers. This further helps to facilitate skills recognition and support the design of training programs for skills and career development. The Skills Framework is also developed with the objectives to build deep skills for a lean workforce, enhance business competitiveness, and support employment and employability.

### Who is it for?

Individuals in their early- and/or mid-career can use the Skills Framework to make informed decisions on education and training, career development and skills upgrading based on the sector, employment, occupation/job role, skills and training information in the framework.

### Benefits to the Individual

- Understand the sector and the employment prospects as well as emerging jobs and skills in demand
- Understand the occupational/job scope, work context, and the work attributes which are demanded by the employers in the sector
- Assess one's career aspiration and make an informed decision before settling on a career choice or switching career
- Appraise the length of the career pathway and the requirements for one to progress into the desired occupation/job role
- Find suitable programs based on skills and career needs

Employers can use the Skills Framework to design progressive human resource management and talent development plans based on the detailed skills information in the framework.

### Benefits to the Employers

- Identify emerging skills and build new capabilities
- Develop occupational/job profiles
- Create comprehensive competency framework as well as training roadmaps for the company
- Strengthen organizational capability to develop staff for improved performance
- Enhance talent attraction, management, and retention

Training providers can use the Skills Framework to gain insights into sector trends and skills in demand, which allow them to innovate and contextualize their curricula design and training programs to suit the needs of the sector.

### Benefits to the Training Providers

- Gain better insights into sector trends as well as existing and emerging skills in demand to innovate and contextualize their curricula design and training programs to suit the needs of employers and learners
- Develop holistic company training plans and business improvement programs, such as job redesign programs for productivity and growth for companies

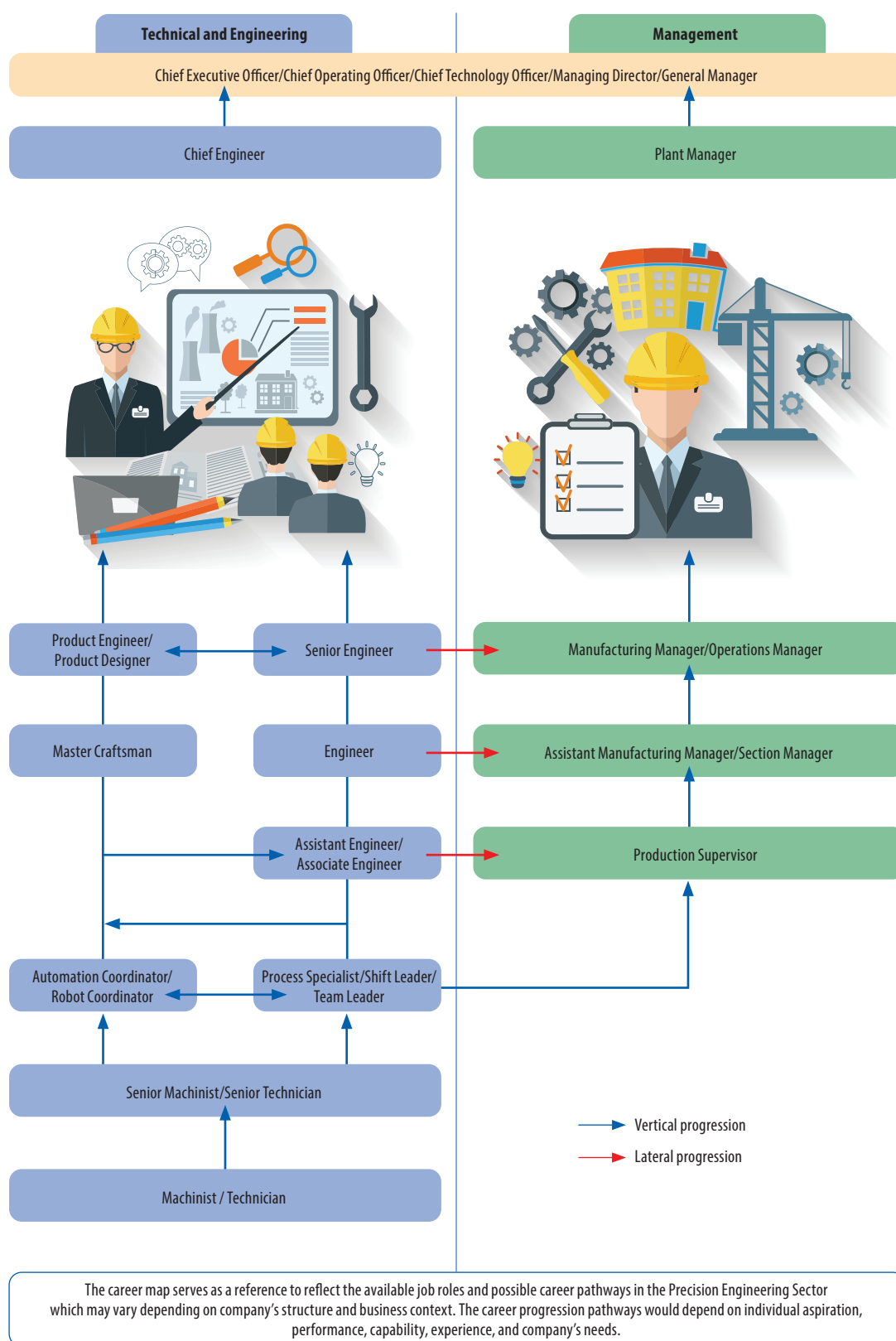
### How does it work?

The Skills Framework consists of five components [9]:

Sector Information	This component describes the sector and employment landscapes and it includes useful statistics on the sector's manpower and occupational/job requirements, in line with the Industry Transformation Map.
Career Pathways	This component shows how the occupations/job roles in the sector are structured progressively based on sector norm. From the Career Pathways, users can identify vertical and lateral advancement opportunities.
Occupations/Job Roles Description	This component describes the skills requirement, work context, and expected profile of the worker performing the occupational/job role. It provides an overall introduction to the occupation/job role.
Skills Description	Every occupation/job role in the Skills Framework contains a set of skills. Each skill is carefully analyzed and written to capture both occupational/job and personal domains of the skill for holistic development. Similar to Occupation/Job Role Description, Skill Description provides overall introduction to the skills by summarizing the performance expectations of the skills.
Training Programs	Training Programs link the skills in the occupations/job roles to programs that are available in the market. The list of programs is not limited to academic qualifications, and continuing education and training programs. It will also list apprenticeships, recognition of prior learning and any other skills-based programs and manpower initiatives, such as SkillsFuture Earn & Learn Programme that are available in the sector.

## Example of Skills Framework for Precision Engineering

Skills Framework for Precision Engineering Career Pathways:



## Annex 2. Key Statistics

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>Annual Average Unemployment Rate (%)</b>											
Overall	2.2	3.0	2.2	2.0	2.0	1.9	2.0	1.9	2.1	2.2	2.1
Resident	3.2	4.3	3.1	2.9	2.8	2.8	2.7	2.8	3.0	3.1	2.9
Singapore Citizen	3.4	4.5	3.4	3.0	3.0	2.9	2.9	2.9	3.1	3.3	3.0
<b>Job Vacancy Rate (Annual, %)</b>											
	-	1.8	2.5	2.8	2.5	2.7	3.0	2.8	2.3	2.4	2.7
<b>Resident Labor Force ('000)</b>											
	19,283	19,857	20,473	20,801	21,196	21,388	21,852	22,323	22,576	22,697	22,927
<b>Labor Force Participation Rate (%)</b>											
	65.6	65.4	66.2	66.1	66.6	66.7	67.0	68.3	68.0	67.7	67.7
<b>Retrenchment (Annual)</b>											
	-	23,430	9,800	9,990	11,010	11,560	12,930	15,580	19,170	14,720	10,730
<b>Reentry Rate of Retrench Residents (Annual, %)</b>											
	-	65.2	67.4	69.7	70.4	67.7	69.8	71.9	64.6	64.6	62.9
<b>Education (%)</b>											
Degree	25.8	26.7	27.6	28.3	29.4	31.5	32.0	32.2	33.7	37.7	36.7
Diploma & Professional Qualification	16.8	19.6	18.1	18.2	18.7	18.4	19.5	19.3	19.4	18.9	19.5
Postsecondary (Non-tertiary)	9.6	7.8	12.0	11.8	12.0	11.6	11.5	12.0	11.5	11.3	11.5
Secondary	23.5	24.3	20.0	20.2	19.2	18.7	17.9	18.2	17.1	16.5	16.4
Below Secondary	24.2	24.3	22.2	21.5	20.7	19.8	19.2	18.2	18.2	17.6	15.9
<b>GDP per Capita SGD</b>											
	56,607	56,619	64,408	67,783	69,417	71,283	72,938	76,503	78,364	83,265	87,108
<b>Median Age (Years)</b>											
	41.0	41.0	41.0	42.0	42.0	42.0	43.0	43.0	43.0	43.0	43.0
<b>Gross Monthly Income (SGD)</b>											
	2,897	2,927	3,000	3,249	3,480	3,705	3,770	3,949	4,056	4,232	4,437
<b>Gini Coefficient</b>											
	0.474	0.471	0.472	0.473	0.478	0.463	0.464	0.463	0.458	0.459	0.458

**Source:** Labor Force Survey, Manpower Research & Statistic Department, MOM [10]

### Annex 3. Singapore Workforce Skills Qualifications (WSQ) Trainees by Level of WSQ Standard of Attainment

Level of WSQ SOA	2011	2012	2013	2014	2015	2016	2017	2018
<b>Total</b>	192,249	198,322	231,009	267,423	267,655	289,699	310,491	327,996
Certificate	147,901	155,148	164,867	188,700	190,680	203,627	220,810	226,721
Higher Certificate	11,678	7,294	11,146	10,728	13,457	15,478	17,478	26,856
Advanced Certificate	48,433	31,628	45,699	55,944	50,727	60,041	61,907	71,782
Diploma	23,363	19,771	32,873	36,117	35,887	41,918	46,436	52,796
Specialist Diploma	5,417	5,760	7,604	8,790	7,902	9,514	10,986	14,664
Graduate Certificate	1,029	751	784	756	483	580	488	594
Graduate Diploma	390	393	550	738	847	980	1,007	653

### Singapore Workforce Skills Qualifications (WSQ) Trainees by Age, Highest Qualifications Attained, and Sex (2011–18)

	2011	2012	2013	2014	2015	2016	2017	2018
<b>Total</b>	192,249	198,322	231,009	267,423	267,655	289,699	310,491	327,996
<b>Age (Years)</b>								
Under 20	10,860	11,575	13,641	14,221	16,016	13,515	18,597	21,607
20–29	37,056	40,260	45,947	52,170	54,876	56,649	65,219	61,703
30–39	44,643	46,722	52,223	56,622	56,326	57,849	56,487	56,205
40–49	44,489	43,950	50,793	56,065	53,375	58,179	58,635	60,570
50–59	38,461	37,916	45,233	54,096	50,673	56,543	58,822	63,575
60–69	13,560	14,812	18,990	27,614	29,108	36,787	40,638	47,828
70 & Over	3,180	3,087	4,182	6,635	7,281	10,177	12,093	16,508
<b>Highest Qualification Attained</b>								
Below Primary	5,695	5,531	8,863	12,074	16,136	16,454	16,993	21,309
Primary	28,343	28,516	26,391	33,538	25,031	25,732	24,546	24,872
Lower Secondary	27,824	22,120	26,606	30,313	27,975	31,491	34,274	36,776
Secondary	54,012	55,977	60,134	64,020	60,786	64,041	67,141	70,332
Postsecondary	12,663	17,318	20,601	21,856	25,276	27,755	32,080	29,183
Professional Qualification	8,624	9,620	10,744	14,030	11,839	14,634	15,057	14,963
Polytechnic Diploma	17,224	19,790	24,144	26,612	31,610	32,133	41,764	42,125
Degree & Above	23,926	27,144	34,032	45,011	48,395	56,295	57,893	59,478
Others / Not Reported	13,938	12,306	19,494	19,969	20,607	21,164	20,743	28,958
<b>Sex</b>								
Male	90,364	95,154	119,170	144,166	143,142	153,730	173,394	183,670
Female	98,582	101,438	109,391	120,818	122,291	133,816	134,715	142,266
Not Reported	3,303	1,730	2,448	2,439	2,222	2,153	2,382	2,060

Source: Skills Future, Singapore

<https://stats.mom.gov.sg/Pages/Singapore-Yearbook-Of-Manpower-Statistics-2019-Higher-Education-and-Skills-Training.aspx> [11].

## Annex 4. Additional Initiatives to Prepare Workforce for Industry 4.0

24 July 2019

At the SkillsFuture Festival @ NUS (SFF@NUS) today, themed ‘Industry 4.0 and the Future of Skills’, Chee Hong Tat, Senior Minister of State, Ministry of Trade and Industry, and Ministry of Education announced three new initiatives to prepare the workforce for Industry 4.0.

### Working with Anchor Companies to Train-for-Sector

First, SkillsFuture Singapore (SSG), Bosch Rexroth, Singaporean-German Chamber of Industry and Commerce, Singapore Polytechnic, and JTC signed a Memorandum of Understanding (MoU) to establish the Bosch Rexroth Regional Training Centre (BRRTC) in Singapore. The center will be located in the Jurong Innovation District (JID), Singapore’s advanced manufacturing campus, and it will play a key role to meet the latest technological, training, and talent needs of the Advanced Manufacturing companies in Singapore and the region.

Specifically, BRRTC will deliver and certify Industry 4.0 Specialists meeting the German Industrie- und Handelskammer (IHK) standard in Southeast Asia. Beyond training and certification, Bosch Rexroth will also collaborate with companies to testbed Industry 4.0 Proof of Concept projects, support implementation of solutions, and develop companies’ expertise through use cases. This will help to accelerate industry transformation and also upgrade Industry 4.0 skills and capabilities in Singapore and the region.

### New IHL Programmes in Emerging Skills

Second, the Institutes of Higher Learning (IHLs) will continue to ramp up the delivery of training in emerging and future skills needed for Industry 4.0 through the SkillsFuture Series. Launched in 2017, the number SkillsFuture Series courses has increased three-fold from 400 to over 1,500. As at March 2019, close to 40,000 individuals have taken up SkillsFuture Series programmes.

Looking ahead, the Institute of Systems Science at NUS (NUS-ISS) signed two MoUs with Ngee Ann Polytechnic (NP) and Temasek Polytechnic (TP). Under this MOU, NUS-ISS will collaborate with NP and TP to recognize NP’s new Specialist Diploma in Business & Decision Analytics, and TP’s Specialist Diploma in Big Data Analytics offered under the SkillsFuture Work-Study Post Diploma Programme (previously known as the SkillsFuture Earn & Learn Programme). Selected modules can stack toward NUS-ISS’s Master of Technology (MTech) programs.

The National University of Singapore (NUS) has also developed the “NUS All-You-Can-Learn™” initiative, which will enable organizations to help their constituents acquire skills and expertise in the emerging areas of Data Analytics, Cybersecurity, Machine Learning, Design Thinking, and Human Capital Practices. NUS has partnered 10 organizations through this initiative, of which five organizations, namely the Association of Chartered Certified Accountants, Institute for Human Resource Professionals, Korn Ferry, National University Health System, and United Overseas Bank inked MoUs with NUS today to jointly express their commitment.

In addition, the IHLs introduced other new programs and courses relevant to Industry 4.0:

- Master of Science in Industry 4.0 by National University of Singapore
- Masters Collective by Ngee Ann Polytechnic
- Micro Learning Course on Industry 4.0 by Temasek Polytechnic
- Specialist Diploma in Augmented Reality & Virtual Reality by Nanyang Polytechnic

### Helping Singaporeans Make Informed Choices in Education, Training, and Careers with Jobs-Skills Insights

Third, to help individuals, enterprises, and IHLs navigate the rapidly evolving skills and job landscape, and make informed choices, SSG is working with partners, such as BurningGlass Technologies, Indeed.com, and JobTech, to provide Jobs-Skills Insights for all three stakeholders.

The Jobs-Skills Insights will draw on timely, quality, and relevant data from these partners based on key themes, such as jobs and skills in demand across industries, the changing mix of job roles and skills requirements, and emerging skills needs. SSG will curate and share these Jobs-Skills Insights on a regular basis through reports, dashboards, and other relevant commentaries and articles.

The Jobs-Skills Insights will help:

- Individuals stay updated on industry transformation trends, job-skills trends, and skills gaps via profiling tools to better inform their skills and career development plans
- Employers develop their transformation plans and invest in training for their employees for career development and skills upgrading, through data on growth sectors and skills needs, and future workforce solutions planning tools
- IHLs and training providers design programs more effectively to address changes in job roles and industry needs. They can use the insights to design courses that continue to be relevant for future cohorts

[https://www.ssg-wsg.gov.sg/news-and-announcements/24\\_Jul\\_2019.html](https://www.ssg-wsg.gov.sg/news-and-announcements/24_Jul_2019.html) [12]



## CHAPTER 9

# VIETNAM

### Industries of the Future and Its Human Resources

Vietnam, like the rest of the world, is open to the many opportunities and challenges brought about by the fourth industrial revolution (Industry 4.0). There are many features to look out for: (i) global internet connection and technologies built on digital technology platforms; (ii) bringing solutions for all aspects of human life from state management to economy, culture, and environment; (iii) creating systematic change within Vietnam, between other nations, industries, and businesses; (iv) human knowledge and science, technology, and innovation (STI) to become a driving force for the development of countries.

Vietnam's economy too will benefit from the successful application of Industry 4.0, estimating that by 2030, Vietnam's GDP may increase by USD28.5–62.1 billion (equivalent to an additional increase of 7%–16% of GDP). It will also change the employment structure and increase the net employment from 1.3 to 3.1 million jobs. Labor productivity in GDP will increase by USD315–640. However, there are also roadblocks for Vietnam in meeting demands for the future industries. For one, the change in employment structure will cause unemployment among low-skilled labor groups, thereby creating pressure on social inequality. Second, it creates economic and technological development challenges, and finally, there is a risk of lagging behind further by being slow to change and failing to promptly take advantage of the benefits of the industrial revolution 4.0 [1].

### Overview on National Policies and Initiatives in Human Capital Development

#### Background of Study

##### Strategies for Human Resource Development in 2011–20

According to Vietnam's human resource development (HRD) strategy for the period of 2011–20, the broad goals are: (i) to make its people the most important foundation and the country's biggest advantage to sustainably develop the country; (ii) to internationally integrate and stabilize society; and (iii) to raise the level of competitiveness to the levels equivalent to advanced countries in ASEAN by using some of their approaches and best practices [2].

The government first approved the strategy and planning of human resource development, followed by the strategy and goals on population and reproductive health in Vietnam. Measures on population structure and population distribution were also given the nod as they will contribute to the successful implementation of industrialization and modernization of the country [3]. At the same time, the government launched the 2011–20 national strategy to protect, care, and improve its people's health. The vision for 2030 is to ensure that everyone is entitled to quality health care, live in safe communities, physically and mentally well, in addition to reducing morbidity, disabilities, enhance stamina, increase longevity, and improve the quality of life [4].

After nearly 10 years of implementing the National Strategy on Population and elevating the healthcare of Vietnam's human resources, considerable improvements can be seen, such as rapid increase in average life expectancy while malnutrition and maternal mortality were reduced. The stature,

physicality, and strength of the Vietnamese people were enhanced too. However, the physical development of Vietnam's human resources still has some limitations, such as low human development index (HDI), lack of comprehensive solutions to take advantage of the golden population (high percentage of working age adults) structure, and adapting to population aging. According to the United Nations Development Programme's (UNDP) HRD report in 2019, Vietnam's HDI index in 2018 was 0.693, which was the world average and ranked 118th out of 189 countries and territories.

From 1990–2018, Vietnam's HDI has increased from 0.475 to 0.693, as shown in Table 9.1.

**TABLE 9.1**

**VIETNAM'S HDI INDEX FROM 1990–2018**

Year	Life Expectancy at Birth	Expected Years of Schooling	Mean Years of Schooling	GNI per Capita (2011 PPS/USD)	HDI Value
1990	70.6	7.8	3.9	1,369	0.475
1995	71.9	9.3	4.6	1,944	0.529
2000	73.0	10.6	5.4	2,725	0.578
2005	74.1	11.3	6.4	3,367	0.616
2010	74.8	12.0	7.5	4,226	0.653
2015	75.1	12.7	8.0	5,314	0.680
2016	75.2	12.7	8.1	5,638	0.685
2017	75.2	12.7	8.2	5,916	0.690
2018	75.3	12.7	8.2	6,220	0.693

Source: UNDP [5]

Vietnam's HDI index in 2018 was at a higher level compared to other countries with average HDI (HDI = 0.634), but it is lower than the average HDI levels of east Asia-Pacific countries, where the average HDI is 0.741). Compared to other Southeast Asian countries with big population, like the Philippines or Thailand (HDI Philippines = 0.712, HDI Thailand = 0.765), Vietnam's HDI is still low at 0.693 in 2018.

**FIGURE 9.1**

**EMPLOYED POPULATION BY AGES FROM 2008–18**



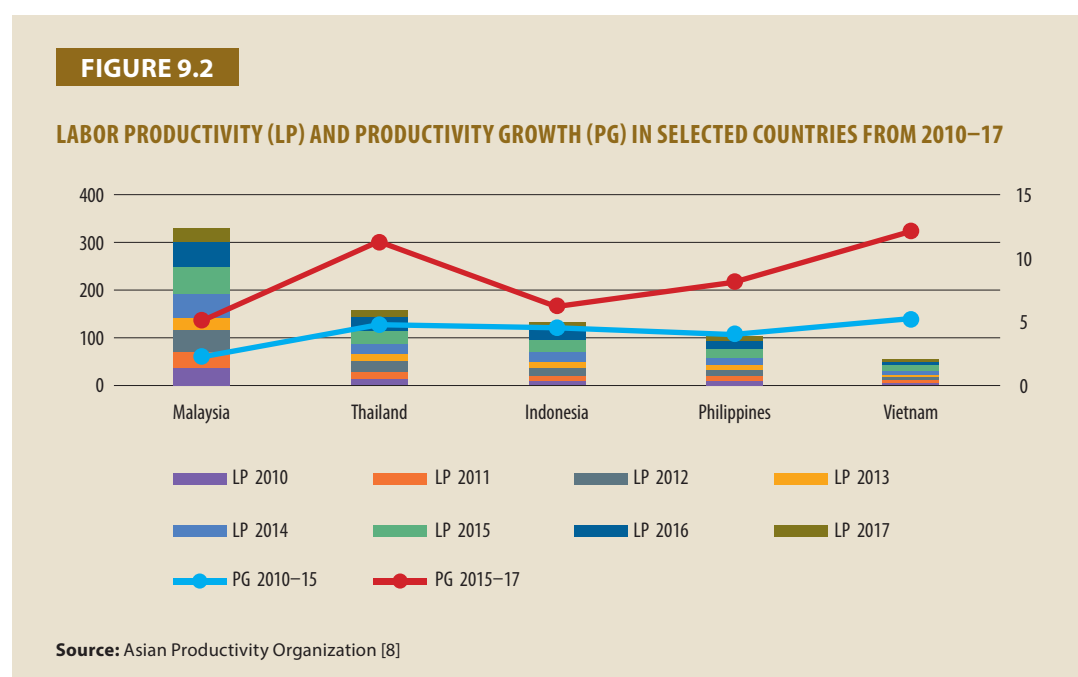
Source: General Statistics Office of Vietnam [6]

In general, the workforce in Vietnam of over 50 years old and more has increased in recent years while the percentages of workers aged 15–24 years and 25–49 have decreased slightly. This is a dark reality of Vietnam's labor force in the coming years.

Vietnam intends to achieve a number of objectives by improving the efficiency of management, mobilization, allocation, and use of resources of the economy. They are to promote rapid and sustainable socioeconomic development, achieve social progress and justice, improve quality of life, ensure national defense and security, and transform Vietnam into a modern industrialist country under the socialist orientation. Thus the structure of the industry will be changed accordingly in the following directions - work on the HDI until it reaches a higher level (between 0.700–0.799) and achieve a HDI value of 0.800 and above as part of Vietnam aspiration for 2045 [7].

Vietnam's labor productivity has continued to improve steadily and significantly over the years, making it a country with a high growth rate in the ASEAN region. With the economic growth of 7.08% in 2018, the labor productivity in 2018 is valued at approximately VND102.2 million/labor (equivalent to USD4,521/worker), an increase of 6% compared to 2017. On average in the period of 2016–18, labor productivity increased by 5.77%/year, higher than the average increase of 4.35%/year during the period 2011–15. In short, in 2011–18, labor productivity increased by an average of 4.88%/year.

Based on purchasing power parity in 2011 (PPP 2011), Vietnam's labor productivity from 2011–18 increased an average of 4.8% a year, higher than Singapore's average at 1.4%, Malaysia at 2%, Thailand at 3.2%, Indonesia at 3.6%, and the Philippines at 4.4%. As a result, Vietnam has closed the gap among ASEAN countries with higher levels of development. In 2011, the labor productivity of Singapore (17.6 times), Malaysia (6.3 times), Thailand (2.9 times), and Indonesia (2.4 times) were higher than Vietnam. But by 2018, this relative distance decreased - Singapore (13.7 times), Malaysia (5.3 times); Thailand (2.7 times), and Indonesia (2.2 times). Despite this, the current level of labor productivity in Vietnam is still very low compared to other countries in the region, notably, the absolute gap continues to increase. Vietnam's labor productivity in 2018 reached USD11,142, only 7.3% of Singapore's productivity level; 19% of Malaysia, 37% of Thailand, 44.8% of Indonesia, and 55.9% of the Philippines. The difference in labor productivity (calculated according to PPP 2011) of Singapore and Vietnam increased from USD132,566 in 2011 to USD141,276 in 2018; similarly, Malaysia from USD42,397 to USD47,545; Thailand from USD14,985 to USD18,973 (see Figure 9.2).

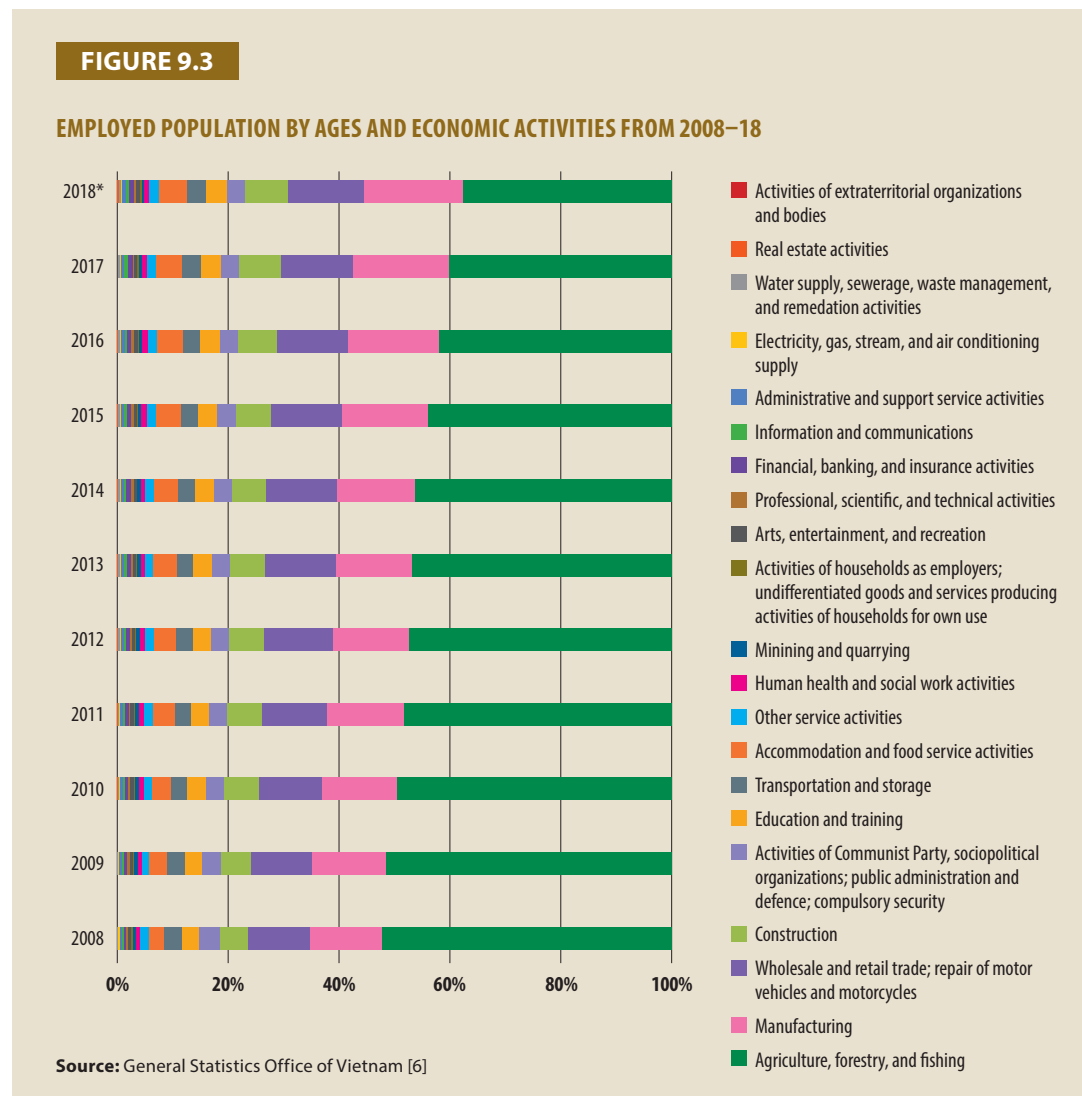


In order to increase Vietnam's labor productivity, the government introduced reforms which included organizing networks and improving governance capacity, elevating national competitiveness, and boosting the business environment. The government also made efforts in accelerating the economic structural change, i.e., restructuring of labor from agriculture to industry and services, especially from low value-added labor to high value-added labor; reforming the banking and financial sectors, prioritizing capital flows into more productive areas; and further reforming the state-owned enterprise sector. It also looked into supporting the private sector, especially by enhancing the spirit of entrepreneurship and creativity; continue attracting selective foreign direct investment; and continue extensive international economic integration [9].

### Initiatives to Meet the Needs of Future Industries

#### Policies on Economic Structural Change

The labor force in agriculture, fishery, and forestry sectors still account for a large proportion of the structure of industries in Vietnam (approximately 50%) while those needed for industries in the future, like information and communication as well as professional and scientific activities are still very low (see Figure 9.3)



In recent years, while the number of workers engaged in agriculture, forestry, and fisheries are large, the scale has narrowed with the restructuring of industries in Vietnam. As such, the number of workers in other industries are gaining, such as in processing and manufacturing, wholesale, retail, and repair of automobiles, motorbikes, and other motor vehicles.

By 2025, the proportion of labor force working in agriculture, forestry, and fishery is expected to be less than 33% of the total labor force nationwide. In 2035, the figure is expected to go down further to less than 25%, and another decade later (2045), it is less than 15% [7].

Vietnam's objectives in formulating national industrial development policies to 2030 and a roadmap to 2045 include:

- i) Industrial contribution to GDP to reach over 40%, processing and manufacturing enterprises in GDP to reach about 30%, and manufacturing to contribute over 20%
- ii) High tech industry in processing and manufacturing industries' value proportion to reach at least 45%
- iii) Value-added industries' growth rate to average over 8.5% per year, of which processing and manufacturing to average over 10%
- iv) Industrial labor productivity growth rate to average 7.5% per year
- v) Industrial Competitive Performance Index (CIP) to be among the top three in ASEAN countries

To achieve these goals, policies have been introduced, including developing industrial human resources. This encompasses orientation for institutions, education and training, welfare, and building and developing a team of entrepreneurs and workers in the new era [10].

Vietnam's readiness to participate in Industry 4.0, according to international assessments, is still low. World Economic Forum's (WEF) "Readiness for Future Production 2018" report classified Vietnam to be in the nascent group, which is weak in both production structure and production dynamics. This report ranked Vietnam at 53 for production motivation and 48 for manufacturing structure. The country's weakness is also seen in production complexity (ranked 72), technology and innovation (ranked 90), and human capital (ranked 70) [11]. In another study conducted by the ASEAN Secretariat in 2018 to assess member countries' readiness for Industry 4.0, Vietnam was 'fledgling' but was very close to the High Potential or Leading group [12].

In order to effectively take advantage of the opportunities provided by Industry 4.0, new economic growth model is required while implementing strategic breakthroughs and modernizing the country. The government also aims to develop a strong digital economy, transform the nation rapidly and sustainably based on STI, and develop high quality manpower. Tackling on enhancing the human resource, the orientation includes innovating content, knowledge-sharing, and training programs. Vietnam also looks into having policies to support retraining and form an open learning network as well [13].

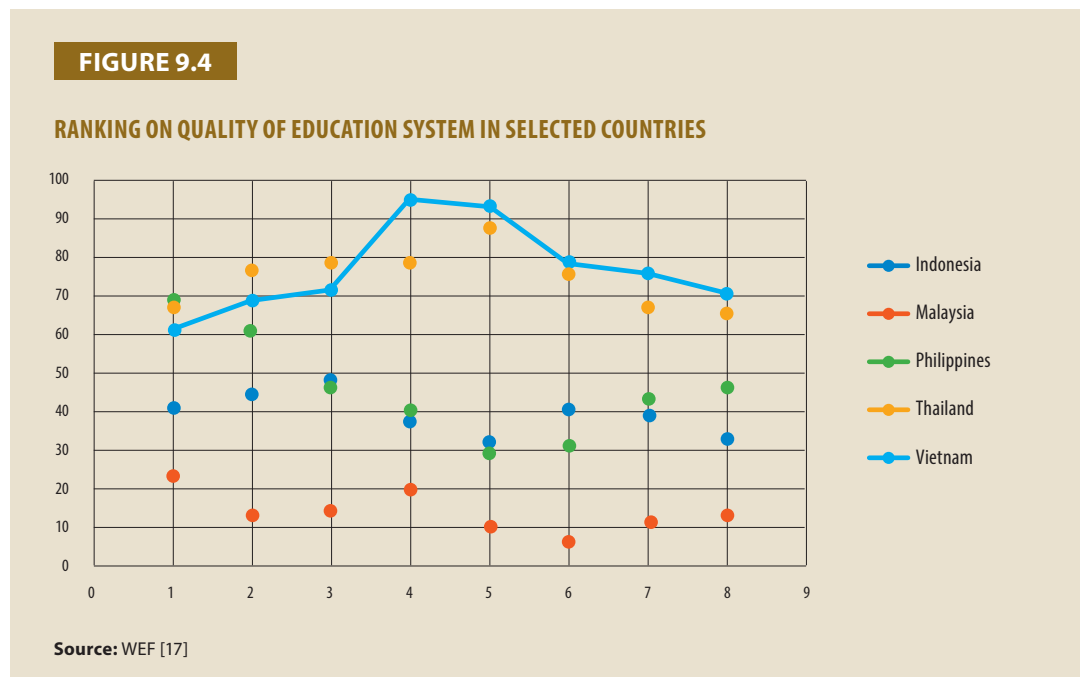
#### Policies on Education and Training

Vietnam's educational development looks into comprehensive innovation, education and training, meeting the requirements of industrialization, modernizing the conditions of socialist-oriented market economy, and integrating the international economic. These are in tandem with Vietnam's goals: educating the Vietnamese people to develop comprehensively and cultivate their potential and creativity; standardize, modernize, democratize, and socialize the people and human resources; and integrate education and training system that is at par with international standards. These goals are set for 2030 and Vietnam is striving toward it by first ensuring education reaches advanced levels in the region [14].

The government has also approved the strategic development of education 2011–20 to comprehensively standardize and modernize the education system.

These reforms aimed to improve the quality of education system, including informal education, life skills, creativity, practical training, foreign languages, and informatics. The targets were also to enhance the quality of human resources to better prepare for Industry 4.0. The education system also incorporates elements of social justice where lifelong learning opportunities are created for every citizen, gradually forming a continuously learning society [15]. The government of Vietnam has also approved the Vocational Training Development Strategy, with the overall goal that by 2020, vocational training will meet the needs of the labor market in terms of quantity, quality, occupational structure, and qualifications. Vietnam adopts the vocational training qualifications of developed countries in the ASEAN region and the world as preparation to form a skilled labor force that contributes to improving national competitiveness. The country also looks into universal training for employees, restructuring of employment, raising incomes, and reducing poverty firmly in ensuring the labor forces' social security [16].

WEF's report highlighted that the quality of the education system as well as higher education and vocational training in Vietnam has a hierarchical growth in recent years. However, when the system is compared to other countries in the region, the gap is not only apparent, but it is also quite wide. Figure 9.4 shows Vietnam's ranking in the quality of education system in selected countries.



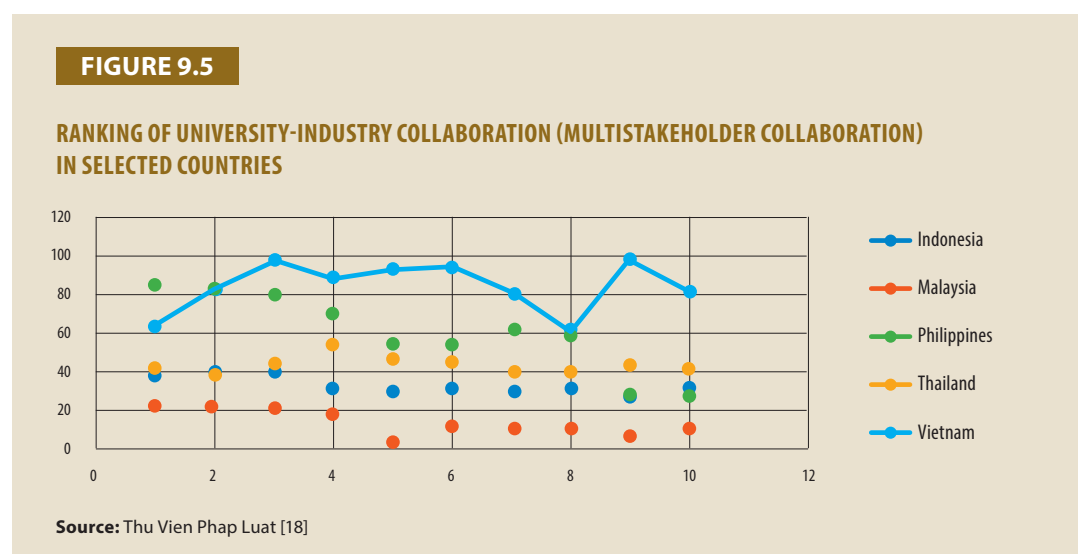
Strategies devised by the government for developing the quality of education in Vietnam begin by first focusing on preschool education, then its higher education, and finally, vocational from the current period to 2025. For preschool education, the Vietnamese government advocates strengthening and developing the network of schools and preschool classes suitable with local socioeconomic conditions, and meeting children's schooling requirements. Diversifying methods, improving the quality of nurturing, caring for, and educating children are carried out in accordance with regional and international preschool quality standards. The quality of preschool education is consolidated, maintained, and improved to prepare children below five years old to enter grade one [18].

For higher education, the government of Vietnam has made a drastic change on the nature and quality of training, where the focus is on scientific researches and specialized technology transfer. The tertiary

education system was designed to meet the needs of human resources, contribute to improving quality and productivity, promote innovative entrepreneurship, and enhance competitiveness with other countries [19]. For vocational education, the Ministry of Labor, Invalids and Social Affairs issued a resolution to continue to innovate and enhance the quality of vocational education in 2021 and orientations to meet the 2030 vision. The aim is to drastically increase the number of admissions, training quality, and efficiency of vocational education. The vocational education system is to be developed with improved methods and qualified trainers, and especially concentrating on training high-quality, application-oriented, and hands-on jobs in fulfilling the manpower needs through training. These are in tandem with improving labor productivity, growth quality, and competitiveness of the economy in the context of international integration and Industry 4.0 [20].

According to a World Bank report, Vietnam's higher education did not produce the expected results because the schools were separated from other core elements of higher education. In Vietnam, the current nonalignment is between higher educational institutions and companies in terms of skills training and research promotion. It also extends to research institutes, other higher education institutions (HEIs), and preparatory education institutions. Research shows that university graduates in Vietnam have good academic skills, but lack work skills; For example, about 70%–80% of graduates do not have the necessary skills for specialist and technical jobs [21].

WEF had also reported that among the Asian Productivity Organization (APO) member countries in Southeast Asia (except Singapore), the level of linkage between Vietnam's HEIs and the global platform as well as other Vietnamese's stakeholders is not tight, thus affecting the training quality of higher and vocational education institutions.



### Policies on Talent Acquisition

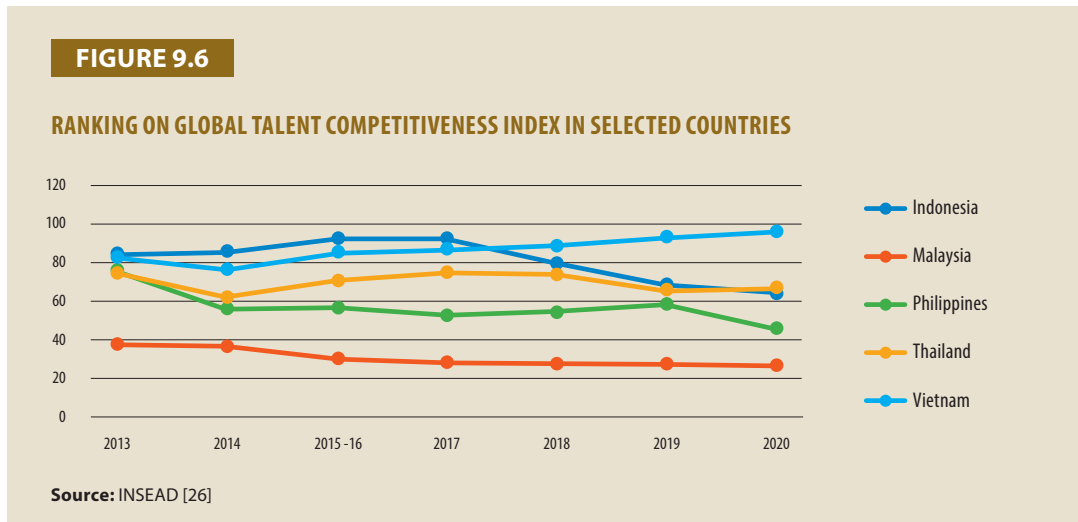
Recognizing that talent is one of the most important factors in determining national development and stability, Vietnam has introduced many policies on attracting and using both local and foreign talents, creating conducive environments and conditions, and adding high quality resources to the country in:

- i) Creating favorable conditions and working environment for individuals engaged in scientific activities and technology, maximizing its capacity, and enjoying benefits worthy of the results of scientific and technological activities
- ii) Ensuring the right subjects, creating a platform for talented people to perform important scientific and technological tasks to promote their talents, and enjoy benefits worthy of their assigned tasks



- iii) Guaranteeing resources to implement the policy of using and respecting individuals in scientific and technological activities. The state has issued policies to attract talents, such as in finances, facilities, professional development training, promotion opportunities, immigration, residence policies, etc. [22–25]

According to the report on global talent competitiveness index (GTCI), compared to other countries in the region, Vietnam's ranking is always lower than other countries in ASEAN (see Figure 9.5).



Vietnam's index is low due to two aspects. The first is the rank of sustainability, including the pension system, social protection, and talent retention being low. The other is the rank of lifestyle, including environmental performance, personal safety, physical density, and sanitation being relatively low.

A study by the Vietnam Association of Scientists and Global Experts (AVSE-Global) has shown that one of the barriers that stopped people from wanting to return is the worry on work environment, wages, quality of life, and social policies, such as insurance, pensions and the application of knowledge in the Vietnamese environment [27].

## Policy Recommendations

The policy recommendations are meant to identify and expand on the following:

- HRD vision: The workforce is empowered with new competencies by training and retraining to obtain advanced skills, knowledge, and attitudes as well as social responsibility for sustainable national development
- HRD mission: To establish the necessary framework in assessing human resource development needs in the context of national development and to establish mechanisms to ensure that these needs are met
- HRD goals: A framework for education and training; a demand-led approach for HRD; HRD integration; and roles and responsibilities of HRD partners
- HRD policies: Three pillars are identified to the success of the policies

### Pillar 1: To Strengthen Education and Training System

#### i) To renew teaching methodology and curriculum

In order to develop human resources to meet the requirements of the national industrial development policy by 2030 for the general education level, with a vision extended to 2045, Vietnam has advocated the deployment of a new training model for science, technology, engineering and mathematics (STEM), foreign languages, IT, digital content. To accomplish these goals, the content and method of teaching secondary education need to change with the positive learning model as follows:

- Students are responsible in managing their own learning. They must set clear learning goals and know what to do to accomplish them
- Students can come up with effective learning strategies. They know how to learn, improve their learning methods, and apply their knowledge creatively
- Students know how to cooperate with friends. They understand that learning is a social activity, that each person has a different perspective on the same issue, exchanging ideas, and sharing knowledge will make the learning more abundant and of quality
- Students are always encouraged throughout the learning process. They see the joy and excitement as well as the benefits of learning
- Teachers are instructors who create a learning environment and teachers learn with students

#### ii) To develop competencies among teachers and education managers

Developing the competencies of the teaching staff and educational managers is key to the successful implementation of Vietnam's education and training strategy. In order to train fully qualified learners, Vietnam launched a project to improve the capacity of lecturers and managers of HEIs to meet the requirements of comprehensive, radical education reform. The education and training period 2019–30 are established with the following tasks and solutions:

- Enhance training for lecturers of HEIs
- Attract scientists and doctorates who are qualified to be lecturers at Vietnamese HEIs
- Foster management capacity building for managers
- Foster professional and competency improvement for lecturers
- Innovate and complete policies [28]

#### iii) To upgrade infrastructure for education system

For preschool and general education, Vietnam has a scheme to ensure good facilities are available for preschool and general education programs in 2017–25. As such school facilities, tools, equipment, and textbooks need to be upgraded to implement effective learning for early childhood and general education programs [29].

#### iv) To enhance lifelong learning

Vietnam should formulate policies to develop and support innovative start-up models in universities. These types of models provide technology training and create ecosystems for innovative start-up businesses, and promote international cooperation in R&D and technology transfer. In addition, priority should also be given to the development and operation of industrial parks and high industrial parks as well as to organizations and individuals with outstanding scientific and technological works.

Renewing the state management mechanism for vocational training according to market demands and specific requirements of employers, include:

- Research and develop a set of standards on minimum skills required of various types of occupations at the request of employers. On that basis, encourage and create conditions for professional associations and other associations to develop their own set of professional standards applicable to their members as part of the occupational standards; guide schools, centers, and vocational training institutions in formulating training programs and methods to meet the above needs
- Bid or appoint contractors to provide labor training services in vocational training support programs at the request of enterprises, employers, and employers; encourage and create favorable conditions for enterprises and training organizations to cooperate and support each other in training and improving skills for their laborers
- Provide training funding for vocational training institutions and other institutions according to the outputs, such as the number of trainees trained according to specific needs of enterprises, the number of graduates reaching vocational standards, the number of graduates getting jobs within six months of graduation
- Encourage enterprises, especially large-scale ones, to train workers to meet the needs of themselves, their partners, and other related businesses
- Continue to expand the model of "coordinated vocational training"

Vietnam should redesign the curriculum, innovate teaching and learning methods, and improve soft skills for students. The objective assessment shows that the country's training system still has many shortcomings - facilities not meeting training requirements, training methods are still old-fashioned, lack of interactivity and practice, and learning does not go hand in hand with industry needs - resulting in the lack of skilled quality after training. Therefore, it is necessary to revamp the university curricula and contents are streamlined, modernized, and made practical. Not only the education and training system need reforming, priority must also be given to science and technology (S&T) and vocational training linked to employment and the needs of society. A multidisciplinary approach is required to make the reforms effective. University governance too needs to change and IT teaching methods should be adopted to impart effective teaching as well as enhance the quality of teachers and management staff.

In this digital age, universities must research and supplement specialties for training in ICT, blockchain, and artificial intelligence (AI). Vietnamese workers' soft skills, foreign language skills, teamwork, IT, and creativity are still limited. While many employees have been trained, employers take the time to retrain them when they do not meet the set requirements. One solution to this is to equip students with soft skills right from beginning, which is in school, by incorporating them into training programs and output standards for students. It is also necessary to encourage and promote self-study to students and to obtain knowledge and practical teachings from experts and entrepreneurs.

## **Pillar 2: To Make HRD More Responsive to the Labor Market and Government Priorities**

### **i) Build and improve the coordination between universities and stakeholders**

Stakeholders consisting of businesses/enterprises, research institutions, other universities, colleges and high schools are essential partners to universities as they bring their own set of advantages to the table. In terms of policies, the state needs to play a role as facilitator between universities and the various stakeholders. Further, it also has to create a mechanism of autonomy and self-responsibility for learning activities, finance, and personnel as well as seek international cooperation.

Universities need to have strategies to improve research capacity, create a brand name and reputation for themselves, and actively change businesses' perception on the benefits of investing in S&T activities as they stand to enjoy profitability, competitiveness, anticipation, and sustainable development. On the other hand, to stimulate affiliation and cooperation, universities need to build databases, invest in infrastructures to improve the quality of activities, and promote research products. Regular dialogues should be organized between these institutions of higher learning and stakeholders as to understand the needs of stakeholders and as a basis for establishing relationships. It is also necessary to promote the development of technology markets, organize and participate in industrial fairs, and develop forms of technology exchange under contracts, technology transfer, and technology services.

ii) Diversified ways to cooperate between universities and vocational schools with stakeholders

Currently, the methods of linking universities with stakeholders are to receive funding from stakeholders. The number of inventions and innovations transferred from universities to enterprises remains limited. There is a rapid increase in terms of cooperation agreements but the number of business partners is very low.

Cooperation with universities in recent years is mainly in training and labor supply activities for enterprises. On matters of scientific and technological research, it is still limited and does not keep up with the trends of the world. Universities that keep pace and comply with the needs of enterprises and markets have the opportunity to develop products under common ownership and for commercialization.

Diversification of education/training and curricula between universities and vocational schools with related parties need to be developed in the following direction:

- Enterprises receive students for practical training and internship
- Enterprises provide technological equipment and funding for teaching, scientific research, and training
- Recruiting scientists from universities to work in enterprises
- Representatives of related parties participate in the professional advisory council in universities
- Stakeholders jointly explore the commercial value of products and/or services that emerge from studies under technology transfer contracts
- Universities and vocational schools to establish companies (partially or wholly owned) to invest, research, and experiment as well as carry out test production
- Universities and vocational schools to build business incubation centers

### **Pillar 3: To Develop Talent Acquisition Plan**

The government has a national strategic scheme with several objectives to attract talents. The first is to research and propose specific policies and solutions on talent pool acquisition. With a legal framework in place, the right talents are to be discovered, trained, and fostered to participate in agencies, organizations, and units in the political system from central to grassroots levels.

Second is formulating the plan of attracting talents while ensuring objectivity, viewpoints, and directions of the party, the laws of the state, and quality assurance. The third and final objective is solutions and proposals from the plan must be feasible, with clear assignment of responsibilities and coordination among agencies, organizations, and units based on functions, tasks, and authority.

- i) Accelerating the process of refining policies and laws on talent and the use of talents

Vietnam has no specific regulation on concepts or criteria for recruiting talents. Therefore, the talent acquisition plan must have clarity in its concepts and ideas in ensuring uniformity and consistency in recruitment.

Policies and laws must ensure the flexibility to attract, value, and treat the talents accordingly. It is necessary to have the mechanisms in place to avoid misuse of policies for personal gain.

- ii) Strengthening the commitment of leaders in attracting, appreciating, and treating talents

In order to attract talents, the role of the leader is one of the most important aspects. A leader who is known to be reputable, fair, charismatic, has good morality and strong leadership qualities with a good plan in place to advance the country will attract talents easily. Talents should be given the freedom to do things differently as well as given the responsibility to carry out projects.

- iii) Creating a breakthrough in financial policies, social welfare policies, and a favorable working environment

In order to attract talents, the state needs to research and develop appropriate policies to honor and respect talents as well as appreciate their capabilities, forte, and knowledge. They must also be provided with a good remuneration package (financially and socially). The onus is on the host to create favorable working environments for their talents so that they will be devoted to their vocation. It is necessary to revamp the process and criteria for promotion and appointment of cadres so that talented workers can be in the right place and appropriate positions to quickly develop their talents. Talents need to be motivated so that they can do their best and maximize their capabilities. Further, the state needs to have more open policies on working conditions, not necessarily attaching talented people to "payroll" and binding them to a fixed job.

There is a need for more appropriate investment strategies for education in general, especially higher education.

### **Roles of Partners in Implementing HRD Strategies in Vietnam**

To deal with the HRD strategies, the involvement and buy-in of each partners in Vietnamese government should be as following:

#### **Public and Institutional Bodies**

- i) Government

- Facilitate the building of strategic relationship between HEIs, technical and vocational education institutions (TVEs), and businesses
- Support HEIs and TVEs to improve curriculum as much as possible
- Create national programs to encourage businesses to provide training and education opportunities for learners
- Formulate policies that encourage lecturers to provide consultancy services

- ii) Education, HEIs, and TVEs

- Develop rating policies and incentive mechanism to encourage lecturers to work with the corporate sector
- Revamp curriculum and programs to meet the demands of labor market
- Develop more short-term retraining programs for students and employees to increase their knowledge and skills as well as develop better attitudes

- Establish student service units that provide support from freshmen to graduates, and develop incubation and innovation centers
- Develop competencies of lecturers and employees to serve students as much as possible in terms of advisory, consultancy on career path, job-orientation, campus life, etc.
- Develop internship process professionally and control the process

iii) Private sector/industries

- Develop an information system on HEIs and TVEs
- Encourage career associations to expand the relationship with HEIs and TVEs
- Provide career opportunities as well as the requirement of industries to HEIs and TVEs
- Cooperate with HEIs and TVEs to guide learners to define their own career path, and consult with students to achieve their career goals
- Cooperate with HEIs and TVEs to design/redesign internship programs to ensure that the capacity of students meets the requirement of future industries

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# ABBREVIATIONS

<b>2u2i</b>	- 2 years @ University + 2 years @ Industry
<b>AI</b>	- Artificial intelligence
<b>AICTE</b>	- All India Council for Technical Education
<b>APINDO</b>	- Indonesian Employers Association
<b>APSDDC</b>	- Andhra Pradesh State Skill Development Corporation
<b>ASEAN</b>	- Association of Southeast Asian Nations
<b>B. Voc</b>	- Bachelor of Vocation
<b>BOI</b>	- Board of Investment
<b>BPO</b>	- Business Process Outsourcing
<b>BRRTC</b>	- Bosch Rexroth Regional Training Centre
<b>CAGR</b>	- Compound Annual Growth Rate
<b>CARS</b>	- Comprehensive Automotive Resurgence Strategy
<b>CFE</b>	- Committee on Future Economy
<b>CHED</b>	- Commission on Higher Education
<b>CII</b>	- Confederation of Indian Industry
<b>CoE</b>	- Center of Excellence
<b>COL</b>	- Critical Occupation List
<b>CSIP</b>	- Council for Skills, Innovation and Productivity
<b>CSR</b>	- Corporate Social Responsibility
<b>DepEd</b>	- Department of Education
<b>DGBAS</b>	- Directorate General of Budget, Accounting, and Statistics
<b>DICT</b>	- Department of ICT
<b>DOLE</b>	- Department of Labor and Employment
<b>DSD</b>	- Department of Skills Development
<b>DTI</b>	- Department of Trade and Industry
<b>EDB</b>	- Economic Development Board
<b>EOI</b>	- Export-Oriented Industrialization
<b>EP</b>	- Employment Pass
<b>EPU</b>	- Economic Planning Unit
<b>EPZ</b>	- Export Processing Zone
<b>ES</b>	- Enterprise Singapore
<b>ESC</b>	- Economic Strategies Committee
<b>FDI</b>	- Foreign Direct Investment
<b>FICCI</b>	- Federation of Indian Chamber and Commerce
<b>FPCCI</b>	- Federation of Pakistan Chambers of Commerce & Industry
<b>GCI</b>	- Global Competitiveness Index
<b>GDP</b>	- Gross Domestic Product
<b>GNI</b>	- Gross National Income
<b>GTCI</b>	- Global Talent Competitiveness Index
<b>GVA</b>	- Gross Value Added
<b>HCI</b>	- Human Capital Index
<b>HDI</b>	- Human Development Index

<b>HDR</b>	- Human Development Reports
<b>HEIs</b>	- Higher Education Institutions
<b>HRD</b>	- Human Resource Development
<b>I<sup>3</sup>S</b>	- Inclusive Innovation Industrial Strategy
<b>IDB</b>	- Industrial Development Bureau (under the Ministry of Economic Affairs)
<b>IHL</b>	- Institutes of Higher Learning
<b>ILMIA</b>	- Institute of Labour Market Information and Analysis
<b>IMF</b>	- International Monetary Fund
<b>IoT</b>	- Internet of Things
<b>IP</b>	- Intellectual Property
<b>IPP</b>	- Investment Priorities Plan
<b>ISI</b>	- Import Substitution Strategy
<b>IT-BPAP</b>	- IT-Business Process Association of the Philippines
<b>IT-BPM</b>	- Information Technology and Business Process Management
<b>ITeS</b>	- IT and Information Technology-enabled Services
<b>ITI</b>	- Industrial Training Institute
<b>ITMs</b>	- Industry Transformation Maps
<b>KADIN</b>	- Indonesian Chamber of Commerce
<b>KPVN</b>	- National Committee of Vocational Training
<b>LFPR</b>	- Labor Force Participation Rate
<b>LOCF</b>	- Learning Outcome-based Curriculum Framework
<b>MDGs</b>	- Millennium Development Goals
<b>MHRD</b>	- Ministry of Human Resource Development
<b>MIS</b>	- Management Information System
<b>MITI</b>	- Ministry of International Trade and Industry
<b>MOE</b>	- Ministry of Education
<b>MOHE</b>	- Ministry of Higher Education
<b>MoU</b>	- Memorandum of Understanding
<b>MRP</b>	- Manufacturing Resurgence Program
<b>MSME</b>	- Micro, Small, and Medium Enterprises
<b>NAVTTTC</b>	- National Vocational and Technical Training Commission
<b>NDC</b>	- National Development Council
<b>NDTS</b>	- National Dual Training System
<b>NIP</b>	- New Industrial Policy
<b>NP</b>	- Ngee Ann Polytechnic
<b>NSDC</b>	- National Skill Development Corporation
<b>NSQF</b>	- National Skill Qualifications Framework
<b>NSS</b>	- National Sample Survey
<b>NUS</b>	- National University of Singapore
<b>PCM</b>	- Participating Car Manufacturer
<b>PDP</b>	- Philippine Development Plan
<b>PISA</b>	- Programme for International Student Assessment
<b>PLWS</b>	- Productivity-Linked Wage Systems
<b>PPP</b>	- Public-Private Partnership
<b>PPP</b>	- Purchasing Power Parity

## ABBREVIATIONS

<b>PRs</b>	- Permanent Residents
<b>PSA</b>	- Philippine Statistics Authority
<b>PTMI</b>	- Philippine Talent Map Initiative
<b>S&amp;T</b>	- Science and Technology
<b>SDC</b>	- Skill Development Council
<b>SDI</b>	- Skills Development Institute
<b>SDG</b>	- Sustainable Development Goals
<b>SDP</b>	- Skill Development Program
<b>SMEDA</b>	- Small & Medium Enterprises Development Authority
<b>SMEs</b>	- Small and Medium Enterprises
<b>SSCs</b>	- Staff Selection Commission
<b>SSG</b>	- SkillsFuture Singapore
<b>STEM</b>	- Science, Technology, Engineering, and Mathematics
<b>STI</b>	- Science, Technology and Innovation
<b>TACs</b>	- Trade Associations and Chambers
<b>TESDA</b>	- Technical Education and Skills Development Authority
<b>TEVTA</b>	- Technical Education and Vocational Training Authority
<b>TP</b>	- Temasek Polytechnic
<b>TUSDEC</b>	- Technology Upgradation & Skill Development Company
<b>TVE</b>	- Technical and Vocational Education
<b>TVET</b>	- Technical and Vocational Education and Training
<b>UGC</b>	- University Grants Commission
<b>UNDP</b>	- United Nations Development Programme
<b>WEF</b>	- World Economic Forum
<b>WSQ</b>	- Workforce Skills Qualifications



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