

Education for Future Industries in Asia

Making Higher Education Fit the
Labor Market of Tomorrow



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 economies 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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EDUCATION FOR FUTURE INDUSTRIES IN ASIA

MAKING HIGHER EDUCATION FIT THE LABOR MARKET OF TOMORROW



EDUCATION FOR FUTURE INDUSTRIES IN ASIA
Making Higher Education Fit the Labor Market of Tomorrow

Dr. Jinho Choi and Dr. Kyung-Seok Min served as the volume editors.

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CONTENTS

FOREWORD	VII
EXECUTIVE SUMMARY	IX
INTRODUCTION	1
Abstract	1
Introduction	1
Research Background	3
Expansion of Higher Education	3
Labor Market Relevant Skills and Knowledge	3
Balance between Higher Education and Labor Market	4
Measurement Issues on Mismatching	6
Concerns over Performances of Higher Education	7
Research Issues and Objectives	7
Research Framework	9
Report Structure	14
References	15
CASE STUDY 1: HIGHER EDUCATION AND SKILL DEVELOPMENT FOR FUTURE INDUSTRY IN INDIA	18
Abstract	18
Introduction	18
The State of Higher Education in India	20
Growth of Open and Distance Learning System	22
Potential of Online Education	23
Corporate Sector Initiatives in Education Sector	24
Skill Development Ecosystem in India	26
Skill Requirements by 2022	31
Industry 4.0 and Positive Government Interventions	31
Challenges in Skill Development	34
Concluding Remarks and Policy Recommendations	35
References	37
CASE STUDY 2: HIGHER EDUCATION FOR HUMAN RESOURCE DEVELOPMENT IN REPUBLIC OF CHINA	43
Abstract	43
Introduction of Case Analysis	43
Economic Development	43
Development in Higher Education	45
Focus and Scope of Case Analysis	49
Identification of Current Initiatives	51
Analysis of Strategies and Ways Forward	52
Discipline-crossing	52
Innovativeness	53

Employability	53
Global Mobility	54
Information Literacy	54
Civic Engagement	55
Conclusion	55
References	56
 CASE STUDY 3: CHALLENGES & OPPORTUNITIES FOR HIGHER EDUCATION IN SINGAPORE	 58
Abstract	58
Introduction	58
The Future Economy and Labor Market	59
Significant structural shifts in the economy and labor market	59
Industry Transformation Program	61
Higher Education in Singapore	61
Phases of Education Policy	61
Structure of the Higher Education System	62
Rising Demand for University Education	64
Towards an Integrated, yet Flexible and Diverse Education System	64
Lifelong Learning and SkillsFuture	65
Lifelong Learning in Singapore	65
The SkillsFuture Movement	66
Expansion of the Higher Education Sector	68
New Universities with Distinct Specializations and Applied Degree Pathways	68
Liberal Arts Education to Nurture Critical and Independent Thinkers	69
Work-learn Programs to Strengthen the Nexus between Education and Industry	69
Lifelong Learning Units in Higher Education Institutes to Coordinate CET Efforts	69
Efforts by Higher Education Institutes to Support Lifelong Learning of Graduates	70
Conclusion	70
References	71
 CASE STUDY 4: HIGHER EDUCATION FOR FUTURE INDUSTRY IN THAILAND	 74
Abstract	74
Introduction	74
Focus and Scope of Case Analysis	75
Thailand Economic Development	75
Development of Higher Education in Thailand	77
Analysis of Current Situation	79
Directions from MHESI	79
Pursuit of World-Class Quality through EdPEX	81
Identification of Current Strategies	82
Thailand 4.0 Initiatives	82
5 First S-Curve Industrial Clusters	84
5 New S-Curve Industrial Clusters	84
EEC Initiatives	86
Analysis of Strategies and Ways Forward	86
Alignment and Challenges Ahead	86

Conclusion	90
References	91
CASE STUDY 5: HIGHER EDUCATION FOR FUTURE INDUSTRY OF VIETNAM	94
Abstract	94
Introduction	94
Current Situation of Higher Education System	96
Development Process of Higher Education in Vietnam	96
Current Situation of Higher Education of Vietnam	98
Higher Education and Vocational Education is Not Connected	101
Disconnection between Different Decrees and Legal Framework	101
Disconnection between HEIs and Research Institutes	102
Education Sector and Labor Market are not Connected	102
The Political Ideology in the Context and Culture of the Society	102
Labor Market for Future Industries of Vietnam	103
Identification of Current Higher Education Strategies of Vietnam	107
Strategies at International Level	107
Strategies and Regulations at National Level	107
Analysis of Strategies and the Way Forward	117
Building HE Strategy 2021-2030	118
Enhancing Legal Framework and System Level Governance	118
Pushing up Autonomy vs. Accountability	118
Qualifications and National Education System Structural Framework in Vietnam	119
Enhancing Vietnamese Quality Assurance Framework	119
Enhancing Linkage with Industry and Business Communities	120
Conclusion	120
References	121
CONCLUSION	126
Research Results of Case Studies	126
Trends of higher education and economic development	126
Balance between higher education and labor market	127
Overall Lessons Learned	130
Limitations of the Research and Suggestions for Improvement	132
References	133
LIST OF ABBREVIATIONS	134
LIST OF TABLES	138
LIST OF FIGURES	139

FOREWORD

The Asia-Pacific region has been successful in advancing socioeconomic development over the past few decades. Poverty has halved and more people have reached middle-class status faster than in any other region over the same period.

One of the key success factors is the ability to adapt to the modern global economy. However, this growth trajectory may not continue. Evolving trends such as technological innovation and demographic transition, among others, are redefining work and production processes. They are causing major changes in the world of work, which may lead to mass job losses, if not anticipated and managed appropriately.

Adapting to changes in the structure of work will require transformation of tasks and related skills. One path forward for the APO members is to develop new models of skilling and education to meet the demands of a quickly changing labor market. This publication presents insights on how some countries in the region are preparing the current and future workforce for new industries.

In this context, higher education is regarded as the key for developing the knowledge, skills, and competencies relevant to future economic activity. It is increasingly expected to play a central role in responding to the challenges of a rapidly evolving labor market. However, the higher education institutions themselves are diverse: from traditional ones to polytechnic, employer-oriented, and online models. Given this, greater understanding of how the higher education can continue to be relevant to labor markets is essential, especially as they continue to evolve.

This publication analyses trends in higher education systems and the labor market in five APO member countries, evaluates how these institutions foster relevant knowledge and skills for workers, and identifies policy approaches to enhance the relevance of higher education for future industry. The participating countries are: India; the Republic of China; Singapore; Thailand; and Vietnam.

The APO hopes that this report will help policymakers and those involved in higher education and worker skilling to adapt to the requirements of future industries.

Dr. AKP Mochtan
Secretary-General

EXECUTIVE SUMMARY

This project, commissioned by the Asian Productivity Organization (APO), aims to identify the knowledge gap and better understand labor market-relevant outcomes of higher education. The effort provides a basis for arranging educational practices and initiatives in accordance with the future industrial changes. Instead of seeking a one-size-fits-all solution, country-level case analyses of five APO member countries identify strong and weak points of higher education performance in terms of graduates' preparation for the workforce, and provide better government and public initiatives for the future industry.

The five APO member countries have achieved rapid growth in higher education and economic sectors during the last several decades. Above all, developing human resources through the higher education system is crucial for Asian countries that are seeking sustainable economic progress and competitive advantages for their future society. The skills and competency required to perform job tasks will change significantly in the future society, as it shifts from traditional manufacturing to knowledge-based high technology industry. The case studies of five countries in this report highlight the importance of cooperation between higher education and labor market to prepare for rapid changes in economic and social structures.

Depending on each country's economic maturity and infrastructure, we have presented the government initiatives in various forms. As a concrete way to link higher education with the labor market, they frequently emphasize the capability of university faculties, the industrial sector's participation in development of curriculum, student learning engagement, domestic quality control system of higher education, and adoption of international evaluation standards.

To propel and shape higher education for the future industry four policy recommendations are proposed.

- Policy endeavors to link universities and industries needs to be actualized and confirmed by the implementation of specific educational programs. As known, higher education graduates with work experience during their study have a smoother transition to the labor market. There is a need to align the skill development initiatives with the demand of the industry, and higher education system should promote its practical curriculum models in the form of design thinking, hands-on project, and work-based learning and internship. Policy efforts have to support the dissemination of best educational practices and mandate their implementation at the operational level.
- It is necessary to check student participation thoroughly in various teaching-learning activities delivered through industry-academy linking programs. Student-centered and active learning programs can produce graduates with the right mix of professional skills and the general competency. Participatory activities of students and the institutions involved in education, referred to as student learning engagement, can be used to assess the accomplishment of the curriculum, linked to the industry aiming to prepare for a future society.

- There is a need to examine students' competency and skills required in future society objectively. Work-based learning for specific skills and general competency can be encouraged through performance agreement between higher education institutes and public authorities. Given the importance of the university's quality that adds values as an educational achievement, it is necessary to adopt a college students learning performance assessment at the policy level. Further, participation in international evaluation programs like Assessment of Learning Outcomes in Higher Education (AHELO) can help Asian country's review their educational performance and compare it with international standards.
- It is important to seek cooperation among Asian countries based on social, economic, and cultural proximity to build practical accreditation system and disseminate experiences of innovative programs in higher education. This will help achieve outcomes relevant to the labor market and strengthen accreditation standards of higher education by facilitating interaction among Asian countries, as attempted in this project.

It is important to refer to the exploratory rather than the confirmatory nature of the country-level case studies in this volume because the analysis of higher education and economic policies have been made based on literature research, mainly public documents of national policy. The APO, which has exercised excellent leadership for economic development and cooperation in Asia, should continue with its effort of sponsoring collaborated research and works that stimulate educational practices of higher education. Regional platforms founded by the APO will contribute to build common grounds to take pilot approaches across countries and share labor market relevant outcomes of higher education for the future industry.

INTRODUCTION

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Abstract

Globally, sustainable economic development is being pursued as an ongoing challenge to increase the percentage of well-paying jobs in the workforce, and simultaneously decrease earning inequalities across individuals, regions, and countries. Experts insist that sustainable growth can be achieved by educational system that can respond to the skill demand of technological changes in a knowledge-based society and combat economic inequality. While education helps individuals get a better personal and social life, the quality of higher education would be sustainable if it balances the supply of college graduates with labor market needs. In order to deal with the balance between higher education and labor markets in Asian countries, this chapter, as an introduction, consists of four sections: research background, research issues and objectives, research framework, and report structure.

Introduction

Sustainable economic development is being pursued globally as an ongoing challenge to increase the percentage of well-paying jobs in the workforce and simultaneously decrease earning inequalities across individuals, regions, and countries [1]. Achieving the Sustainable Development Goal of United Nations (UN), which includes 17 sub-goals, is a difficult task not only for developed countries that have already reached high growth, but also for late runners who have to accomplish both growth and sustainability at the same time.

Meanwhile, most experts have insisted that success of the educational system that can respond to the skill demand of technological changes in a knowledge-based society and combat economic inequality [2] can help achieve sustainable growth. Experts also emphasize that fostering basic skills, inclusiveness, and equality in primary and secondary education ensures that more members of a society participate in school education. In the higher education that nurtures advanced talents, the quality of education performance, which conforms to social innovation and technological changes, plays an important role. While formal education is important for students in obtaining skills and attitudes to contribute to their society, the expansion and quality of higher education can be sustainable if it properly reflects labor market needs in its teaching and learning practices [3].

According to Humane Resource Development Theory [4, 5], people expect higher education institutes to efficiently provide students, i.e., the future employees, with technical, discipline-specific knowledge or skills, and general cognitive/affective competencies. In other words, graduates with academic degrees have better chance of getting a secure job, higher-earning premium, and better working conditions. These are important factors affecting personal well-being and the level of job satisfaction.

The number of participants and those completing higher education is steadily increasing worldwide, as more high school graduates, driven by personal and social interest, have started to pursue higher studies. Also, various new types of higher education institutes have been established in response to the market demands, which are linked to regional, national, and global economic developments. Thus, the current trend calls for the expansion of the financial support for higher education, both in public and private sector. The Asian Development Bank (ADB) has specifically suggested that the government should allocate more resources to encourage higher education in general, rather than concentrating on small numbers of prominent institutes [6].

Alongside the growing interest in technological development, expansion of higher education, and educational accountability in the Industry 4.0 era, there are various studies on the scientific and empirical verification of higher education performances and the effectiveness of educational policies. For example, the Organization for Economic Co-operation and Development (OECD) has investigated the outcomes of higher education by reviewing various forms of the educational system and stages of economic developments in OECD member countries.

The OECD's 'Enhancing Higher Education System Performance' project has been carried out to benchmark higher education performance among its member nations and to provide an analytical framework of country review reports on education initiatives and practices [7, 8]. The benchmarking approach, as a research methodology, is a practical way to provide cross-country comparisons of each country's education system and industry structure. Recently, a series of country review reports focusing on labor market relevance and the outcome of higher education [9, 10] have acknowledged the higher education systems and practices in Norway and Mexico.

While education helps individuals maintain a personal and social life of higher standard, the quality of higher education would be sustainable if it balances the supply of college graduates with the labor market needs. The fourth Sustainable Development Goal (SDG 4) of education, which aims to ensure inclusive and equitable quality education and promotes lifelong learning opportunities for all, can be followed properly only when it is combined with SDG 8 that focuses on decent work and economic growth [11]. The Asian Productivity Organization (APO) launched a project to conduct the research on 'Higher Education for the Future Industry' to improve the understanding of the correspondence between higher education and the labor market in the APO member countries. It invited National Experts from five APO member countries to implement country-level case analyses on current and future directions of higher education under the circumstances represented by rapidly changing economic environment.

A research coordination meeting was convened 19-21 November 2019 in Taipei, Republic of China to discuss the overall research scope and framework. The chief experts, national experts, and the APO officers driving the research attended the meeting. While the chief experts provided direction of the research and main policy issues that the APO intended to achieve, the national experts presented their country-level reports as a part of the preliminary research activity. The country-level reports actually helped participants to get a common understanding about the balance between higher education and the labor market among the APO member countries. The experts discussed the scope of higher education and future industry and agreed to take into account the International Standard Classification of Education 2011 (ISCED) classification and the direction of industry 4.0 proposed by World Economic Forum (WEF). They recommended that the country-level reports should focus on specific, favorable education practices of each country aligning with national policy initiatives to improve the outcome of higher education in terms of the labor market relevant skills and competency.

This chapter, an introduction, consists of four sections that provide the overall direction of the project: research background, research issues and objectives, research framework, and report structure. The country-level case analyses, from chapter two to six, provide more information and practical evaluation of the balance between higher education and labor market.

Research Background

Expansion of Higher Education

Higher education has continuously expanded in line with the economic developments as well as technology and knowledge. The United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS) indicated that world over students enrolling in tertiary education more than doubled from 95 million in 1999 to 207 million in 2014 [8, 12]. The OECD also projects that by 2030, over 300 million people in the 25-34 year age group will have tertiary qualification in OECD and G20 countries, as compared to 137 million in 2013 [13]. Two underlying factors explain the expansion of higher education enrollment in all continents.

Overall, the demand for higher education has soared, attributing to growing upper-secondary school graduate rates, as it is assumed that academic degree guarantees secure job, higher-earning premium, and better working condition, which are important factors that shape individuals personal well-being. The uptake of higher education is also linked to the expectation of social mobility through educational attainment. This is especially true in the developing countries. The second factor relates to high-technology-oriented economic changes; the so-called knowledge-based society demands more qualified employees who have obtained professional knowledge and skill through higher education. In other words, universities provide the opportunity to study and develop the most advanced theories and, and the academic findings of universities provide the basis for technological innovations and industrial developments.

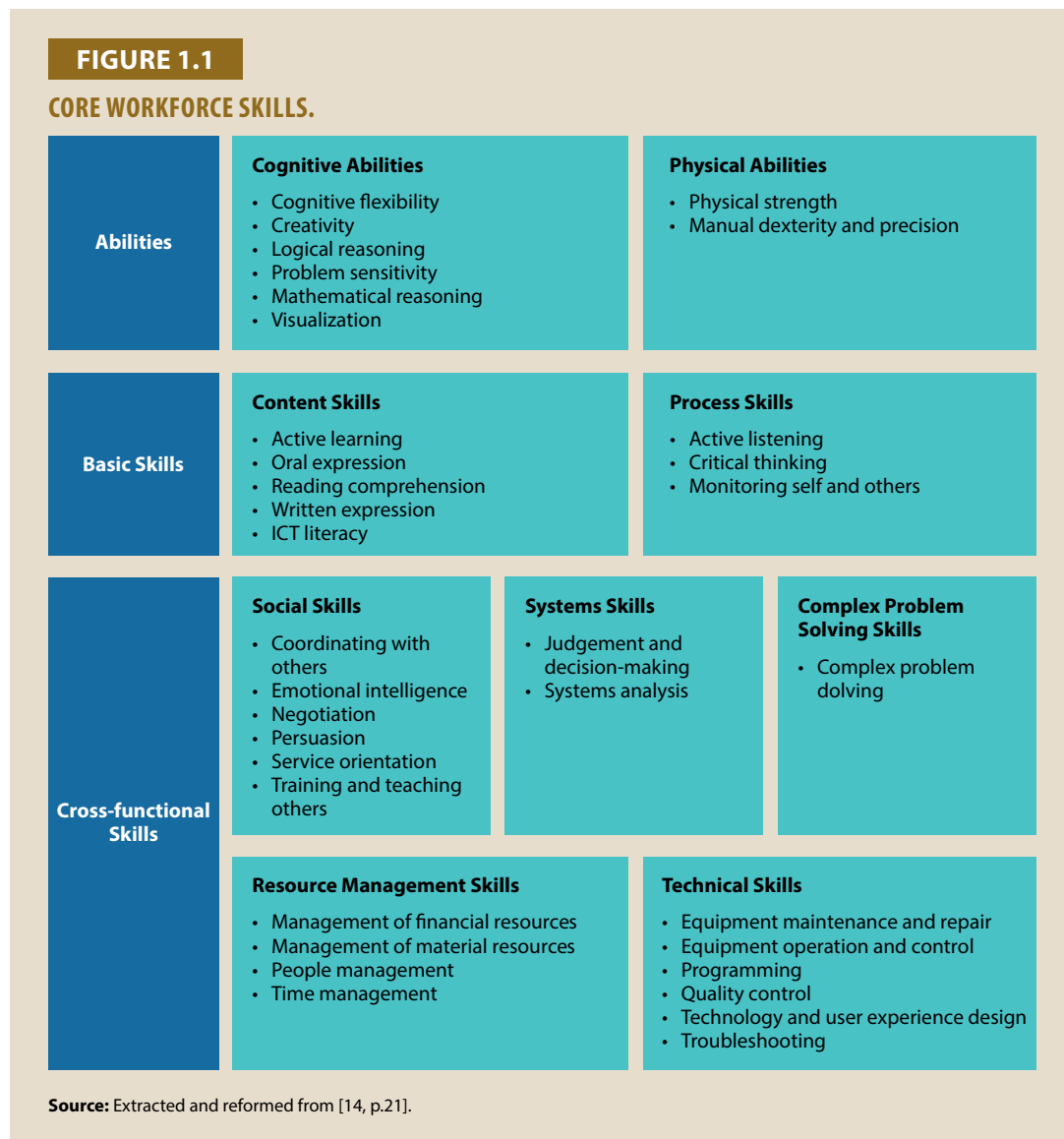
Further, while traditional higher education has been represented by research-oriented universities and academic ivory towers, the expansion of higher education led to the emergence of new educational institutions. With various titles such as junior and community college, polytechnic university, and on-line cyber university for life-long education, these new types of institutes share some common characteristics; the orientation to employers and integration with the labor market. The diversity of institutional types is due to the growing numbers of private education providers rather than public-sector education institutes to meet the market demand for practical education. Private institutions are found more often in the Asian region due to the relative shortage of public funding and steep demand for higher education, while the countries are experiencing rapid economic development [12].

Labor Market Relevant Skills and Knowledge

Higher education helps produce graduates equipped with technical, professional, discipline-specific knowledge and skills. Thus, academic degree, diploma, or certificate, and qualifications are treated as verifications for labor market since they prove that the person is qualified for certain jobs and tasks. In addition, higher education provides more general ability, referred to as transversal skills [7, 8], which are needed to perform job-related tasks in various workplace settings. These transversal skills, frequently called competencies, include a range of complex combinations of cognitive, social, and attitudinal dimensions such as literacy, problem-solving, analytical reasoning and critical thinking. This also includes attributes like communication skills, teamwork, perseverance, leadership, and self-organization, etc. The knowledge required by the post-industrial

society and drastic change in technology are linked with the role of higher education, as well as various demands on the capacity of graduates accordingly.

The skills required for new employees can be classified under three categories: expertise and the core competency that needs to be acquired through formal education and job trainings [14]. As shown in Figure 1.1, besides looking for simple knowledge-driven basic skills like reading, comprehension, and oral expression, companies are increasingly demanding transformable social and cognitive competencies to suit variety of situations, such as active learning, and complex problem solving, etc.



Balance between Higher Education and Labor Market

The debate on the return of schooling is associated with a specific skill and competency in a more general sense, concerning curriculum and fields of study. The connection between higher education and industrial sector is directly affected by education policies at a national level along with the characteristics of individual universities. It also varies in form according to the stage of diffusion of higher education and the target industrial fields in each country. Complex issues related to labor

market relevance and outcomes of higher education, which encompass individual choices, educational practices in institutions, higher education system, and public policy, have been a subject of academic research for several decades.

Figure 1.2 lists the types of mismatch between higher education and labor market in earlier research [15]. It shows that despite the use of various terms that indicate the problems with the performance of higher education resulting from its expansion, the key issue of the balance between higher education and labor market in prior studies can be summed up as “does the higher education properly supply the capabilities required by the industry?”

FIGURE 1.2	
TERMINOLOGY AND DESCRIPTION OF SKILL MISMATCH.	
Skill Shortage (surplus)	Demand (supply) for a particular type of skill exceeds the supply (demand) of people with that skill
Skill Gap	Type or level of skills is different from that required to adequately perform the job
Vertical Mismatch	The level of education or qualification is less or more than required
Horizontal Mismatch	The type/field of education or skills is inappropriate for the job
Overeducation (undereducation)	Workers have more (less) years of education than the job requires
Overqualification (underqualification)	Workers hold a higher (lower) qualification than the job requires
Skills Obsolescence	Skills previously used in a job are no longer required and/or skills have deteriorated over time

Source: Extracted from [15, p7]

Much literature on the balance between higher education and labor markets has focused on schooling years or educational attainment in terms of labor supply. It connects employability and salary with completed schooling years, which is frequently called ‘vertical mismatch’ between education and labor market [16, 17, 18]. Vertical mismatch is sometimes dealt with as over (under)-education and over (under)-qualification. Business or economics-oriented research, consider educational attainment, like degree and diploma, as a proxy for the knowledge and skills that an employee may possess. In other words, employers regard formal education as an indicator of the candidates’ productivity potential and as information for screening. The traditional measures of outcome of higher education included earnings, employment rates, and job status (permanent or temporary). An assumption set in advance is that higher education provides useful skills and knowledge and college graduates, on an average, can earn more and attain more stable jobs than less-educated individuals. It focuses on the average market outcomes but the average may mask significant variation by definition.

On the other hand, a recently emerging literature has paid more attention to fields of study (or type of institutes, attending university or vocational college), concerning how and why college major

matters in terms of employability, wage range, and productivity of employees [19]. For example, it is believed that courses in health science and engineering increases the likelihood of graduates getting jobs in their own field, while there seems to be less chance of employability in humanities, arts, and social sciences. This is horizontal differentiation (e.g., skill gap or skill shortage). The main issue is whether college majors (fields of study) for graduates are linked to the current job. Here, it has been assumed that college students select their major with the expectation of finding a job related to the subject and equip themselves with relevant skills and knowledge [20]. It can be said that not all higher education graduates enjoy the benefits of the labor market such as high wages and stable jobs. Labor outcomes vary significantly from person to person, and specific information on market returns depends on the fields of study [7, 8].

Measurement Issues on Mismatching

Prior studies on the results of higher education and its relevance to the labor market do not present consistent research results. For example, while some studies are concerned about the seriousness of over-education and under-skilling because of the expansion of higher education, others argue that the mismatch is addressed adequately through transfers to other suitable jobs or promotions within the same workplace. Some studies also argue that vocation- and technology-oriented education is a form of higher education that properly reflects employers' needs. Others emphasize the importance of the general cognitive and social ability in higher education that can be transferred to a variety of job environments because technical-oriented education may cause rapid skill obsolescence [17, 19]. The discrepancy of these findings is attributable to what measurement indicators have been utilized along with various factors like individual characteristics, education systems, and economic structures that affect educational performance.

Measurement indicators employed to investigate the relevance of higher education to the labor market are distinguished in respect of subjective and objective definitions [19]. The first, subjective measurement is typically a report of the workers' own evaluation. Workers report the degree of match between their job and education, ranging from 'highly related' to 'not related at all'. An example of a question aiming to measure the match is "Considering the relationship between your work and your education, to what extent is your work related to your college major? Was it closely related, somewhat related, or not related?" In other studies, with a more open-response survey, respondents have specified the job requirement related to the field of education attended. Hence, employees are classified as being matched when component of the job requirement is closely related to their major.

The objective measurement of linkage evaluates the relationship between worker's educational degrees and the job tasks. Evaluators usually use the ISCED and International Standard Classification of Occupations (ISCO) codes to classify educational levels and occupational destinations, respectively. Experts define match according to a normative correspondence between educational qualification and occupational requirement. A normative correspondence table presents the relation between the skills or knowledge of a college major and the job requirement. When the knowledge set of an educational qualification and the occupation does not correspond, there is a mismatch. It is objective by definition of experts' professional evaluation. While some occupations and educational qualifications can fit into more than one category, too many categories increase the complexity of evaluation criteria for assessing a match between higher education and labor markets.

Despite the advantages of subjective and objective measurements described above (e.g., ease of measurement and simplicity of aggregation), both the employee and the public require a more

direct measurement of the knowledge and skills of the individual graduates; they want to use the information to determine the effectiveness of education and for employment decision-making. Accordingly, OECD is developing Assessment of Higher Education Learning Outcomes (AHELO) to measure general skills and specific skills (for engineering majors) of college graduates [21], along with the Program for International Assessment of Adult Competencies (PIAAC) [22, 23].

Concerns over Performances of Higher Education

Reports indicate that employment rate of people with tertiary degree is about nine percentage points higher than those who have upper secondary education, and earnings are an average 57% higher in OECD countries [11, 16]. In addition, people with a higher education degree are more likely to participate in public life, take care of the environment, and be in good health. Furthermore, the national GDP and labor productivity have risen significantly with an increased portion of the workforce that has acquired tertiary degrees [24, 25]. This also means higher the proportion of more competent employees in terms of knowledge and skills, the higher is the productivity of each enterprise, which in turn plays a positive role in improving the productivity of the national economy as a whole.

Questions related to its productivity have, however, been raised about the efficiency of higher education. Even though there have been relatively high earning premiums and employment rates, these benefits are diminishing and being distributed unevenly according to the field of study (e.g., engineering and health science vs. humanities and arts) [7, 19]. Some higher education graduates have trouble finding jobs best suited to their qualifications and expectation, while there is a continuous shortage of qualified graduates who can work in the emerging industrial fields. Doubts have also been raised about the current system and content, and whether the practice of higher education is appropriate for the future industry, and the fourth industrial revolution.

Besides, employers frequently highlight the flaws and blame the higher education system since new employees are not equipped to perform productive job tasks when they earn degrees [8]. In other words, employers complain that while they need talents with practical capabilities and ability to function on the ground, the university education only provides traditional and academic knowledge without responding to the social changes. Besides, there are concerns whether the contents taught in higher education overlaps with tasks required in the job [19], or whether the skill and knowledge obtained by the graduates during higher education is aimed to help them complete their job tasks in the new technology-oriented environment.

This project aims to identify this knowledge gap to understand labor market-relevant outcomes of higher education better. The effort provides a basis for arranging educational practices and initiatives in accordance with the future industrial changes. Instead of seeking a one-size-fits-all solution, the country-level case analyses, presented throughout chapters 2 to 6, discuss the current context of educational and economic status. It also identifies strong and weak points of higher education performance in terms of the graduates' readiness for the workforce, and suggests better government/public initiatives for the future industry.

Research Issues and Objectives

This report covers both successful and unsuccessful cases of higher education practices and government initiatives in five APO member countries. It focuses on how universities and governments are cooperating to increase the relevance of higher education system for the labor

market as a way to meet the diverse needs of the future industry. The main question, however, is about the most effective way to create a balance between higher education and labor markets. The study aims to evaluate the pathways of school to work in India, the Republic of China, Singapore, Thailand, and Vietnam with concrete case analyses. This report attempts to make comparisons between the countries, considering the fact that participating nations have their own educational systems and economic structures. It also focuses on various higher education credentials (skills and competency), which may show different linkage strengths with labor markets.

The main objective of the report is to:

1. Analyze the trends of higher education systems and the labor market of each country.

Each chapter of the country-level case analysis provides information on the status of higher education and economic structure. The APO member countries have a unique context of social, economic, and cultural development and the case studies discuss the transformation in major higher education policies and economic changes during the last 20 years to provide the background information. It also explores the level of coordination between higher education and the labor market, and the relevance of competency and skills in higher education to the job market and economic changes in each country.

2. Evaluate the balance between higher education institutes that foster the development of labor market-relevant knowledge and skills.

A country-level case analysis provides and evaluates concrete approaches of higher education institutes that successfully fosters labor market relevant knowledge and skills such as overall curriculum structure (e.g., competency-based curriculum) and specific learning/teaching programs (e.g., design thinking program, work-based learning and internship, partnership with employers, and extra-curricular activities). Educational programs that are effectively linked to the labor market can be discussed in terms of the program's objectives, educational contents, and student performance (e.g., employability), depending on the actual level of implementation (period, participating students, etc.)

3. Identify approaches of government/public sectors on a policy level to enhance the relevancy of higher education to labor markets.

Since higher education systems and practices are related to or affected by government regulation and initiatives, the country-level case analyses include public initiatives and national policy options (e.g., performance-based funding, school regulations, and university evaluation systems) that could help improve the labor-market relevant outcomes of higher education. Since education policies suggests a general direction guiding the academic program of higher education institutes and works as a social factor affecting the educational performance, its positive and negative aspects can be discussed at the same time.

4. Sum up lessons concluded in the case study of each country and come up with recommendations for the next step.

With respect to the significance and limitation of higher education system, current educational practices, and public initiatives considering the labor market demands, the necessary efforts and directions are discussed for the future industry. The five countries involved in the study have their own educational and economic environment, and seek education policies and implementation accordingly. Rather than relying on a consistent analysis of a single data, the benchmarking application, which evaluates the best practices

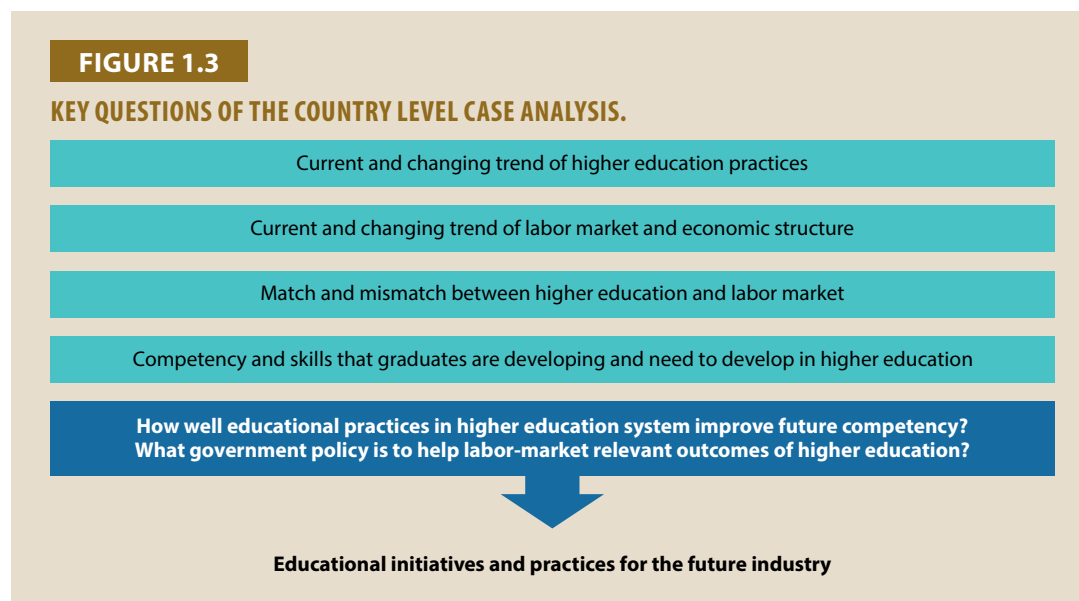
of individual countries, may provide a practical basis for presenting the direction of higher education for future industries.

It is important to highlight the expertise of the participating countries contributing to this project. Nation experts of the five APO member countries analyze the balance between the labor market and educational system and provide suitable and typical case examples for the future industry in each chapter of a country-level case analysis.

Research Framework

While higher education affects individuals and society, there have been concerns about whether graduates are ready or qualified to join the rapidly changing society characterized as Industry 4.0. Labor market-relevant outcomes of higher education need to ensure returns to individual efforts and public investment in higher education.

The country-level case analyses in the report aim to improve the linkage between higher education and the labor market by discussing successful model case studies from APO member countries. The main question provided in the previous section, addresses the initiatives and educational practices needed for the better linkage between higher education and the labor market. The question has been answered by investigating the current trend of higher education and economic development, and evaluating the balance between educational practices and the labor market in terms of competency and skills that graduates develop. Figure 1.3 shows the main idea and issues discussed in this report.



As shown in Figure 1.3, the country-level case analysis was conducted to achieve the following:

- Discuss the current practices and changing trends of higher education, and economic development to provide contextual information.
- Evaluate the linkage between higher education and the labor market to illustrate current concerns on a gap between them (e.g., horizontal mismatch and vertical mismatch).

- Provide successful/unsuccessful cases of educational practices and government initiatives to improve more labor market-relevant competency and skills.
- Propose necessary initiatives and practices of higher education to develop labor market-relevant outcomes.

To deal with the issues mentioned above, the country-level case analysis treats scopes of the analysis presented as the following.

1. The levels of higher education

Higher education is central to human capital development and plays a critical role in the success of economic innovation [11, 14]. Higher education institutes raise the primary and secondary teachers as well as college lecturers, who can support the overall educational system of a country. Furthermore, they train the high-level technical and administrative personnel needed for various social and private sectors [6]. Traditionally, higher education refers to a research-oriented university attended by the competitively selected elites. The recent trends of higher education, however, include expansion of participation, diversity of college types, and active internationalization [21].

As the history and culture differ by country, analyzing higher education systems of each nation is somewhat complex. Within the national or regional educational systems, different educational institutes possess different missions and perform a variety of educational practices. To fulfill the purpose of the country-level case analysis, the scope and functions of higher education must be defined in advance.

In general, the formal education system consists of three stages: primary education, secondary education, and higher education. Similarly, the higher education sector includes three aspects of education, research, and social engagement. This report mainly focuses on educational activity of higher education, which is operationalized as teaching and learning. In addition, the scope of higher education is defined as ISCED 2011 [26] shown in Table 1.1.

TABLE 1.1

EDUCATIONAL LEVELS UNDER THE ISCED 2011 CLASSIFICATION.

ISCED Classification	Definition of Each Level
ISCED 4	Post-secondary non-tertiary education Serves to broaden rather than deepen the knowledge, skills and competencies gained in upper secondary level. Programmes may be designed to increase options for participants in the labour market, for further studies at tertiary level, or both. Usually, programmes at this level are vocationally oriented.
ISCED 5	Short-cycle tertiary education Often designed to provide participants with professional knowledge, skills and competencies. Typically, they are practical-based, occupation-specific and prepare students to enter the labour market directly. They may also provide a pathway to other tertiary education programmes (ISCED levels 6 or 7). The minimum duration is 2 years.
ISCED 6	Bachelor's or equivalent level Designed to provide participants with intermediate academic and/or professional knowledge, skills and competencies, leading to a first degree or equivalent qualification. Typical duration: 3-4 years full-time study.

(Continued on next page)

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ISCED Classification	Definition of Each Level
ISCED 7	Master's or equivalent level Stronger specialisation and more complex content than bachelor's level. Designed to provide participants with advanced academic and/or professional knowledge. May have a substantial research component. Programmes of at least five years' duration preparing for a long first degree/qualification are included at this level if they are equivalent to a master's level programmes in terms of their complexity and content.
ISCED 8	Doctoral or equivalent level Designed to lead to an advanced research qualification. Programmes at this level are devoted to advanced study and original research, and exist in both academic and professional fields.

Source: Extracted and reformed from [3, p19]

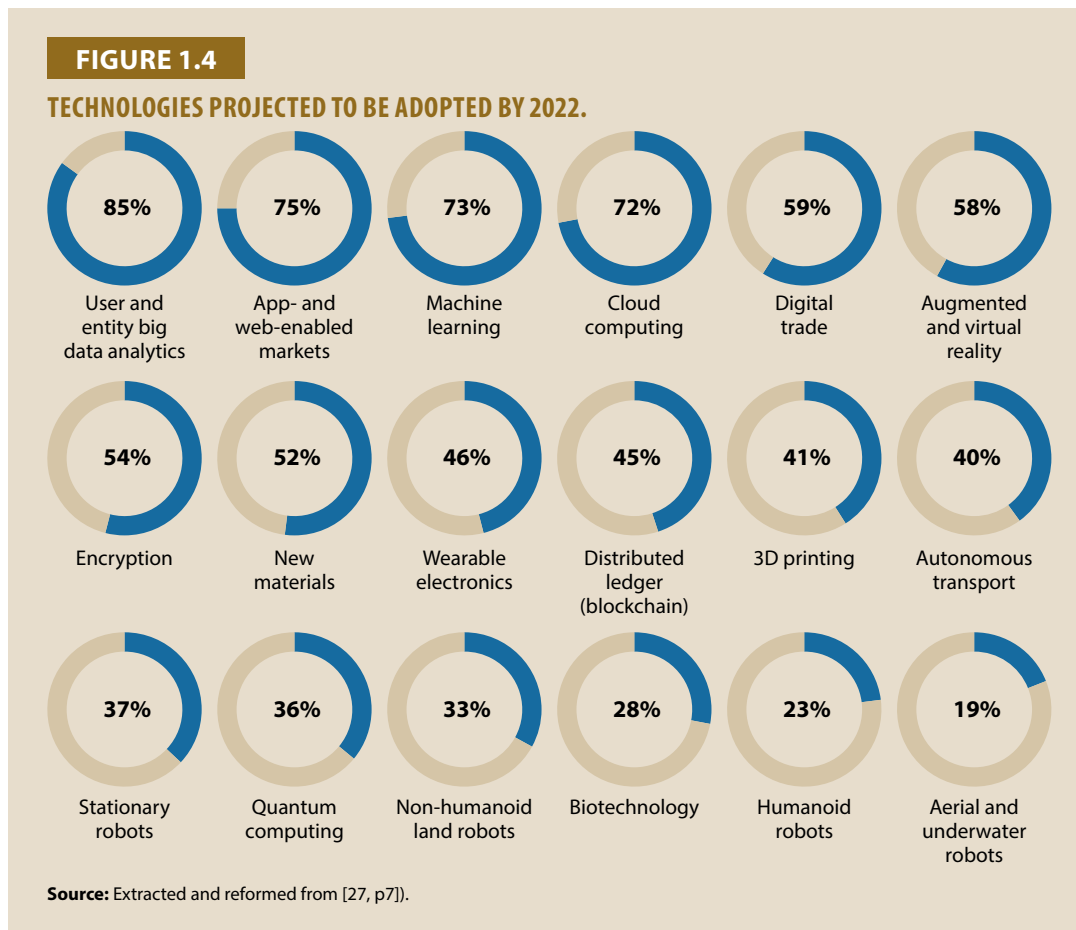
Usually, higher education or tertiary education covers levels 5-8 of Table 1.1 [26], which encompasses college education of levels 5 and 6, and graduate schools of levels 7 and 8. It has been pointed out that institutional differentiation within higher education is crucial to evaluate educational outcomes [16]. Considering the fact that educational policy initiatives mainly focus on college education, country-level case analyses concentrate on levels five and six in this project. However, some country-level case analyses may include level 4, which reflects the current popularity of practical, vocational education along with academic degrees in the university.

2. The future industry and Industry 4.0

The term 'Fourth Industrial Revolution' was coined at the Davos World Economic Forum (WEF) in January 2016. The WEF, in its report 'The Future of Jobs' [14, 27], had predicted that the fourth industrial revolution will come sooner or later, resulting in social transformation such as job topography changes. It also defined the fourth industrial revolution as an era of technological convergence in which the boundaries of physical, digital, and biological spaces are diluted based on the digital revolution (the third industrial revolution).

Even though Industry 4.0 refers to the emergence and diffusion of a range of new digital industrial technologies, the concrete definition of it is not clear. People usually associate several new technologies like big data and analytics, autonomous robots, simulation, horizontal and vertical system integration, the internet of things (IoT), cybersecurity, cloud computing, additive manufacturing, and augmented reality with Industry 4.0. According to the 'Future of Jobs' survey conducted by WEF [27], 85% of business executives worldwide are likely to adopt big data analytics while 75% of them intend to expand app-enabled markets by 2022 (see Figure 1.3). Hence, the Fourth Industrial Revolution is expected to affect the skill capacity of the workforce and change key capabilities required by the industry, increasing the demand for advanced cognitive competency such as complex problem-solving skills [14].

Various technological developments are discussed as the Fourth Industrial Revolution, which itself is mentioned as characteristic of the future industry. The new era may be prepared and presented in various forms depending on the level of development of individual countries since each country is defining the prospect and plans for future social changes based on its own economic and social contexts. Accordingly, the country-level case analysis of this study aims to present the changes reflected in the next 5-10 years by upskilling and restoring activities based on the overall trends of Industry 4.0, or the unique industrial development directions of each country as an image of the future industry.



3. Competencies and skills relevant to labor market

Rapid advancements in technology and the increase of automation in emerging economies may limit the task of the traditional workforce in the manufacturing sector and demand more complex set of knowledge and skills. Labor market-relevant skills are defined as “the bundle of knowledge, attributes, and capacities that enable individuals to successfully and consistently perform an activity or task, and that can be built up and extended through learning” [28]. These are categorized into three broad skill sets [7], as below.

- **Discipline-specific skills:** This reflects a solid theoretical and practical understanding of the subject matter.
- **General skills:** This involves understanding, interpretation, analysis, and communication of complex information, and the ability to apply this information in a specific context.
- **Social and emotional skills:** These help manage emotions and work together to achieve common goals.

In addition, OECD refers to transversal skills as a broader category, which combines cognitive, social, and emotional skills. It also emphasizes that the skillsets should work well in conjunction with personal attitudes and values such as adaptability, curiosity, and openness. In the same vein, the focus of higher education and the labor market deals with student’s transitional competency

rather than traditional knowledge and skills. The word ‘competency’ was coined by David McClelland in 1973, who insisted that intelligence is not the only measure of human ability [29]. Competency is defined as the common characteristic of higher task performers in the industry and is more than just knowledge and skill. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skill, knowledge, and attitude) in a particular context [30]. It is also categorized into three broad sets.

- Using tools interactively is using a wide range of tools to interact effectively with the environment: both physical ones such as information technology and socio-cultural ones such as the use of language.
- Interacting in heterogeneous groups is to engage with others.
- Acting autonomously is to take responsibility for managing their own lives and to situate their lives in a broader social context.

The WEF expects that the skills required to perform a job will change significantly in the future society. Its survey result showed that about 58% of core skills required for jobs would remain the same (so-called skills stability), but there will be an average 48% shift in the required workforce skills by 2022; analytic thinking and active learning will continue to grow in prominence, while technology design and programming remain high on importance [27].

In this project, we focus on competency, which can be learned through higher education and is required in the labor market as shown in Figure 1.4. The comparison of Figure 1.1, Figure 1.4, and Figure 1.5 may provide a clearer definition of the capabilities and skills required in the industrial and educational sectors. However, the country-level case analysis may deal with specific skills and knowledge that are relevant to certain types of educational practices and selective industrial domains.



4. Individual characteristics, educational practices, and government initiatives

The balance between higher education and labor markets is not a simple outcome of the school curriculum or teaching activities, but influenced by the structure of the labor market related to the stage of economic development, public/government policy on the supply of education, and the demand of industry [31]. While higher education within a country is institutionalized quite variously, the pathway from higher education to job opportunity also varies across countries. For example, labor market-relevance and outcome of higher education in country-level case analyses have to be dealt with taking into account several layers such as factors of individual, institution, and government initiatives.

First, as is well known individuals decide to go for higher education based on several personal reasons such as future wages, personal preferences, possibility of graduation, and a combination of these with uncertainties. Individual exogenous determinants of selecting education and job include gender, age, race, marital status, disability, and so on. Further, the most important individual factor that predicts educational and occupational outcomes, but not studied well, is the ability of an individual. Graduates with high educational achievement, treated as a proxy measure of ability, tend to find jobs that relate to their field of study [21, 31] easily. Here, individual competency, obtained in higher education, is also differentiated into two categories as mentioned before, specific skills that can be applied to limited vocational tasks immediately and general skills that are transferable to a broad range of vocational tasks. In this project, individual exogenous determinants (gender, age, and race) are understood in the context of social culture as well. Individual competency, field of study, study program's prestige, and type of education will be dealt with either as an individual or institutional determinant according to the aggregation level.

Second, there are various ways of teaching and learning in higher education in order to build labor market-relevant competency and skills. Employers insist that they could reduce the cost of selection and allocation of new employees by hiring candidates who have experienced workplace-based or internship training in their organization or a related company [32]. Educational practices involve not only specific studying programs, but also many factors (e.g., student admission policy, reputation and competition of institutes, legal and regulatory) indirectly affecting the outcomes of higher education. This report mainly focuses on concrete educational practices: curriculum design, innovative learning and teaching programs, work-based learning and internship, extra-curricular activities, contract departments or institutes, academic and career support systems, and so on.

Third, higher education has gone through unprecedented growth during the last few decades and it is anticipated as one of the paths through which students can succeed in their life. Political interest has increased in enhancing individuals' social and job careers, developing incentives for efficiency in schooling, and mobilizing resources to meet the rising demands of the labor market. Consequently, the higher education systems and practices are related to or affected by government regulation and initiatives. The country-level case analysis examines how government and institution policy-makers build policies to improve the relevance of higher education to the labor market, which includes performance-based funding, regulations, and evaluation systems. Thus, the case study may provide an answer to the question on what aspects of policy lever and operation would improve or constrain the balance between higher education and the labor market.

Report Structure

This report consists of three parts; Chapter 1 serves as the introduction, Chapters 2 to 6 present five country-level case analyses and Chapter 7 provides the overall conclusion. All chapters pursue the

common theme, the relationship between higher education and labor market in general or specific sense and the chapters are complete on its own. Hence, readers may accept this report, either as a whole or select any particular chapter. This introductory chapter provides an overall background, key ideas and goals, and the analytic framework of this volume. It also includes the topic and practical context of the relationship between higher education and future industry.

The following five chapters present specific case studies conducted in each of the participating countries: India, the Republic of China, Singapore, Thailand, and Vietnam, in alphabetical order. Each of these five chapters includes background information on economic status, higher education system, the focus of government initiatives, exemplary cases of educational practices to keep balance with future labor markets, and further directions of educational and economic innovation. It intends to ensure the coherence and integrity of each chapter but there is a degree of autonomy, with which each national expert has adapted the cross-national ideas and approaches.

The final chapter is the conclusion of this report, which articulates the main findings of each country, major insights on the direction of higher education for the future society and recommendations for further practices and research.

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CASE STUDY 1

HIGHER EDUCATION AND SKILL DEVELOPMENT FOR FUTURE INDUSTRY IN INDIA

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Abstract

India's growth story is full of upheavals in the post-independence period. India intends to become a USD five trillion economy by 2025. The growth phases (whenever they have been experienced) indeed have been propped up by its human capital. A series of factors like globalization, demographic changes, Industry 4.0, and more recently COVID-19 have altered the context of India's future growth. Review of literature shows that the education system and skillsets which served India well in the past are no longer adequate to support the economy and its future growth requirements and, therefore, consequent skill shortages and skills mismatches will have wider ramifications at micro and macro levels. The study proposes overhauling and reorientation of the education system and emphasizes on the critical role of skill development. It also focuses on other measures, varying from spreading awareness and ensuring participation of all stakeholders in skill development to evidence-based policymaking, from developing institutional mechanisms to drawing lessons from the best practices of other countries, collaboration at a regional level, and to developing mechanisms for mutual recognition. All these appear to be crucial for bringing youth closer to the labor market and provide the industry with the future-ready workforce.

Introduction

One of the largest economies of the world in terms of area and with population of over 1.3 billion, India is one of the largest democracies in the world. Its growth story is indeed very interesting and full of upheavals in the post-independence period. After growing at a slow rate of about 3.4% on an average during the first three decades of planning (from the 1950s to 1980), which is termed as the "Hindu Rate of Growth", the Indian economy registered a relatively higher growth rate of 4.8% per annum during the 1980s. The New Economic Policy heralded a new era for India and the consequent transformation of the economy enabled it to experience still a higher growth rate of 5.6% during the 1990s and 7% per annum in the subsequent decade. The growth story of India appeared to be unstoppable [1] and it survived two global crises of 2008 and 2011. The growth it experienced during this period indeed was indicative of the resilience it had developed [2, 3]. Despite political and economic paralysis [4, 5] in the aftermath of the crisis

during 2011-12 and the relatively poor performance of the national economy, India has shown resilience and has also made tremendous progress in its socio-economic growth in the first two decades of the 21st century. India's growth story was termed by the World Bank to be remarkably stable and resilient in the 1990s [6] and it had projected that India's GDP growth rate would accelerate to 7.3% and 7.5% in 2018-19 and 2019-20, respectively. In terms of GDP (PPP) ranking, India occupied the third rank in 2019, while People's Republic of China (PRC) and the USA were ahead as per the World Economic Outlook, 2019 of the International Monetary Fund (IMF). On a nominal basis, India was ahead of the UK and France bagging the 5th rank (after USA, PRC, Japan, and Germany) [7]. Though the economic growth has decelerated in India¹, it is still projected to be the fastest growing economy in Financial Year (FY) 2020 amongst the G-20 nations. India intends to become a USD five-trillion economy by 2025 [8]. With the recent outbreak of the novel coronavirus, initially it was felt that there would be limited impact on India's economy [9] but subsequently it has been realized that the extraordinary scale of disruption caused by COVID-19 is unprecedented² and a fiscal lift will be required [10]. India's economy shrank by 8% in the year 2020 as per International Monetary Fund (IMF) and India's growth prospects were upgraded to 12.5% in 2021 [11]. But the IMF is likely to revisit the growth forecasts for India due to resurgence of COVID-19 cases in India [12].

Indeed, growth acceleration and sustenance are crucial to achieving goals of employment generation, poverty alleviation, relieving rural distress, and helping India achieve high-income status but it also requires addressing various structural problems first. National and international trends in the form of the growing middle class, rapid urbanization, demographic changes, technological changes, and digitization offer immense opportunities, but they also pose several challenges. The Fourth Industrial Revolution, encompassing technologies, is transforming the way we live and work. The integration of the new digital technologies like artificial intelligence (AI), robotics, and internet of things (IoT) into the industrial processes has been termed as the Fourth Industrial Revolution. Indeed, these technologies carry a huge potential of raising productivity and improving well-being. Therefore, nations need to prepare their labor force to leverage these technologies.

Since the development of human capital depends on the national education systems, there is a need to look at the state of education, especially higher education system and skill ecosystem of India, in order to assess whether the country has future-fit education and skill ecosystems. Since higher education is the main provider of skills, the government should understand the crucial role of education in building quality human capital and the need to foster a good match between the demand and supply of skills. This requires continued impetus for the institutional reforms at all levels of education. With the right policies in place, the country can move on to a higher growth trajectory. This can help in faster reduction of poverty and transform India into a prosperous state.

The present study has been undertaken against this background. The structure of the study follows a section approach, where Section II focuses on the state of higher education in India and Section III on the country's skill development ecosystem. Section IV focuses on national policies for reorienting the skill ecosystem to meet the evolving economic and labor market demands in India. Section V includes the conclusion and policy recommendations.

¹ In a written reply to the Lok Sabha, the lower house of Parliament in India, Finance Minister Nirmala Sitharaman said that although the country's economic growth had decelerated, its economy continues to be the fastest-growing among G-20 nations and the goal of becoming a USD five-trillion economy will be achieved by 2025.

² The COVID-19 shock has been compared to the global financial crisis of 2008 in some articles. For example, see: <https://dnyuz.com/2020/03/17/coronavirus-shock-vs-global-financial-crisis-the-worse-economic-disaster/>. Accessed on 29 March 2020.

The State of Higher Education in India

The role of education in facilitating social and economic progress is well recognized. It is empirically verified that education impacts economic growth positively [13a, 13b, 14]. Thus, we clearly understand that the improvement in the basic life skills, learning skills, and livelihood skills comes from the betterment in the quality education, which in turn positively impacts the quality of life for the population around, the strengthening of education is also inevitable for the achievement of rapid and inclusive growth. In the present era of information and technology, primary education might be of utmost importance but not without ignoring the necessity of higher education [15].

“Higher education is of paramount importance for social and economic development. Institutions of higher education have the main responsibility for equipping individuals with advanced knowledge and skills required for positions of responsibilityestimated social rates of return of 10% or more in many developing countries also indicate that investments in higher education contributed to an increase in labor productivity and to higher long term economic growth essential for poverty alleviation.” [16]

Given the ongoing changes like progressive globalization, technological advancements, urbanization, and demographic transformation, jobs are becoming more and more skill-intensive. These changes underline the growing importance of education in general and higher education in particular in building up and improving human capital. The need to foster a good match between the demand and supply of education as well as skills has also been brought to the fore by these changes.

India has one of the largest higher education systems in the world in terms of number of institutions and the third largest in terms of enrolment [15], after PRC and the USA. India’s higher education is managed by the University Grants Commission (UGC) and the various councils. The UGC, established by a statute in 1952, has been empowered to promote and coordinate university education in India and also approve grants to them. There are different regulatory bodies to manage the professional courses, like Medical Council of India (MCI), Bar Council of India (BCI) and All India Council for Technical Education (AICTE), among others.

It can be observed from Table 2.1 that at the time of independence, India had 20 universities and approximately 500 colleges. The total enrollment then stood at 0.2 million [17]. By the end of the Tenth Plan (2002-07), there were 378 universities, 18,064 colleges, faculty strength of 492,000, and an estimated enrolment of 14 million students. As per All India Survey of Higher Education (AISHE) 2018-19 [18], there were 993 universities, 39,931 colleges, and 10,725 standalone institutions, with a total enrolment of 27.2 million in important programs at undergraduate and postgraduate levels in the regular mode.

There are variety of higher education institutes in India. Of the 962 universities, there are 548 general universities, 142 technical, 63 agriculture and allied, 58 medical, 23 law, 13 Sanskrit, and nine language universities. The rest 106 fall under other categories. India’s total enrolment in higher education is estimated to be 37.4 million, 19.2 million males and 18.2 million females. Overall, women constitute 48.6% of the total enrolment. Also, while the Gross Enrolment Ratio (GER)³ in higher education is 26.3%, the GER for male population is 26.3% and that for females is 26.4%. Distance enrolment constitutes about 10.62% of the total enrolment in higher education sector [18].

³ GER implies total enrolment in higher education, regardless of age, expressed as a percentage to the eligible official population (18-23 years) in a given school year.

TABLE 2.1

GROWTH OF HIGHER EDUCATION INSTITUTIONS AND ENROLMENT IN INDIA.

Year	Universities	Colleges	Total HEIs	Enrolment (in millions)
1947-48	20	496	516	0.2
1950-51	28	578	606	0.2
1960-61	45	1,819	1,864	0.6
1970-71	93	3,277	3,370	2.0
1980-81	123	4,738	4,861	2.8
1990-91	184	5,748	5,932	4.4
2000-01	266	11,146	11,412	8.8
2005-06	348	17,625	17,973	10.5
2007*	378	18064		
2018-19**	993	39931		

Source: Government of India. Higher Education in India and GATS: An Opportunity, consultation paper, Department of Commerce, September 2006 [17]; Joshi S. Sustainable Development of Higher Education Sector in India for Catalyzing Services-driven Growth; The Maastricht School of Management Working Paper No. 2012/01, 2012 [15]; Government of India; All India Survey on Higher Education (AISHE), New Delhi: Ministry of Human Resource Development, Department of Higher Education, 2019[18].

Note: * Data from Eleventh Five-Year Plan 2007-12, Vol. II, p.22. Government of India.

** Data from AISHE2019.

962 of the 993 universities responded on the AISHE web portal for the survey.

Not only has the number of institutions expanded in India, as shown in Table 2.1, the enrolments of tertiary students also increased in the post-independence period. Overall, the enrollment of tertiary students has increased 183.17%, up from 9.69% in 2001 to 27.44% in 2017. However, India lags behind on the GER front as compared to that of developed countries. Among developing nations, Brazil, Indonesia, and the Philippines had a higher GER⁴ [19] than India. It is important to point out here that despite the mammoth higher education system, demand far outstrips supply in India. Three factors that explain the excess demand are: proliferation of higher education institutes, huge demand for education abroad, and higher rates of return in higher education sector [20]. The lag in supply of public higher education is accounted for by high fiscal deficit⁵, which stood at 6.5% of the GDP in 2009-10 and is pegged at 3.8% of GDP for 2019-20, competing demand for budgetary resources for the primary and secondary sectors, regulatory framework, and biases against the private sector supply [20]. The underinvestment in education [15, 21] gets reflected in abysmally low expenditure (as percentage of GDP) on overall education (3.2% of GDP in 2007 and 2.7% in 2017-18) and higher education (less than 1% in 2007).

Since the demand for higher education is very high, it is essential to explore additional sources of finance to expand the existing capacity, improve upon it, and align the system with global standards. Besides, the current education system faces the challenge of availability, accessibility, affordability, accountability, accreditation, and quality⁶ along with equity [15]. As has been pointed out in a

⁴ GER in tertiary education stood at 51% for Brazil, 36.44% for Indonesia, and 35.48% for the Philippines.

⁵ Fiscal deficit refers to a shortfall in the government's revenue compared with its expenditure.

⁶ Only 3 Indian institutes were among the top 200 universities in the world in 2018 as per the annual Quacquarelli Symonds (QS) World University Rankings 2018 (see <https://www.rediff.com/getahead/report/career-3-indian-institutes-in-q-s-top-200-universities-in-the-world/20170609.htm>. Accessed on 2 March 2020). ; and IT boom plateauing, admissions dip, many Tamil Nadu engineering colleges face closure (see <https://indianexpress.com/article/education/it-boom-plateauing-admissions-dip-many-Tamil-Nadu-engineering-colleges-face-closure-6294616/>. Accessed on 2 March 2020).

recent World Bank Report [22], 55% of Indian children suffer from learning poverty⁷. Though the aim of achieving universal education is commendable, the focus of the government must shift to building solid foundations in classrooms across the country. In fact, poor quality of schooling can lead to the human capital deficit that can have major cost impact for future prosperity of India since human capital is the most important component of wealth globally⁸.

Growth of Open and Distance Learning⁹ System

In addition to the regular mode of learning, the Open and Distance Learning (ODL) mode occupies a special place in India's higher education system because of its major contribution in enhancing the gross enrolment ratio and making it more inclusive. The education through this mode has been made available and accessible to the disadvantaged groups such as those living in remote and rural areas, working people, and women. The government has tried to meet the demands of lifelong learning by providing an innovative system of university-level education which is both flexible and open in terms of methods and pace of learning, including the combination of courses, eligibility for enrolment, age of entry, conduct of examination, and implementation of the programs of study; this has become a necessity in the knowledge society. Besides, it provides an opportunity for building skills and qualifications. It is important to point out that India has one of the largest distance education (DE) systems in the world, second only to PRC. Box 1 lists the institutions that offer DE at present in India.

Institutions Offering Distance Education in India

- National Open University
- State open universities
- Distance education institutions (DEIs) at:
 - Institutions of national importance
 - Central universities
 - State universities
 - Deemed to be universities
 - State private universities
- DEIs at standalone institutions:
 - Professional associations
 - Government institutions
 - Private institutions

Source: UGC. ODL: What, Why and How. <https://ugc.ac.in/deb/pdf/ODLwhatwhyandhow.pdf>. Accessed on 27 March 2020.

⁷ The World Bank described learning poverty as "being unable to read and understand a simple (age-appropriate) text by age 10".

⁸ In high-income OECD countries 60% of total wealth is made up of human capital, says the World Bank.

⁹ Open learning covers a wide range of innovations and reforms in the education sector that advocates flexibility to the learner concerning entry and exit; pace and place of study; method of study and also the choice and combination of courses; assessment and course completion. Distance Education (DE) is an umbrella term that describes all the teaching-learning arrangements in which the learner and the teacher are separated by space and time. It is a mode of delivering education and instruction to learners who are not physically present in a traditional setting of a classroom. Transaction of the curriculum is effected utilizing specially prepared materials (self-study learning materials) that are delivered to the learners at their doorstep through various media such as print, television, radio, satellite, audio/videotapes, CD-ROMs, and the internet. Also, a technological medium replaces the inter-personal communication of conventional classroom-based education that takes place between the teacher and the learners [12].

The ODL system in India has registered a phenomenal growth over the last six decades. It accounts for 25% of the total enrolments in higher education. It is commendable that from a single institution in 1962 (Delhi University), India now has over 250 ODL institutions, including central, state, deemed to be, and private universities, along with many standalone institutions. These ODLs are currently controlled by the UGC. Today, ODL has enormous growth potential in India because of excess demand for tertiary education, constraints on public budgets, and availability of low cost ICT tools and data connectivity [23].

Potential of Online Education

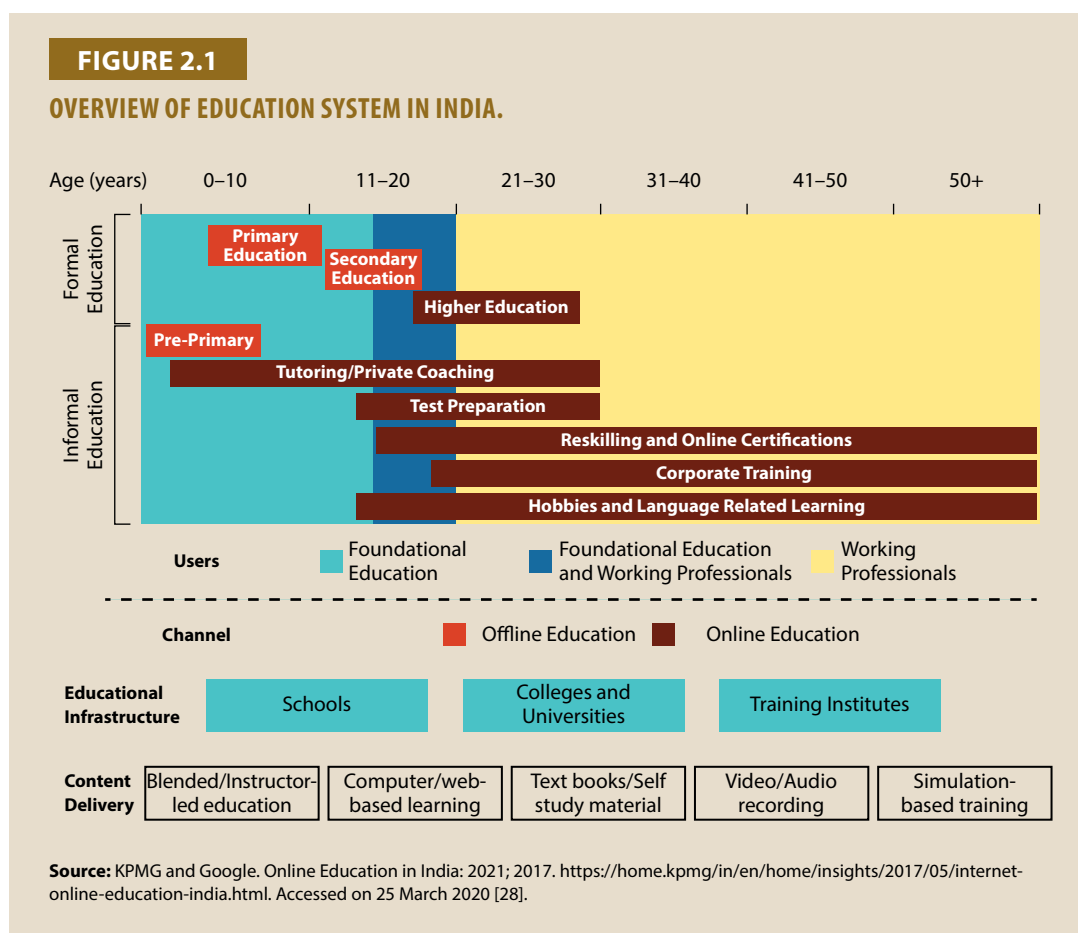
In addition to formal education and ODL systems, online education too¹⁰ (and that too informally) has been emerging in India as an alternative for offline regular education channel (see Figure 2.1). Online education has been defined as learning modules which can be accessed by an individual through internet-enabled services and is restricted to consumer paid services. As per a KPMG report, informal education includes “pre-primary, coaching classes, vocational education, and multi-media/technology-based educational courses aiding as a supplement or substitute to formal education” [24]. A recent study of KPMG and Google [24] reveals that online education system in India is set to touch USD1.96 billion by 2021, up from USD0.25 billion in 2016, a CAGR of 52% with approximately 9.6 million paid users in 2021 (up from 1.57 million paid users in 2016). The paid users perceive convenience, flexibility with commencement dates, and variety of study material and low cost¹¹ as key motivating factors to adopt online channels. Online education has emerged as an alternative for offline regular education channels in states like Kerala and Bihar and the union territory of Jammu and Kashmir.

The unemployment rate has been increasing in India, and going by the KPMG report, approximately 280 million job seekers are expected to enter the job market by 2050 [24]. However, the unemployment situation will be worsening in the next few months as recession appears inevitable because of the devastations caused by COVID-19. Therefore, with the onset of technology, the online mode of learning can be exploited to build human capital. With Industry 4.0 wave touching the shores of India’s economy, the demand for people possessing industry-relevant training has been increasing. The leadership is very committed to increasing educational attainments and improving the quality of education. A program for universal elementary education, Sarva Shiksha Abhiyan (Education for All), was initiated in 2001 and the Constitution of India was amended to make elementary education a fundamental right.

The government has also initiated and designed programs like Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) for undergraduates and lifelong learners. The initiative aims to achieve the three cardinal principles of the education policy, namely, access, equity, and quality. The government through these programs wants to take the best teaching-learning resources to all, bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy [25]. Another initiative is eBasta, which brings together three categories of stakeholders: students, teachers, and publishers. Through this framework school textbooks are made accessible in digital format as e-books. eBastas are accessible, portable, and carry no packaging or shipping cost as they are made available through

¹⁰ Online education has been defined as the learning modules that are made available through internet-enabled devices. The institutes have developed B2B, B2C and C2C solutions as per the needs and requirements of the market [24].

¹¹ Online skill enhancement courses are around 53% cheaper than offline alternatives. This is primarily because of lower infrastructure cost and a larger student base [24].

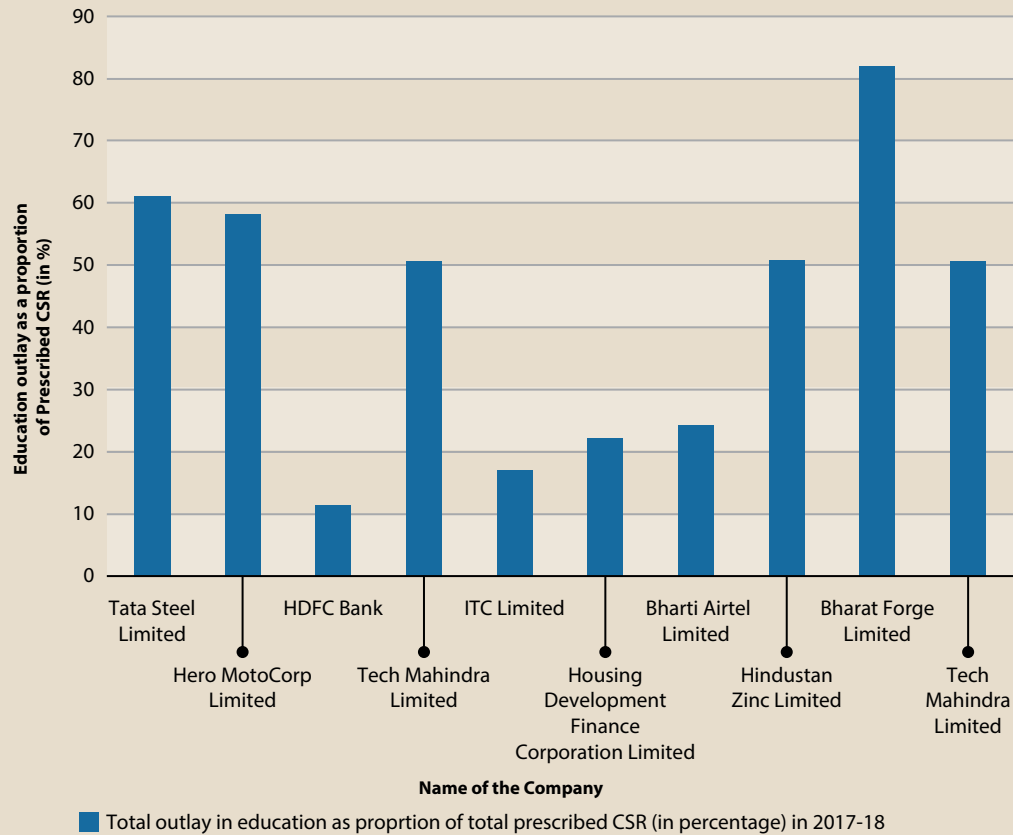


the internet [26]. Besides, the government has also launched initiatives like Rashtriya Madhyamik Shiksha Abhiyan (RMSA), Skill India and Digital India to provide an enabling infrastructure to students who want to study online. These initiatives will help in bridging the demand-supply gap of skilled professionals.

The New Education Policy 2020 [27] proposes “the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4, while building upon India’s traditions and value systems.”

Corporate Sector Initiatives in Education Sector

In addition to the government’s efforts, some private companies like TCS, Infosys, Wipro, HCL Technologies, and Tech Mahindra, as well as the tech services industry body National Association for Software and Service Companies (NASSCOM) have been undertaking various initiatives for educating, training, and empowering youth of India and preparing them for the future. India’s corporate sector has risen to support various initiatives of the government under the corporate social responsibility (CSR) mandate and also to understand its social responsibility towards the people of India. It can be observed from Figure 2.2 how some companies like Bharat Forge Limited have devoted more than 80% of their CSR outlays on education initiatives. These initiatives assume different forms, from building infrastructure to improving quality of education, and improving hygiene and nutrition among children.

FIGURE 2.2**CSR OUTLAYS OF TOP 10 INDIAN COMPANIES IN EDUCATION: 2017–18.**

Source: Top 10 Education CSR Projects in India in 2018. https://csrbox.org/India_CSR_news_Top-10-Education-CSR-Projects-in-India-in-2018_361. Accessed on 29 March 2020.

Undeniably, India is a young country that is likely to reach its peak by 2025, and a quarter of the world's total workforce will be in India. It is important to mention that the average age of Indians in 2020 was 29 as compared to 37 in PRC and the US, 45 in Western Europe and 48 in Japan. This makes India one of the youngest nations. Hence, it does need to prepare for the demographic change that is underway [28]. Though in addition to formal education, the informal education¹² market has been growing in India because of internet penetration and enhanced acceptance of the alternative mode of learning, the country has among the lowest proportions of trained youth in the world. A committee constituted by the Education Ministry (previously Ministry of Human Resource Development) to prepare the draft of the National Education Policy observed that less than 5% of the workforce in the 19-24 age group receives vocational training in India. This is in contrast to 52% in the USA, 75% in Germany, and 96% in South Korea [29].

As for employability, a focused study done by a New Delhi-based employment solutions company Aspiring Minds, highlighted that out of 0.15 million engineering students barely 7% were suitable for core engineering jobs in 2013. Though 97% of graduating engineers were aspiring for jobs either in software engineering or core engineering, a meager 3% had suitable skills to get employed

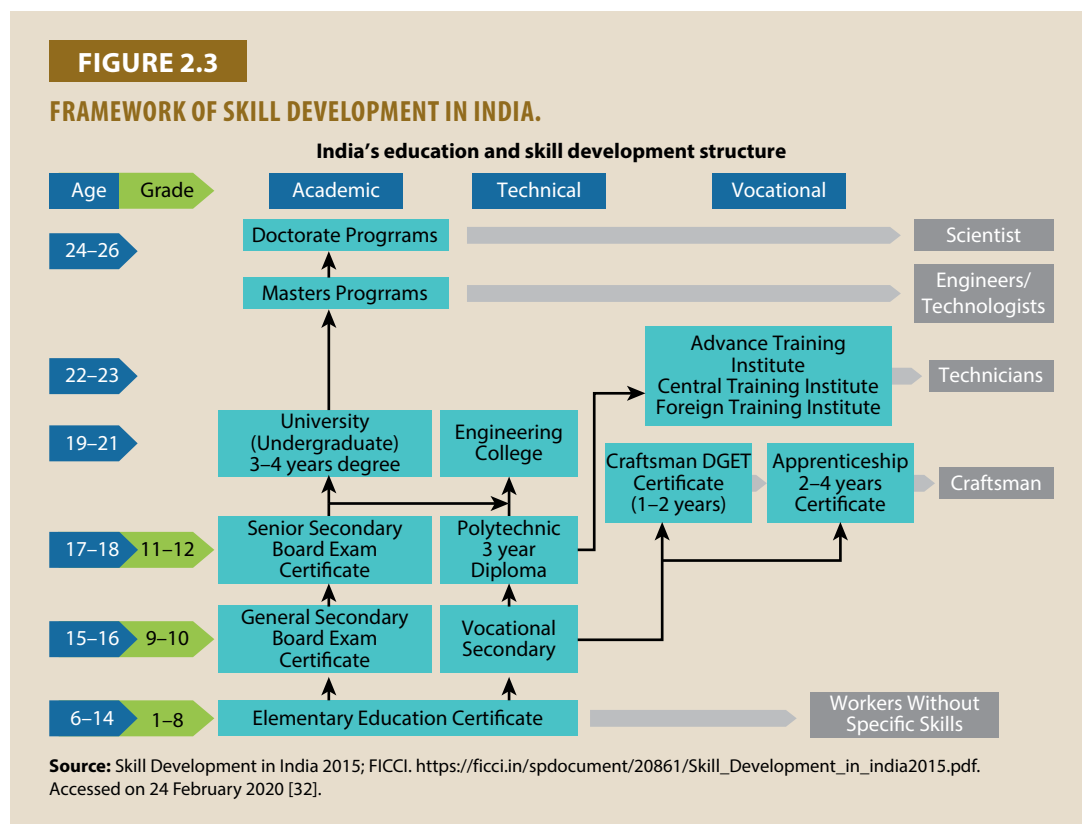
¹² Informal education includes pre-primary, coaching classes, vocational education, and multi-media/technology-based educational courses aiding as a supplement or substitute for formal education [28].

in software or product market, and only 7% were found to be suitable for handling core engineering tasks [30]. A disconnect between the formal education system of India and workforce requirements becomes quite evident from the skill gaps that exist across the sector and their skill requirements. A study conducted by the leading industry body, the Federation of Indian Chambers of Commerce and Industry (FICCI), clearly says, “As the new job roles emanating out of upcoming disruptions are entrepreneurial, scientific, creative and emotional in nature, it is necessary for us to refer to the education and skill ecosystem.” [31].

Having discussed the state of higher education in India in Section II, we now move on to an overview of the skill development ecosystem in India in the next section.

Skill Development Ecosystem in India

Skill development¹³ is crucial for the economic growth of India. However, at present India faces the twin challenge of non-employability of large sections of educated but low skilled or unskilled workers, and paucity of well-trained labor force. The skill development issue in India has both demand side and supply side aspects. The demand side problem is being addressed by ensuring the expansion of economic activities and the creation of large employment opportunities. The assurance on the supply side is being provided by projections with respect to the youth population in India. However, the employability ratio¹⁴ of youth brings to light the reality of skill gaps that exists between industry requirements and the level of skills of workers due to varied reasons, including inadequate training infrastructures, inappropriate mix of skills and education, outdated curricula, limited industry interfaces, and limited standards. [32].



¹³ This section is based on the FICCI study [30].

¹⁴ In India the ratio was as low as 17.5% as compared to 76.5% in the USA and 27.5 % in Malaysia [15]

As can be observed from Figure 2.3, the skill development ecosystem in India is as large and diverse as the country itself. It provides varied levels of skills across an extremely heterogeneous population and is complex too. Skill development in India can be broadly segmented into education and vocational training. In India, elementary, secondary, and higher education is governed by the Education Ministry while the UGC is responsible for coordination, determination, and maintenance of standards of higher education. It not only provides recognition to universities in India but also disburses funds to such recognized universities and colleges. Technical education covers engineering education, polytechnics, etc., and is regulated by the AICTE. The National Education Policy 2020 recommended setting up of the Higher Education Commission of India (HECI) and abolition of autonomous bodies such as the University Grants Commission (UGC) and the All Indian Council for Technical Education (AICTE) by the academic year of 2021.

Skill acquisitions can happen in India through formal or informal ways. Formal vocational training can take place through the public sector in the government-run Industrial Training Institutes (ITIs) and the private sector Industrial Training Centers (ITCs) vocational schools, specialized institutes for technical training, and apprenticeship training by the industry. The private sector participation has been increasing, but this space continues to be dominated by the public sector. Informal training, on the other hand refers to heredity skills or skills acquired through self-learning or learning on the job.

The Directorate General of Employment (DGE) in the Ministry of Labor is the apex organization for development and coordination at the national level for the programs relating to vocational training including women's vocational training and employment services. The National Skill Development Corporation (NSDC) is a not-for-profit public limited company set up by the Ministry of Finance under the public-private partnership (PPP) model. The government through the Ministry of Skill Development and Entrepreneurship (MSDE) holds 49% stakes in NSDC, while the private sector has the balance of 51%. The NSDC aims to promote skill development by catalyzing the creation of large, quality, and for-profit vocational institutions. The National Policy on Skill Development and Entrepreneurship, 2015 laid out Skill India Mission and envisaged the creation of Sector Skill Councils (SSCs) by the NSDC. The NSDC board has so far approved and formalized 37 SSCs (see Figure 2.4), while two others have been approved and are being set up in chemical and paint/coating sector. SSCs play a vital role by ensuring that the training is relevant to and aligned with industry needs and is in keeping with the national skill development policy. They bring together all the stakeholders, including the industry, labor, and academia. There are over 600 corporate representatives in the governing councils of these SSCs [33].

It has been realized now that skill development is not a standalone activity. It has six components: Labor Monitoring Information System (LMIS), National Occupational Standards, National Competency Standards, National Training System, National Accreditation System, and National Assessment System. A National Certification System ensures the recognition and acceptance of acquired competencies nationally and internationally. Since the industry is the ultimate user of skills, the standards need to be developed in due consultation with the industry and the government has to be the facilitator. There is a need to align the skill development initiatives with the needs of the industry [34, 35].

As shown in Figure 2.5, the skill ecosystem in India comprises decision-making bodies, enablers, implementing agencies, and beneficiaries [32, 36]. India occupies a unique place in the global ecosystem. It has an edge over other nations because its average population will be less than 29

FIGURE 2.4**SECTOR SKILL COUNCILS.****Thirty-nine Sector Skill Councils to cover all the major sectors**

Priority Sector	<ul style="list-style-type: none"> • Auto • Retail • IT/ITeS 	<ul style="list-style-type: none"> • Media and Entertainment • Healthcare • Gems and Jewelry • Leather • Electronics • BFSI 	<ul style="list-style-type: none"> • Logistics • Construction • Food Processing 	<ul style="list-style-type: none"> • Life Sciences • Hospitality • Textiles and Handlooms • Apparels • Handicrafts • Power • Iron and Steel 	<ul style="list-style-type: none"> • Hydrocarbons • Chemicals and Petrochemicals • Furniture and Furnishing • PwD • Green Jobs 	<ul style="list-style-type: none"> • Management • Strategic Manufacturing
Large Workforce		<ul style="list-style-type: none"> • Rubber 	<ul style="list-style-type: none"> • Telecom • Capital Goods • Agriculture 	<ul style="list-style-type: none"> • Aerospace and Aviation • Mining 	<ul style="list-style-type: none"> • Sports • Paints and Coatings • Earthmoving and Infra Building 	<ul style="list-style-type: none"> • Instrumentation
Informal Sectors			<ul style="list-style-type: none"> • Plumbing 	<ul style="list-style-type: none"> • Beauty and Wellness 		<ul style="list-style-type: none"> • Domestic Workers
	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16

Source: Government of India. Ministry of Skill Development and Entrepreneurship; and Sector Skill Council (SSC), NASSCOM.

FIGURE 2.5**SKILL ECOSYSTEM IN INDIA.**

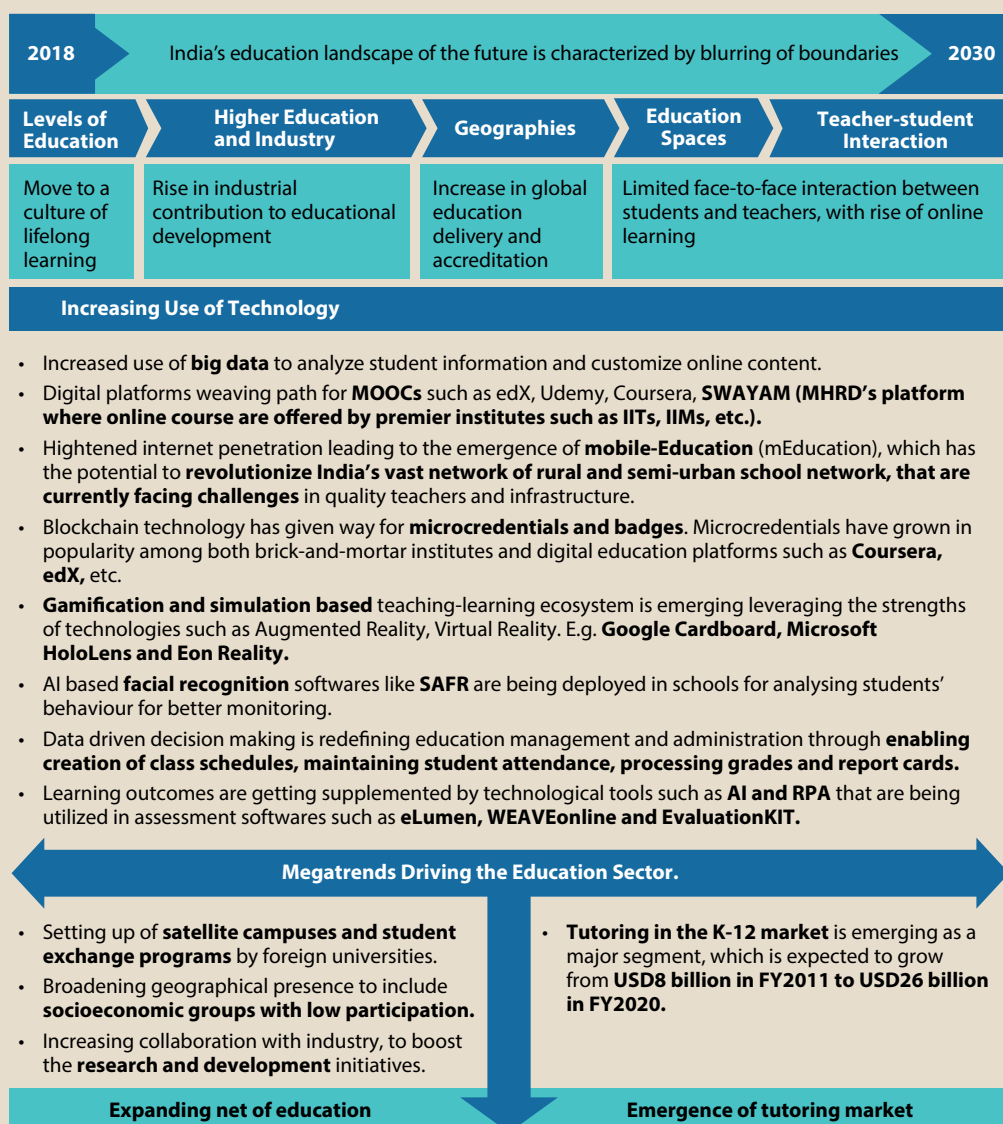
Key Bodies	Enablers	Implementing Bodies	Beneficiaries
<ul style="list-style-type: none"> • Ministry of Skill Development and Entrepreneurship • MHRD • Ministry of Rural Development (MoRD) • Other central ministries 	<ul style="list-style-type: none"> • State Skill Development Mission (SSDM) • NSDC • NSDA • SSCs • NCVT • SCVT • Labor laws • Minimum Wages Act • Financial institutions • Apprenticeships Act 	<ul style="list-style-type: none"> • ITIs • Training providers • Captive training by employers • Schools • Universities • Assessment companies 	<ul style="list-style-type: none"> • Marginalized societies • Unemployed youth • Low income group • School and college students

Source: Adapted from FICCI. Skill Development in India in 2015. [32].

Note: NSDA, NCVT and SCVT stand for National Skill Development Agency, National Council of Vocational Training and State Council of Vocational Training, respectively.

years for the next six years. Thus, the maximum number of working-age population in the world (population between the ages 15-59) will be in India. The country's education system has been changing due to technological development. Following are the key emerging trends in the education landscape identified by FICCI [31].

Greater use of technology in the education sector (see Figure 2.6), the growth in the domestic industrial output, the Make in India initiative, and the Fourth Industrial Revolution accelerated the crucial need for educating and skilling India's working-age population. The Skilling India initiative acquires enormous magnitude and unprecedented urgency as there is a need to train first-time job seekers and upskill and re-skill those people who are already in the job. The government has been focusing on skill development through different agencies and aims to train 500 million people by

FIGURE 2.6**KEY EMERGING TRENDS IN EDUCATION LANDSCAPE.**

Source: Reproduced from Future of Jobs in India: 2.0. FICCI [31].

2022. It has shown its intent and a strong commitment to skilling by establishing the Ministry of Skill Development and Entrepreneurship, to help coordinate and consolidate the skilling efforts of multiple government and private stakeholders.

'The Future of Jobs in India: A 2022 Perspective', a report prepared by FICCI, NASSCOM, and EY [31, 37] provides a vision of change in the Indian job market over the next few years. It identifies three primary forces that have transformed the Indian job landscape: globalization, adoption of exponential technologies, and demographic changes. The report was based on the survey of over 100 Indian CXOs across five industrial sectors, IT-BPM, retail, textiles and apparel, automotive, and banking, financial services, and insurance (BFSI). According to the FICCI study [33], by 2022 over 9% of the workforce would be deployed in new jobs that did not exist earlier. As many as 37% would be deployed in jobs that have radically changed skill sets, and about 54%

will fall under the unchanged job category (see Figure 2.7). In the organized sectors like the five named above, new job roles are likely to emerge as shown in Figure 2.7.

FIGURE 2.7
KEY FINDINGS ON FUTURE OF JOBS IN INDIA.
Workforce mix in 2022


9%
would be deployed
in new jobs that do
not exist today



37%
would be deployed
in jobs that have
radically changed
skill sets



54%
will fall under
unchanged job
category

Source: EY Future of Jobs respondent analysis

A snapshot of the future of job in the organized sector (2022)

	Workforce that			New Job Roles
	would be deployed in new jobs that do not exist today (projected for 2022)	would be deployed in jobs that have radically changed skill sets (projected for 2022)	will face an existential threat to their jobs (for 2017)	
IT-BPM	10%–20% 	60%–65% 	20%–35% 	<ul style="list-style-type: none"> VFX artist Computer vision engineer Wireless network specialist Embedded system programmer Data scientist Data architect AI research scientist RPA developer Language processing specialist Deployment engineer 3D modeling engineer 3D designer Cloud architect Migration engineer Android/iOS app developer Digital marketing
Automotive	5%–10% 	50%–55% 	10%–15% 	<ul style="list-style-type: none"> Automobile analytics engineer 3D printing technician Machine learning based vehicle cybersecurity expert Sustainability integration expert
Textiles & Apparel	5%–10% 	35%–40% 	15%–20% 	<ul style="list-style-type: none"> Apparel data analyst/scientist IT process engineer E-textiles specialist Environment specialist PLC maintenance specialist
BFSI	15%–20% 	55%–60% 	20%–25% 	<ul style="list-style-type: none"> Cyber security specialist Credit analyst Robot programmer Blockchain architect Process modeler expert
Retail	5%–10% 	20%–25% 	15%–20% 	<ul style="list-style-type: none"> Customer experience leader Digital imaging leader IT process modeler Digital marketing specialist Retail data analyst

Source: Reproduced from Future of Jobs in India: 2.0. FICCI [31].

In the second phase of the study, FICCI envisages analyzing five more sectors including education¹⁵ [31]. Let us have a look at the skill requirements in India in the near future.

Skill Requirements by 2022

The demand for the highly skilled labor force in India is going to increase because of the recent government initiatives like Make in India, Smart City Mission, and Digital India. A study by the NSDC on skill gaps across sectors for the period 2010-2014 estimated that an additional 109.73 million skilled manpower will be required by 2022 across 24 key sectors [33].

Besides India, it has been noticed that even in OECD countries¹⁶ [38], the ongoing changes in the labor market along with economic, technological, and demographic changes are generating imbalances between demand and supply of skills. As a result, there are “skill surpluses” or “skill shortages”. Both situations can lead to sub-optimal use of individuals’ skills in their job as many workers accept jobs in the fields that are different from the ones they specialize in (i.e., field of study mismatch) or jobs below the level of education (i.e., over qualification). Skill mismatches or shortages, surpluses, and mismatch at work have negative impact on workers [39, 40], firms, and the economy. The adoption of new technologies at a slower pace delays production, increases labor turnover, reduces productivity and earning potential [38]. Over-qualified/skilled workers face wage penalties and reduced job satisfaction. Negative labor market outcomes can harm a range of areas of society. On the contrary, good labor market outcomes support overall well-being; ensure value for public investments; provide private returns to individuals who invest in their education; and build the supply of skills needed for economic success. [41]

Industry 4.0 and Positive Government Interventions

Industry 4.0 or digital wave, which implies a combination of industry and the internet of things (IoT), has brought in an opportunity for India to realize its manufacturing ambition. The realization of dreams requires much more effort now as it further requires rejuvenation of traditional industry or digitization of the manufacturing sector. However, as a report by the All India Management Association (AIMA) says, “At present, India lags its global peers in I4.0 adoption. A significant portion of the Indian manufacturing sector is still in the post-electrification phase with the use of technology limited to systems that function independently of each other. The integration of physical systems on cyber platforms, the basic premise of I4.0, is still at its infancy. Furthermore, the micro, small and medium enterprises (MSME) segment has very little access to technology due to the high-cost barrier.” [42]

As has been observed by the FICCI in its study [31], the current job landscape has been getting revolutionized in India because of the disruptive changes brought in by technological advancements, demographic changes, and globalization. These changes are likely to impact job creation, job displacement, and labor productivity. New job roles are likely to emerge, like that of visual effect (VFX) artists, data scientists, data architects, artificial intelligence (AI) research scientists, and automobile analysts (see Figure 2.7). Labor market experts observe that in future high-level cognitive skills will be in great demand because of automation. The occupational shortages (implies

¹⁵ Other four sectors are health care, construction, tourism and hospitality, education and transportation, and logistics [31].

¹⁶ OECD points out that across its member nations, an average 35% of workers are mismatched by qualifications with shares of over and under-qualified workers roughly the same (17% and 19% respectively). The magnitude of qualification mismatch varies substantially from one country to the other. For example, the extent of over qualification is one in two workers in Mexico and Chile and less than two in 10 workers in the case of the Czech Republic [38].

a large proportion of workers might be employed/engaged in occupations which are short in those sectors) may be experienced more in certain sectors like education as well as in Information Communication Sectors as the skill demands (like learning strategies, skills, and critical thinking, etc.) will be high. Routine and physical skills will also be in less demand. Occupations that face a high risk of automation usually employ low-skill workers involved in routine tasks. The challenge posed by automation and technological advancement calls for concerted targeted policy action designed to equip low-skill workers with the required skills so that neither gets displaced nor excluded from the labor market in the future [38].

Keeping in view the ongoing changes, the government is quite receptive to the current change and its implication on employment. Accordingly, it has initiated various schemes and programs under various ministries. Some of the initiatives [43] to enhance the relevance of the higher education sector (HES) to the labor market have been summed up in Table 2.2.

TABLE 2.2**INITIATIVES FOR SKILL DEVELOPMENT INITIATED BY VARIOUS MINISTRIES AND DEPARTMENTS.**

Serial No.	Name of Ministries/ Departments	Name of the Scheme
1	M/O Skill Development & Entrepreneurship	<ul style="list-style-type: none"> • Pradhan Mantri Kaushal Vikas Yojana (PMKVY) • National Apprenticeship Training Scheme (NATS) • Craftsmen Training Scheme • Craftsmen Instructor Training Scheme • Skill Development Initiative Scheme
2	M/O Rural Development	<ul style="list-style-type: none"> • Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) • Rural Self-Employment Training Institutes (RSETI)
3	M/O Housing & Urban Poverty Alleviation	<ul style="list-style-type: none"> • National Urban Livelihoods Mission (NULM)
4	M/O Textiles	<ul style="list-style-type: none"> • Integrated Skill Development Scheme (ISDS)
5	M/O Agriculture & Farmers Welfare	<ul style="list-style-type: none"> • National Food Security Mission (NFSM) • Agri-clinic & Agri-business Centers Scheme • Extension Reforms and Farm School • Krishi Vikas Kendras (KVKs) • Skill training to agri-graduates • Promotion of Farmer to Farmer Extension
6	M/O Skill Development & Entrepreneurship	<ul style="list-style-type: none"> • Entrepreneurship Development Programme • Entrepreneurship Skill Development Programme (ESDP) • Management Development Programme (MDPs) • Assistance to Training Institutes Schemes (ATI Scheme) • Skill Upgradation & Quality Improvement & Mahila Coir Yojana (MCY) • Tool Rooms • Central Manufacturing Technology Institute (CMTI)
7	M/O Tourism & Culture	<ul style="list-style-type: none"> • Scheme of capacity building for service providers, Hunar Se Rozgar Tak Scheme
8	M/O Human Resource Development	<ul style="list-style-type: none"> • Vocationalization of School Education • Scheme of Community Development through Polytechnic • National Institute of Open Schooling (NIOS) • Vocational Educational Program Practical Learning through Accredited Vocational Institutes • National Apprenticeship Training Scheme (NATS) • Jan Shikshan Sansthan

(Continued on next page)

(Continued from previous page)

Serial No.	Name of Ministries/ Departments	Name of the Scheme
9	M/O Electronics and Information Technology	<ul style="list-style-type: none"> Scheme for Financial Assistance to States for Skill Development in Electronics System Design and Manufacturing (ESDM) sector Skill Development in Electronics System Design and Manufacturing (ESDM) for Digital India
10	M/O Tribal Affairs	<ul style="list-style-type: none"> Vocational Training for Tribal Youth
11	M/O Women & Child Development	<ul style="list-style-type: none"> Support to Training and Employment Program for Women (STEP)
12	M/O Commerce & Industry	<ul style="list-style-type: none"> India Leather Development Program
13	M/O Development of North Eastern Region	<ul style="list-style-type: none"> Capacity Building and Technical Assistance
14	M/O Home Affairs	<ul style="list-style-type: none"> UDAAN
15	M/O Minority Affairs	<ul style="list-style-type: none"> Seekho Aur Kamao Nai Roshni (leadership development program for minority women)
16	M/O Social Justice & Empowerment	<ul style="list-style-type: none"> Financial Assistance for Skill Training of Persons with Disabilities Special Central Assistance (SCA) to Scheduled Castes Sub-Plan (SCSP) National Scheduled Caste Finance & Development Corporation National Safai Karamcharis Finance and Development Corporation (NSKFDC) National Backward Classes Finance & Development Corporation (NBCFDC)
17	M/O Food Processing Industries	<ul style="list-style-type: none"> Skill Development Programme under National Institute of Food Technology & Management (NIFTEM) and Indian Institute of Crop Processing Technology (IICPT)
18	M/O Ministry of Chemicals & Fertilizers (Department of Chemicals & Petro-Chemicals)	<ul style="list-style-type: none"> Central Institute of Plastics Engineering & Technology (CIPET), Chennai
19	D/O Industrial Policy & Promotion	<ul style="list-style-type: none"> Indian Leather Development Program (implemented by the Footwear Design and Development Institute)
20	D/O Youth Affairs	<ul style="list-style-type: none"> Skill Upgradation Training Programme (implemented by Nehru Yuva Kendras Sangathan) Skill Development Training program under the National Council for Training in the Vocational Trades (NCVT) Scheme Skill Development Training for National Service Scheme Volunteers

Source: Ministry of Statistics and Programme Implementation, Central Statistics Office, Social Statistics Division, Government of India. Selected Socio-economic Statistics India.2017, p.42 [43].

In addition to the initiatives taken for skill development, the government has been trying to collaborate and strengthen its ties and involve private companies, as well as chambers of commerce in industry and services for skill development, as mentioned above, particularly for skilling and up-skilling imperatives in areas of new and emerging technologies [44].

The NASSCOM Foundation's Skills Initiative works to bridge the gap that exists between the available skills and employability. Under this initiative, there is a provision to provide employability-

focused skills to the youth from tier-2 and tier-3 colleges across India. CSR funds have been utilized to train young job aspirants on current and future industry skill needs like Big Data, AI, and CRM (non-voice). The NASSCOM Foundation works closely with NASSCOM SSC, the IT Sector Skills Council. All training curriculum is in line with the Qualification Packs (QP) prescribed for similar skills by the SSC. The NASSCOM Foundation has been able to train over 200,000 people in diverse skills over the past few years [44].

Various initiatives launched by the government from 2014 onwards indicate that the transformative journey of manufacturing through Industry 4.0 has already begun. The four major initiatives, namely, Make in India, Skill India, Smart Cities Mission, and Digital India Mission are spearheading wider adoption of Industry 4.0 in private sector. Companies too, are coming forward through CSR initiatives in the field of education and skill development and supplementing the efforts of the government in overcoming skill gap and preparing future-fit workforce. Software companies like Infosys, Wipro, TCS, HCL Technologies, and Tech Mahindra are spending huge amount in training and hiring programs, incorporating industry-oriented curriculum to provide the future-ready workforce.

The Fourth Industrial Revolution characterized by digital manufacturing alongside smart and autonomous systems, fueled by data machine learning is now transforming the world. Several factors like the rising middle class, a workforce dominated by the millennial, and the aging population across the world are changing the world economy. There is a need, therefore, to improve human resources by harnessing the skills of innovation, creativity, and problem-solving. There is also a need to align the education system with the requirements of the Fourth Industrial Revolution and with current global trends. The traditional methods of education are becoming obsolete and alternative models like online learning¹⁷ are emerging due to the introduction of internet and its increased penetration. At present, there is a need for innovators and problem-solvers in India who can apply knowledge into action. There is also a need to change and design the education system according to the need of Industry 4.0. Indeed, the aforementioned forces have changed the skill requirements of firms, also posing a threat of human workforce replacement. There is a need for a strategy to prepare the country for upcoming transformation. The development of education and skilling infrastructure across all sectors in line with the emerging industrial setup is the need of the hour. However, the skill levels of the Indian labor force are very low, and vary widely by gender, location, social, religious, and consumption groups [45]. The government has undertaken several initiatives to minimize and then to do away with skill differentials over time. A brief account of them has been presented in Table 2.2. There are a lot of challenges in skill development of the population, which are touched upon the next sub-section.

Challenges in Skill Development

One of the major challenges in skill development is the lack of mobility of students. Studies identify that the traditional mindset, low willingness to migrate, low salaries at the entry level, lack of recognition of long-term premium associated with skilling, inability to pay for training, lack of employer endorsements, and illiteracy are the reasons which make the workforce less responsive towards skilling initiatives. There is a lack of awareness on the part of employers, especially in the unorganized sector about the new skill ecosystem which includes the National Occupational Standards, QP, and National Skills Qualifications Framework. It has also been observed that skill

¹⁷ The online education market in India was USD247 million in 2016 with approximately 1.57 million paid users as per the study by KPMG and Google in 2017.

premium or financial incentives are not important components of the skill ecosystem in India. “The other issue is identifying the right training partner who can meet the requirement of the industry and can fit into the new skilling ecosystem. Scaling up of these partners is another challenge that needs to be addressed considering markets behave differently from state to state.” [36]

The mismatch between the aspirations of youth and jobs is another issue. There is a need for organizing proper counseling sessions to bring alignment of aspirations vis-à-vis jobs on offer. There is also the need for collaboration between industry, NSDC, SSCs, training providers, and states to create conducive ecosystem.

Ensuring minimum wages for skilled and unskilled workers as per the Minimum Wages Act, 1948 is yet another issue. The local factors like prices of essential commodities, socio-economic aspects, and paying capability, among others, play an important role in the determination of minimum wages and also cause variation in minimum wages across the country. Although minimum floor price has been discussed extensively and revised too in some states, its implementation is a challenge [36].

It is important to point out that one of the important structural bottlenecks faced by the Indian manufacturing sector is long list of labor laws that are rigid as well as too complex. According to Bhagwati and Panagariya [46], India has about 200 labor laws, 52 of which are Central Acts. There is a large body of literature on the impact of India’s labor regulations on economic outcomes, which gets reflected in lower employment growth, a lesser increase in per capita income, and sluggish economic development. “With more than 50 acts and regulations governing employers in terms of their industrial relations practice, the complex bureaucratic process and reporting mechanism has been a deterrent for the industry to either setup fresh capacity or formally employ additional manpower. While organized sector and white-collar jobs with lesser intervention as well as an absence of trade unions have had fat flexible governing guidelines and restrictions, the unorganized sector having 93% of the current workforce has been facing lots of challenges.” [36]

Apart from over 120 NSDC-funded training partners, multiple training agencies are working with different government departments as implementing partners. The Ministry of Rural Development alone works with more than 1,000 Project Implementation Agencies (PIAs) under its Aajeevika scheme. Training partners face the problem of physical infrastructure and manpower. It is difficult to find right trainers due to low incentive for teachers and remote location of institutes. An outdated curriculum and lack of industry connect are the other problems.

Empirical studies [47-50] indicate that there will be displacement of existing jobs because of the technological changes brought about by the Fourth Industrial Revolution. Yet the City and Guilds Group’s Skills Confidence report 2016 [51] says that employees in general seem to be largely unaware of the future trends and there is no sense of urgency to adapt skills to the changing nature of the economy. They falsely believe that their skills would remain relevant in the next few years. Therefore, the study suggested that businesses should invest in high-quality training and support employees as they develop their skills. They should pay particular attention to the skills that are likely to be high in demand in the future. This suggestion is highly relevant for India too.

Concluding Remarks and Policy Recommendations

India’s growth story is full of upheavals in the post-independence period. The Indian economy has experienced different phases, from the “Hindu rate of growth” to “Unstoppable India”, from

“Shining India” to “Whining India”, yet it managed the 2008 and 2011 crises remarkably well, which points towards its resilience. India’s economic growth, however, contracted during the pandemic in 2020. The ‘bouncing back and fading pattern of India’s growth’ implicitly indicates that the worst is not yet over. However, India intends to become a USD five trillion economy by 2025. It is to be noted that the growth phases (whenever it was experienced), indeed, have been propelled up by its human capital. But a series of changes like globalization, technological and demographic changes, and now the pandemic have altered the context of India’s future growth. The education system and the skill sets that served India well in the past are no longer adequate to support the economy and its future growth requirements. The deficit in literacy as highlighted by the World Bank and other agencies is indeed a leading contributor to “human capital deficit” in case of India and improving learning outcomes is essential for increasing human capital, productivity, growth, and prosperity. The World Bank very rightly observes: “Without that foundation, many people are leaving schools or tertiary institutions without essential cognitive, socio-emotional, digital, and technical skills. This leaves them unprepared for an uncertain world in which the nature of jobs is changing rapidly and adaptability is at a premium.” [52] India has been facing skill shortages and skills mismatch as the education system is unable to keep pace with the rapidly evolving skill demands as the Fourth Industrial Revolution is hitting the shores of India too. This skill mismatch has wider ramifications not only at micro and macro levels but also for competitiveness and job landscape in the country. Given these challenges, a very narrow time frame to harness demographic dividend (its demographic advantage too lasts until 2040) [53] and to overcome skill shortages, the study recommends steps that are critical for bridging the skill gap and can enable India continue with its economic growth.

Firstly, India will have to overhaul and reorient its education system to align it with evolving global needs. OECD Education 2030 stakeholders [54] have co-developed a “learning compass” that shows how young people can navigate their lives and their world. It very clearly recognizes the need to prepare future-ready students, who will later constitute the workforce of the country. Secondly, skill development is critical. In addition to positive policy interventions by the government through different ministries, regional cooperation ranging from collaboration in regional labor market analysis to development of mutual recognition mechanisms for skilled workers can play an important role [55]. It has been rightly recognized in National Policy for Skill Development and Entrepreneurship.

“Skill development, however, cannot be viewed in isolation. Skills are germane to, but not always sufficient for securing adequate economic dividends. Skills need to be an integral part of employment and economic growth strategies to spur employability and productivity. Coordination with other national macroeconomic paradigms and growth strategies is therefore critical” [56].

Evidence-based policymaking can play a crucial role in reducing the negative effects of skill imbalances on the aggregate economy, individuals, and employers. The government intends to scale up skill development efforts in India by creating an institutional and implementation framework that is appreciable. The setting up of the Ministry of Skill Development and Entrepreneurship in 2014 to drive the Skill India agenda in a Mission Mode to converge existing skill training initiatives and combine scale and quality of skilling efforts, is a step in the right direction. Several initiatives by the government, if implemented properly and earnestly, can help bridge the demand-supply gap and help overcome the problem of skill mismatch. India, like the OECD countries, needs to prepare a brigade of future-ready students who possess a range of skills,

including cognitive and meta-cognitive skills (e.g., critical thinking, creative thinking, learning to learn, and self-regulation); social and emotional skills (e.g., empathy, self-efficacy, and collaboration); and practical and physical skills (e.g., using new ICT devices). It becomes all the more important as India has the capacity¹⁸ to meet its skilling demand. It also has the potential to cater to the expected skill shortages that the aging developed world is likely to face. Therefore, comprehensive and coordinated policy interventions are a must to ensure that the new technologies translate into better outcomes for all.

It has been recognized globally that the labor market situation of young people is indeed influenced by the cohort size and labor demand. The institutional factors play a vital role in the integration of youth from school to work. They can mitigate or aggravate obstacles of transition. The transition from school to work is structured in different ways across countries and world regions. In India, general education is predominant; therefore, there is a need to add vocational education and training to general education in India as is the case in Scandinavian countries, and as has been proposed in the New Education Policy 2020 to bring the young closer to the labor market. In Germany and its neighboring countries, the dual vocational training model is followed, which ensures a smooth transition from school to work. There is a need to draw lessons from this model. The model relies on government support, employer participation, and strong social partnership. In all developed countries and some developing countries, there is a two-way integration of school leavers into the labor market. The first stage is related to labor market-related education and training and the second stage is concerned with absorption/integration in the labor market. In India, there is a need to follow this model [57]. Besides, there is a need to spread awareness amongst all stakeholders including students, parents, industry (SMEs), teachers as well as trainers about the need for skills. The students and parents need to look beyond traditional jobs, traditional pedagogy, and traditional styles of knowledge acquisitions. There is a need to change the perception of SMEs towards skilled vis-a-vis unskilled workforce. They need guidance on the sources of supply of skilled labor, emerging sectors, and the premium to be paid for skilled workforce. Besides, there is a need for creation of new capacities, utilization of idle infrastructure in educational institutions, engagement of industry and chambers of commerce in curriculum design and teachers training, and adoption of innovative skill development delivery mechanisms [32].

As has been aptly described by OECD, “Success will go to those individuals, institutions, and countries that are swift to adapt, slow to complain and open to change. The task for the government is to help their citizens’ rise to this challenge by assuming that by 2030 all of these people are equipped with the knowledge and skills they need for further education, work, and life.” [58]

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¹⁸ India's annual skilling capacity was estimated at approximately seven million during 2013-14. [53]

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CASE STUDY 2

HIGHER EDUCATION FOR HUMAN RESOURCE DEVELOPMENT IN REPUBLIC OF CHINA

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Abstract

Preparing for the future of work for youngsters seems to be increasingly difficult, if not impossible, in this day and age of uncertainty. If we cannot foresee the type of work that might be in need in the course of lifetime of today's youth, policymakers, business leaders, and higher education providers will need to be innovative in order to prepare students for the future. How do they do that? Perhaps one can find traces of “answers” in the present, as mentioned in this chapter. After a brief overview on the Republic of China's (ROC's) development in economy and higher education, this chapter introduces the case study of the Department of Civil Engineering at National Taiwan University (NTUCE), an academic body that is well known for not only its research excellence but also its forerunning teaching experiments. The chapter will discuss how this department in a top university in the ROC prepares its students (as well as faculty, staff, and the department itself) for the future with innovative approaches in teaching, research, and administrative practice in order to maintain its competitiveness. The discussion will be presented with a framework provided in the White Paper on Human Resource Development by the Ministry of Education (MOE) of the ROC, specifically in six perspectives: discipline-crossing, innovativeness, employability, global mobility, information literacy, and civic engagement.

Introduction of Case Analysis

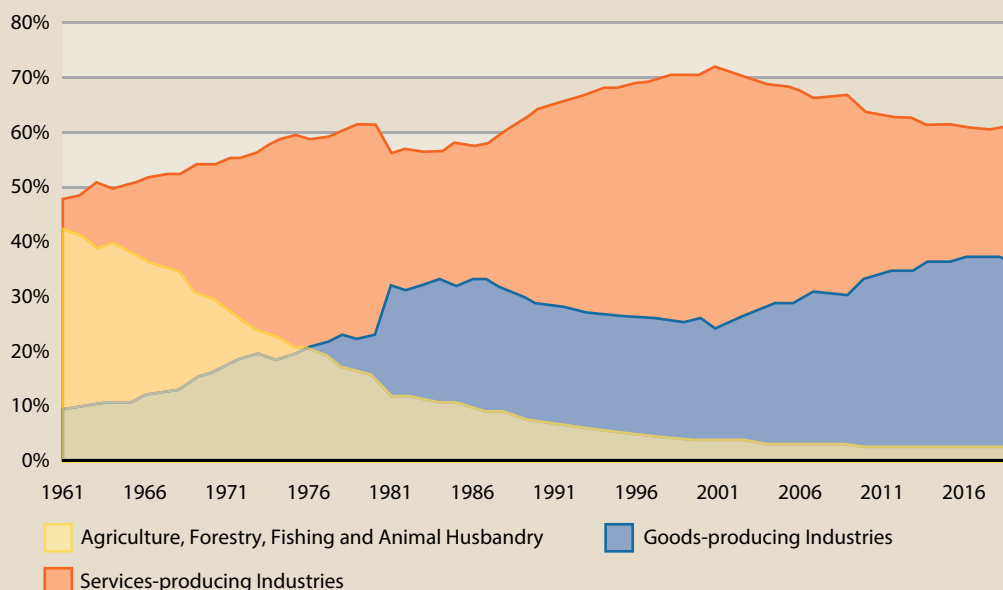
Economic Development

The ROC's economic development has gone through a rapid transformation in a relatively short period of time. As indicated in Figure 3.1, the important role of agriculture in the country's gross domestic product (GDP) in the 1960s and early 1970s was gradually replaced by that of manufacturing by the mid-1970s. In addition, toward the end of 1980s, the service sector picked up its significance in the economy in terms of occupational employment (see Figure 3.2).

In the decades after World War II, the country quickly progressed from the import-substitution phase in the 1950s to the export-orientation phase in the 1960s and early 1970s [1]; from relying on domestic light industry to heavy industry in the late 1970s [2], which laid the foundation for the economic development later on. The “growth with equity” during this period was particularly impressive to most economists [2].

FIGURE 3.1

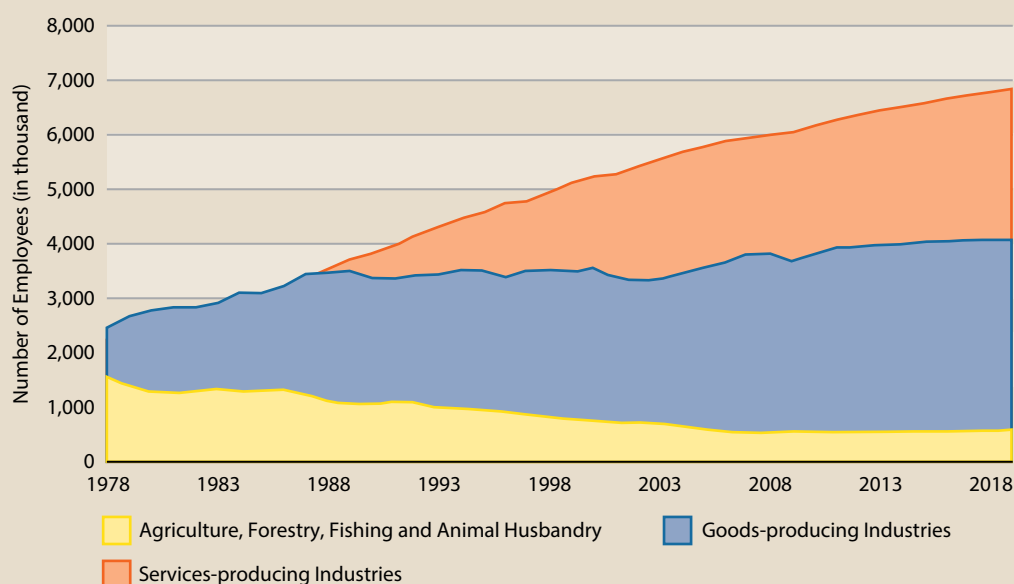
PERCENTAGE SHARE OF GDP BY SECTOR IN THE ROC.



Source: National Statistics, ROC (Taiwan). Retrieved from <https://www.stat.gov.tw/ct.asp?xItem=37407&CtNode=3564&mp=4>.

FIGURE 3.2

OCCUPATIONAL EMPLOYMENT IN THE ROC BY SECTOR.



Source: National Statistics, ROC (Taiwan). Retrieved from <https://www.stat.gov.tw/ct.asp?xItem=37135&CtNode=517&mp=4>.

The decades of the 1980s and 1990s saw the steep rise in the ROC's advancement as its economy entered the science-and-technology-oriented phase. The economy moved from being labor-intensive to capital-and-technology-intensive [1]. As the world's most important exporter of computer manufacturing at the time, the technology sector brought an impressive round of

economic upsurge for the country. The miracles, however, came to a halt in the early 2000s when the ROC's economic performance weakened. The average annual growth declined from 9.3% in the 1970s and 1980s to 6.6% in the 1990s, and then to 4.8% in the 2000s [2]. The society as a whole went through a struggle, as people had to adjust to the new status of economic stagnation after decades of continuous growth.

On a closer look at the country's economy in the 21st century so far, one would see more stories than merely the fluctuation of growth. Unemployment and labor force participation remained steady despite the harder time, but statistics also showed that most of the growth benefited owners instead of workers, as compensation growth greatly lagged behind productivity growth [2]. The inequality in wealth distribution started to become apparent in the society since the mid-1980s. At the same time, the growth in R&D spending was slow but steady, reflecting the increasing sophistication of the country's products that required more research and development [2]. The share of government's spending in the GDP, however, dropped significantly from 29% in 1992–93 to 16% in 2015 [3].

During this time, the ROC faced the rise of the BRIC countries and the strong thump of globalization [4], especially the rise of China next door as a super economy. The country has been forced to respond with accelerated transformation in industries. The upgrade of human resources has become crucial in its pursuit of competitive advantages in a new type of economic development, which is knowledge-based, sustainable, and just [4]. The government has promoted six emerging industries, including biotechnology, green energy, and medical care, and the four emerging intelligent industries of cloud computing, smart electric vehicles, intelligent green buildings, and invention and patent commercialization [4].

It should be noted that together with the transformation in economy, the ROC also went through drastic transformation in the political system in the past 50 years. The country went from being a hard authoritarian before the 1970s to a soft authoritarian in the second half of the 1970s and 1980s, and eventually to a democracy after the 1990s.

Development in Higher Education

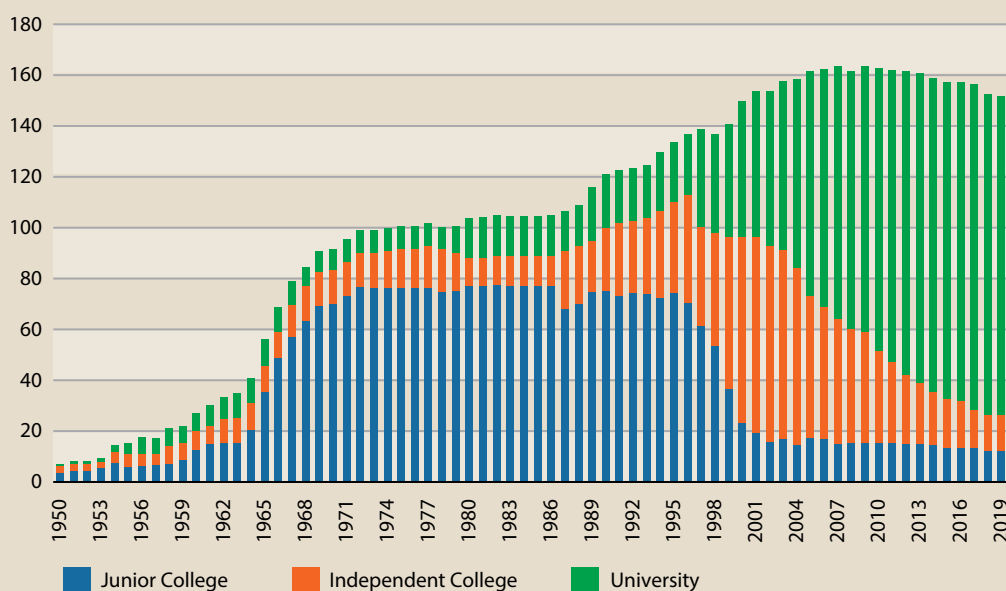
Higher education in the ROC has undergone tremendous changes in the past decades. It not only grew in terms of size, but also partially changed its role in the society, as the country's economic and social landscape changed. The importance of higher education in the country's economic development, however, has remained significant, though the games and playfields of economic and political mechanism have differed. To most higher education providers, the difficult question is, amid very different internal and external environment of higher education, how to change its practices in order to foster talents that can remain relevant in the future?

In terms of size, the number of higher education institutions increased at a remarkable speed over the years, rising from 56 in 1965 to 134 in 1995, and then to 164 in 2009 at its peak (see Figure 3.3). The number of students in higher education, coupled with the growing number of institutions, increased from 85,346 in 1965 to 751,347 in 1995, and then to 1,332,445 in 2015 (see Figure 3.4). The percentage of higher education enrollment to students at all levels went from 3% in 1965 to 16% in 1995, and then to 33% in 2015. The net enrollment rate to higher education soared from 15.95% before 1984 to 53.20% in 2004 [5], depicting a rapid transition from elite to mass and then to universal education in Martin Trow's classification [6]. By end of 2019, there were 152 higher education institutions in the ROC, including 126 universities, 14 colleges, and 12 junior colleges,

with 1,213,172 students and 45,045 full-time teachers. The net enrollment rate to higher education was as high as 70.55% in 2019 (see Figure 3.5), with a rather significant emphasis on engineering and business majors (see Table 3.1).

FIGURE 3.3

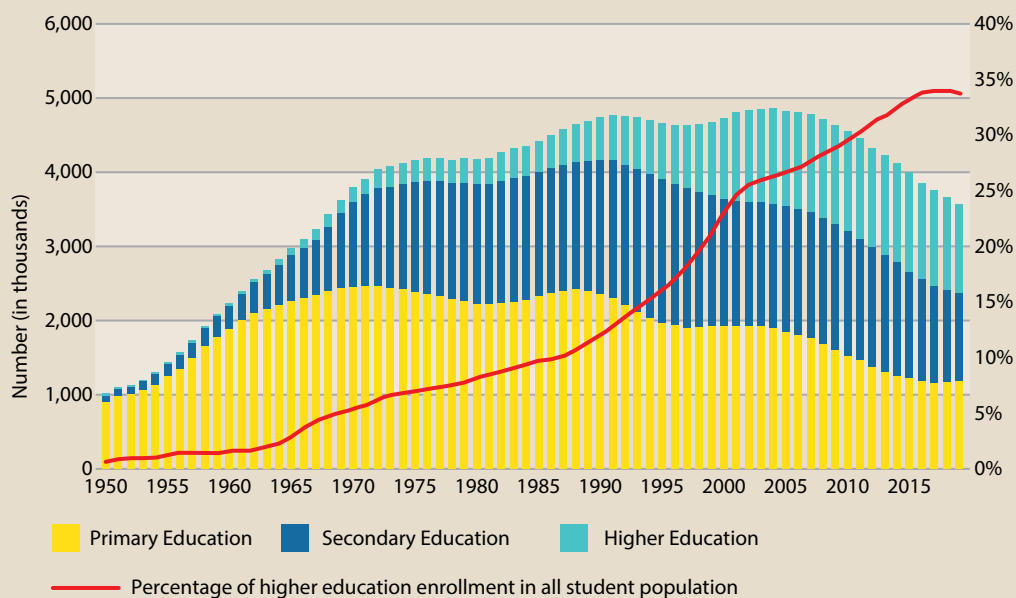
NUMBER OF COLLEGES AND UNIVERSITIES IN THE ROC.



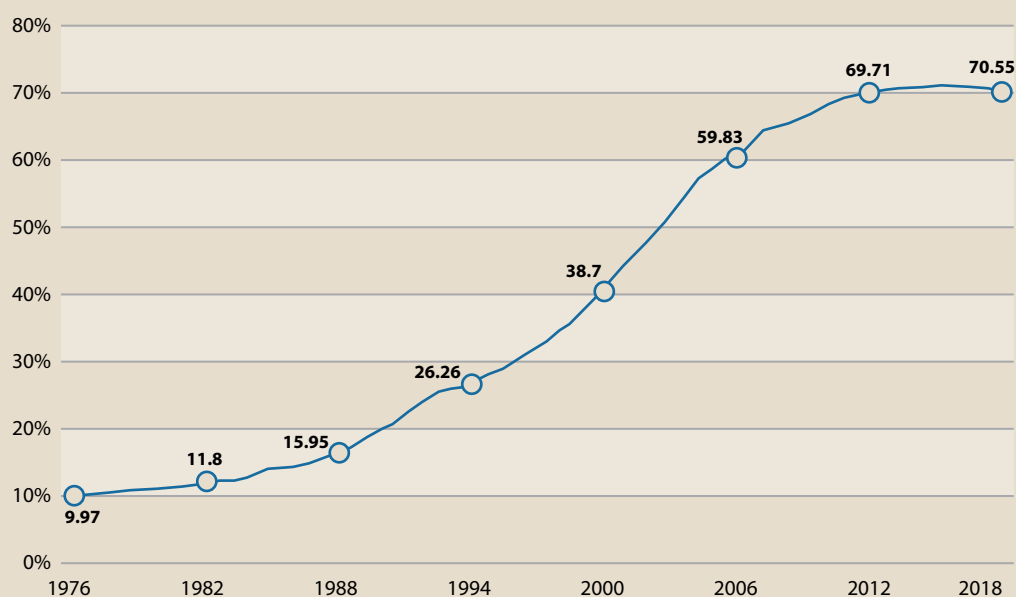
Source: Department of Statistics, Ministry of Education. Retrieved from <https://depart.moe.edu.tw/ED4500/cp.aspx?n=1B58E0B736635285&s=D04C74553DB60CADhttps://www.stat.gov.tw/ct.asp?xItem=37135&ctNode=517&mp=4>.

FIGURE 3.4

STUDENT ENROLLMENT IN THE ROC: ALL LEVELS (1950–2019).



Source: Department of Statistics, Ministry of Education. Retrieved from <https://depart.moe.edu.tw/ED4500/cp.aspx?n=1B58E0B736635285&s=D04C74553DB60CAD>.

FIGURE 3.5**NET ENROLLMENT RATE IN HIGHER EDUCATION.**

Source: National Statistics, ROC (Taiwan). Retrieved from <https://www.stat.gov.tw/ct.asp?xItem=37135&ctNode=517&mp=4>.

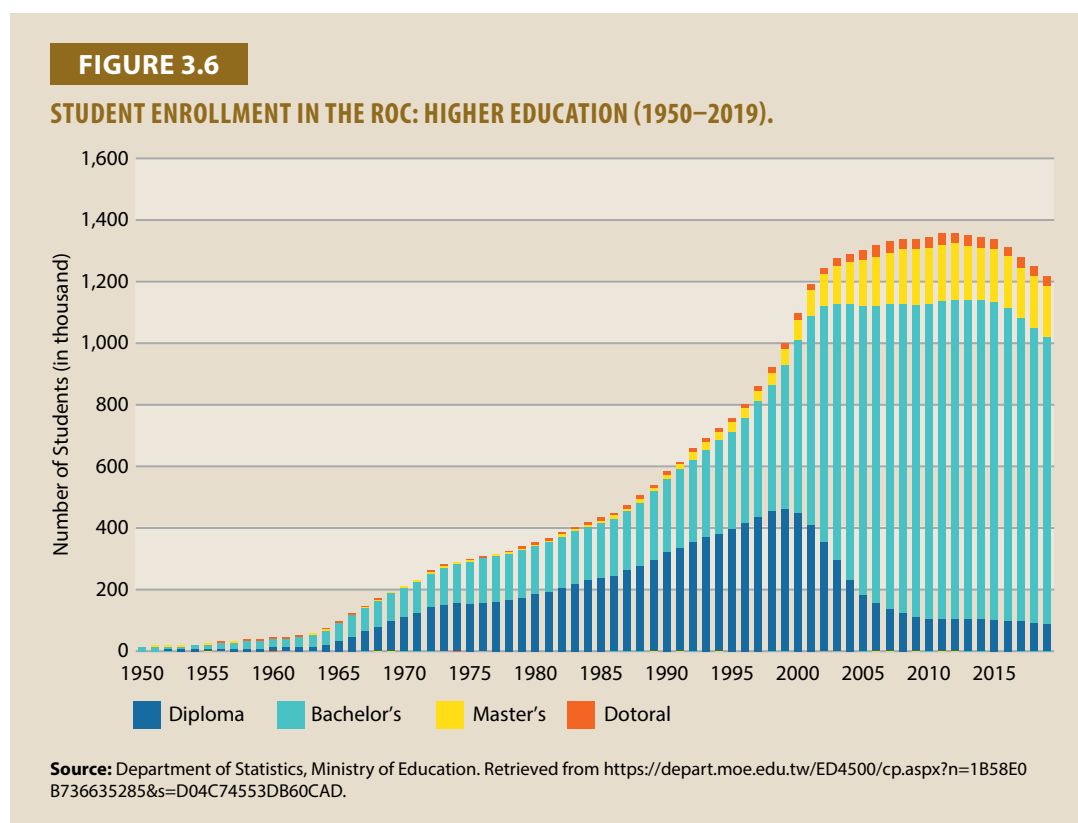
TABLE 3.1**NUMBER OF STUDENTS IN COLLEGES AND UNIVERSITIES BY FIELD (2019).**

Field	Number of Students	Percentage
Engineering, Manufacturing and Construction	241,483	19.9
Business, Administration and Law	225,474	18.6
Arts and Humanities	201,282	16.6
Health and Social Welfare	150,711	12.4
Service	143,115	11.8
Information and Communication Technologies	80,364	6.6
Natural Sciences, Mathematics and Statistics	61,257	5.0
Social Sciences, Journalism and Library Information	57,493	4.7
Education	35,466	2.9
Agriculture, Forestry, Fisheries, and Veterinary Medicine	14,857	1.2
Other	1,670	0.1
Total	1,213,172	100.0

Source: Ministry of Education, Department of Statistics. Retrieved from <https://depart.moe.edu.tw/ED4500/cp.aspx?n=1B58E0B736635285&s=D04C74553DB60CAD> and <https://www.stat.gov.tw/ct.asp?xItem=37135&ctNode=517&mp=4>

As in most societies, the growth of the ROC's higher education was heavily influenced by the nation's policies. As the country's compulsory education was extended from six to nine years in 1968, secondary education rapidly expanded in the late 1960s and higher education grew along with it in the 1970s, supporting the economy's transition to industry-emphasis and export-

orientation. The growth of higher education was halted for almost two decades afterward out of concerns of compromised quality brought upon by the hasty growth in the previous period. In the late 1980s, the government finally relaxed the restriction in response to the lifting of the 38-year-long martial law, gradual democratization of the society, and the country's transition to knowledge economy. As it was at the height of the ROC's "economic miracle," the government invested in the establishment of new public higher education institutions and allowed the establishment of private ones. In this phase of higher education expansion, four-year universities apparently took on the major role, while the role of junior colleges gradually subsided. Starting around 2000, four-year universities experienced large growth in graduate programs (see Figure 3.6).

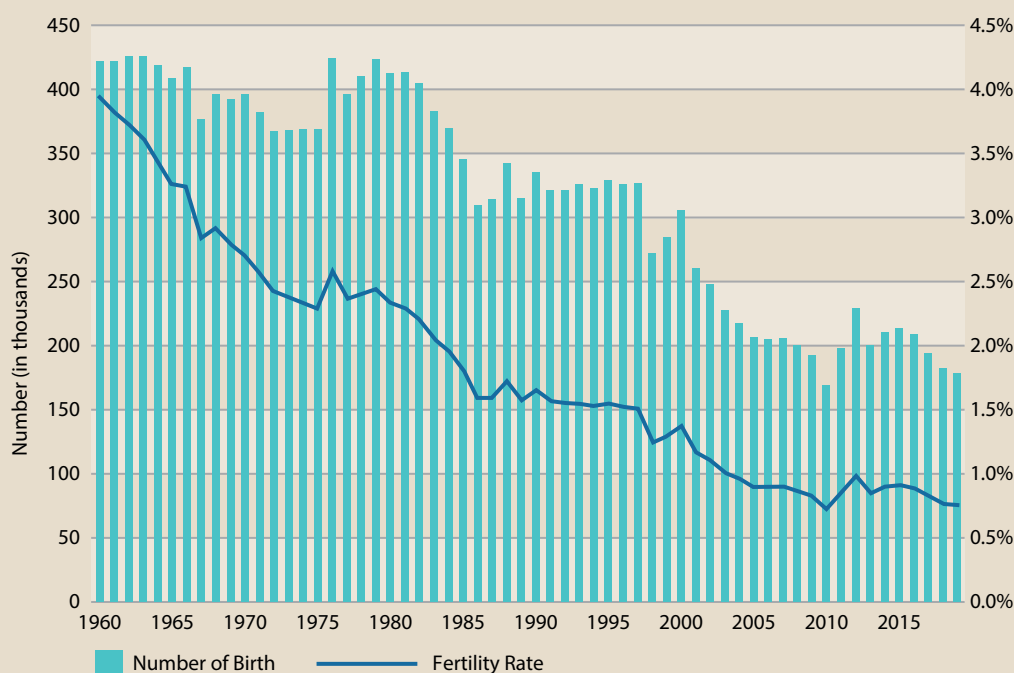


This wave of expansion of higher education has had an impact on the society in different ways. Gender parity in higher education attainment improved in the younger cohorts [7], though male students are still favored at the master's and doctoral levels [8]. On the other hand, university education that was once out of reach to most in the society has become highly accessible now [7], to the point that there are more university seats available than high school graduates who want to get admission in college. The meaning of a university degree has gradually changed, while the pedagogy and institutional management are trying to catch up with it, resulting in the need of professional development in teaching.

Moreover, the imbalance in supply and demand of the university seats has hit the sector from two directions: oversupply of university seats after the wave of higher education expansion and undersupply of university-age students brought upon by the country's declining birth rate (see Figure 3.7). A negative growth in university enrollment is estimated at about 30% by 2023, threatening the survival of about 20 to 30 colleges and universities [9]. Newer or vocational-track polytechnic universities are among the ones under the most severe pressure for survival.

FIGURE 3.7

FERTILITY RATE AND NUMBER OF BIRTHS, ROC.



Source: Department of Household Registration, Ministry of the Interior. Retrieved from <https://www.ris.gov.tw/app/portal/346>

At the same time, the ROC's universities are faced with the pressure brought upon by neoliberal globalization of the sector. Universities are guided by the government to reach out to other countries not only in terms of research collaboration but also in teaching. In recent years, the channels of cross-border exchange have also extended to solicitation of students and now even, in a small number, teachers. "Internationalization" has become a buzzword in universities, though its scopes and levels vary from institution to institution [10], e.g., offering English-instructed courses, setting up all English programs, enhancing global connections, and seeking international accreditation [11].

In addition, university governance is forced to be more responsive to the outside world as well as various domestic stakeholders. The rigid structure of university governance and administration is also under scrutiny for decelerating transformation, which is in urgent need by universities in this new age. Some steps to decentralize governmental regulations on the operation of universities as well as to encourage cross-institutional sharing of resources in various ways have been carried out; strategies with a flavor of privatization have also been attempted [9, 12, 13], though their actual effect varies. Attempts of commercialization in higher education seem to mostly focus on industry–academic cooperation [5] so far.

Focus and Scope of Case Analysis

In response to the political, economic, and social changes in the country, the MOE has devised transformation plans and adopted various initiatives to progress higher education over the past decades. Among them, the White Paper on Human Resource Development in December 2013 set the direction of the development of the country's higher education. Though the scope of the white paper covered education at all levels in the ROC, higher education plays a crucial role in its

application. Several major policies and initiatives in higher education were implemented following the announcement of this white paper. Therefore, this document is highly useful for illustrating the case study on a top-notch program in the ROC, in terms of the progress made by the country.

The white paper (see Figure 3.8) laid out the main vision of “transform and break through: cultivating diverse and excellent human resource to co-create a happy and prosperous society.” Under the vision, four objectives were spelled out: 1) cultivate excellent and dedicated teachers; 2) narrow the gap between learning and employment; 3) strengthen students’ international competitiveness; and 4) redouble students’ future productivity.

Ten principles were laid out in support of the implementation of the vision and objectives, including responding to development of the world, aligning with human resource planning, emphasizing “learning power” over credentials, valuing continuation and comprehensiveness of education, valuing equality in resource allocation, and encouraging the business sector to participate in talent cultivation. With the principles, five strategies were laid out:

1. Redirect to positive values
2. Reorganize effective systems
3. Re-evaluate resource allocation
4. Re-establish partnership
5. Reshape learning power

The implementation is to be carried out through 16 driving strategies and 39 action plans in three major areas. These include: compulsory education, vocation education, and higher education, internationalization, and global position of talents.

Six key competencies were laid out as the focus of education in the future:

1. Global mobility: Language skills, international and multicultural perspectives, and the courage to strategize at the global level.
2. Employability: Application of learning on future work, and problem-solving ability.
3. Innovativeness: The ability to be unique and original, and to explore new territories and opportunities.
4. Discipline-crossing: The ability to navigate across professional disciplines, engage in cross-disciplinary communication and analysis, and comprehend evaluation.
5. Information literacy: The ability to utilize information technology tools, to navigate through information, and utilize mobile learning.
6. Civic engagement: The ability to take responsibility for oneself and respect differences, to proactively participate in the society, and enhance public interest.

FIGURE 3.8**BLUEPRINT OF WHITE PAPER ON HUMAN RESOURCE DEVELOPMENT.**

Source: Ministry of Education. Blueprint of White Paper on Human Resource Development; p. ii. (Mandarin, translated by the author).

With the white paper as the backdrop and its six competencies as the framework, the following section presents the practice of a university department in its attempts to prepare students (as well as faculty and staff, and even the department itself) for the future of work.

Identification of Current Initiatives

With more than 75 years of history, NTUCE is one of the most prestigious civil engineering departments in the ROC. Ranked among the Top 30 in QS World University Rankings by Subject in 2018, the department is well established for its academic excellence in the research of civil engineering nationally and globally. The department is also the leader in construction and civil engineering in many different ways and areas [14]. Moreover, in recent years, the department has been well known for its innovativeness in curriculum reform among not only engineering

departments but also all university departments across the board [15-17]. In the current year, NTUCE has more than 1,000 students in bachelor's, master's, and doctoral degree programs, 54 full-time teachers, and almost 30 part-time teachers [14].

As with other university departments, the development of NTUCE has been highly correlated with the development of the Taiwanese society. The department was initially established before World War II in the Japanese Era for the purpose of assisting the needs for engineering and technological development of the Japanese Empire; it was then known as the Department of Civil Engineering of the Imperial College of Taipei. After the war, the department changed its name (to the current one) owing to the change in political regime and continued with its mission of educating future civil engineers. It was called upon to support the needs of the country again in the 1970s when the then ruling Kuomintang (KMT) government decided to forego the insistence of recovering China and started to invest in the island's infrastructure by launching the Ten Major Construction Projects (1974–79). The number of faculty members and students grew; on the other hand, most of the NTUCE students chose to go overseas for advanced education upon graduation.

Analysis of Strategies and Ways Forward

Using the six competencies proclaimed in the white paper as the framework, we would discuss the development and strategies of NTUCE in its path of responding to the changing world. Though these strategies were not coordinated beforehand to intentionally “make” NTUCE the way it is today, its development provides useful insights for academic programs, universities, or governments that are interested in devising a better future. The content in this section has been prepared based on the interviews with the Department Chair of NTUCE, Prof. Shang-Hsien (Patrick) Hsieh, and supplemented by the knowledge of the researcher through her years of collaboration with the faculty members of the department in various projects.

Discipline-crossing

Cross-disciplinary learning/teaching seems relatively natural to civil engineering programs than others because the discipline by itself incorporates the knowledge from many other areas, ranging from science and engineering to social sciences. Though the curriculum for underclassmen focuses more on math and science, for upperclassmen, a good portion of the courses involves knowledge from planning, management, transportation, etc. Knowledge in other areas such as the automobile industry as well as in social and economic aspects of the society also becomes more visible in the advanced level of learning and research.

On the other hand, it does take conscious efforts to get university faculty members, who are usually accustomed to dwelling in their own areas of expertise, to engage in active collaboration with colleagues with other specialties. NTUCE is no exception. The main efforts of discipline-crossing have gradually shifted from encouraging students to enable their own paths of multi-disciplinary learning, either within or outside the realm of civil engineering, to encouraging the faculty to collaborate through co-teaching or joint research projects. In order to do so, the department has been experimenting with more innovative ways of co-teaching at the departmental level in recent years.

Other strategies for fostering cross-area collaboration within the department were also implemented. For instance, NTUCE created several course clusters, which allow students to obtain a certificate upon the completion of each cluster. The current clusters include Architecture, Railway, Disaster

Prevention, Wood Structure, and Civil Engineering. In addition, the department is starting to set the direction for recruiting new teachers who demonstrate cross-disciplinary capability.

Over 15 years ago, NTUCE started to integrate different areas of expertise through research centers. At the moment, there are nine centers under the department, including Research Center for Building & Infrastructure Information Modeling and Management, Railway Technology Research Center, High-Tech Facility Research Center, Sustainable Infrastructure Research Center, and AI Research Center.

Innovativeness

In the past, engineers were trained to solve problems that were well defined; it is no longer the case these days, as the world has become less and less predictable. Future engineers should, thus, be able to solve problems that might be ill-defined and come up with creative solutions. In response to these dynamic needs, new pedagogies are deemed necessary.

NTUCE has always seen innovation through student advising, especially at the graduate level. In recent years, especially with the subsidies from some MOE projects, the efforts are gradually permeating to the undergraduate level. The large-scale implementation of the curriculum that focuses on hands-on learning in recent years [17] sees another wave of innovativeness, as students are provided with the opportunities for new creation through hand-on projects and not just a fixed set of knowledge in the textbooks. Some of the results could be observed from the fact that NTUCE students swept the awards in a variety of civil or construction engineering creativity contests held recently.

Employability

There are a few points worth mentioning in the practice of NTUCE that might enhance employability of its graduates in the future. The department is clear on the direction of its curriculum: general education on civil engineering at the undergraduate level that aims to expand students' horizon and cultivate future leaders; professional training at the graduate level that is aimed toward employment. As one of the top university departments with most graduates having pursued advanced degrees overseas in the past, the teaching at NTUCE had traditionally focused on theory. This emphasis, however, is gradually being forced to transform for two major reasons: 1) an increasing number of graduates are gearing towards completing their master's degree, as the industry is now demanding graduate degrees from future employees; and 2) the department is paying increasing attention to the new learning needs of the students. New pedagogies such as the aforementioned curriculum that emphasizes hands-on learning allow students to steer away from the previous theory-only focus; this change is anticipated to help students in their future workplace in terms of connecting theory with practice.

NTUCE's recent curriculum on hands-on learning through intensive group projects also enhances students' competencies in teamwork as well as communication with peers, various stakeholders, and those from non-civil-engineering disciplines. Such skills are in high demand by employers these days. Moreover, these hands-on courses are anticipated to attract students who have real interests in civil engineering instead of those who were selected merely by their performance in the entrance examination.

Finally, the Executive Master of Construction Administration (EMCA) that NTUCE provides for the professional development of civil engineers with six or more years of work experience is also

helpful in boosting employability. With 15–20 CMBA students each year and more than 200 graduates to date since 2003, NTUCE can see both its teachers and traditional students better connect in terms of obtaining first-hand knowledge about the industry. As a result, the department, as a whole, is able to enhance its connectivity between the academia and the industry.

Global Mobility

NTUCE has had a good tradition of international collaboration. Its teachers are mostly those who have been trained abroad, which equips them with proficiency in English. Teaching at a certain level of English has been rather common among the faculty members, which has laid the foundation of its long-term practice of recruiting international students from various countries in Southeast Asia, North and Central America, the Middle East, etc. With 15–20 international students per year, even domestic students get a good chance of interacting with peers from across the globe. In addition, an international program on earthquake engineering was created in the late 1990s.

Despite that, more aggressive initiatives to promote an even more international environment have been implemented in recent years. Starting last fall, NTUCE launched an all-English program in undergraduate education, which is one of the first in the ROC, converting one of the three parallel groups of courses into English instruction while maintaining the other two in Mandarin. In addition, the department recruited teachers with no proficiency in Mandarin from India and Japan last year and is expected to continue to do so in the future.

Part of the effort for creating a more international environment extends to fostering active academic participation among students. For more than 30 years, NTUCE has been part of a longstanding 7-university coalition, KKHTCNN, which is composed of the following civil engineering universities from Asia: Korea Advanced Institute of Science and Technology (KAIST) from the Republic of Korea, Kyoto University from Japan, The Hong Kong University of Science and Technology from Hong Kong, Tongji University from China, Chulalongkorn University from Thailand, National Taiwan University from the ROC, and National University of Singapore from Singapore. In addition, for 27 years, together with The University of Tokyo and University of Seoul, the department is part of Trilateral Student Activity (TSA). Both these events are held annually to encourage students to actively participate and befriend peers or prospective fellow civil engineers. Exposures like these have widely broadened the global horizon for youngsters in the development of their professional identity and offered them a professional view of the outside world beyond the country's border.

In recent years, NTUCE has also strived to establish deeper connections with other universities in Asia. They include joint degrees with National University of Civil Engineering (NUCE) in Hanoi and with Ho Chi Minh City University of Technology as well as scholarships with outside funds for overseas students in need. At present, additional connections with overseas companies are being sought.

Information Literacy

Since NTUCE is an engineering department, information literacy seems to be organically embedded in the nature of teaching and learning and needs no further emphasis. In fact, civil engineering, particularly structural engineering, was one of the earliest adopters of computing. Established in 1995, the Division of Computer-Aided Engineering (CAE) under the department is world-renowned for the students' skills in information technology. Even now, when information literacy is far more prevalent, the teachers of the division proactively work toward advancing themselves in their field

of research. They are accustomed to embracing emerging technologies as well as emerging ideas and are, therefore, pioneers in civil engineering. These days, they also thrive to engage in cross-disciplinary integration such as collaborating with computational materials or artificial intelligence.

Civic Engagement

Given the nature of civil engineering, which emphasizes on improving the life of the public and well-being of the society, it seems rather natural for its faculty and students to be more devoted to civic engagement than their counterparts in, say, other fields of engineering. NTUCE does see a rather high portion of its teachers taking part in public service through their profession at different levels, such as civil organizations, university administration, and even national politics; this trend has especially been observed in recent decades.

Despite that, the department is attempting to better its involvement in civic engagement by, for instance, introducing more systematic approaches for students to put sustainability in the center of their thinking as well as using design thinking in their learning to enhance the empathy part of design.

Conclusion

Though no one can predict the future with certainty, the Government of ROC seems to be preparing for the future under the assumption that the economy will rely even more strongly on knowledge and technology, innovation and creativity, and interconnections with the world. On the social side, the assumption for the future seems to be increasing agility as well as importance of bottom-up voices, which fits the traits of a democratic society that the country has matured into. As the ROC's higher education expands and upgrades, the ties between the sector and the economy, represented by work at the individual level, are even more compellingly emphasized than before. A more open, responsive, and active higher education is called upon to prepare for the country's workforce, especially when the future is increasingly uncertain.

The traditional mindset of mass production, quality assurance above innovation, cost-effectiveness over value-add, and efficiency and obedience over creativity that has sculpted higher education is apparently outdated. The weight, on the other hand, of the journey to the future is the heavy residuals of the old mindset in university teaching and operation, which could decelerate the country's economic transformation. The difficult task at hand, therefore, is how to fast-track higher education in support of the desired future at the national, university and individual program level.

The case study presented in this chapter illustrates the effort of the Department of Civil Engineering at National Taiwan University to transform in six different perspectives: discipline-crossing, innovativeness, employability, global mobility, information literacy, and civic engagement. With gradual but steady support from different directions, the department encourages not only students but also teachers to traverse boundaries in professional expertise. Through academic advising at the graduate level and curriculum reform that focuses on hands-on learning at the undergraduate level, the department is guiding prospective civil engineers to enhance their capacity to deal with ill-defined problems, which could take up an important part of engineering-related issues in the future. With the implementation of the curriculum reform, a new pedagogy, and a professional development program for experienced civil engineers, the department enhances employability of its students to a great degree.

The efforts to boost global mobility of its graduates are multifold: a new all-English program, not only faculty- but also student-centered, long-term multi-lateral activities with universities across Asia, etc. on top of the more conventional joint programs and academic exchanges. Some faculty members in the department have also taken upon themselves to be early adopters of technology and started embracing emerging technologies and ideas in their professional arenas. The introduction of a new pedagogy that focuses more on sustainability and empathy was utilized to help enrich civic engagement in students' education.

The purpose of introducing a case study is to provide readers with the opportunities to develop insights applicable in their own context; this case study is no exception. The efforts of NTUCE have been successful because of its own context in a certain time and place. Solid evaluation of its status quo and continuous endeavor to develop strategies for a better tomorrow, however, are the core of the case. Apparently, these practices are not only preparing its students but also its faculty and staff as high-quality workforce for the future.

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CASE STUDY 3

CHALLENGES & OPPORTUNITIES FOR HIGHER EDUCATION IN SINGAPORE

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Abstract

In adapting to an increasingly complex and volatile global economy where industries and jobs are transforming at a much faster pace than before, Singapore has identified lifelong learning as a key approach undergirding socio-economic policies, to build a future-ready workforce that is not only equipped with in-demand skills, but also agile, innovative and globally competitive [1]. Beyond the pursuit of highest possible qualifications early in life, Singapore is also shifting its emphasis towards the mastery of deep skills that can be utilized effectively on the job [1]. A transformation of higher education in Singapore is therefore underway, to take on an expanded role in supporting the lifelong learning objectives and delivering a diverse range of skills, competencies, and talents that the economy needs. This change requires a coordinated effort, driven not just by policymakers and higher education institutions, but also through active involvement and partnerships with industries and employers. By examining the range of policies and initiatives leading the transformation of higher education in Singapore, this chapter aims to elucidate the challenges and opportunities for higher education in this future of disruption.

Introduction

For the higher education sector, it is a time of challenges, as much as it is a time of opportunities. Without a doubt, higher education plays a highly integral role in contributing to the economy. It is a critical vehicle to support labor market needs, to equip the workforce with advanced skills and competencies required by the economy, and to foster higher productivity and generate innovation. Globally, the demand for higher education continues to grow [2]. Enrolment in higher education is rising, alongside its perceived potential to lead to better life opportunities, including better employability and better pay.

At the same time, the global economy is becoming increasingly complex and volatile. Significant structural shifts in the global economy, such as the changing global value chains and rapid developments in digital technologies, are disrupting industries and jobs at a much faster pace than before. These shifts are impacting the composition of employment, the nature of job tasks, and the type of skills required, with machines expected to replace humans in performing many functions. With technology replacing routine tasks, the demand for high-level cognitive skills is expected to

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rise [3]. In this future of disruptions, individuals will not only have to build deep skills and capabilities, but also learn constantly throughout the life and adapt to new contexts at work quickly. It will, therefore, be a challenge for higher education to transform itself to remain relevant and attuned to delivering the skill needs of the workforce. The conventional frontloading education system is no longer adequate. It is no longer sufficient for higher education to just graduate students who are equipped with in-demand skills and competencies sought after in the labor market. It is also increasingly necessary for higher education to take on an expanded role to support education and learning endeavors well beyond graduation.

It is therefore unsurprising that Singapore has identified lifelong learning, led by the umbrella SkillsFuture movement, as a key approach undergirding the transformation of its education system and policies, to foster a diverse and future-ready workforce that is not only equipped with in-demand skills, but also agile, innovative and globally competitive [1]. As technologies and jobs continue to change and cause disruptions throughout the lifetime, it is clear that the education system in Singapore will have to move from the pursuit of the highest possible qualifications early in life, towards an emphasis on the mastery of deep skills that can be utilized effectively on the job [1]. At the same time, higher education institutions in Singapore will have to take on an expanded role in supporting the lifelong learning objectives and in delivering a diverse range of skills, competencies, and talents required by the economy.

With lifelong learning as a key narrative, this chapter will examine the challenges and opportunities for higher education in Singapore in the context of the evolving future economy. The chapter will examine the policies and strategies that Singapore has taken to integrate and align its education system and policies with the broader transformations in the economy and industries. The subsequent sections proceed as such. First, it reviews the key trends in the economy and labor market, as well as those of higher education, in setting the necessary background and contexts for subsequent discussions. Second, it examines lifelong learning, through SkillsFuture, as a key strategy in policy undergirding changes in the higher education landscape. Third, it looks at the range of programs and initiatives that higher education institutions in Singapore have introduced to create a more diverse and expanded higher education landscape and to nurture a wider range of interest and talents among the future workforce. Finally, it concludes with some thoughts on the challenges and opportunities for higher education in the context of the disruptive future economy.

The Future Economy and Labor Market

Significant structural shifts in the economy and labor market

In recent years, Singapore's economy has experienced relatively stable economic growth, an average of 2-3% per annum from 2014 to 2019 [4-9]. Meanwhile, the labor market remains relatively stable. From 2009 to 2019, non-seasonally adjusted resident unemployment rate remains relatively steady at between 2.6% to 4.1% [10]. Income from work has also continued to grow steadily. The real median income growth of 3.8% per annum in the recent five years from 2014 to 2019 was significantly higher than the 1.9% per annum in the preceding five years from 2009 to 2014 [10]. In absolute terms, the median gross monthly income of full-time employed residents in 2019 was SGD4,563 (USD3,197), compared to SGD3,770 (USD2,641) in 2014 and SGD2,927 (USD2,051) in 2009 [10].

Nonetheless, the Singapore economy shows signs of maturing. Furthermore, in tandem with changes in markets globally, the Singapore economy is also seeing significant structural shifts. In

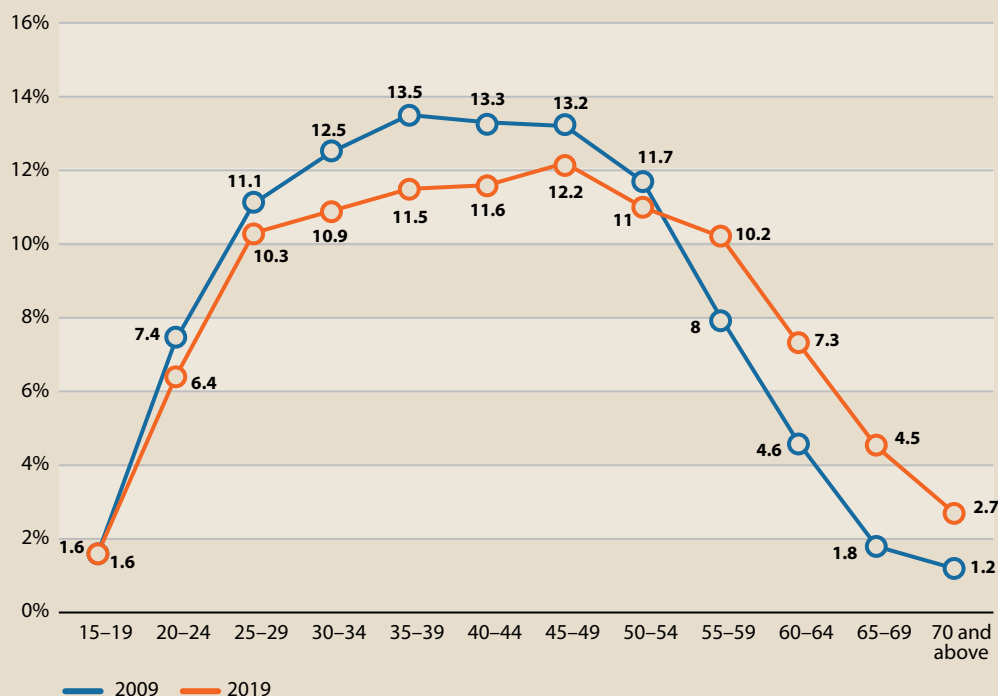
a periodic review of Singapore's economic strategies for the next decade, the Report of the Committee on the Future Economy noted the key challenges: "Global growth has been subdued and is expected to be lower than in the previous decade. Populations in developed economies and some developing ones are aging. Global productivity growth has been sluggish, though technological changes could yet generate new waves of innovation and breakthroughs. [...] Global value chains are also changing. [...] We are in an era of rapid technological change. Innovation cycles have shortened. New technologies can supplant entire industries, displacing all their workers, even as they create new opportunities" [1].

The report [1] noted that the Singapore economy will have to diversify, build wider and deeper connections with market regions across the world, as well as foster global innovation and technology networks in order to better harness new ideas. At the same time, with rapid technological changes and shortened innovation cycles, the shelf-life of skills is shortening. Individuals will need to constantly refresh and deepen their skills to create value. To increase the efficiency of the labor market, employers will have to create opportunities for their employees to utilize these skills.

Meanwhile, Singapore's population, and by extension its labor force, is aging rapidly. The proportion of residents aged 55 and above in the labor force rose significantly from 16% in 2009 to 25% in 2019 [10] (see Figure 4.1). The median age of residents in the labor force rose from 41 years in 2009 to 44 years in 2019 [10], and it is expected to increase further. The trend of an aging labor force is due to a combination of factors, including persistently low fertility rates over the last decade and longer life expectancy.

FIGURE 4.1

AGE DISTRIBUTION OF THE RESIDENT LABOR FORCE IN SINGAPORE (IN % FOR 2009 AND 2019).



Source: Comprehensive Labor Force Survey, Manpower Research and Statistics Division, Ministry of Manpower, Singapore [10].

Note: Data for each year may not add up to 100% due to rounding off.

The rapidly aging resident labor force poses a significant challenge to Singapore's economic growth. To drive continued economic growth despite the shrinking local labor supply, the government has in the past looked outwards to top-up the supply with foreign, low-skilled workers. However, this approach has shown to be increasingly unsustainable in the long run, and the government has increasingly shifted the focus towards building a manpower-lean economy [11-12]. Moving forward, the economy will have to restructure to become more innovative and productivity-driven [12]. To remain competitive, industries will have to transform to leverage digital technologies and Industry 4.0 solutions and build strong local capabilities in the labor force [12-13]. At the same time, individuals will have to prepare for longer careers, and keep their skills and knowledge up-to-date for lifelong productivity and employability.

Industry Transformation Program

The challenges that Singapore is facing in its future economy and labor market are complex. In responding to the structural shifts in the economy and labor market, Singapore launched the SGD4.5 billion (USD3.2 billion) Industry Transformation Program (ITP) in 2016 as an integrated plan to develop and implement holistic strategies to drive economic growth and competitiveness through technology and innovation [14-15]. Under the ITP, the government worked with firms, industries, trade associations and chambers, unions, training and education providers, as well as research agencies to develop Industry Transformation Maps (ITMs) for 23 key industries under six clusters covering 80% of Singapore's GDP. Each industry-specific ITM examines the industry landscape and maps out the future trends and needs, to develop and implement targeted and sector-focused restructuring efforts. Each ITM consists of a growth and competitiveness plan, supported by four pillars [15]:

- **Productivity:** Strategies to support companies, especially Small and Medium Enterprises (SMEs), enabling them move to higher value-added (VA) activities and raise operational efficiency.
- **Jobs and Skills:** Investing in people, to equip them with deep skills to support the shift to greater value creation.
- **Innovation:** Strategies to leverage R&D to develop new products and services.
- **Trade and Internationalization:** Supporting companies in reaching out to the overseas markets.

Jobs and skills are important parts of the ITMs. Here, the implications are two-fold. First, the active role of employers in providing high value-added jobs and in making more effective use of the skills of their employees is instrumental in promoting better outcomes for higher education [3]. Second, in supporting the transformation of industries and the future economy, continued investments into education and workforce development is a crucial part of the overall strategy. The next section will elaborate on the recent trends and developments in higher education in Singapore.

Higher Education in Singapore

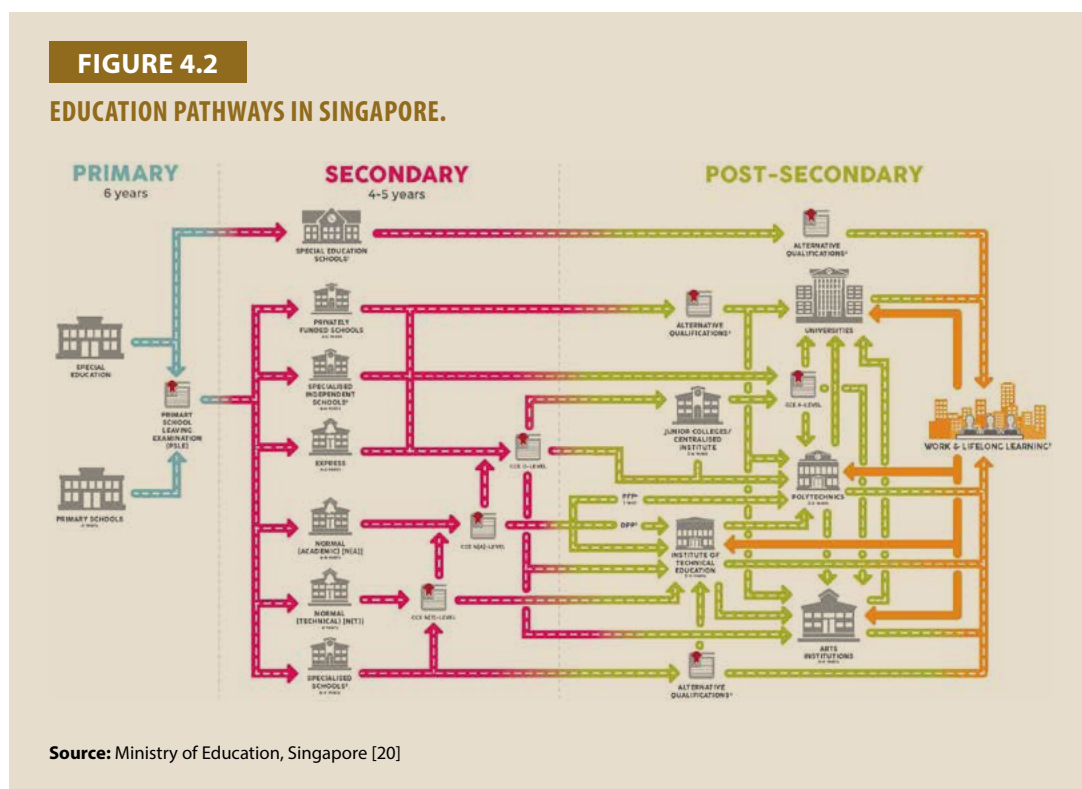
Phases of Education Policy

As a small and open economy, developing high quality and productive workforce is the key to driving Singapore's economic growth and competitiveness. Singapore has invested heavily in

education and training, to equip its people with the necessary skills and competencies. Over the years, Singapore has continuously adapted its education policies and initiatives to align it with the changing economic needs of the country. The education system has gone through four main phases of transformation: survival-driven (1958-1978), efficiency-driven (1979-1997), ability-based, aspiration driven (1997-2011), and student-centric, values-driven (2012-present) [16-18]. The four phases mark the shift from the early objectives of widening access to and participation in basic education, to the more recent objectives of enabling all individuals to realize their full potential and develop a passion for lifelong learning, through quality pre-employment training (PET) and post-employment continuous education and training (CET) systems [17, 19].

Structure of the Higher Education System

Currently, after receiving about 10 years of general education, consisting of six years of primary education and four to five years of secondary education, students continue their post-secondary education at either the junior colleges (JCs) and centralized institute (CI) for pre-university education, the polytechnics, or the Institute of Technical Education (ITE) [19]. Academically-inclined students from the JCs/CI or polytechnics may then further their education at one of the six autonomous (publicly-funded) university (AU) [19]. Figure 4.2 provides an overview of the education pathways in Singapore.



Apart from the AUs, the polytechnics and ITE are considered an integral part of the higher education landscape in Singapore, to provide students with complementing education and learning opportunities. The AUs traditionally provide an academic-based education leading to degree qualifications, while the polytechnics provide practice-oriented programs leading to diploma qualifications. ITE provides technical and vocational education. Table 4.1 provides an overview of different post-secondary education institutions in Singapore.

TABLE 4.1

AN OVERVIEW OF POST-SECONDARY EDUCATION INSTITUTIONS IN SINGAPORE.

Categories	ISCED Classification	Number of Institutions	Description
Junior Colleges (JCs) / Centralized Institute (CI)	Level 4 (Non-tertiary general education)	19	<p>JCs and CI provide a two- or three-year pre-university course, leading either to the GCE A-Level exam or the International Baccalaureate Diploma Program.</p> <p>Graduates from JCs and CI typically expect to further their education in an autonomous university.</p> <p>(JCs and CI are not categorized as Higher Education Institutions.)</p>
Institute of Technical Education (ITE)	Level 4 (Non-tertiary vocational education)	3 campuses	<p>ITE provides technical and vocational education, leading to either a Nitec or Higher Nitec Certificate.</p> <p>ITE graduates who want to further their education may be considered for admission to the polytechnics, as well as for ITE's Technical Diploma programs.</p>
Polytechnics	Level 5	5	<p>Polytechnics provide three-year, full-time courses leading to a diploma qualification. A polytechnic education places strong emphasis on practice-oriented learning, with opportunities for industry-related training.</p> <p>While majority of polytechnic students expect to enter the workforce upon graduation, about 20% of each cohort will continue their education at an autonomous university.</p>
Arts Institutions	Levels 5 to 6	2 institutions offering publicly-funded programs	<p>Arts Institutions provide a range of publicly-funded degree and diploma programs for students interested in pursuing visual and performing arts at the tertiary level.</p>
Autonomous (or publicly-funded) Universities (AUs)	Levels 6 to 8	6	<p>There are six publicly-funded AUs in Singapore:</p> <ul style="list-style-type: none"> • Nanyang Technological University (NTU) • National University of Singapore (NUS) • Singapore Institute of Technology (SIT) • Singapore Management University (SMU) • Singapore University of Social Sciences (SUSS) • Singapore University of Technology and Design (SUTD). <p>Each of the six AUs has developed distinct niche areas, offering degree-granting undergraduate and graduate programs in different focus areas.</p> <p>In 2020, about 40% of each cohort will enter one of the six AUs to participate in a publicly-funded, full-time degree program, while another 10% will participate in a part-time degree program.</p>

Source: Ministry of Education, Singapore [19]

Rising Demand for University Education

In the last decade, in line with global trends, the demand for university education in Singapore has increased. Recognizing the importance of higher education in building a highly-skilled and sophisticated workforce for an advanced economy, the government has increased the number of publicly-funded universities. The proportion of each cohort who will enter one of the six AUs in Singapore to participate in publicly-funded, full-time degree programs has risen from about 27% in 2012 to 40% in 2020 [21]. Furthermore, another 10% of each cohort will undertake publicly-funded, part-time degree programs [21]. This expansion of university places is carried out in a carefully calibrated and gradual manner, with due considerations on maintaining the quality and relevancy of university education and graduate manpower to the needs of the economy [21-22]. In particular, the government thought that it would be necessary to diversify the university landscape through a range of institutional models, pedagogical approaches, and program offerings across the university sector, to nurture a wider range of interests and talents for the dynamic economy [21]. Apart from enhancing existing AUs, three new universities namely SIT, SUTD, and SUSS were set up, each offering distinct, niche programs [21].

The AUs in Singapore have continued to perform well, as indicated by their global rankings and in the labor market outcomes of their graduates. The two comprehensive universities in Singapore, NTU and NUS, have consistently performed well in global university rankings. In the Quacquarelli Symonds (QS) World University Rankings released in 2019, both NTU and NUS were jointly ranked at 11th place in the world and top in Asia [23]. The employability of graduates from the AUs has continued to improve. The findings from the Graduate Employment Survey 2019 showed that the proportion of graduates with full-time permanent employment six months after graduation has increased to 81.7%, from 81.2% in 2018 [24]. The median gross monthly salary among new graduates in full-time permanent employment was SGD3,600 (USD2,523) in 2019, a slight increase from SGD3,500 (USD2,452) in 2018 [24].

Apart from publicly-funded polytechnics and AUs, there are also private education institutions (PEIs) offering external diploma and degree programs in partnership with overseas universities. These programs complement the courses offered in the publicly-funded education system and fulfill growing demands for higher education. However, there are concerns about differences in graduate employability and returns to education between graduates of PEIs and AUs. The findings of the Graduate Employment Survey 2017/2018 indicate that the employment rate in full-time, permanent employment of new graduates from the PEIs was 48.2%, as compared to 81.2% of graduates from the publicly-funded AUs [25]. Moreover, the median gross monthly salary of these graduates from the PEIs was SGD2,650 (USD1,857), below the median of SGD3,500 (USD2,452) for graduates from the AUs [25]. The possible factors that contribute to the differences include institutional and course quality, as well as potential signaling effects and employers' perceptions of the degrees [26]. These findings also suggest that decisions to participate in higher education have been made with considerations on employability and a corresponding demand for graduates in the labor market.

Towards an Integrated, yet Flexible and Diverse Education System

Alongside the rising demand for university education, there are risks that the number of graduates is increasing too high, and too fast. This fuels a paper chase with no consideration of the benefits that university education can yield [22, 27]. Instead of unchecked increase, it would be more meaningful if alternative pathways to career success are opened up, which can cater to different individual strengths and aspirations.

In this context, the Singapore education system aims to become more flexible and diverse. This includes developing multiple education pathways for individuals to cater to their unique strengths, interests and learning styles, to foster a greater diversity in skills and talents in the economy. For one, the education system seeks to move away from the distinction between the academic and vocational track. Then Minister for Education Ong Ye Kung reasoned: “We realized the need to develop an education system with multiple paths to success, to support and cater to the diverse strengths and talents of our people. It is not a traditional two-track system, with an academic path and a vocational path, but a multi-path system; that traditional divide between an academic path and vocational path has become artificial and obsolete, because what is cognitive and technical is not clear-cut. [...] A person needs both knowledge and skills in order to do well” [28].

At the same time, the education system has also made attempts to blur the divide that was there between PET and CET. Instead, it has built an integrated system where education and learning is a lifelong process, interspersed and integrated with work. The shift towards an integrated and lifelong education system facilitates better transitions between education and career. This enables the workforce to stay relevant and employable amidst rapid changes in the economy. This presents both challenges and opportunities for higher education, as will be further elaborated in the next sections.

Lifelong Learning and SkillsFuture

Lifelong Learning in Singapore

Lifelong learning as an approach in Singapore’s socio-economic policy is not a recent development. In 1997, during the launch of the vision ‘Thinking Schools, Learning Nation’, the then Singapore Prime Minister Goh Chok Tong noted: “Learning will not end in the school or even in the university. Much of the knowledge learnt by the young will be obsolete some years after they complete their formal education. [...] The task of education must, therefore, be to provide the young with the core knowledge and core skills, and the habits of learning that enable them to learn continuously throughout their lives. We have to equip them for a future that we cannot really predict. [...] Education is a continuum, starting with the early pre-school years and continuing throughout life” [29].

In this early articulation of lifelong learning, the focus was still largely on pre-employment education. Then, as Singapore moved towards a knowledge-based economy in the twenty-first century, the vision ‘Thinking Schools, Learning Nation’ sought to create an education system that equipped students with thinking and inquiring skills that were increasingly sought after when they entered the workforce [30]. This vision called for a reform of the curriculum and teaching methods in schools, including those of higher education institutions, to shift from content knowledge and rote learning routines, towards fostering creative thinking skills and lifelong learning dispositions [30-31].

Separately, alongside the PET system, Singapore has throughout the years made headway in developing a comprehensive CET system to support adults and employers in their continuing education and training needs. In 2003, the Workforce Development Agency (WDA), a statutory board under the purview of the Ministry of Manpower, was established to oversee workforce development aimed at enhancing the employability and competitiveness of Singapore’s workforce. Amongst a key initiative of the WDA was the establishment of the Workforce Skills Qualifications (WSQ) in 2005. The WSQ is a national credential system that trains, develops and certifies the

skills and competencies of the workforce, in alignment with industry needs. The WSQ articulates clear training and certification pathways for individuals to enhance their skills and progress in their careers, and guide employers in training and developing the capabilities of their employees. In particular, the WSQ is an occupational and competency-based system that does not require academic pre-requisites for entry. It facilitates the recognition of skills and competencies required for each job role [32-33].

The SkillsFuture Movement

To lifelong learning in Singapore, the SkillsFuture movement was launched in 2014. “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 towards an advanced economy and inclusive society. [...] No matter where you are in life – schooling years, early career, mid-career or silver years – you will find a variety of resources to help you attain mastery of skills. Skills mastery is more than having the right paper qualifications and being good at what you do currently; it is a mindset of continually striving towards greater excellence through knowledge, application and experience”[34].

Rather than two separate PET and CET systems, the SkillsFuture movement marks a distinct policy shift towards the development of an integrated, lifelong education and learning system to support the next phase of Singapore’s economic development. SkillsFuture is a ‘whole of society’ movement, bridging the divide between education and work, integrating the traditionally distinct pre-employment education and post-employment training, and strengthening the nexus among educational institutions, including higher education institutions and private training providers, as well as industries, employers, and individuals as key stakeholders and partners to deliver integrated and future-ready education services. These objectives are reflected in the four key thrust areas of the SkillsFuture movement [34]:

- 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 needs.
- Promoting employer recognition and career development based on skills and mastery.
- Fostering a culture that supports and celebrates lifelong learning.

The launch of the SkillsFuture movement also coincided with the restructuring of WDA into two separate statutory boards, one of which is SkillsFuture Singapore (SSG) under the purview of the Ministry of Education. This was done to drive and coordinate the implementation of the national SkillsFuture movement, promote lifelong learning through the pursuit of skills mastery, and strengthen the ecosystem of quality education and training in Singapore [35].

SkillsFuture Programs and Initiatives

SkillsFuture has introduced a comprehensive range of programs and initiatives targeted at different stakeholders, including students, adult learners, enterprises, and training providers. In many of these programs, higher education institutions have taken on a greater role to lead in their development and implementation. Table 2 provides a list of key SkillsFuture programs and initiatives.

TABLE 4.2

LIST OF KEY SKILLSFUTURE PROGRAMS AND INITIATIVES.

Stakeholders	Programs and Initiatives
Students	<p>Education and career guidance equips students (from primary schools to universities) with the necessary knowledge, skills and values to make informed education and career decisions based on individual strengths and interests. This program helps to facilitate the transitions between school, higher education, and work.</p> <p>The program is also extended to adults through career and training advisory services such as career coaching, employability skills workshop, and networking sessions.</p> <p>Enhanced internships are offered to polytechnics and ITE students as part of their curriculum. It provides students with exposure to the real work environment and enables them to make a better transition into the workforce.</p> <p>MySkillsFuture is a one-stop online portal that pulls together tools and resources related to career and learning, to help Singaporeans make informed choices and plan their skills and career development throughout life.</p> <p>SkillsFuture Work-Study Programs is a suite of programs co-designed and co-delivered by higher education institutions and the industry, to provide students with a work-study pathway leading to a qualification/certification. Under the work-study programs, students undergo a combination of facilitated learning in the classroom, as well as structured on-the-job training.</p>
Adult Learners	<p>SkillsFuture Credit aims to encourage individual ownership of skills development and lifelong learning.</p> <p>Since 2016, all Singaporeans aged 25 and above are eligible to receive an opening credit of SGD500 (USD350) that can be used for education and training. The credits can be used for a broad range of government-supported courses.</p> <p>In 2020, all Singaporeans aged 25 and above received a one-off credit top-up of SGD500 (USD350). Moreover, to provide further support for mid-career employees, all Singaporeans aged 40 to 60 years old received an additional SGD500 (USD350) credit that can be used for career transition programs.</p> <p>SkillsFuture Mid-Career Enhanced Subsidy provides Singaporeans aged 40 and above with enhanced subsidies of up to 90% of selected course fees, to support mid-career Singaporeans to upgrade their skills and stay relevant in the changing workplace.</p> <p>SkillsFuture Series is a curated set of short, industry-relevant training programs that focus on priority and emerging skills for the future. The majority of courses are offered by higher education institutions, while complemented by those offered by private training providers.</p>
Enterprises	<p>The Skills Framework is an integral component of the Industry Transformation Maps. It provides key information on sector, career pathways, occupations/job roles, as well as existing and emerging skills required for occupations/job roles. It also provides a list of training programs for skills upgrading and mastery.</p> <p>The Skills Framework aims to create a common skills language for individuals, employers and training providers. This helps to facilitate skills recognition and support the design of training programs for skills and career development.</p> <p>SkillsFuture Enterprise Credits aims to encourage companies to invest in enterprise transformation and workforce capabilities development. It provides eligible companies a one-off SGD10,000 (USD7,000) credit to support out-of-pocket expenses for skills training, job redesign, and business transformation.</p>

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Stakeholders	Programs and Initiatives
Training Providers	<p>IN.LEARN 2020 is an innovative learning initiative that aims to drive the use of blended learning in CET to enhance the quality, accessibility, and effectiveness of learning.</p> <p>Training and Adult Education (TAE) Industry Transformation Map and Skills Framework guides the professionalization and capabilities building within the TAE sector, in order to deliver high quality and responsive TAE services that addresses the critical and emerging skills need of employers and individuals.</p>

Source: SkillsFuture [36].

The Role of Higher Education Institutions under SkillsFuture

Traditionally, the remit of higher education institutions, particularly those of the universities, have been regarded as PET. As reflected by the range of SkillsFuture programs and initiatives, it is clear that higher education institutions are expected to step up and play a more significant role in supporting lifelong learning, not only to deliver a more responsive and forward-looking curriculum for students, but also to provide continuous education and training opportunities for adult learners. This is noted in one of its early mentions of SkillsFuture in 2014, by the then Deputy Prime Minister of Singapore, Tharman Shanmugaratnam: “Our educational institutions, including our universities, will play important roles in SkillsFuture. And we have to move beyond thinking there are simple divides between education and work, between pre-employment education and post-employment training, or between nurturing broad skills and developing specialist knowledge. These divides are too simple for the world that’s evolving before us. Too simple a divide because of the way technology is changing, jobs are changing and the way education must change if we are to prepare people well for life” [37].

The next section will examine the expanded range of programs and initiatives that higher education institutions in Singapore have introduced to create a more diverse and expanded higher education landscape and support lifelong learning efforts.

Expansion of the Higher Education Sector

Alongside the rising demand for higher education, higher education institutions in Singapore have developed and implemented an expanded range of programs and initiatives. These are aimed to expand their reach and create a more diverse higher education landscape, as also remain relevant to the needs of the economy and labor market. To tighten the nexus between education and industries, the higher education institutions have co-designed and co-delivered some of these programs in partnership with industries and employers to ensure relevancy and applicability in the knowledge and skills that is learnt at school. The higher education institutions have also sought to reform their curriculum and teaching methods to nurture critical and independent thinkers who have the cognitive ability and dispositions that allows for lifelong learning. At the same time, the higher education institutions have stepped up to play a larger role in providing CET services, to provide lifelong education and training opportunities.

New Universities with Distinct Specializations and Applied Degree Pathways

The expansion of the university landscape not just corresponds to an increase in university places, but also to an increase in the diversity and choices of programs offered. Three new AUs were established – Singapore Institute of Technology (SIT) and Singapore University of Technology and

Design (SUTD) in 2009, and Singapore University of Social Sciences (SUSS) in 2017, each providing niche degree programs to nurture a more diverse and wider group of interests and talent for the future economy. In an early proposal for setting up the new university, it was suggested that the academic programs offered by SUTD should take on an integrated and interdisciplinary approach in its design [21]. This is because “jobs in the future will not only require a deep knowledge of a particular specialization, but also the ability to integrate knowledge across traditional disciplinary lines. [... And] graduates will need to be able to adopt an integrated approach to knowledge and problem-solving” [21].

Separately, SIT and SUSS offer applied degree pathways that place strong emphasis on practice-oriented learning and integrate and intersperse both work and study into their degree programs, to better prepare graduates with specific skills relevant to the job market. SIT focuses on science and technology courses, and caters to polytechnic graduates who wish to upgrade their diplomas to degrees. SUSS focuses on courses related to the social sciences, and caters to a diverse student profile, not only to fresh school graduates, but also to part-time adult learners with work experiences.

Liberal Arts Education to Nurture Critical and Independent Thinkers

In another key attempt to diversify the university landscape, the Yale-NUS College was established in 2013 as the first liberal arts college in Singapore, to offer a broad-based, multidisciplinary liberal arts program for high-caliber undergraduates. This marks a distinct departure from a highly technical education that prepares graduates with specific professional or vocational skills for the job market, towards one that seeks to develop well-rounded graduates with a lifelong passion for inquiry and knowledge [21], who have the ability to learn new skills, accept new approaches, and are adaptable and resilient in the face of uncertainty [38]. Arguably, in moving into an increasingly volatile and complex digital future where knowledge and information is readily accessible, a liberal arts education that nurtures critical and independent thinkers, and teaches graduates not just what to learn – but learning how to learn – will become more valuable [38].

Work-learn Programs to Strengthen the Nexus between Education and Industry

In order to strengthen industry relevance of their programs and facilitate stronger linkages between the curriculum taught in school and the needs of the workplace and industry, higher education institutions have tied up with industry partners to provide students with work attachments and internship programs ranging from six weeks to six months as part of the curriculum in polytechnics, ITE and the universities. In such programs, students learn through work-based training under the guidance of industry mentors, and gain industry exposure and opportunities to apply their skills. This facilitates their transition into the workplace after graduation.

Higher education institutions are key anchors in implementing the suite of SkillsFuture Work-Study Programs. In these programs, higher education institutions co-design and co-deliver the curricula with industries to provide students with a work-study pathway leading to a qualification/certification. Students undergo a combination of facilitated learning in the classroom as well as structured on-the-job training [36]. An evaluation of the SkillsFuture Earn and Learn Program (an earlier iteration of the Work-Study Program offered to fresh graduates from the Polytechnics and ITE), found positive wage returns for Polytechnic graduates who were enrolled in the program [39].

Lifelong Learning Units in Higher Education Institutes to Coordinate CET Efforts

Since 2016, lifelong learning units have been set up in higher education institutions in Singapore to coordinate and oversee programs offered to adult and continuing learners. These include

delivering short, bite-sized modular courses in priority and emerging areas through the SkillsFuture series [19]. The lifelong learning units drive ongoing CET efforts, to help adult learners upgrade their skills and stay relevant to the changing workplace.

Efforts by Higher Education Institutes to Support Lifelong Learning of Graduates

The AUs have also introduced programs and initiatives to provide lifelong learning support for their graduates. For example, NUS introduced the NUS Lifelong Learners Program in 2018 to provide their graduates with opportunities for skills upgrading and lifelong learning for up to 20 years from the time the student is admitted into the university. Under the program, graduates are given vouchers to offset the cost of enrolling in CET courses offered by the university [40]. Similarly, to encourage their graduates to continue upgrading themselves to remain relevant and employable, SUSS introduced the Lifelong Learning Credit (L2C) scheme in 2018. The L2C scheme provides each graduate with a SGD500 (USD350) learning credit that can be used to offset fees for courses taken at the university [41-42]. These initiatives send an important signal to graduates that learning does not end with getting a degree, but it is a continuous process of upgrading one's skills. At the same time, these initiatives also signify that higher education institutions are moving beyond graduating students to nurturing their progress throughout life.

Conclusion

It is clear that higher education remains integral and relevant, to support labor market needs and equips the workforce with advanced skills and competencies required by the economy. With the rising demand for high-level cognitive skills alongside rapid technological developments, the demand for higher education will continue to grow, as evidenced by the global upward trend in enrolment rates. This presents massive opportunities for higher education institutions to expand their programs and initiatives to cater to a wider and more diverse group of learners. At the same time, in adapting to an increasingly complex and volatile global economy where industries and jobs are to be transformed at a much faster pace than before, the higher education sector faces the challenge of having to transform its approaches and take on an expanded role in supporting the lifelong learning objectives. The sector also needs to become more responsive in delivering the range of skills, competencies, and talents that the economy needs.

As we have seen from this case study, in responding to the evolving economic landscape, Singapore has sought to move towards an integrated, yet flexible and diverse lifelong education and learning system, to support skills development in a more fluid workforce of the future. Undergirded by lifelong learning as a key approach, Singapore took on the 'whole of society' movement through SkillsFuture to develop and implement a comprehensive range of policies and initiatives to deliver integrated and future-ready education services. These efforts are driven not only by policymakers and higher education institutions, but also through active involvement and strong partnerships with industries and employers.

At the broad systemic level, this includes integrating the PET and CET systems and expanding education pathways to facilitate access to lifelong learning opportunities. At the institutional level, this includes a need to expand higher education curriculum and update teaching methods to ensure that provisions are relevant and applicable to future work demands. Education provisions can no longer be only about knowledge acquisition, but must also seek to develop creative thinking skills and learning to learn capabilities. At the individual level, this means having to change mindsets from chasing paper qualifications to acquiring the necessary learning habits and dispositions as

required by the changing economy as a lifelong learner. Meanwhile, higher education institutions will need to strengthen the nexus with industries and employers to better align their programs and courses with the needs of the future economy. This is because the active role of employers in providing high value-added jobs and in making more effective use of the skills of their employees is instrumental in promoting better outcomes for higher education [3].

In the age of digital disruption and the recent disruption caused by COVID-19, higher education must continue to adapt itself, in rising up to the challenges and opportunities of the future economy. No doubt, this will be a lifelong and continuous process of learning, unlearning and relearning.

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CASE STUDY 4

HIGHER EDUCATION FOR FUTURE INDUSTRY IN THAILAND

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Abstract

The need for graduates who are well prepared to meet the requirements of the new knowledge-based economy has been widely advocated over the last decade across the world including Thailand. The main objectives of this chapter are to portray the future ecosystem of Thai higher education and reveal a significant gap between job readiness and employability according to future industry expectations. This chapter outlines an overview of Thailand's economic development, the background of Thai higher education and the policies of newly established Ministry of Higher Education, Science, Research and Innovation (MHESI) that presently guides Thai higher education, and the pursuit of world-class quality of Thai higher education institutes through Baldrige's Education Criteria for Performance Excellence (EdPEX) framework. This chapter also addresses the Thai government strategies on Thailand 4.0 and Eastern Economic Corridor (EEC) initiatives, and future challenges ahead of Thai higher education including the requirement of global citizenship skills as part of MHESI strategic goals.

Introduction

The purpose of this chapter is to reflect the past, current, and future trends of higher education in Thailand in four parts. The first part displays the overview of Thailand's economic development and its current economic challenges. The second part describes the background of Thai higher education and presents the current policies of MHESI to pursuit the journey to performance excellence of Thai higher education institutes through Baldrige's EdPEX framework. The third part focuses on the direction of the Thai government's 20-year strategic plans on Thailand 4.0 and EEC initiatives. And the last part reveals the future challenges ahead of Thai higher education.

Higher education institutes prepare and develop students to be part of the workforce, and in the coming decade, the challenge of workforce preparation will increase. While the economy grows, those preparing the future workforce will be faced with a challenge as job vacancies increase due to both market growth and current workers reaching retirement and leaving the workforce. Traditionally, higher education practice tasks faculty with developing appropriate curricula for students to adequately prepare them for employment, but often they lack direct industry input into the course content and design. The lack of industry context results in content that may not adequately meet the current market needs resulting in a gap between industry requirements and graduate skills.

Exploring future workforce needs through government policies and strategies enables the researcher to evaluate and synthesize opportunities and engage partners within higher education and the

business communities to formulate education options to meet the needs of workplace environments. This chapter offers insight into Thai higher education ecosystem and identifies the current and future industry needs, and future job expectations under Thailand 4.0. The goal is to develop enrichment and educational offerings in collaboration with future industrial clusters, future employers, and higher education institutes.

Focus and Scope of Case Analysis

Thailand Economic Development

Over the last four decades, Thailand has made remarkable progress in social and economic development, moving from a low-income to an upper-middle income country in less than a generation [1]. Thailand's economy grew at an average annual rate of 7.5% in the boom years from 1960 to 1996 and 5% following the Asian financial crisis during 1999–2005, creating millions of jobs that helped millions of people to come out of poverty. Multiple dimensions of welfare have been improved: higher number of children getting more years of education, and everyone being covered by health insurance or other forms of social security.

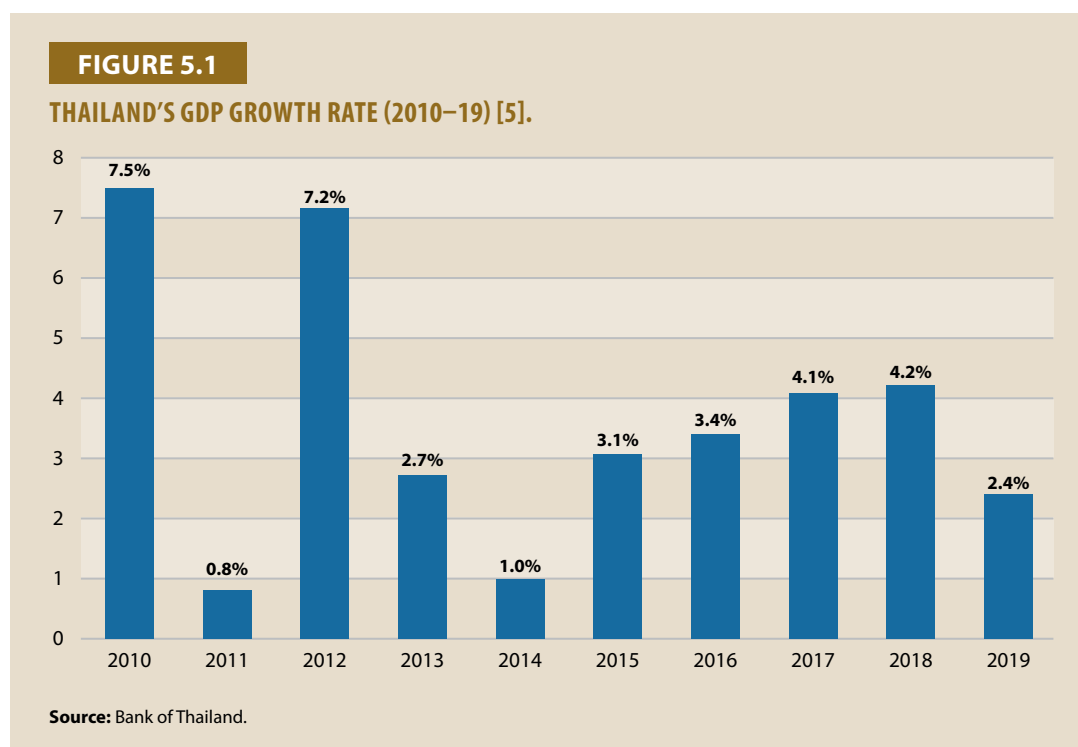
Poverty declined substantially over the last 30 years from 67% in 1986 to 7.8% in 2017 (as measured by the upper-middle income class poverty line of USD5.5/day). Compared with the earlier decade, the period from 2015 to 2018 experienced slower growth with an average GDP of 3.66% (see Figure 5.1) [2]. The fall in agricultural prices and negative impacts on farmers contributed to worsening household welfare. The period was also marked by declining levels of employment in agriculture and manufacturing sectors and low wage growth. Large regional disparities remain, and in the Northeast region, the number of poor people has increased.

The economy of Thailand is heavily dependent on exports, which account for more than two-thirds of the country's gross domestic product (GDP). Thailand itself is a newly industrialized country, with a GDP of THB16.318 trillion (USD505 billion) in 2018, and the 8th largest economy of Asia, according to the World Bank [2]. As of 2018, Thailand had average inflation of 1.06% and an account surplus of 6.4% of its GDP [2].

The industrial and service sectors constitute the major part of the Thai GDP, with the former accounting for 39.2%. Thailand's agriculture sector produces 8.4% of the GDP, lower than the trade and logistics and communication sectors, which account for 13.4% and 9.8% of the GDP, respectively. The construction and mining sector add 4.3%, while other service sectors (including financial, education, and hotel and restaurant) account for 24.9% of the country's GDP [3]. Telecommunications and trade in services are emerging as centers of industrial expansion and economic competitiveness [4].

Thailand is the second largest economy in Southeast Asia, after Indonesia. While Thailand's per capita GDP was USD7,273.56 in 2018[2], it ranks in the middle in Southeast Asia, after Singapore, Brunei, and Malaysia. In July 2018, Thailand held USD237.5 billion in international reserves [6], the second largest in Southeast Asia (after Singapore). Its surplus in the current account balance ranks at 10th in the world, at USD37.898 billion in 2018[7]. Thailand ranks second in Southeast Asia in external trade volume, after Singapore [8].

The nation is recognized by the World Bank as “one of the great development success stories” in social and development indicators [9]. Despite a low per capita gross national income (GNI) of



USD6,610 [10] and ranking 83rd in the Human Development Index (HDI), the percentage of people below the national poverty line decreased from 65.26% in 1988 to 8.61% in 2016, according to the new poverty baseline of the National Economic and Social Development Council (NESDC) [11].

Thailand has one of the lowest unemployment rates in the world, reported as 1.1% for the first quarter of 2020 [12]. This is due to a large proportion of the population working in subsistence agriculture or being in other vulnerable employment (own-account work and unpaid family work).

With a free-market economy, Thailand has a strong domestic market and a growing middle class, with the private sector being the main growth engine. The Thai economy is well integrated into the global marketplace, with exports accounting for over 70% of the country's GDP. Thailand also has a strong industry sector (40% of GDP) and a robust and growing service sector (50% of GDP) centered on the tourism and financial services industries. Though traditionally Thailand has been an agrarian society, and historically one of the few net food exporters, the agriculture sector today accounts for approximately 9% of the country's GDP.

Given the importance of exports to Thailand, it has been a leader in the region in terms of trade liberalization and facilitation with the rest of the world, starting with its Asian neighbors. Thailand is a key player in the Association of Southeast Asian Nations (ASEAN), enjoying a strategic location that provides easy access to a large market of over 622 million people [13], making it a community of connectivity, a single market and production base. Furthermore, Thailand's convenient access to China and India, as well as to other East Asian countries such as Japan and the Republic of Korea, takes this huge consumer market to even bigger proportions.

Thailand's friendly relations and expanding networks of free trade agreements with other countries have further opened up trade access to markets both within and outside the region. These, coupled with the nation's strategic positioning, have made Thailand a regional center for international

travel and trade, as well as a hub for various industries, of which the most notable are the automotive industry and agro industry. With a favorable investment climate, an entrepreneurial spirit and an open society, Thailand has been chosen by many businesses, media firms, international organizations and non-governmental organizations.

Thailand has made impressive progress over the past decades; the country joined the group of upper middle-income economies in the early 2010s and performed well in many areas. Poverty has plummeted and well-being has improved considerably, notably with respect to health and education.

Development of Higher Education in Thailand

Starting with the reforms introduced by King Chulalongkorn in the late 1800s, Thailand had a strong tradition of sending students abroad for higher education. Many of those in leadership positions, both in public and private sectors, have studied overseas. His Majesty King Bhumibol was educated in Switzerland, and His Majesty's father, Prince Mahidol, studied medicine at Harvard. Prior to the Pacific War, Europe, especially England, was the most popular site for overseas study. In the post-war period, overseas opportunities have greatly diversified. In the 1960s and 1970s, during the Cold War period, there was considerable USA funding available for talented Thai students to pursue advanced studies in the US. A high percentage of top-ranking Thai civil servants have studied abroad. The Thai government has also provided considerable funding to support overseas study. Even if the Thai civil servants do not receive a fellowship for a program abroad, they receive their full government salary while on approved study leave, either internationally or locally. This has been a major source of support for overseas education and training.

Thailand's first and premier university, Chulalongkorn University, was established on royal lands in 1916 by King Vajiravudh (King Rama VI) and named in honor of his father, King Chulalongkorn. Since then, the Thai monarchy actively supports Thai higher education. For most renowned public universities, the graduates receive their university degrees personally from the Royal Family.

The Thai system of higher education is both large and complex with a myriad of potential opportunities for those graduating from the secondary school level or having met secondary equivalency requirements through non-formal education. Amazingly, there are a total of 155 institutions offering some type of higher education (excluding vocational degrees). Most secondary school graduates aspire for admission to one of the highly selective prestigious public universities. Admission to these universities is based primarily on performance in a standardized national university entrance examination administered by the Ministry of University Affairs. This examination has been in use since 1962. Such an evaluation process, however, has resulted in a meritocratic system that clearly favors those from a high socioeconomic background, having studied in the best secondary schools, often in Bangkok or other urban areas of the country. A thorough analysis of the examination results of students from all regions of the country indicates rather dramatic disparities. Students attending school in more remote and economically disadvantaged areas such as many parts of the north, northeast, and some parts of the south have much less chance of taking and/or passing the university entrance examination. To combat such inequalities, regional universities have developed special quota systems to ensure a specific number of slots for university students from their own regions.

In applying for admission to select universities and taking the national university entrance examination, students indicate specific faculties and institutions in terms of priorities. Thus,

some students may choose fields in which they do not have a genuine interest (but where competition may be low) to enhance their chances of gaining admission to the most prestigious university possible.

The elite universities are quite diverse in nature and tend to specialize, though Chulalongkorn University and the three major regional universities (i.e., Chiang Mai University, Khon Kaen University, and Prince of Songkla University) are comprehensive in their offerings. Thus, in establishing various universities, the country has been rather eclectic. Chulalongkorn University has somewhat a British flavor, while Thammasat University is noted for politics and is more French oriented. The literal meaning of Thammasat is moral sciences. Mahidol University is known for medicine and science and is named after a prince who studied at the Harvard Medical School. Kasetsart University, which has an agricultural orientation, was somewhat modeled after a USA land grant institution and is noted for its extensive and effective outreach programs.

For students who cannot gain access to these selective elite public institutions of higher education, there are multiple options. In recent years, a number of new public universities have been established in local areas. They provide special quota admissions for students from their respective regions. In some cases, private universities supported by local politicians have been actively developed as a mechanism to provide higher education opportunities to those in the local regions and from rural backgrounds.

Another educational opportunity for students is attending one of Thailand's two large open universities. In 1971, Ramkhamhaeng University was established as Thailand's first formal Open University to meet the growing social demand for higher education that could not be met by the existing selective universities. Ramkhamhaeng University now offers both Bachelor's and Master's degrees and has a large number of students. This institution is an open admissions university, which is basically a conventional university with direct classroom learning and instruction complemented by media. It also serves working adults who may be interested in a second degree and/or enhancing job-related skills in a specific area. In 1978, Thailand established a second open university, Sukhothai Thammathirat Open University (STOU), which is an open distance university, basically an innovative university without walls. It has students in all 76 provinces of Thailand learning via television, radio, correspondence, and internet. STOU has targeted working adults as a major clientele for its programs and has several doctoral programs.

Another option for higher education is a group of institutions known as Rajabhat Institutes, which were formerly teacher training colleges. In total, there are 38 Rajabhat Universities located in every other province [14], providing convenient access to those residing in remote areas of the country. When they were transformed from teacher training colleges into Rajabhat Institutes in the early 1990s, their curricula were diversified to provide training and learning in many practical fields, such as tourism management, business administration, and other social sciences.

For students interested in technology and technical fields, there are nine Rajamangala Universities of Technology, which have been developed from polytechnic and vocational schools of technology known as Rajamangala Institutes of Technology since 2005 [15]. Similar to the Rajabhat Universities, Rajamangala Universities offer bachelor's degree, master's degree, and doctoral degree specifically in technology and related fields.

In recent years, the growing demand for higher education has stimulated the private sector to offer more opportunities for students to complete secondary school. These institutions tend to be more

expensive than the public ones. There are 72 private universities in Thailand serving almost as many students as the selective public universities [16]. Of these private universities, 55% are located outside of Bangkok, thus, helping to serve higher education needs in the regions.

Given its central location in both Asia and Southeast Asia, Thailand has been considered a potentially attractive market for international universities and colleges. The most well-known institution of this type is the Asian Institute of Technology (AIT). It serves students throughout the Asia-Pacific region and has international faculty. AIT grew out of the Southeast Asia Treaty Organization (SEATO) Graduate School of Engineering in 1967. Roughly, 20% of AIT's funds are provided by the Thai government. Assumption University, a private university, uses an exclusive English language curriculum and has many international faculty members. Additionally, a number of Thai universities collaborate with overseas institutions to offer special international programs. For example, the Sasin Graduate Institute of Business Administration, housed at Chulalongkorn University and established in 1982 in collaboration with the Wharton School at the University of Pennsylvania and the J.L. Kellogg Graduate School of Management at Northwestern University, offers internationally oriented English language MBA programs. The institute was the first in Thailand to provide an English language graduate management program. Similarly, Mahidol University International College uses an exclusive English language curriculum and serves both Thai and international students who seek higher education in English.

During the economic boom of the 1985–95, there were many plans to establish new international colleges and universities. With the economic crisis of 1997, many of these plans collapsed since they were highly dependent upon private sector funding. Prior to the economic crisis, Thailand was also developing international academic programs to serve the needs of students from transitional economies such as Cambodia, Lao PDR, and Vietnam. As Thailand recovers from its economic crisis, such programs are likely to be revitalized and expanded.

In 2017, approximately 55.53%, or 1,735,256 students, in the 18–21 age group were enrolled in higher education institutes (excluding open universities) [17]. There were two major reasons for this development. First, the Thai government offered a major loan program to assist students to help meet the costs of both upper-secondary and college-level education. Second, the former government introduced a minimum wage campaign that guaranteed monthly salary for the university graduates at THB15,000 per month.

Analysis of Current Situation

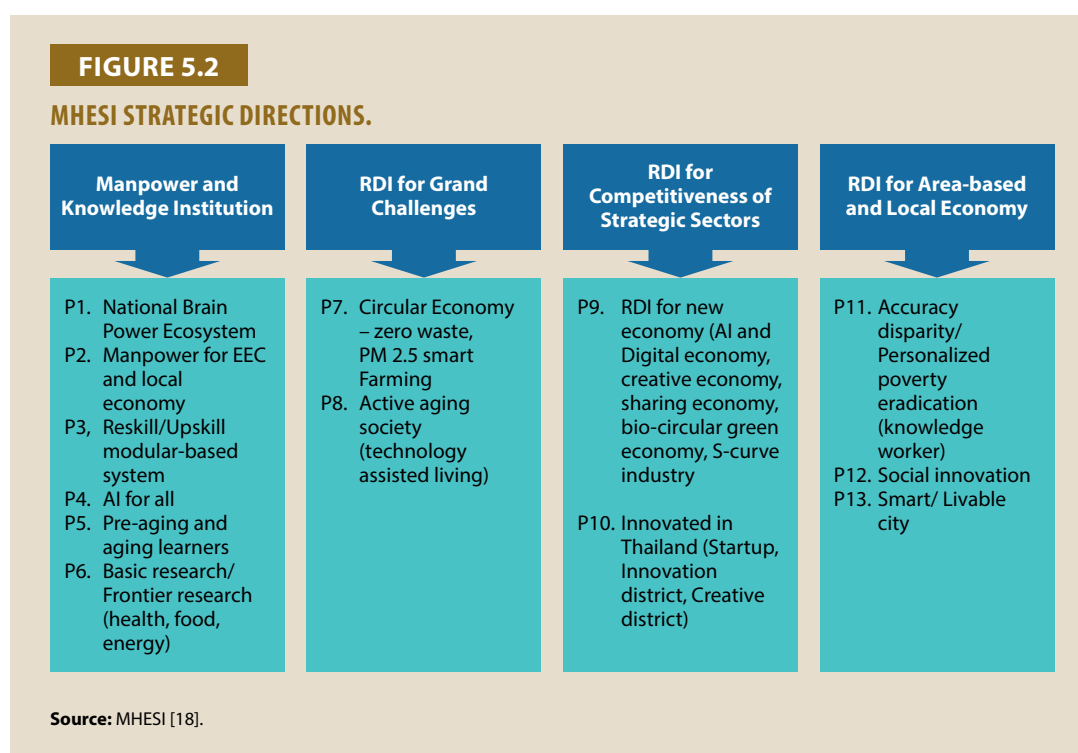
Directions from MHESI

MHESI was recently established on 2 May 2019 based on the Act of Ministries, Bureaus, and Departments Improvement (No. 19), 2019. The main responsibility of MHESI is to promote, support and direct higher education, science, research and innovation in order to develop the country.

MHESI has four missions: The first mission is to promote, support and supervise higher education to keep up with the changing world through academic independence and management. This mission also includes developing manpower in accordance with the needs of the country and conducting research and making innovations to develop communities, societies and countries in science, technology, social science, humanities and interdisciplinary education. The second mission is to promote, support and supervise research and innovation of higher education institutions and agencies in research and innovation systems that are under the ministry as well

as collaborate with agencies in research and innovation systems that are outside the scope of the ministry. The mission further entails to proceed in a direction that is relevant and consistent with the country's policy, strategy, and science and research and innovation plans. The third mission is to provide an important ecosystem and infrastructure for higher education, science, and research and innovation. This mission also includes promoting cooperation to develop specialized high-level manpower and cooperation in research and innovation with government agencies, the private sector, local administrative organizations and individuals or agencies in foreign countries. And the last mission covers other operations that fall under the duties and powers of the ministry as per the laws.

At the foundation, the MHESI Master Plan focuses on knowledgeable and skilled human capital along with sufficient scientific and technological infrastructure and enabling factors vital to the creation of a thriving innovation system. Therefore, the MHESI strategies and measures are mapped out to develop these vital factors, based on four strategic directions (or platforms), namely (1) Manpower and Knowledge Institution; (2) Research Development and Innovation (RDI) for Grand Challenges; (3) RDI for Competitiveness of Strategic Sectors; and (4) RDI for Area-based and Local Economy (see Figure 5.2).



The main focus of the first platform, Manpower and Knowledge Institution, is on development of National Brain Power Ecosystem through the elite Thai universities network to support both local economy and EEC (mega project initiated in Eastern Thailand in three provinces, namely Chachoengsao, Chon Buri, and Rayong). This ecosystem should help develop the national manpower by not only providing degree-based education but also reskilling/upskilling modular-based education that allows pre-aging and aging learners to increase their working capabilities to support the current pre-aging society. This platform also includes the basic research and frontier research that focus on health science, food technology, alternative energy, and artificial intelligence (AI).

The second platform, RDI for Grand Challenges, gears research and innovation of higher education institutions to address global and local challenges that have a grand impact on societies, e.g., air pollution with PM2.5 (particulate matter that have a diameter of less than 2.5 micrometers), application of the circular economy concept to the industry sector, application of the zero waste concept for manufacturing process design, and research that addresses issues of a growing aging society in Thailand.

The third platform, RDI for Competitiveness of Strategic Sectors, drives research and innovation that align with the country's strategic policy, 20-year strategic plans, new economy, and particularly Thailand 4.0 initiatives and new S-Curve Industrial Clusters.

The last platform, RDI for Area-based and Local Economy, directs research that helps develop the quality of living of local communities and societies and leads to social innovation for a smart and livable city.

In conclusion, MHESI promotes, supports, and supervises higher education institutes to develop the Thai knowledge workforce through enquiry-based learning, vocational skill improvement through work-integrated learning, and enhanced collaboration among universities, industries, and research institutes via cooperative education and improved academic/research personnel mobility, as well as infrastructure/enabling factor development programs, such as regional science parks, industrial technology assistance, tax incentives, and innovation financing.

This strong foundation will support the development of society, local communities, economy, and environment with the ultimate goal of providing a high quality of living in society and a sustainable economy driven by creative innovation. Strength in science, technology and innovation will help the country cope with emergent issues and future challenges, such as aging society, social disparity, globalization, regionalism, climate change, water–food–energy security, and emerging diseases. Networking is an essential part and is emphasized by the creation and promotion of active collaboration through strong linkages with local and international partners.

Pursuit of World-Class Quality through EdPEX

Since Thailand's education reform in 1999, universities are required by law to put in place internal and external quality assurance systems. With the rapid increase in the number of universities, Office of the Higher Education Commission (OHEC) has been working toward putting in place internal quality assurance (IQA), focusing on “minimum standards” for universities.

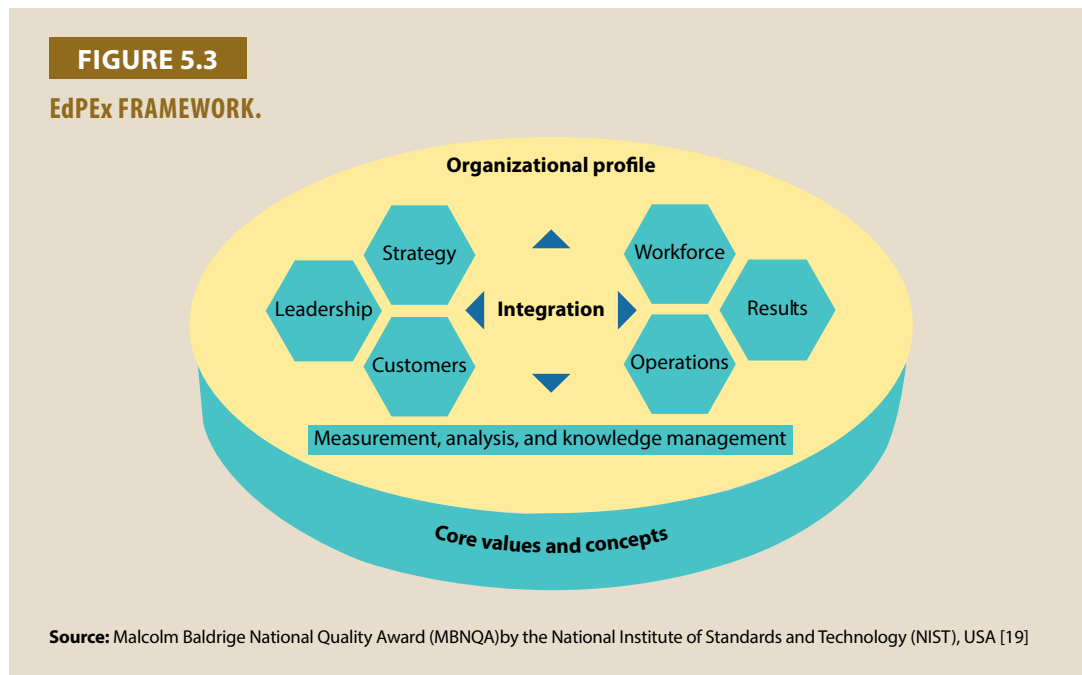
However, the need to provide universities with more comprehensive tools to strengthen their IQA and help them identify their strengths and weaknesses has been long overdue. With this in mind, OHEC did some groundwork a few years ago and selected the world-renowned Malcolm Baldrige National Quality Award (MBNQA) framework as a tool to help universities strengthen their operations.

To respond to the global challenges, Commission of Higher Education (CHE) has shifted the priority mission from setting standards to promoting higher education on the basis of academic excellence. Consequently, EdPEX, derived from the MBNQA framework, was introduced as a new approach of IQA for Thai higher education institutions that currently have IQA or external quality assurance (EQA) results at a “very good” level.

The EdPEX framework is non-prescriptive and focuses on the results to allow the institutions to choose their most suitable tools for facilitating institutional quality improvement, e.g., Plan-Do-Study-Act (PDSA), Balanced Scorecard, accreditation, and self-improvement. The requirements of

EdPEX are embodied in the following seven critical aspects of the organizational management and performance management: (1) Leadership; (2) Strategy; (3) Customers; (4) Measurement, Analysis and Knowledge Management; (5) Workforce; (6) Operations; and (7) Results (see Figure 5.3).

Currently, OHEC staff and assessors are trained in the EdPEX framework and use it for the assessment of the universities. To encourage the application of this new approach, it has been promised that the universities that decide to adopt this approach will be excused from the required completion of IQA for OHEC.



Identification of Current Strategies

Thailand 4.0 Initiatives

Thailand has identified a total of 10 industries to target for investment under a new digital internet of things (IoT) plan that will be vital to the country's future economy. These industries are referred to as the S-curve industries of Thailand.

Together, they represent shifting of gears for business in Thailand and an economic transformation for the country. They will be the foundation upon which both education and commerce will be focused as the country seeks to attain the Thailand 4.0 policy.

An "S-curve" describes the mathematical arc that typical companies go through as they enter the marketplace and begin to undergo cycles of growth and stagnation. The "S" in the term refers to the word "Sigmoidal", which is a mathematical term from which the S-curve formula is derived. The arc represents the surges and lulls in profitability and growth over time that a company encounters as natural cycles of business and marketing.

A new, ultimately successful company starts at the bottom of its S-curve. The curve begins to rise as products start selling, and the company gains investment. As word gets out about the products or services, it experiences rapid growth until its market matures. At this point, its growth slows as the market may also become saturated.

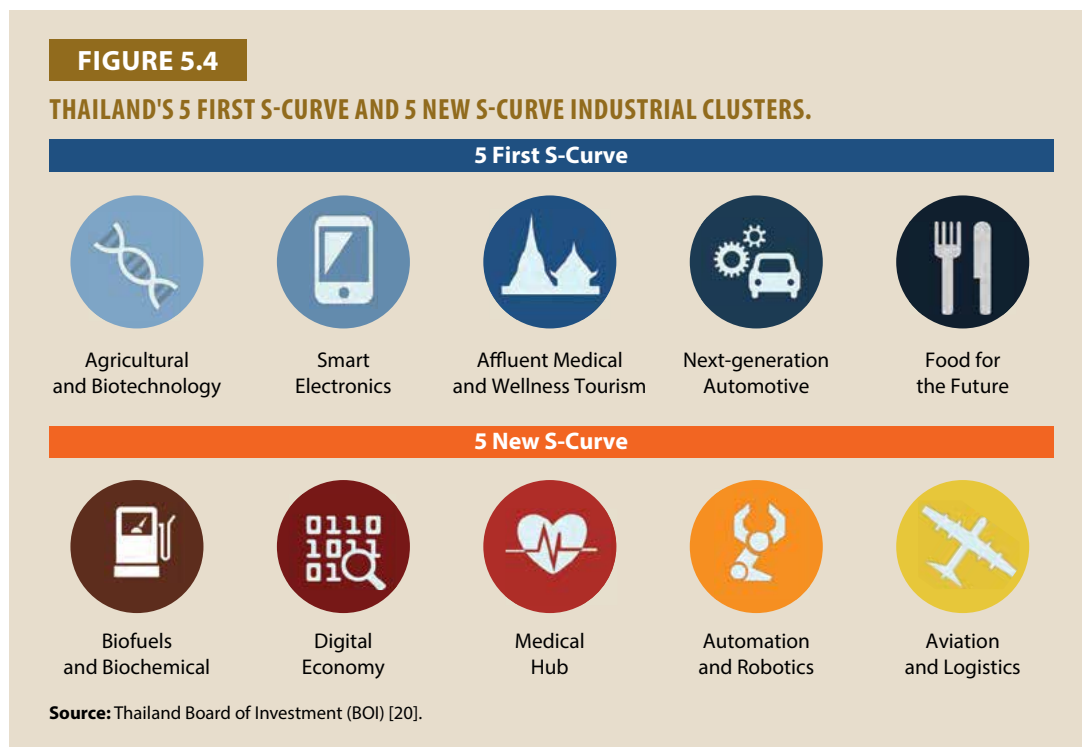
The company has hit an inflection point. Normally in a marketplace, there are five types of people categorized by the amount of time it takes them to adopt an innovation or technology. These five types of “adopters” or buyers are represented in an S-curve as inflection points.

The innovators and risk-takers will be the first ones to adopt a new product or innovation. They will test it and provide public feedback that will hopefully encourage the next group. The next group is made up of trend-setters, people who are always on the lookout for a technology or innovation that has been reviewed favorably. The group that buys the product after the trend-setters, the early majority of the consumers, represents the apogee of the product’s appeal in the marketplace. However, the product will continue to sell to a large number of people, called the late majority, which represents a delayed reaction to the early majority’s adoption of the product. This is the point where the product reaches a steeper slope on the S-curve.

But as the adoption of the innovation starts to slow down, the product reaches “critical mass”. This is a phenomenon where the product has become so popular or useful that it continues to diffuse itself into the rest of the community and becomes an accepted, everyday norm. The best recent example of critical mass is smartphone technology, which has become an everyday part of life to hundreds of millions of users around the globe.

The 10 S-curve industries of Thailand have been targeted as the best industries to support the country in attaining the much-coveted level of “critical mass” in the innovations they will offer and the markets they will enter.

These industries have been targeted in two phases of five industries each. The first five industries on the list, as shown below in Figure 5.4, represent the first phase targeted in 2014, while the other five represent the second phase targeted in 2018. Together, these industries are cited by business experts as representing the best chance for the country to attain the goal of Thailand 4.0.



5 First S-Curve Industrial Clusters

Agricultural and Biotechnology: With a thriving agriculture sector, Thailand is a natural location for biotech companies looking for abundant available natural resources. The country has over 15,000 varieties of plant life and a year-round growing season that acts as a further inducement for biotechnology.

With the country's agriculture sector currently transitioning to "smart farming" methods to increase its crop yield, and an already developed infrastructure of research and development facilities, Thailand is well-positioned to become a leader in the biotechnology industry.

Smart Electronics: As the heart of IoT, smart devices that can act interactively and autonomously are the future of both appliances and handheld devices. Thailand's electronics industry has been a major contributor to the country's GDP for decades. Some of the world's largest multinational electronics manufacturers have plants in Thailand, including LG Electronics, Fujitsu, Seagate, Sony, Samsung, and Western Digital.

Thailand's competitive edge in the industry comes from its well-established supporting industries that supply automatic data processing components and hard disk drives, making the country an industry leader with room to grow.

Affluent Medical and Wellness Tourism: Thailand has been quietly growing its health tourism or medical tourism profile for many years now. It has benefited from the excellent doctors, staff and facility at its hospitals that rank among the world's best medical facilities.

It has also benefited from the logistical and bureaucratic expertise of transferring patients into and out of the country safely and comfortably. This ability has added greatly to Thailand being seen as a desired destination for world-class medical care. The industry can only benefit from Thailand's push to integrate smart technology, robotics, advanced genetics and biosciences with the already established high-level of medical care.

Next-Generation Automotive: Thailand is the largest car manufacturer in the Asia-Pacific region, with the industry providing employment to around 850,000 people and contributing 10% of the country's GDP [21]. Thailand has a head start in experience over fledgling auto manufacturing nations such as Vietnam and Indonesia.

But with recent innovations such as telematics, electric vehicles (EVs), and autonomous driving being offered by the industry worldwide, the country must step up its technological capabilities to maintain its dominance.

Food for the Future: The food processing industry in Thailand is one of the most advanced in Southeast Asia, and one of the country's most valuable and important industries. Together with the food industry as a whole, they contribute 23% of the country's GDP.

With such a well-established, advanced, and stable industry poised to benefit from innovations and advancements in robotics and automation, targeting this industry for further investment was a sensible decision.

5 New S-Curve Industrial Clusters

Biofuels and Biochemicals: In this industry as well, Thailand has enjoyed a head start over other

regional, neighboring countries. By investing in this industry at the turn of the new century, Thailand has established a complete supply chain of biofuels and biochemicals.

With the energy needs of the country growing as its population, industries, and exports grow, biofuel industry development is an important investment that lowers the energy costs for the nation. Biochemicals are also important both to the agriculture and medical industries of Thailand.

Digital Economy: The digital industry in Thailand is focusing its efforts on both IoT and AI. The industry comprises established companies as well as startups. The established companies will provide facilities, mentoring and education to the startups in a collaborative atmosphere.

Together, these entities also plan to invest their time and efforts in providing innovative solutions to all the other targeted industries on the list. The digital industry may well turn out to be the most important one as its innovations can be applied to all the other industries.

Medical Hub: Integrating medical services to utilize innovative and smart technologies is not only the way forward for Thailand's health care policy but also a way to boost health tourism.

Today, surgical robotics, smart algorithms, telemedicine, genetic data, and health trackers serve to streamline and enhance the capabilities of both doctors and medical procedures. Thailand has enjoyed years of its advanced medical skill, experience and knowledge that has allowed the country to become a hub of medical tourism in Asia. By investing further in integrating the medical services to include new technologies and innovations, Thailand can become the hub of medical tourism in the world.

Automation and Robotics: With the medical industry, food processing industry, and automotive industry being natural users of robotics and automation technology, this industry will be vital to raising the capabilities of several of the other S-curve industries.

Thailand's working population is aging, and the younger generations have become better educated and are looking for jobs that suit their qualifications. It has become imperative for Thailand to invest in robotics and automation to maintain its supremacy in the industries that can benefit from these technologies.

Aviation and Logistics: The need to provide maintenance, repair and overhaul (MRO) services and logistics services increases as a country expands its ability in tourism and exports. Creating an MRO and logistics hub in Thailand is a necessary investment for the future that will help guarantee a lack of disruption in the supply chain of either exports or tourism.

It is one of the industries that will help other S-curve industries grow and succeed while it contributes both jobs and revenue to the country.

There is an old saying that aptly illustrates the effort that Thailand is making and the industries it is choosing to attain Thailand 4.0: "A rising tide lifts all boats". It means that the industries chosen by Thailand for investment can help each other in finding success, by providing technologies and innovations for the benefit of all. It is the concerted effort that is the crucial factor.

In helping one another, they can raise the country's economy, the well-being of its people and its status in the global community. Overall, they can serve to unite the country in prosperity and provide an avenue for advancement far into the future.

EEC Initiatives

The Royal Thai Government has laid out a 20-year strategy for Thailand to achieve high-income status by 2036. The strategy includes a wide range of top-down initiatives, especially in infrastructure and people development, to transform Thailand into a nation that can compete against wealthier and more knowledge-based economies. The government calls the strategy “Thailand 4.0”, taking a cue from the concept of “Industry 4.0” aimed at developing an innovative, value-based industrial landscape.

The EEC development lies at the heart of Thailand 4.0. EEC is an area-based development initiative, aimed to revitalize the well-known Eastern Seaboard where, for 30 years, numerous business developers have experienced a rewarding investment journey and exceptional achievements.

The EEC project initially focused on the three Eastern provinces, namely Rayong, Chon Buri, and Chachoengsao. The EEC development plan envisages a significant transformation of both physical and social development, and plays an important role as a regulatory sandbox uplifting the country’s competitiveness.

EEC aims to be a strategic area to drive and leverage the country’s development toward “Thailand 4.0”. This will be implemented by promoting investments in targeted industries, developing infrastructure and public utilities, providing services for investment and business activities, systematizing and capitalizing on technologies, and enhancing human resource development in order to achieve prosperity and sustainable future.

In response to the urgent need of workforce for the 10 S-Curve Industrial Clusters, the government has set up the Eastern Economic Corridor of Innovation (EECi) as a source of innovation and technology development, and the Eastern Economic Corridor of Digital (EECd) or Digital Park Thailand in the EEC area. The objective of EECi is to establish an innovation park within EEC to support research and development carried out by the government sector, the private sector, universities, and local communities [22].

EECi will be the inspirational force in developing and upgrading the EEC special economic zone (SEZ) with technology and innovation. This is aimed at creating an innovation district within the SEZ and fostering joint research and development projects among the public sector, the private sector, universities, and local communities.

Thailand’s Digital Park (EECd) is the destination for global players and world-class digital nomads to invest in businesses under the Work–Learn–Play concept. EECi and EECd will accelerate the development of EEC on: equipping human resources with skills and qualifications to fulfill industry’s needs, providing sufficient quantity and quality of workforce (especially those with vocational certificates), and supporting research, innovation, and technology to drive targeted advanced technology industries for further commercial purposes.

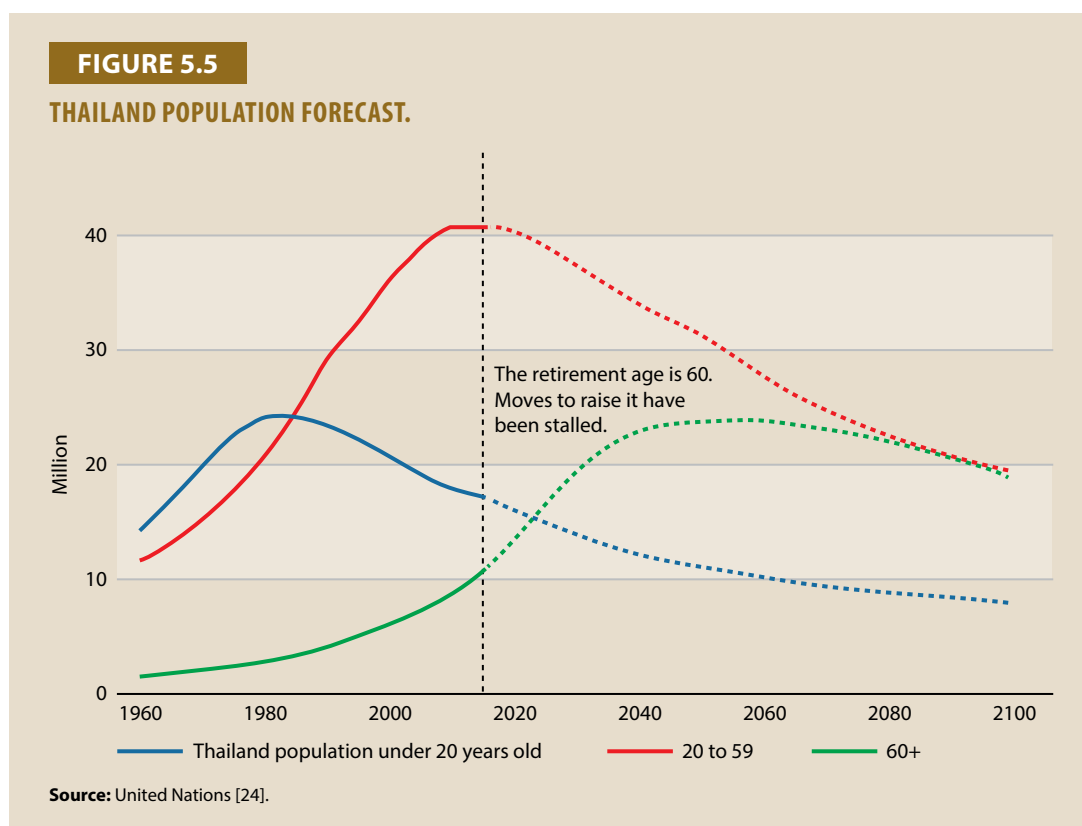
Analysis of Strategies and Ways Forward

Alignment and Challenges Ahead

The first challenge of higher education in Thailand is related to the decline in the number of students due to low birth rate and the number of available seats in universities. For much of the 20th century, Thai higher education was focused on the quantitative aspect of educational provisioning. However,

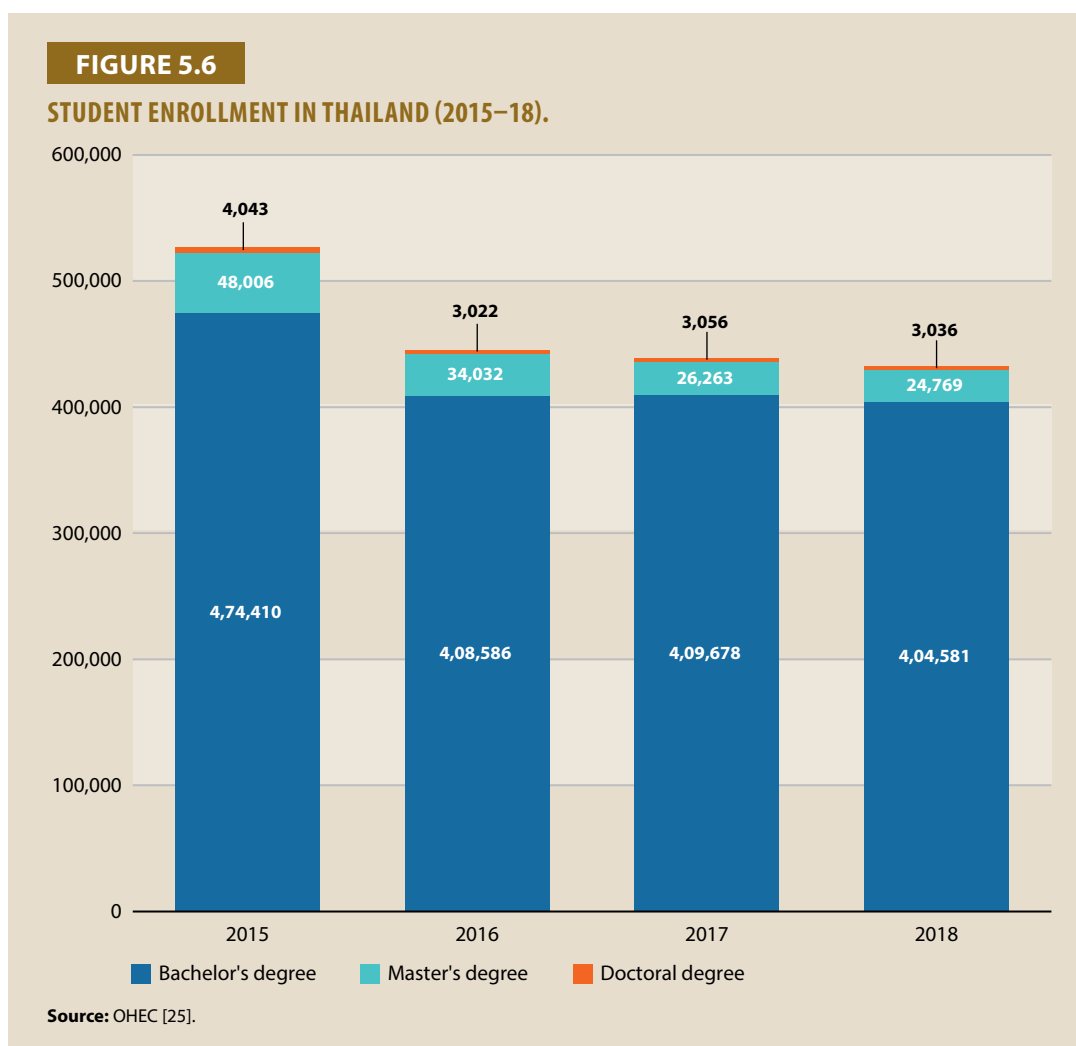
as a pre-aging population, Thailand is experiencing a decline in fertility rates. While the enrollment ratio of students in higher education is increasing, the total number of annual enrollments has fallen due to changes in the population rates of school-age children. In 2013, OHEC reported 1,870,738 students to be enrolled in higher education institutions whereas in 2017, enrollment dropped to 1,735,256 [23]. This is a decline of 135,482 seats or a 7.2% drop from the 2013 numbers.

It is foreseeable that enrollment statistics will continue to decline as population growth rates continue to drop. Therefore, in a few years from now, if the present growth rate continues (see Figure 5.5) and the trend of new student enrollment in higher education heads down (see Figure 5.6), Thai higher education may face a problem similar to that currently being experienced in Japan. It is estimated that Japan has an oversupply of 200 universities due to a declining student population, due to which existing higher education institutions are desperate for students and are lowering their standards [26].



The second challenge is related to the quality of higher education institutes in Thailand. The necessity for Thailand to compete internationally is based on the creation of quality graduates and partly through university ranking. For much of the 20th century, Thailand focused on the quantity aspects of providing higher education to the masses. However, Thai higher education has not met the international standard and continues to be outpaced by its regional neighbors. According to the QS World Southeast Asia university rankings in 2020 (see Figure 5.7), the Thai universities ranked 8th (Chulalongkorn University) and 11th (Mahidol University), lower than universities in Singapore, Malaysia, Indonesia, and Brunei [27].

There are also a large number of social science graduates compared with graduates in science, technology, engineering, and mathematics (STEM) education who would support innovative future



industries. Additionally, Thai higher education must aim to create an educated workforce with the ability to think critically and solve problems using a systematic approach and multicultural exposure by participating in the international communities.

The third challenge is the skill mismatch. Due to economic modernization, foreign direct investment in manufacturing, and the necessity for more skilled labor, there is a corresponding need to educate and develop the skills necessary to meet the demands of the labor market. As the diploma and degree carriers entered the labor market and received the best offers, parents and students saw the need to invest in higher education for the specific purpose of job attainment. This credentials as demanded by the labor market translated into greater student numbers in higher education. Therefore, both the need for skilled labor and the need for a university degree to attain professional positions have supported Thai higher education for the past 50 years. However, Thai higher education has failed in its efforts to create and provide skilled labor with critical thinking skills and qualified talents to the labor force both locally and globally.

The last challenge is internationalization of higher education programs. Although English is taught at all levels in the Thai primary and secondary education, it is not commonly used in day-to-day life and most students leave secondary school with a limited understanding of grammar and virtually no comprehension of English usage for academic purposes. It is well established that Thai

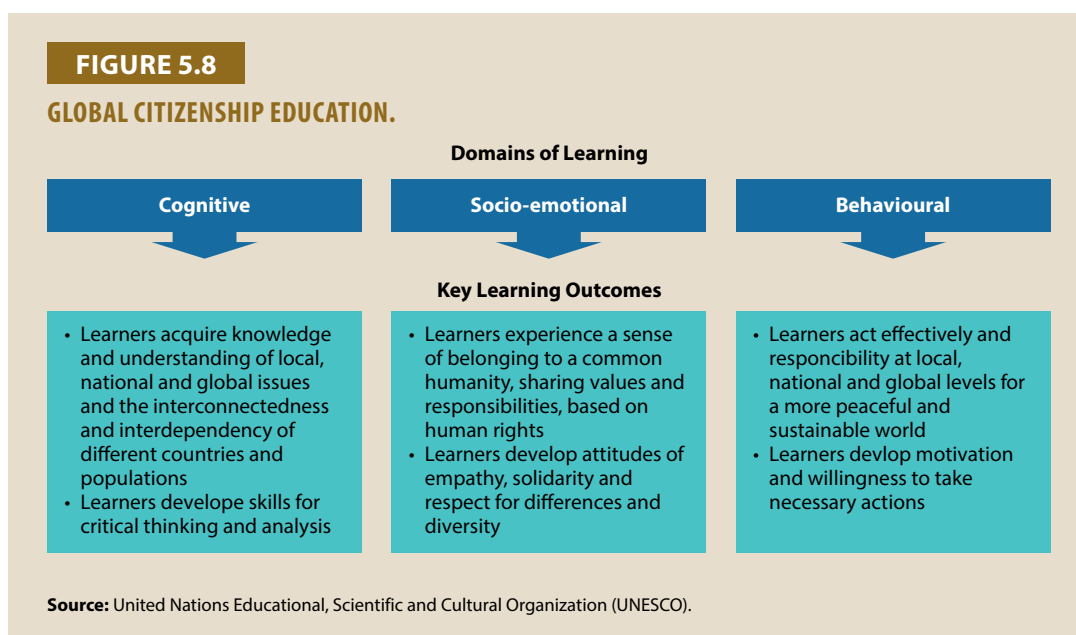
FIGURE 5.7**SOUTHEAST ASIA UNIVERSITY RANKINGS 2020.**

Source: QS World University Rankings [28].

students have an interest in studying English, yet the results of many years of study have shown little improvement in the Thai education system [29, 30].

Apart from English language, internationalization requires multicultural exposure to develop knowledge and understanding of global issues as part of global citizenship education [31]. A core concept in Thai higher education is the promotion of Thai values and traditions (i.e., Thainess). Yet, many of the values that underlie Thainess are not in line with global citizenship education (see Figure 5.8).

An important cultural issue Thai student's face when selecting and entering higher education programs is the social connectivity, which is equally important as the actual knowledge attained from completing a degree. Throughout the process of entering the job market, one must use the social connections from family and school to land the interviews and eventually secure employment. Within this multi-sociocultural setting, a student must analyze the potential connections available



within different college programs. However, within this desire to cultivate the right relationships, there is a delicate balancing act involving the comprehension and assimilation of international values and the retention of Thainess.

Conclusion

The primary contribution of this chapter is toward identifying current relevant issues within the higher education sector in Thailand and providing a holistic perspective for improving the university–industry ecosystem so that it aligns with the national policies and strategies of Thailand 4.0 and EEC initiatives.

While the higher education sector has seen rapid development in recent years through implementation of EdPEX initiated by OHEC, very few educational degree programs are being developed with the awareness of future industry requirements and expectations. Most of the faculties involved in curriculum development as well as the regulators of such activities such as CHE are required to reconsider the gap between the current academic readiness and the requirements of the future industrial clusters and global citizen competencies.

Among the various ways for closing the gap are steps in developing university–industry ecosystem within higher education institutes. The universities should proactively evaluate future industrial needs and try to align their undergraduate and graduate programs accordingly. The universities are required to upgrade and update their curriculum on a continuous basis, introducing “specialized elective courses” in their degree programs that are relevant to the needs of both the first five and new five S-Curve Industrial Clusters. Courses need to be continuously redesigned and revised in a very proactive manner so as to integrate the latest technologies and trends relevant to the basics of those courses, in particular relevant to the needs of the expanding industry sector.

The universities also need to invite people from the future industry sector to teach some specialized elective courses or at least provide short seminars or workshops for the benefit of the students. For their long-term sustainability, the universities should form small research groups headed by senior

academics to facilitate the research and development needs of the future industry and interact with the future industry sector on a regular basis.

To cater to the needs of the future industry in a way to keep pace with international developments, both the top-level academic community and the industrial spearheads need to do some visionary thinking and strategic planning that is beyond their day-to-day management tasks. This approach would be highly beneficial for higher education as well as the future industry sector.

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CASE STUDY 5

HIGHER EDUCATION FOR FUTURE INDUSTRY OF VIETNAM

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Abstract

The research focuses on what higher education institutions (HEIs) in Vietnam and the government can do together to increase the relevance of higher education system and the labor market as a way to meet the diverse requirements of the future industry¹. The main content of the research includes current situation of higher education system, the requirement of labor market in Vietnam in the context of Industry 4.0 reform, and strategies and ways forwards for HEIs and the government in the country. The higher education sector in Vietnam is categorized at three levels: international/regional, national and institutional, and those related to the stakeholders in the sector at different levels. At the international level, the Government of Vietnam and HEIs have endeavored to successfully join different international and regional organizations with fruitful higher education activities like APEC and ASEAN. At the national level, the Communist Party of Vietnam plays the leadership role and it has identified education as the top priority, and the government has emphasized the importance of efficient and effective governance in higher education. The research, therefore, has analyzed some main aspects including the regulatory framework, state budget, university charter, higher education strategy, qualification framework and national education system structural framework, as well as national quality assurance system and accrediting agencies. At the institutional level, many aspects of internal governance are limited by external institutional constraints and overly centralized approach to governance. So, the research has focused on main aspects including governance and administration, stakeholders of HEIs, accountability, autonomy, and internal quality assurance of HEIs. The research has also identified strategies and regulations of the government and HEIs aimed at enhancing the quality of higher education system to meet labor market in the context of industry 4.0 reform such as building higher education strategy 2021-2030, enhancing legal and governance framework, pushing up autonomy vs. accountability, making clear qualification framework and national education system structural framework; and enhancing linkage between HEIs and industries or business communities.

Introduction

During the past over thirty years from the start of the ‘Doi Moi – Renovation’ policy in 1986, Vietnam has boosted its internationalization efforts to integrate into the global higher education sector. The higher education system in Vietnam has been undergoing a major transformation

¹ Future industries in this report refer to the requirements of Industry 4.0 reform.

influenced by national and international developments such as the rapid expansion of student enrolment, a relative decrease in public funding along with a shortage of private funding, the increasing importance of research and innovation in the global and knowledge-based economy, the need for highly skilled labor force to increase productivity and enhance performance, and wider competition between the HEIs. The impact of international and regional trends in the ASEAN countries on curricular reform, quality assurance, qualifications recognition and mobility has become one of the key drivers of change. The private sector, previously forbidden in a Soviet-Union block economy, was especially encouraged to develop the higher education sector through establishment of private HEIs and colleges as a way to meet the rapidly growing demand for higher education.

The government and HEIs have endeavored to join activities and movements led by international organizations to smoothly integrate into the global higher education community and become its full-fledged member. Vietnam has ratified the UN Global Sustainable Goals 2030, and is a member of global organizations like the International Network of Quality Assurance Agencies in higher education, ASEAN, and APEC forum. Vietnam has maintained close links with neighboring countries and integrated deeply into the regional arrangements with the ASEAN nations. Clearly the trend is towards alignment with regional higher education systems and frameworks such as ASEAN Qualification Framework and ASEAN Quality Assurance Framework. These two frameworks have been the point of reference for local education arrangements and policies.

Within HEIs, many aspects of internal governance are limited by external institutional constraints and overly centralized approach to governance. Despite the deregulation policy adopted by the government, the plethora of laws, regulations and decrees, most of the time contradictory in nature, leave little room for exercising a full blown institutional autonomy; the dilemma that the higher education system needs to further deal with. In contrast, a move towards financial decentralization has been made to grant the HEIs greater operational discretion, particularly with respect to organizing their noncore revenue-enhancing operations and the management of finances. However, the need for capacity building for most HEIs to ensure a smooth transition to self-governance continues to impede delegation of authorities and full autonomy in governance and operation.

The passing of Resolution of the Politburo No 52/NQ-TW September, 2019 regarding a number of guidelines and policies to actively participate in the fourth industrial revolution has a vision to make Vietnam one of the smart production and service centers as well as one of the leading start-up and innovation centers in Asia by 2045. The vision includes enabling high labor productivity and becoming capable of mastering and applying modern technologies to all socio-economic fields. The Resolution strongly emphasizes on education and technology development and the need to reviewing the overall education and training program and innovating its contents to enhance the accessibility, creative thinking and adaptability to the technological environment that is constantly changing and developing, and introducing digital and basic foreign language skills into educational curriculum. It also highlights the need for innovating teaching and learning approaches based by applying digital technologies, taking the assessment of enterprises as a measure for the training quality of HEIs in the field of information technology, and making conditions for new models of education and training based on digital platforms to develop. The other focus areas include paying attention to developing priority industries with high readiness such as information technology, electronics and telecommunications; network safety and security; intelligent manufacturing industry; finance and banking; e-commerce; digital agriculture; digital tourism; digital culture; healthcare; and education and training. The resolution also aims to prioritize resources for

implementing a number of national key research programs on priority technologies, with a focus on information and communication technology, mechatronics, new technologies in the field of energy, artificial intelligence, biotechnology and biomedical electronics [51].

Before that, Resolution No. 29-NQ/TW identifies education as the top priority, and that investment in education is prioritized over other socio-economic development plans. With regard to higher education, the specific objectives include: (1) focus on training skilled labor, cultivating talents, developing learners' personal qualities and independent study capabilities, and creativity; (2) complete the network of HEIs with an occupation structure and qualifications appropriate with the national manpower development plan, some of which reach the regional or international level; and (3) diversify HEIs meeting the demands for development of technology and industries, and the requirements for the national construction and defense, and international integration.

In terms of higher education for the future industry, the Government of Vietnam recognizes the importance of efficient and effective governance in the sector with due recognition of specific features of Vietnam's social and political economy and its higher education system.

Current Situation of Higher Education System

Development Process of Higher Education in Vietnam

Historically, the higher education system in Vietnam has been driven by the socialist ideology, centrally planned and controlled governance with a key actor, the Ministry of Education and Training (MOET) as the provider of "public goods" for enhancing higher education provisions. The system was also characterized by state provisions for higher education and it was only in 1989 that the first ever private HEIs, Thang Long HEIs, was established by a group of intellectuals on an experimental basis (originally known as people-founded), with the major aim to improve access to HE [37]. Although the legal framework supporting establishment of nonpublic HEIs did not appear until 2005, with the establishment of Thang Long HEI and a precedent of establishing non-public HEIs based on issuance of decrees, the private HE institutions started to mushroom.

The system underwent significant reform in 1993 as a consequence of landmark commitments made by Communist Party of Vietnam Central Committee about the importance of education in the social and economic development of Vietnam and the need for the higher education system to be reformed and expanded. The effects were immediate. The government moved to establish a unified national system of large, comprehensive, research-oriented HEIs, meaning, in effect, that the Soviet model of small, specialized colleges and institutes were officially abandoned. The government also allowed public HEIs to levy tuition fees, within strict limits, thereby introducing an element of market demand to the provision of higher education. More significantly, it introduced two new sectors of high education, a semi-public sector, comprising state-owned institutions funded entirely from tuition-fee income, and a 'non-public' sector, comprising community-owned institutions, also funded entirely from tuition-fee income. Acceptance of the need for a non-public sector meant that for the first time private ownership, even if in a highly contained form, became officially sanctioned within the higher education system.

Since 1993, the system has expanded at a dramatic rate. During the academic year 1992–1993, there were 162,000 higher education students in Vietnam, representing a gross enrolment rate of about 2%².

² Gross enrolment rate is defined here as the number of students enrolled in higher education as a proportion of the relevant age group in the population.

By 2006–2007, the number of students had increased to 1.54 million, representing a gross enrolment rate of 13%³. The system has also become much more diverse. In 1992–1993, there were 103 HEIs, nearly all of which were small and specialized, focusing only on teaching, not on research. Nine of these institutions were classified as universities, the largest of which had an enrolment of just over 3,000 students, and there was one non-public university only⁴. By 2006–2007, there were 322 HEIs, of which 139 were universities and 47 non-public universities and colleges. Six of the public HEIs had enrolments of more than 40,000 students and the average enrolment size of HEIs was 8,500⁵.

In 1998, the government decreed that higher education programs could only be undertaken at designated HEIs or college. This decision placed a boundary around what could be officially described as higher education in Vietnam. The government also drew a distinction between degree-granting institutions (HEIs-ties) and institutions that were restricted to awarding associate degrees (colleges). This decision gave HEIs and colleges a separate status. All HEIs and research institutes were given permission, subject to state approval on the basis of satisfying certain criteria, to award degrees at master and doctoral levels. This change represented another major departure from the Soviet model of the earlier era, in which research training belonged largely to specialist research institutes.

In 2000, a further distinction was drawn between HEIs, which were expected to provide opportunities for study across a wide range of disciplines and to develop research capability and colleges, which were expected to provide opportunities for study within a single field of study and not to have a research role. This classification was extended in 2001 by the addition of community (junior) colleges as a specific type of HEI, one that provided vocational training programs, as well as programs articulated with courses offered by HEIs and senior colleges.

In 2004, a selected group of 14 HEIs was identified as the ‘key’ higher education institutions in Vietnam. The group included all five HEIs designated in 1993 as forming the core of a renovated higher education system, and nine other large HEIs, several of which had formerly been amalgamated with one or other of the two national universities⁶.

In 2005, the government resolved that, in the future, higher education institutions in Vietnam would be either public or non-public. This resolution meant that semi-public institutions (which in 2002–2003 accounted for 3% of all higher education students) would cease to exist, either by becoming fully public or by becoming non-public⁷. The government also resolved that approximately 40% of all higher education enrolments should be in the non-public sector by 2010, a marked increase from the level of only 13% in 2003–2004. It introduced a new classification scheme for non-public HEIs, that is, they were to be classified either as ‘for-profit’ or as ‘not-for-profit’, and it committed the state to the growth of ‘not-for-profit’ non-public HEIs through the provision of generous tax exemptions and land grants. The government also told public HEIs to adopt a more client-centered and less bureaucratic approach to service delivery.

3 See The WB (2008: 14–15), for a brief account of changes in the gross enrolment rate in higher education in Vietnam. This rate must, however, be seen in broader perspective. It falls well below the OECD average, which is now over 50%, and it is lower than the rate in People's Republic of China, which is currently 20% and rising rapidly.

4 The non-public university only, it is Thang Long University

5 Harman G., Hayden M., Nghi P.T. *Reforming Higher Education in Vietnam-Challenges and Priorities*. Springer, 2018. Pg 16-17.

6 In 1993, the two national HEIs designated by the Government were the Vietnam National HEIs of Hanoi and the Vietnam National HEIs of Ho Chi Minh City.

7 Resolution no. 05/2005/NQ-CP, dated 18 April 2005

Late in 2005, even more significant reform measures were adopted. Within the framework of a Higher Education Reform Agenda (HERA)⁸, the government announced a package of measures that included the following:

- A significant expansion of the higher education system, providing for 45% of the relevant age group by 2020 (up from 13% in 2006-2007).
- A significant increase in the number of qualified higher education staff, sufficient to ensure a staff/student ratio of 1:20 by 2020 (earlier about 1:30), with at least 35% of academic staff having doctoral qualifications (up from 15%).
- The establishment of two types of higher education institutions, one to be research-oriented (accounting for 20% of all enrolments) and the other to be more vocationally applied.
- A significant expansion of the non-public sector, to account for 40% of all higher education enrolments by 2020 (up from about 13% at present).
- The development of an advanced research and development culture, with research and development activities to account for 25% of the system's income by 2020 (up from about 1%).

Questions have been raised about the viability of many of the measures adopted in HERA [18]. The costs alone in expanding the system so rapidly, while at the same time ensuring a sufficient number of qualified academic staff, are likely to be extremely challenging for the economy of Vietnam.

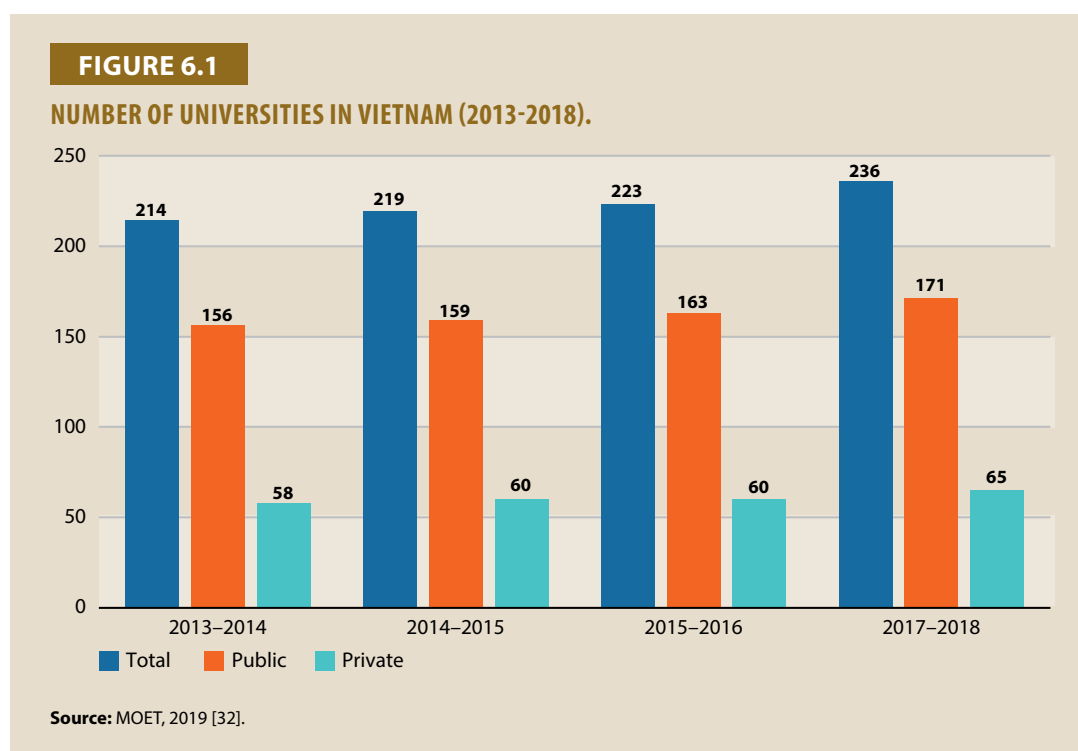
Since 1993, the higher education system has been divided into two structural models, two-tier and one-tier. The two-tier model consists of two levels of institutional management and leadership, known as “umbrella universities” with a presidential board and member universities with a rectorate board. There are five comprehensive universities in which two national universities report to the Prime Minister (Vietnam National Universities, one at Hanoi and one at Ho Chi Minh City); three regional universities report to MOET and provincial people's committees [31]. Under the “umbrella universities” are member universities, faculties and institutes, which operate relatively independently from each other. The rest are the one-tier model with one level of management. These HEIs are essentially mono-disciplinary institutions and are now moving towards more diversified disciplines like Academy of Finance, Academy of Banking, and National Economic University.

Current Situation of Higher Education of Vietnam

By 2018, there were 236 universities across Vietnam, including 27.6% private institutions and 72.4% public sector institutes. Amongst top public universities, leading institutions in certain fields are selected to be ‘key university’, which are prioritized for state funding. By 2017, a total of 22 universities were selected to be key universities, including two national and three regional universities. Apart from the national, regional and key universities, the public sector also includes several inter-governmental institutions, which are new model universities of excellence, and have been established based on the partnership agreement between the Government of Vietnam and other countries. These include, Vietnamese German University in Ho Chi Minh City, University of Science and Technology Hanoi, and Vietnam Japan University. Transnational private institutions,

⁸ Resolution no. 14/2005/NQ-CP, dated 2 November 2005.

such as RMIT Vietnam and British University Vietnam, also started to appear in the 2000s attracting more students (approx. 10,000 students currently enrolled) due to the quality of provisions and promises for recognition of qualifications at a broader international level.

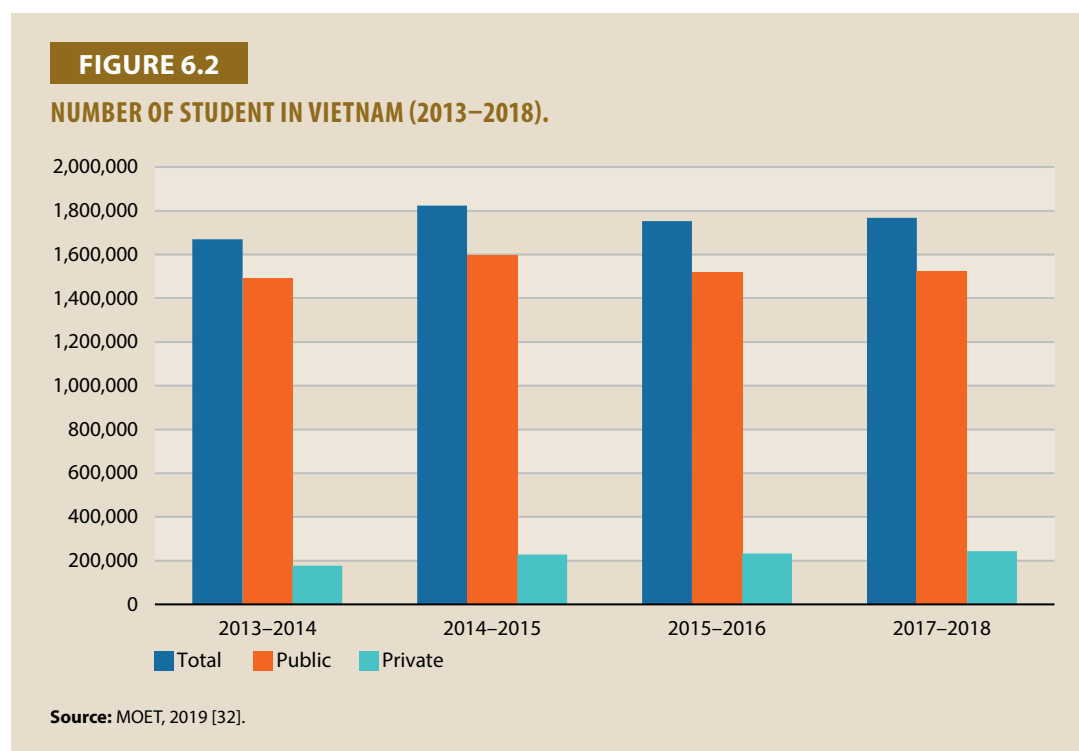


As is clear from Figure 6.1, the quantity of universities increased gradually from 2013 to 2018 and over two-thirds of all universities in Vietnam are public. In the 2013-2014 academic year, Vietnam had more than 200 universities, specifically 156 Public universities and 58 Private universities. The next two academic years, as per the report, saw the number of universities, state-owned and non-state owned, rise by about 4-5 universities every year. The 2017-2018 school years in particular, saw considerable growth in the total number of universities with 236 universities. The number of public universities had an upward trend between 2013 and 2018. Meanwhile, the number of private universities remained stable at 60 universities. In conclusion, public universities are a big part of the education system in Vietnam.

Of the 236 universities, 93 are under the management of MOET; the remaining report to line ministries and provincial people's committees. There is also a network of 55 research institutes of all levels providing post-graduate programs. As stipulated in the Law on Education, MOET oversees all academic issues of universities and institutes. There is also a network of research institutes offering post-graduate programs. Academically, according to the Law on Education, MOET oversees all academic, resource, administrative and financial matters of the public universities, whereas Ministry of Finance (MoF) is directly involved and controls the finances of the public universities.

According to the legal framework, private institutions consist of both for-profit and not for profit institutions, basically allowing all types of private institutions to operate. In practice, amongst the HEIs leaders, scholars, and government officials there is a continuous debate over the definition of the term 'not-for-profit' and its operation. This creates a lot of confusion. The private sector

accounts for 27.6% of all universities in the system and the number of students enrolled in private universities represents only 13.8% (243,975 of the total 1,767,879 students).

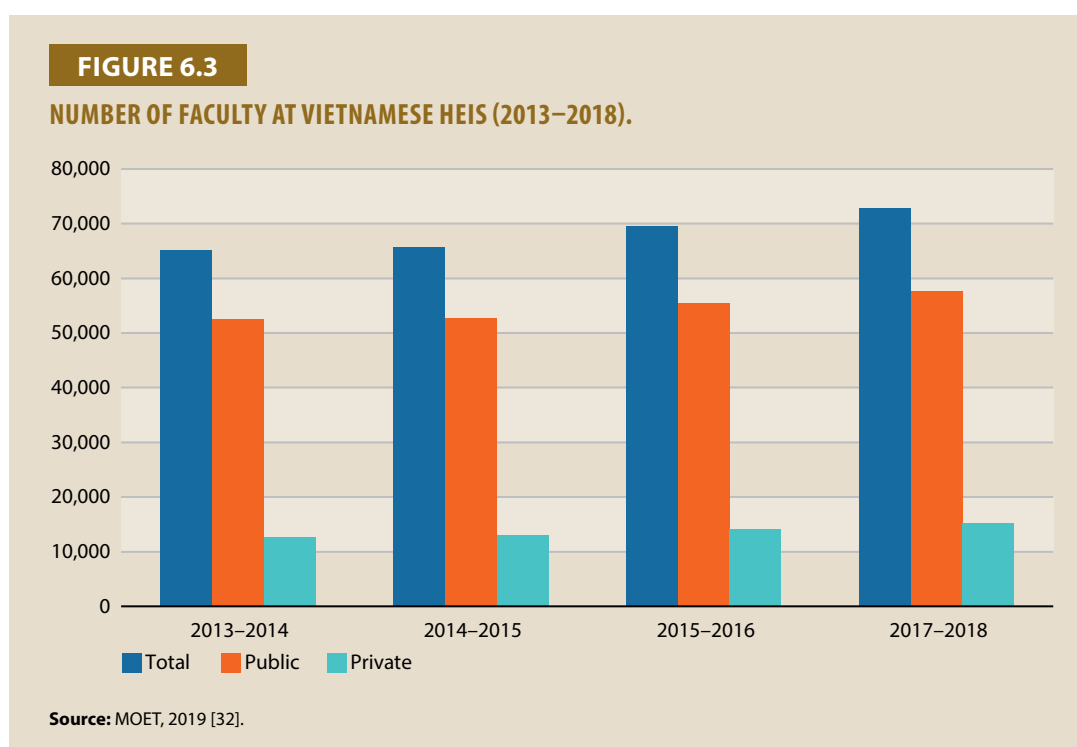


As can be seen from the Figure 6.2, the number of students in Vietnam fluctuated constantly over academic years and the student population can be broken down into two groups: public and private students. In Vietnam, most of students were from public institutions. During the academic year 2014-2015, the total number of students climbed moderately and reached a peak of 1,824,328 before going down to 1,753,174 students in the next academic year because of a decrease in the number of students in public area. The number of students in public HEIs rose slightly in 2017-2018 school year, driving a growth in the total number of students across the country.

Besides, there are 70,328 Vietnamese students enrolled in overseas studies, predominantly in the US, Australia, Japan, France and the United Kingdom. Vietnam is one of the countries with a high number of out-going students at all levels. In terms of numbers, Vietnamese students ranks 6th in the USA, 5th in Australia, 3rd in Japan, and 9th in France⁹, all in search for better quality education and ultimate recognition of qualifications internationally. Hence, strategically, quality issues and learners' experience in Vietnam need a major reconsideration if higher education in Vietnam is to become competitive at the regional and national levels and enable a better quality of education and access for all locally.

Figure 6.3 shows the number of faculty in the period of four academic years. As can be seen from the bar chart, Vietnam saw an upward trend in the number of faculty during 2013-2014 and 2017-2018 school years. The four academic years saw the total number of faculties in public and private HEIs increase gradually. It is evident that there are more faculties in public HEIs, as compared to private institutions, because most HEIs in Vietnam are public HEIs and colleges.

9 UNESCO Institute for Statistics. <http://uis.unesco.org/en/uis-student-flow>



It is clear that there is a rapid growth in the number of both public and private HEIs as well as students. However, the trend related to student-faculty ratio in both public and private sectors are clearly moving in opposite directions. The student-faculty ratio in public sector institutions is moving closer to align with the international average of 12:1, as compared to 28:1 in academic year 2013–2014, and 26:1 in academic year 2016–2017. The private sector, which is currently in line with the international trend, on the other hand seems to be departing from the international average, from roughly 13:1 in 2013–2014 to 16:1 in 2016–2017. In fact, Circular 24 /2015/TT-BGDDT dated 23 September 2020, stipulates that “teacher/student ratio: should not be over 1:10 for arts and sports programs; 1:15 for medical and medicine program; and 1:20 for other disciplines”. While prioritizing quality in the change agenda, serious consideration needs to be given on the quality (qualifications) and quantity of the faculty members.

Besides, there are some typical characteristic of the higher education in Vietnam in these domains:

Higher Education and Vocational Education is Not Connected

Higher education and vocational education are under the state oversight of two ministries, MOET and Ministry of Labor, Invalids and Social Affairs (MoLISA), respectively, as stipulated by the Law on Higher Education and the Law on Vocational Education. Specifically, MOET oversees all 235 HEIs and all teacher training colleges and secondary schools. The vocational colleges and secondary schools are under the control of MoLISA. The two ministries adopt two separate systems of state management and hardly share approaches, practices, data or resources. The two systems work in isolation, and there is limited collaboration between them.

Disconnection between Different Decrees and Legal Framework

Overall, the legal and regulatory framework of the country is predominantly contradictory in nature, partly due to the fragmentation in the system and partly due to issuance of an array of decrees, decisions and circulars by different government authorities without a prior joint deliberation

and agreement. A classic example is the contradiction between the Vietnamese Qualifications Framework (VQF) and National Education System Structural Framework (NESSF). Both VQF and NESSF were developed and adopted in 2016. The VQF was issued by the Prime Minister and prepared by the Committee for National Qualifications Framework Development with representatives from MOET and MoLISA, the two ministries that are tasked to manage and implement it. The NESSF has been developed by the team from MOET, which involves different members from VQF.

The two frameworks are crucial as a basis for understanding, interpretation and development of qualifications, programs and curricula, teachers and learners, standards and criteria for quality evaluation and management, and any future efforts to improve the local education system to assure systemic consistency. However, as the implementation of the VQF is still underway, this framework has not been reflected in, or connected to any above-mentioned documents, and is not reflected in the legislative documents. As a matter of fact, the two frameworks are in absolute contradiction with each other. While the VQF promotes a unitary system (with no division between academic and professional tracks), the NESSF underpins a binary one, in which the HEIs are officially categorized into research oriented, application oriented and practice oriented, although, the distinction between the latter two is not clearly stated, or shared among the stakeholders. This is a clear manifestation and consequence of a highly fragmented system.

Disconnection between HEIs and Research Institutes

Historically, as a legacy of the socialist and Soviet systems, research institutes and academics have been separate from the institutions of higher learning and have been under the oversight of different levels of authorities at the national level, including Prime Minister, ministries and provincial authorities. This impacted the HEIs and diminished their major driving force, research, which led to a decline in the capacity of faculty members and staff to innovate. In fact, the government has been taking steps to reduce the disconnection between these two systems, e.g., through the law on higher education, which regards research institutes with doctoral training as HEIs. This is in contradiction with the law on science and technology regarding HEIs as a research agency. The government and higher education sector needs to put in more effort to narrow the gap between the two systems.

Education Sector and Labor Market are not Connected

A major disconnection is also observed between the education sector, in general, and the labor market, both vertically and horizontally. Vertically, different education levels (junior, primary, and secondary-12 years), vocational and higher education are disconnected both in terms of the content and relevance to the market needs. This leads to the horizontal disconnection between education and labor market, thus impacting negatively on the system's responsiveness to the socio-economic development needs of the country.

The Political Ideology in the Context and Culture of the Society

Since the Communist Party of Vietnam plays a leadership role, developments and initiatives in higher education are also under the direction of the Party. This direction is reflected in two important resolutions: Resolution No. 29-NQ/TW dated 4 November 2013 and Resolution No. 19-NQ/TW dated 25 October 2017. The first resolution identifies education as the top priority and stresses for investment in education over other socio-economic development plans. It sets two overall targets, which are: (1) to make a fundamental and dramatic transformation in the quality and effectiveness of education to respond to the course of construction, protection of the nation and learning demand

of the people; (2) to develop an open education system that is practical and effective, in terms of teaching, learning and management, with appropriate structure and methods, and one that is linked with developing an educational society; assures the conditions for quality improvement; is standardized, modern, democratic and socialized, and can integrate well into the world education. The endeavor is aimed to enable Vietnam's education sector achieve an advanced level in the region by 2030 [53].

With respect to the higher education, the specific objectives are: (1) to focus on training skilled labor, cultivating talents, developing learners' personal qualities, independent study capabilities, and creativity; (2) to complete the network of HEIs with an occupation structure and qualifications appropriate with the national manpower development plan, some of which reach the regional or international level; and (3) to diversify HEIs to meet the demands for development of technology and industries, the requirements of national construction and defense, and international integration.

The resolution also sets the targets for continuing education, which revolves around access for all, especially for those in rural and disadvantaged areas and for beneficiaries of incentive policies, for education and improvement of knowledge, professional skills and living standards, to enable workers to switch their occupations, and eliminate illiteracy.

In order to realize these objectives, the resolution identifies nine solutions that are aimed at promoting substantial and comprehensive changes in the approach of delivering education. It also emphasizes on innovation, efficient funding mechanisms, capacity building at the system level, and enhanced life-long learning opportunities in line with internationalization agenda.

Secondly, Resolution 19-NQ/TW specifies that one of the eight missions is to rearrange and restructure public organizations. Specifically, in higher education, institutions are to be merged or dissolved if they do not operate efficiently and effectively. It also specifies that teacher education HEIs will be restructured to establish several key teacher training HEIs to train teaching staff and school managers. Besides, the government will invest heavily in world-class public HEIs in some fields. Resolution No. 19-NQ/TW has been a light that lead the developments of higher education since 2013. The implementation of this resolution, strategies and policies in higher education requires the involvement of Communist Party (CP) organizations of all levels. These include, Vietnamese Fatherland Front, National Assembly, Ministry of Education and Training and line ministries, other governmental bodies and local authorities. The monitoring and assessment of the implementation of the resolution are conducted by Central Propagation Agency in cooperation with the CP organizations, and are reported periodically to the Politburo and CP Secretariat.

Labor Market for Future Industries of Vietnam

Countries around the world are entering the next industrial revolution, commonly called Industry 4.0 reform. The three previous industrial revolutions were: 1) Industry 1.0: mechanization, water power, and steam power; 2) Industry 2.0: mass production, assembly line, and electricity; and 3) Industry 3.0: computer and automation. Industry 4.0 reform features technological advancement through increased use of mobile communications, interconnectivity, big data, artificial intelligence (AI), robotics, autonomous vehicles, nanotechnology, biotechnology, and quantum computing.

Industry 4.0 reform offers possibilities for transforming entire systems of production, management, and governance. It presents opportunities and challenges in the workplace, both for the industry and individuals. As jobs become more mechanized, excess labor will shift into other sectors and

job types. Many workers will need transition into high-skilled occupations, including those jobs that will be increasingly performed through online platforms. These changes will require planning, education, and training [22, 23].

Areas of focus to foster the readiness of the Vietnamese labor force for industry 4.0 reform include the following.

Labor force participants must be equipped with digital literacy: Machines, robots, artificial intelligence, and information technology are rapidly entering workplace and will affect jobs. Vietnam's educational system plays an important role in increasing digital literacy for workers in the labor market. STEM education (science, technology, engineering, and mathematics) will provide critical skills for the new Industry 4.0 reform [61].

Technical Skills will be Highly Sought after by Employers: While Vietnam's vocational training or colleges are less favored than higher education, or HEIs by students and their parents, vocational training should ensure the provision of quality technical skills needed by the labor force in a sophisticated economy [61].

Non-technical skills will be necessary to complement technical skills: These include leadership, problem-solving, creativity, critical thinking, teamwork, and time management. The education system, both higher education and vocational training, should add socio-emotional and cognitive skills into their curriculum development [61].

Skills development will be more important than general education/training: This type of transition in the education system will be necessary to provide a full range of skill development opportunities across a broad population base for continuous learning [61].

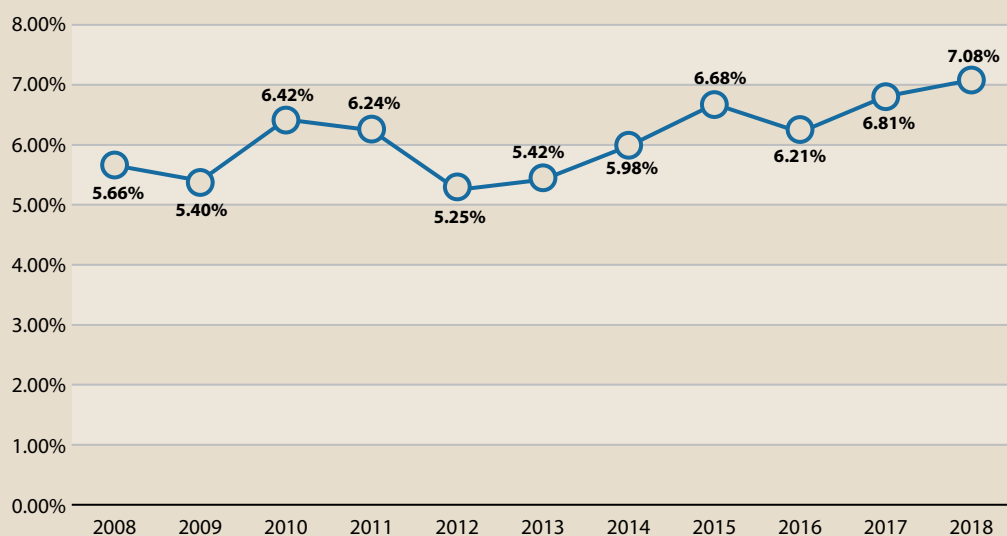
Other analyses have described the phenomenon of “job polarization” that will result from increased demand for high-skilled, higher-wage professionals (e.g., managers and technicians) and low-skilled, lower-wage workers (e.g., sales and service employees), while middle-skilled, middle-wage jobs (e.g., clerks and operators) will decline. Vietnam has an ample supply of low-skilled, low wage workers but a shortage of high-skilled, higher-wage professionals. More than 70% of employers who are hiring in managerial and technical professions are unable to fill positions, as compared to 30% of those hiring clerks and operators [61].

Vietnam has experienced rapid and steady social and economic development in the last three decades, with a recent upward trend. As shown in Figure 6.4 below, Vietnam's GDP expanded by 7% in 2018, the highest increase since 2008 [23].

Much of the increase comes from the manufacturing sector, which is considered as the main driver of the economic growth in Vietnam, expanding at a rate of 10% annually, with 1.5 million manufacturing jobs being added between 2014 and 2016. Since manufacturing jobs tend to be more productive, the average output per worker is about three times higher than the average in all sectors. This has lifted overall GDP growth, raised wage growth, and contributed to rising living standards and a steady decline in poverty [61]. The manufacturing sector is followed by service and agriculture, forestry, and fisheries sector in terms of their contribution towards the economic growth of Vietnam and its progress to become a lower-middle-income country.

FIGURE 6.4

VIETNAM'S GROSS DOMESTIC PRODUCT (2008–2018).



Source: VEPR, 2019 [58].

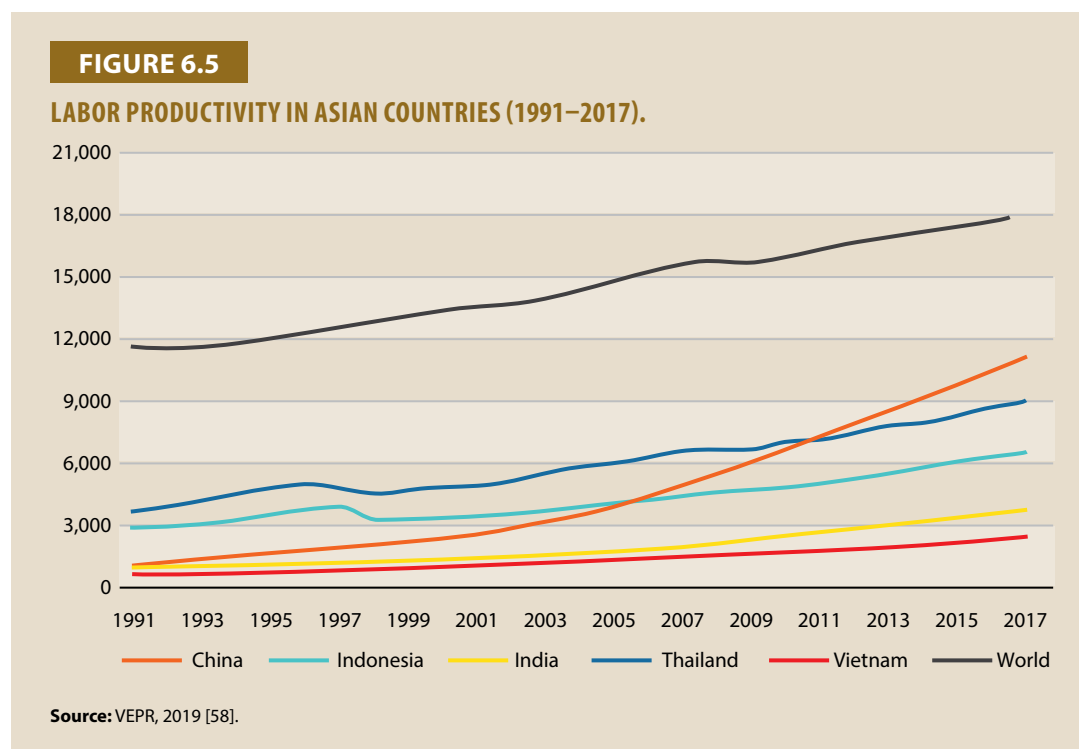
For Labor Supply: Vietnam is currently enjoying the golden period of labor force backed by a strong labor supply. It had a 55-million strong labor force in 2018, with a low unemployment rate of about 2%. While the rural work force comprises over two-thirds of the total, the number of urban work force is rapidly increasing. The labor force participation rate was 77%, which is among the highest in the world [17]. However, Vietnam's population is aging, and the size of the labor force is projected to start declining from 2040 onwards, which will cause added strain on the already overworked population [61].

In Vietnam's large and active labor force, quality is the biggest concern. Most adult workers do not have certified professional or occupational skills. Only about 12 million workers or 22% of the labor force have a minimum three-month training certificate. Of those, five million workers (10%) had four-year HEIs degree or above and two million (3%) had three-year college degree. The remainder (9%) had elementary or intermediate certificates [23]. Among ethnic minorities, the percentage of workers having a HEIs or college degree is around 6%, or about half the rate of qualified workers of the general population category.

For Labor Demand: In 2018, approximately 38% of Vietnamese workers were in the forestry and fishery sector; 27% in the industry and construction sector; and 35% in the service sector [23]. This represents a shift from previous years from agriculture, forestry, and fishery into the other sectors. In total, over one-third of workers were considered unskilled, while 11% were managers and high- and medium-skilled technical staff, which roughly corresponds to the percentage of workers with higher education or college degree.

For Labor Productivity: Overall, labor productivity in Vietnam has increased in the last decade, a rise of 23% from 2008 to 2016 [58]. However, Vietnam's general productivity still ranks low compared to other ASEAN countries. In nine selected industries, including manufacturing, construction, transportation, and communications, Vietnam's productivity stood at the ASEAN

average. In other industries, including agriculture, electricity, water/gas, and retail Vietnam ranked second lowest [58] on the productivity front. As seen in Figure 6.5, Vietnam ranks even lower when compared to other Asian countries and the world.



The rise of knowledge-intensive industries will inevitably require new skill sets, while automation will replace some jobs and workers and transform the nature of others [61]. In agriculture sector, which accounts for nearly 40% of the total labor force, the adoption of mechanization will be vital to increase productivity and diversify the rural economy. However, it will also replace jobs [23]. Within the manufacturing sector, textiles, clothing and footwear, and the electronics and electric sectors will be highly impacted by the adoption of technology advancements, which will shift workers to occupations that require greater skills and have higher productivity. Meanwhile, the digital revolution has the potential to shift workers to more customer-oriented jobs in the service sector, where a number of jobs are increasingly being done through online platforms (Uber, Grab, and e-commerce) [23]. Demand is growing for technology-focused businesses, including financial technology (fintech), blockchain, e-commerce, electromechanics, thermomechanics, smart urban management, AI, and renewable energy, among others. This is reflected in several recent studies and will have significant implications on the labor market [23].

The net impact on the labor force in growth sectors in Vietnam will depend on the ability to adapt to the evolving needs of the labor markets and to increase the technical capacity of the workforce. Education and training programs must prepare the labor force for entry into targeted industries by helping absorb knowledge and technology from the rest of the world and to diversify into new and more sophisticated products. Therefore, HEIs started allocating more resources into new targeted programs in information technology (IT) or integrating IT into existing programs (such as engineering, data science), to respond to the industry 4.0 reform. As the vast portion of Vietnam's population relies heavily on the agriculture sector, the demands for human resources in agriculture and agricultural sciences are still high. Some HEIs are already developing or expanding high-tech

agriculture and biotechnology programs, and private enterprises are cooperating with HEIs on technology research like improving productivity of certain types of flowers and dragon fruit production, for example.

Identification of Current Higher Education Strategies of Vietnam

The higher education strategies and governance of Vietnam have been vested into a multi layer and complex system involving diversity of actors at different levels including at international, national and institutional levels.

Strategies at International Level

Vietnam has joined a series of international treaties, thus promoting its international integration. In 2004, Vietnam concluded WTO accession negotiation package with EU at the margin of ASEM summit in Hanoi, which also implied trade of intellectual property, allowing free movement of educational and intellectual assets. This opens up the Vietnamese higher education to international investors as well as encourages the Vietnamese investors and intellectual mobility internationally. Vietnam also adopted the UN Sustainable Development Goals (SDG) 2030. The National Action Plan on the implementation of the 2030 Agenda for sustainable development was signed by the Prime Minister in May 2017. This is the legal foundation for Vietnam to realize its international commitments and contribute to global sustainable development. SDG Goal 4 is on education and the targets are related to improved access to education, enhanced quality, social inclusion as well as capitalization on the lifelong learning.

After becoming a member of WTO in January 2007, Vietnam has refocused its efforts towards regional integration, and has joined ASEAN as well as Free Trade Agreements (FTAs) with other countries in the region. It has also adopted the ASEAN Charter (2007). In terms of educational integration into the ASEAN region, such frameworks as ASEAN Quality Assurance Framework, ASEAN Qualifications Framework were adopted by the Government of Vietnam as signposts for enhancement and regionalization of its higher education system. Individual representatives of the Vietnamese higher education system are also members of the ASEAN University Network and its Quality Assurance arm (AUN-QA). One of the key activities of AUN is assuring a high level of quality among HEIs in ASEAN through its Quality Assurance assessment system.

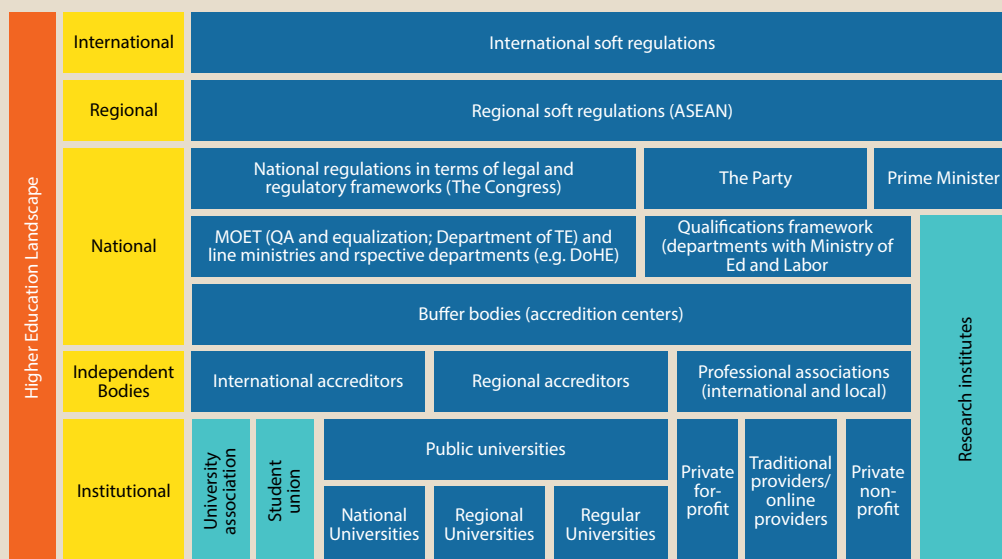
Strategies and Regulations at National Level

At the national level, the higher education system has multi-actor governance model, with the Communist Party Secretary General, Chairman of the National Assembly, and the Prime Minister being ultimate decision makers at different levels (see Figure 6.6). Vietnam is a single-party socialist republic. Overall education is regulated heavily and dominated by the state-funded public education, with private providers entering the market only as early as in the 2000s. The state's ideological oversight often diffuses politics into curriculum.

The authority for strategic planning and its execution is currently with the MOET, although several other line ministries are responsible for the performance of HEIs. Basically, the MOET is currently holding major functions like the strategy development, regulations, strategy implementation and evaluation and monitoring of the system performance, which may cause conflicts of interest. By Western standards, Vietnamese law can be bureaucratic and bewildering with its regulations that are sometimes contradictory as well as through issuance of a plethora of decrees, which sometimes override different regulations, thus causing further confusion in the system.

FIGURE 6.6

OVERVIEW OF HIGHER EDUCATION GOVERNANCE IN VIETNAM.



Source: WB Report [61].

Law and Regulatory Framework: The National Assembly is the highest authority under the Constitution. It passes laws to create a legal environment for implementation. Ministries are responsible for drafting and implementing legislation and can affect changes in the legal framework quickly and with little notice, which makes relevant ministries in a strong position to decide the fate of the legal framework in Vietnam. The main legal instruments in Vietnam includes laws, degrees, circulars and non-legal documents such as code of conduct non-binding guidelines are not often used. Each of these legal instruments has the force of law and must be complied with. Therefore, there is a dense list of legal documents regulating the operations of HEIs and internal and external stakeholders in higher education, which most of the time are contradictory in nature and provide scope for diverse interpretations.

All activities of higher education in the country are regulated by two major laws, Law on Education and Law on Higher Education.

The Law on Education was first enacted in 1998 to set regulations on the national education system. In 2005 a new Law on Education was promulgated and replaced the 1998 Law. After four years, in 2009, this law was reviewed and amended, and has been active till present. Between the first Law on Education (1998) and the 2005 law were several important changes. First, the 2005 law puts focus on education quality and effectiveness and included stipulations on accreditation to officially introduce this instrument as the first state quality management effort at the national scale. Plus, the 2005 law also added new regulations to promote the development of the private sector and the establishment of private HEIs. The major changes between the law in 2005 and the revised law 2009 evolved around some minor amendments predominantly related to the formation of higher education institutions and HEIs Council. However, due to its non-responsiveness to the system needs, the Law on Education is now again under review for amendment in response to the recent radical changes in local education system.

Compared with the Law on Education, the Law on Higher Education was developed and enacted much later, in 2012. In particular, the law supports the sustainable development and reform of higher education in Vietnam. It synthesizes the issues that had been addressed through different circulars, decrees and decisions prior to its origination, e.g., institutional autonomy and accountability; quality assurance; HEIs' roles in research; science and technology; private HEIs; national and regional HEIs; and HEIs classification and ranking. Regardless of the fact that autonomy of HEIs was promulgated in the Law on Higher Education (2012), its technical implementation has been facing challenges so far, partly because of its late approval and issuance of by-laws enabling its implementation and partly due to the contradictions with other legal documents and the lack of capacity of HEIs and government to jointly and coherently put the given autonomy into practice. Likewise, it is also under review for amendment due to the changes in the scope and definition of higher education as well as in the level of autonomy and accountability.

Further, in 2013 and 2014, the National Assembly also passed the Law on Security and Defense Education and the Law on Vocational Education and Training, respectively. The Law on Vocational Education and Training (2014) redefines higher education by excluding colleges from the scope of higher education, in particular, which is in contradiction with the 2012 law that defines it as involving colleges, HEIs and research institutes. Due to this change, many articles of this law regulating colleges need further revision for relevance purposes. Later on, some decrees added up to the confusion at the level. For example, Decree 73/2015/ND-CP (2015) provides a new classification of HEIs with three distinctive layers: research-intensive, application-oriented (focusing on the application of research outcomes) and practice-oriented HEIs (focusing on developing students' practical skills, and the distinction between the latter one is not always unanimously shared or understood).

Besides, many other legal and regulatory documents steer the system, e.g. Law on Complaints, Law on Civil Servants, Law on Public Servants, Law on Independent Audit, Law on the Management and Use of Public Assets; each issued by respective authorities, which most of the time work in isolation, thus contributing heavily to the system fragmentation and, therefore, inefficiency.

Cumulatively, drawing on the needs identified and the deficiencies of the legal framework an endeavor is being made to revise the legal framework. However, care needs to be taken to do the respective revisions coherently and holistically, with joint efforts of different stakeholders to fight the fragmentation prevailing in the system as well as to provide a robust framework to manage the higher education system in line with the needs for the long-required procedural and substantive changes at the system and institutional levels.

State Budget for Higher Education: In 2004, the National Assembly passed the Resolution No 37/NQ-QH requiring that starting 2007, the government will allocate 20% of its budget (including both central and provincial budget) for education and training sector. The target has been nearly achieved in recent years. In 2015, about 10% of total government spending on education and training (or 0.54% of GDP) was allocated to higher education. However, more than half of government spending on higher education was drawn from the tuition fees. Excluding tuition fees, higher education received only 5% of total government spending on education and training (or, 0.8% of total government spending and 0.25% of GDP). This is extremely low public spending for a country that has aspiration to become an upper-middle income country by 2035[60]. It is also lower than any other country in the region.

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Overall 22 national key HEIs are considered flagship of Vietnam. They are given greater autonomy in academic operations, though still under state management of Prime Minister (two national universities), MOET and other related ministries and local authorities (other 20 universities). Apart from the two national universities that report to the Prime Minister and 97 HEIs that report fully to MOET, the remaining 136 HEIs are under management of MOET with respect to enrollment, curricula and education quality, as well as management of their respective line ministries such as MOET, Ministry of Industry and Trade (MOIT), and Ministry of Agriculture and Rural Development (MARD) on institutional management structure, human resources, and financial management. Clearly, in terms of autonomy, heavy reliance on the governance funding leaves little room to exercise financial autonomy, let alone come up with diversification of the funding sources.

HEIs in Vietnam receive recurrent funding via their respective line ministries, except for the two national HEIs which receive it directly from the Ministry of Finance. In 2006, the government adopted the Decree 43/2006/ND-CP dated 25/04/2006 on financial autonomy of public service delivery units. HEIs were expected to increase their self-financing capacity for recurrent expenditure from non-government sources (tuition fees, consultancy services, technology transfer, production, business, service charge, etc.).

The government sets ceilings for tuition fees for public HEIs by group of disciplines every five years. The latest ceilings are defined for the academic years 2015/2016 to 2020/2021 in Decree No. 86/2015/ND-CP. The unweighted average tuition fee per student was VND737,000 per month in 2015-2016 and it has been increasing annually by 10%. On an average, annual total per student cost of studying in a public HEIs or college was VND14,000,000 in 2014 and VND17,800,000 in 2016 (approximately USD800), accounting for 32% and 37% of GDP per capita in the same years¹⁰. Per-student cost in private HEIs and colleges increased more rapidly from VND17,700,000 in 2014 to VND28,800,000 (roughly USD1,300) in 2016, primarily due to increases in tuition fees. While tuition fees for public institutions accounted for 45% in 2014 and 46% in 2016 of total per-student cost, those for private institutions accounted for 59% and 69%, respectively.

In general, in terms of funding policies, no link has been made between the government approach to funding and performance of HEIs, which weakens the accountability approaches pursued by the government.

The University Charter: The Law on Higher Education mandates that MOET oversees higher education. Line ministries and ministerial bodies need to work in cooperation with MOET to effect state management roles as authorized. The state oversight of higher education also involves

¹⁰ GDP per capita was VND43.4 million in 2014 and VND48.6 million in 2016.

provincial people's committees. To oversee its operations and quality, there are two departments under MOET: the Department of Higher Education and Department of Quality Management (this department was originally established in 2003 and named Department of Testing and Accreditation for implementing the national accreditation policies and system).

The government regulates the operations of higher education institutes through the HEIs Charter. Before the currently active HEIs Charter promulgated in 2014, there were two earlier versions of the Charter issued in 2003 and 2010. The Charter includes 58 articles, setting out regulations on all aspects of public, private, not-for-profit HEIs from HEIs statutes and regulations, missions, authority, autonomy and social responsibilities of HEIs; structural organization, management and operations; teaching staff and learners; and finance and assets. The Charter stipulates HEIs to issue their statutes, regulations and internal rules in conformity with its regulations, and assigns MOET to oversee and inspect the implementation of the Charter at HEIs.

Besides the official HEI Charter, the Prime Minister grants special charters that are different from the standard HEI Charter for a number of HEIs, like the new model HEIs. The Charter stipulates that HEIs are autonomous in making decisions on strategies, goals and development plans; organizational structure; academic and non-academic staff development; expenditures and investments, and tuition fees of honor programs corresponding quality assurance conditions; student recruitment and curriculum development, degree management and awards and the deployment of research and international cooperation, quality assurance and selection of accreditors.

Together with the Charter, there is an array of legal documents in the form of decrees, circulars and decisions that regulate the operations of HEIs and state management bodies of higher education at the central and provincial levels. As a common policy practice, circulars provide guidance to relevant parties on how to implement decrees. However, as mentioned before, the plethora of decrees coming afterwards are contradictory to the Charter that grants autonomy and, thus, infringes the HEIs rights to self-governance and self-management.

Education Development Strategy: One of the important legal documents is the 2011-2020 Education Development Strategy, promulgated with Decision No. 711/QĐ-TTg dated 13 June 2012 by the Prime Minister. It points out the pitfalls and challenges of the national education system including poor education quality, ineffectiveness of provisions, inconsistent and poor management of institution highlighted as key problems, among other things. The strategy sets out a mission of transforming the education system substantially and comprehensively toward standardization, socialization, democratization, international integration, and adaptation to the socialist-oriented market economy, linking with science and technology development and focusing on quality improvement. In particular, the strategy outlines solutions in the following eight areas:

- Renovation/Reform of education management;
- Enhancement of Policies and Professional development of academic and managerial staff;
- Renovation of curricula development, testing and assessment;
- Enhanced investment in education and renovation of finance and funding mechanisms;
- Improvement of the linkage between education and industry, scientific research and technology transfer;

- Enhancement of educational support to disadvantaged and ethnic minority people and social welfare beneficiaries;
- Development and enhancement of research in the field of education;
- Expansion of internationalization in education and improvement of effectiveness of these activities.

The Government Resolution 14/2005/NQ-CP of 2 November 2015 on fundamental and comprehensive reform of higher education is regarded as the country's blueprint of 2020 higher education development strategy. Essentially the strategy had set forth directions for education including higher education sub-sector up to 2020, including all development programs, projects and activities in higher education.

Unfortunately, in this case too, due to the lack of respective implementation strategies, robust monitoring, and evaluation mechanisms, the country failed to put the strategy in place in a due manner. As a consequence, further confusion and dissatisfaction in the system was observed, which also holds true in case of the concepts related to autonomy, accountability, quality and quality assurance, issues related to integrity, equality and equity and other concepts promulgated in the legal frameworks and the Education Development Strategy.

As per the higher education Strategy 2021-2030, there is a clear direction on how to strengthen quality of provisions, capitalize on life-long learning, establishment of clear learning paths, equal access and enhanced inclusion, which is in line with the UN SDG 2030 Goal 4. This entails a thorough revision of the governance model of higher education and HEIs, Vietnamese Qualifications Framework, establishment of a coherent and holistic Vietnamese Quality Assurance Framework, revision of approaches to teaching, learning and assessment methodologies to allow diversity of modes of delivery, including online learning, among other things as well as capitalizing on introducing life-long learning mechanisms.

Vietnam Qualifications Framework and the National Education System Structural Framework: To integrate smoothly at the regional and international levels, the VQF was approved and promulgated by the Prime Minister Decree 1982/QĐ-TTg of 18 October 2016. At the same time, the National Education System Structural Framework was also issued with Decision 1981/QĐ-TTg. Decree 1982 also stipulates that MOET should take the lead in cooperation with MoLISA, MoF, line ministries, provincial authorities and HEIs for implementing the VQF in higher education and translating the VQF into the learning outcomes of all degree levels in the sector. As per stipulations by Decision 1981, higher education includes bachelor, master and doctoral education; therefore, the task of MOET is to translate the skills and capabilities from level 6 to level 8 of the qualifications framework into programs.

The VQF was developed in alignment with the ASEAN Qualification Framework, sets out eight levels of qualifications, and is benchmarked against the national qualification frameworks of systems developed by Australia and the EU countries. If we take a look at the structure and classification of the HEIs, which predominantly makes distinctions between research-oriented and professional tracks, the current version of VQF is mainly unitary and does not reflect the binary approach the country is pursuing. Such confusion at the VQF level may cause further issues with recognition of qualifications, at both regional and international levels.

Considering QFs are one type of transparency tools established to promote readability and recognition of qualifications across different systems, further refinement of the VQF is necessary to ensure that it reflects the de facto education system of the country. Further, clear learning paths need to be specified, which is currently not the case, to ensure smooth mobility of students both horizontally and vertically across different levels and degrees. Lastly, emphasis should be given to life-long learning and recognition of prior learning.

The promulgation of VQF and NESSF frameworks is expected to be fundamental for the development of programs and curricula, teachers and learners, standards and criteria for quality evaluation and management, and any future efforts to innovate the local education system to assure systemic consistency. Thus, necessary steps need to be taken to ensure the alignment between the two, and most importantly, relevance of the two to the actual higher education system in the country, which is, unfortunately, not the current direction as of now.

National Quality Assurance System: At the national level, a holistic National Quality Assurance Framework is absent at the moment. According to the Department of Quality Management (DQM), MOET, the development of such a framework is on their agenda, and it is to be developed with reference to the ASEAN QA framework issued by AUN-QA. Due to the lack of a holistic and coherent QA framework, a systematic and effective design of QA tools and their respective implementation has turned into a major issue. Coupled with the lack of expertise in QA, it makes it harder for HEIs to initiate QA activities from the grassroots level. A common approach adopted by most HEIs and their QA units is to observe strictly what has been imposed by MOET, reducing it to a mere compliance.

At present, DQM acts as a MOET's department in charge of accreditation, testing and degree recognition. Apart from DQM, there are five "independent" external quality assurance centers, which carry out accreditation of the institutions and their programs. Four centers have been in operation for a while, whereas one is still in its establishment phase. These centers were established based on Circular 61/2012/TT-BGDDT dated 28 December 2012, stipulating the conditions for establishment of accrediting bodies, their functions, responsibilities and authority. As defined by the circular, accrediting organizations include public and private organizations that undertake the evaluation and recognition of Higher Education Providers (HEPs) and their programs. The circular also specifies that these organizations remain independent of HEPs. Of the four active centers, one each is located in two national HEIs, one at the Danang HEI (regional), and last one at a private center operating under the umbrella of the Vietnam Association of HEIs and Colleges. Apart from the private center, the three centers are at present receiving fund from their parent institutions and report on their performance to the Presidential Board, the Party, and MOET. This arrangement of the accreditation system puts a question mark on the independence of the accrediting agencies since there is a conflict of interests, thus, leading to diminished trust in the system and the validity and credibility of the decisions.

The higher education system in Vietnam is also open to international accreditors and there is virtually no regulation to govern the provisions of the international evaluators, nor are there policies in place on the recognition of the results of those evaluations. Thus, such regional and international external evaluators such as AUN-QA, a regional organization for accreditation and recognition in the ASEAN, High Council for Evaluation of Research and Higher Education (HCERES), a French agency, Association to Advance Collegiate Schools of Business (AACSB), Accreditation Council for Business Schools and Programs (ACBSP), Accreditation Board for

Engineering and Technology (ABET) and others, have been invited to accredit selected HEIs and their programs. AUN-QA, favored by the MOET for its quality of reviews, has conducted evaluation for accreditation at both institutional and program levels in Vietnam.

Policies and Regulation at HEI level: The typical HEIs model in the system is a small, subsidized, mono-disciplinary, teaching-only institution, a legacy of the influence of the Soviet higher education before the 1990s. The collapse of the Soviet Union system in the early 1990s drove a search for a new governance model and structure. Since then, there have been some changes, which are reflected in new versions of Law on Education (amended in 2009), Law on Higher Education (2012) and Charter for HEIs (2014).

The traditional organizational structure of public HEIs includes Communist Party Committee (CPC), Board of Executives, Academic Board, advisory boards (if any), departments and faculties, and other associations such as trade and student union. In this structure, the CPC holds a leadership role, leading institution's strategies and developments. In practice, the CPC is the most powerful entity, which makes final decisions on top personnel matters and strategic planning. A HEIs Council did not exist in this model and its legal status was not stipulated in any legislative document until the Education Law was passed in 2005. Associated with this was the so-called all-in-one model, where the Rector was also the CPC Secretary, Chairman of Academic Board, and HEIs Council Chairman. For private HEIs, a Board of Governors/Trustees is equivalent to HEIs Council in public HEIs.

Governance and Administration: The current laws stipulate that the public HEIs be governed by the HEIs Council. The Council's functions, roles and composition are also specified by law. As per the stipulation, the HEIs Council (UC) should be composed of HEIs' managers, faculty and staff representatives, government authorities, and representatives from the industry and private sector. This is one of the most substantial changes to HEIs' governance structure since 2005. However, in practice, such councils are neither operational nor do they function appropriately as defined in HEIs and colleges. The HEIs Council either has not been established or is redundant in the governance structure in many public HEIs. The reason behind this is the traditional 'academic' governance model that has been in operation for a long time without any such a council. Many leaders, managers and administrators believe their institutions run well without a council. Further, the establishment of such a council was not accompanied by rearrangements and reassignments of tasks among existing bodies. For a few institutions that established a council, the Chair of the HEIs Council used to be the Rector and Secretary of the Communist Party Cell. In this case, the power was still in the same hands, and there was not much difference in having a HEIs Council. The recent changes introduced in the 2014 Charter for HEIs, effective since 2015, stipulates that the rectors and vice rectors of HEIs may not undertake the UC chair's role. This might have a positive impact provided such factors as capacity to manage in a new way are in place.

Stakeholder Involvement in Higher Education: Stakeholder involvement in higher education governance and quality assurance is and has always been crucial to promoting effectiveness and relevance of higher education provisions. It is even more so in the era of market economy, rapidly changing economy and increasingly competitive world. Stakeholder involvement has become a major part of the new managerial management of HEIs as well as its quality assurance. Both internal (e.g., students, faculties, staff) and external (e.g., alumni, graduates, employees, government, regional and international peers, sponsors, donors, society at large) have a major role in shaping and driving constant improvement of the quality of higher education. The pattern of involvement of internal and external stakeholders in the governance of higher education and quality

assurance is extant in all the systems all over the world. In some systems, like in Europe, it is at a more advanced level and in some others, like Asia-Pacific and Eastern countries, it is still less vividly expressed, partly due to cultural peculiarities.

The main benefit of involvement is consideration of a diversity of perspectives in the decision-making process, which leads to ownership and active engagement in the improvement of the higher education systems. On the other hand, involvement of youth from the early stages of their career in the management and decision-making processes builds a strong capacity for youth in leadership for taking up more responsible roles in the future.

Pro-active participation of external stakeholders in the public HEIs in term of strategic planning, governance and other relevant operations is quite limited. Participation of students in HEIs activities is very limited, compared to that of other internal stakeholders. If they do participate, it is only for meeting accreditation criteria and in compliance with MOET's regulations, which is reflected in passive activities like surveys and interviews.

Academic staff has a voice in certain academic issues at the faculty level, but their participation in activities at the institutional level is negligible. In some cases, where academics have a chance to participate, their voice does not have much weight. Among the academic and non-academic staff, managers participate extensively in the HEIs' affairs, and so have an influential voice.

Accountability of Higher Education: Institutional accountability is evaluated through three lenses: assurance of academic quality and integrity, social responsibility, and financial responsibility. It is a legal requirement that HEIs bear the responsibility for quality assurance, specifically in evaluation of accreditation programs and institutions, quality improvement, and maintenance and development of such QA conditions as academic and non-academic staff force, curricula and materials, physical facilities and services, and financial resources. HEIs are also required to make data and information about QA conditions, research and training outcomes, and accreditation status available to the public. The law also sets out regulations on HEIs' accounting practice, audit and financial disclosure. For public HEIs that receive state funding, the utilization and allocation of funds are under the regulation of the law on state budget. Relevant stipulations in the Charter for University 2014 are consistent with this law. Apart from these regulations, the law also specifies that accreditation status is the basis for autonomy, but does not state a specific mechanism for this.

In Vietnam, public HEIs closely observe MOET's licensure and accreditation requirements. They all join national and regional accreditation systems at both institutional and program levels. However, their quality assurance activities aim at meeting and conforming to accreditation standards, and hardly go beyond these preset requirements. The self-evaluation reports drafted for accreditation purposes, including surveys to evaluate a number of functional areas typically teaching and student support as per MOET's requirements, as well as the major findings in it are hardly used for improvement purposes. Quality assurance measures leading to enhancement and improvement of institutional performance and program relevance have not yet been shaped into a culture of quality and are reduced to mere compliance with the standards imposed by MOET. In other words, except from some individual cases, for the majority of HEIs the driver for engaging in quality assurance process and that of accreditation is externally imposed by the government, rather than an intrinsic motivation of HEIs themselves, a condition which is at the heart of effective quality assurance. Such an attitude leads to a culture of compliance and questions the value of "accountability" to the learners and public, at large.

Quality assurance in research is not a focus and is somewhat ignored. Except for medical HEIs, very few HEIs have a code of conduct in research or research ethics policy or a procedure to monitor research processes in place.

Conventionally, public HEIs maintain limited communication with the public and external stakeholders. Apart from the information and data made public as per MOET's T3-disclosure policy (stipulated by Circular 09/2009/TT-BGDDT), the public has restricted access to information about the HEIs' affairs and operations. It should be noted that the data provided in line with T3-disclosure policy have very low level of reliability and accuracy. The HEIs do not have systems such as regular periodical surveys to track feedback from employers and alumni, and employability of new graduates. Usually, surveys are conducted with a narrow purpose to feed into the accreditation paperwork. Nor are the survey results treated with due follow up to feed the results back into decision-making and respective dissemination to relevant stakeholders.

In line with the 3-disclosure policy first promulgated by MOET in 2009 (now regulated by Circular 36/2017/TT-BGDDT dated 28 December 2017, coming into effect from 13 February 2018) the HEIs are relatively open to the public. Information about HEIs' teaching, learning and other areas are publicized on their websites. Information on academic matters and facilities is more open than it was while that of finance and management remains mostly confidential and very little information about these areas is revealed.

Autonomy of Higher Education: In general, as opposed to their international counterparts, the HEIs have relatively restricted freedom in taking decisions on academic, personnel, financial, and organizational issues. As a rule, they have to report to their upper management bodies or to seek permission for almost everything that is not considered as 'regular/day-to-day operations' and has not been prescribed previously. With a greater extent of deregulation recently, more autonomy has been granted to HEIs, especially in academic affairs.

Although all HEIs are under the same policy and regulatory framework, they may perceive and render the policies and legislative regulations differently. Therefore, they apply the policies differently and adopt different approaches to decision-making. Predominantly, interpretation of the regulatory frameworks is dependent on the leadership of individual HEI, which most of the time leads to adoption of a 'fence-breaking practice'; a flexible application of rules and regulations. Practitioners of this approach [44] are usually aware of the entailed risks from whistleblowers and, therefore, do not wish to share this application of the rules with other partners, thus further isolating HEIs from each other. This leads to lack of collaboration and learning from each other, another manifestation of fragmentation, prevalent at the institutional and inter-institutional levels.

Internal Quality Assurance: According to MOET policy, all HEIs are required to set up QA units or centres [31]. Therefore, QA units have been established in most HEIs in Vietnam, with varied sizes, roles, functions, and reporting lines. For some, the unit is an independent centre, for others, it is part of a section that has other responsibilities, mainly of testing and inspection. Yet in other cases, a vice-rector in charge of academic affairs or equivalent is also responsible for QA.

On the other hand, MOET is responsible for setting accreditation standards and procedures and licensing accreditation agencies, including those from among the government, non-governmental and private agencies. For the second objective, the framework outlines the process of developing quality systems at the institutional level, including: (1) establishment of quality centres; (2)

development of quality assurance mechanisms including internal and external reviews, and (3) other feedback mechanisms. As clearly demonstrated, the QA framework, instead of keeping policies and approaches at a very generic level, goes deep into the HEI operations by stipulating establishment of centres, establishment of mechanisms for internal and external reviews and other feedback mechanisms, whereas establishment of quality culture is impossible to limit to the above.

Thus, internal QA units in HEIs perform several major functions as follows:

- Conducting self-evaluation for accreditation of programs and institution as a whole;
- Implementing MOET's requirements on QA, mainly linked to accreditation requirements;
- Conducting surveys on stakeholders opinions and experiences;
- Testing and examinations;
- Taking care of ISO and/or other inspections;
- Reporting on QA upon MOET's request.

As coordinating units, these centres connect different units of their institutions to fulfil MOET's requirements on QA and accreditation. As clearly demonstrated, the internal quality assurance is underpinned more by the compliance culture, while leaving little room for establishment of a robust internal quality culture leading to continuous enhancement.

In this area, HEIs are free to develop an internal QA system that best fits their contexts. Some HEIs are deploying an ISO quality management system to manage their documentation and filing system more effectively. Some adopt the MOET's standards as a guide to quality management. In general, most HEIs do not have an internal QA system in place; instead they have QA units, which predominantly are concerned with compliance with the accreditation and licensure standards.

In conclusion, the review of overall governance model of the higher education system reveals that an overarching policymaking takes place predominantly at the Party, Prime Minister and line Ministries levels. Those three bodies are responsible for strategy and policy making, implementation of the latter as well as monitoring and evaluation of performance of HEIs, which itself creates conflict of interests. In between the triad of government bodies and the HEIs there are centers for evaluating the performance of HEIs. These are established in the premises of some public HEIs and report directly to the president of the host HEIs, besides sending other reports to the government. As of now, there is no independent body to take care of the implementation of the strategies and policies, and to oversee and monitor the performance of HEIs and their programs. This leads to conflict of interests and distrust in the system's credibility.

Analysis of Strategies and the Way Forward

The higher education system in Vietnam is undergoing serious transformation, triggered by the country's need to establish a high-quality performance system aligned with the international trends, and to further the country's integration into global higher education sector with industry 4.0 reform. During the last thirty years, from the start of the 'Doi Moi – Renovation' policy in 1986, Vietnam

has boosted its internationalization efforts in order to integrate into the global higher education sector. The higher education system has been in the process of reforming itself at all levels, including at the system, institution and program levels. However, due to the lack of robust implementation mechanisms for ensuring gradual introduction of reforms (e.g., clear strategies, objectives targeted to enhance the system-wide capacity, setting key performance indicators, and lack of a robust monitoring mechanism), the whole endeavor has been reduced to mere policy-on-paper. The confusions created by contradicting policy and regulatory documents, therefore, have had a negative impact on the system.

Strategies and ways forwards for HE system for future industry in Vietnam should be focused on some domains as follows:

Building HE Strategy 2021-2030

The government is currently developing its Higher Education Development Strategy 2021-2030, which aims to establish a high quality, financially sustainable system that is responsive to socio-economic development demand, can drive innovation, and is part of global HEIs. It also underpins the SDGs implementation in the country by breaking down Goal 4 to such priorities at the country level as equal access to education, quality, and life-long learning. With the aim to achieve the set goals, a major revision of the legal framework, approaches to governance, VQF, VQAF, and other respective policies and frameworks has been undertaken to ensure successful implementation of the strategies. To make the changes holistic and comprehensive the institutional level governance, autonomy and accountability, as well as approaches to teaching, learning assessment, research and related quality assurance is to be undertaken to ensure establishment of quality culture.

Enhancing Legal Framework and System Level Governance

The system is governed by an array of laws, decrees and circulars/decisions, which in most of the cases are issued by the Prime Minister, MOET and line ministries and are contradictory in nature. Currently, drawing on the needs identified and the deficiencies of the legal framework, an effort is being made to revise the legal framework. However, care should be taken to do the respective revisions coherently and holistically with joint efforts of different stakeholders to fight the fragmentation prevailing in the system as well as to provide for a robust framework to manage the higher education system in line with the needs of long-pending procedural and substantive changes at the system and institutional levels.

At the higher education system level, the sole authority dealing with setting strategies and implementing the strategies is MOET, which finds it challenging to function effectively since most of the times the roles of policymaker, implementer and evaluator collide with each other, causing major conflicts of interests. On top of it, there is a lack of adequate capacity in the MOET to effectively assume all the responsibilities, especially considering the high level of details the government goes into while managing the HEIs. Thus, a need for a buffer body to take care of the implementation and reporting on the effectiveness of the approaches is becoming palpable.

Pushing up Autonomy vs. Accountability

During the last 30 years, Vietnam has been transitioning from a highly centralized control system to the supervision of higher education. Under such circumstances, autonomy has been gradually granted to all types of HEIs in various dimensions of institutional operation: academic, organization, personnel and finance. Because of such deficiencies with the system as contradictory regulations and lack of capacity of HEIs to assume the responsibilities linked with exercising a well-balanced

model of autonomy and accountability, the above-mentioned regulations introducing autonomy have not been successful so far. Despite the trend of granting more autonomy to HEIs, the self-governing power of Vietnamese HEIs for their internal operations is still lower than those of benchmarked countries. This is due to several factors such as: (1) contradicting regulations issued by different authorities; (2) low capacity of HEI to exercise autonomy; and (3) resistance to change.

Accountability mechanism for HEIs has been established. However, such mechanism is still at premature level. The government is reluctant to dismantle the traditional micro intervention and direct control measures and still wants to steer the HEIs through vertical accountability (i.e. accountability to the government) options such as licensing, inspection and reporting. This approach, in many cases, might make implementation burdensome for HEIs. Meanwhile, horizontal accountability options (accountability to students and parents and community at large) such as quality accreditation or HEIs board are weak and need further improvement.

The relationship between autonomy granted to HEIs and obligations of accountability pertaining to HEIs respectively is blurred. While the autonomy is over-complicated with different types of HEIs having different levels of autonomy, the accountability mechanism is one-size-fit-all, i.e. a single accountability mechanism applies to all HEIs and they are not rewarded or sanctioned in accordance with their performance of accountability. A small but increasing number of HEIs have started to proactively involve in international accountability frameworks other than that of the government. This phenomenon reflects the current trend of internationalization of the Vietnamese HEIs and the endeavor to be regionally and internationally recognized. Thus, there is a dire need to bring in coherency and consistency in the regulatory frameworks as well as build on the capacity to exercise the expected new approaches is still tangible.

Qualifications and National Education System Structural Framework in Vietnam

Two major frameworks regulate the system: the Vietnamese Qualifications Framework and the National Education System Structural Framework, both adopted in 2016. The promulgation of VQF and NESSF frameworks is expected to be fundamental for the development of programs and curricula, teachers and learners, standards and criteria for quality evaluation and management, and any future efforts to innovate the local education system to assure systemic consistency. However, these two frameworks, being highly contradictory in nature, might still further complicate and confuse the system if applied as they are. As per the draft VQF, higher education system in Vietnam is a unitary system, meaning there is no differentiation between academic and professional tracks, whereas the NESSF and the actual higher education system, as described above clearly demonstrates existence of a de facto binary system of education in Vietnam. Further, clear learning paths need to be specified, which is currently not the case, to ensure smooth mobility of students both horizontally and vertically across different levels and degrees. Considering QFs are one type of transparency tools established to promote readability and recognition of qualifications across different systems, further refinement of the VQF is necessary to ensure it does reflect the de facto education system of the country.

Enhancing Vietnamese Quality Assurance Framework

The quality assurance arrangements for higher education in Vietnam have been in place for about 15 years. However, the system is still struggling for alignment with the international trends in QA, coherency and consistency in operations. Despite a diversity of mechanisms in place (e.g., licensure, institutional and program accreditation, inspection, ranking, classification), the system still lacks in the major tools that evaluate the core of the quality of provisions and ensures credibility

and trust, including evaluation of learning outcomes, evaluation of evaluators, and certification of professionals. Further, the existing QA mechanisms are either partially applied or have found implementation issues and are still on hold. Together, the external quality assurance, which is controlled through a variety of regulatory documents contradictory and overlapping most of the times, predominantly drives a high level of compliance by the HEIs. It, however, deprives them of the opportunity to enhance their internal quality assurance systems, hold ownership of their performance, and development of a quality culture. Last but not the least the higher education system needs in major revamp of its external and internal quality assurance and capacity building to bring to forefront all endeavors for improvement and enhancement.

Enhancing Linkage with Industry and Business Communities

Most HEIs have established some connection with enterprises and firms, both at the international and local level, since accreditation standards require HEIs to engage industry members in the development of curricula and to survey employer satisfaction and opinions. However, these activities are inconsistent and ad-hoc, usually resulting from alumni networks and individual connections rather than from a strategic development plan to respond to labor market demands. Many HEIs report difficulties in maintaining a long-term relationship and further engaging enterprises with their institution's activities and training process.

Currently the industry side has expressed some interest in developing relationships with HEIs, but the lack of an appropriate platform and government regulations has limited its development. Firms point out that its resource investment requires them to coordinate with HEIs. However, it outweighs the few benefits they gain from this cooperation. HEIs also have limited resources to coordinate cooperation activities with enterprises. However, there is neither any regulation, nor any government organization in charge of enhancing this linkage.

Conclusion

During the last over thirty years, from the start of the 'Doi Moi - Renovation' policy in 1986, Vietnam has boosted its efforts to internationalization and integrate into the global higher education sector. The higher education system has been in the process of reforming itself at all levels, including national management system, institution and program levels. The higher education system in Vietnam is undergoing a serious transformation, triggered by the country's need to establish a high-quality performance system that is aligned with international trends and the industry 4.0 reform. A lot of emphasis has been made on processes in national and regional HEI models, increasing ratio of private HEIs in the sector; accountability, autonomy, quality assurances, and researches with international common requirements.

The latest of Resolution of the Politburo No 52/NQ-TW Sep, 2019 on a number of guidelines and policies to actively participate in the Industrial Revolution 4.0 has a vision towards 2045 is making Vietnam one of the smart production and service centers as well as one of the leading start-up, innovation centers in Asia. It also aims to have high labor productivity and becoming capable of mastering and applying modern technologies to all socio-economic fields to meet Industry 4.0 reform. The Resolution No. 29-NQ/TW identifies education as a top priority. Investment in higher education has been prioritized over other socio-economic development plans with the specific objectives. These include: (1) focus on training skilled labor, cultivating talents, developing learners' personal qualities and independent study capabilities, and creativity; (2) to complete the network of HEIs with an occupation structure and qualifications appropriate with the national

manpower development plan, some of which reach the regional or international level; and (3) to diversify HEIs meeting the demands for development of technology and industries, and the requirements for the national construction and international integration.

However, the lack of robust implementation mechanisms for ensuring the gradual introduction of reforms and lack of a robust monitoring mechanism has reduced the whole endeavor to mere policy-on-paper. The confusion created by contradicting policy and regulatory documents, also means it is yet to have any positive impact on the system and is still far away from its target of reforms in the higher education sector to meet the labor market requirements for future industry, or Industry 4.0 reform.

It is important that the government goes ahead with the strategies for improving the higher education system in Vietnam and to make it ready for the future industry. Some of the initiatives and policies that need attention are building and implementing Higher Education Strategy 2021-2030; pushing up autonomy vs. accountability of higher education; implementing systematic Qualifications Framework and National Education System Structural Framework; enhancing Quality Assurance Framework; as well as enhancing linkages between HEIs with industry and business community in the reform process.

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CONCLUSION

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This project aims to identify the knowledge gap for a better understanding of the labor market-relevant outcomes of higher education. It provides a basis for arranging educational practices and initiatives in accordance with the future industrial change. Instead of seeking a one-size-fits-all solution, country-level case analyses, presented throughout Chapters 2 to 6, discuss the current context of the educational and economic status, identify strong and weak points of higher education performance in terms of graduates' preparation for the workforce and provide better government and public initiatives in each country.

This chapter summarizes the case studies of the five APO member countries, including trends of higher education and economic development, the balance between higher education and labor market, and policy initiatives to enhance the relevancy of higher education to labor markets, among others. It also suggests policy recommendations for 'educational initiatives and practices for the future industry'.

Research Results of Case Studies

Trends of higher education and economic development

The five APO member countries, which had experienced political and social transformation, have achieved rapid growth in higher education and economic sectors over several decades. Quantitative indicators such as the admission rate of higher education and the gross domestic product (GDP) objectively prove the expansion of higher education and economic advance in these countries.

The expansion of higher education in Asia has impacted on the society in various ways. Most of all, educational equality has improved in attaining higher education even though male students and economically advantaged people still constitute a large portion in universities. Higher education through a technology-driven online system has been made available and accessible to the disadvantaged groups such as those living in remote and rural areas, working people and women. For example, Open and Distance Learning (ODL) mode in India shows its major contribution in enhancing the gross enrollment ratio and makes education more inclusive. Moreover, the emergence of new types of higher education institutions, such as polytechnics, vocational colleges, and open universities has expanded students' choices and career paths from schools to workplaces. In other words, university education is not only limited to traditional academic research but can also support the diverse strengths and talents of future employees and tend to provide multiple ways to career success.

In the APO member countries, the educational programs of higher education are not limited to individual national levels but show the tendency of globalization. The international college

activities represented by student-exchange programs or research collaboration expand to partnering directly with overseas universities (e.g., Asian Institute of Technology in Thailand), offering English-instructed programs for seeking international accreditation (in Vietnam and Singapore), and soliciting students from abroad. Thus, a more performance-oriented and market-oriented globalization trend has been strengthened in Asia.

Alongside the rising demand and supply for higher education, most countries except India are expecting aging and declining of population due to long life expectancy and low birth rates. While Thailand and the Republic of China are concerned about high level of vacancies in their universities, Vietnam is looking for consistency in administrative regulations and government policies for quality control of higher education institutes (e.g., accreditation system). In terms of the effectiveness of university education, India, Thailand, and Vietnam are more concerned about the linkage between higher education and labor markets because of the low employment rate of college graduates and the lack of high-skilled workforce. Singapore and the Republic of China, on the other hand, maintain relatively high employment rates.

Asian countries, which have been experiencing relatively low economic growth rates since the 2000s, seek to identify their future core industry sectors on the basis of their economic fundamentals. That is, in political, geographical, and demographic contexts, each country tries to prepare for the era of the Fourth Industrial Revolution, the transition from export-oriented, manufacturing-centered, and labor-intensive economic structures.

The Republic of China has promoted six emerging industries; namely, biotechnology and green energy, medical care, and the four emerging intelligent industries of cloud computing, smart electric vehicles, intelligent green buildings, and invention and patent commercialization. Thailand has identified a total of ten industry clusters (named as five first S-curve and five new industrial clusters) to target for investment under the Thailand 4.0 policy. They will be the foundation upon which both education and commerce will be based as the country aims to transform its industry into an innovative and value-based one. Similarly, India with four major initiatives of Make in India, Skill India, Smart Cities Mission, and Digital India Mission, Singapore with its Industry Transformation Program, and Vietnam with Resolution of the Politburo No 52/NQ-TW Sep, 2019 build on integrated plans to implement holistic strategies to drive economic growth and sustainable development through technology and innovation.

Above all, in Asian countries seeking a sustainable economic progress and developing human resource is crucial to their pursuit of competitive advantages for the future society. In particular, they seek innovation in the education sector through cooperation with the industry for future capacity development of human resources.

Balance between higher education and labor market

The two questions will be crucial to evaluate the balance between higher education and the labor market: Does higher education empower students with innovative, creative knowledge and skills to respond to ongoing technological changes? Can higher education graduates expect work opportunities corresponding to the effort they have invested in? The skills and competency required to perform job tasks will have changed significantly in the future society which will shift from traditional manufacturing industry to knowledge-based high technology. The case studies of the five countries included in this report highlight the importance of cooperation between higher education and the labor market to prepare for the rapid changes in economic and social structures.

Depending on each country's economic maturity and infrastructures, government initiatives are presented in various forms.

Despite the expansion of higher education and the high economic growth, India faces the problem of fostering human resource, indicated by the lack of basic skills and overall technical education. The low employability ratio of youth points towards the gap that exist between job requirements and the level of skill of workers due to varied reasons including inadequate training infrastructures, an inappropriate mix of skill and education, outdated curricula, and limited industry interface and standards.

The ROC recognizes the problematic imbalance between the over expansion of higher education and slowing population growth. The country has set six future capacities to emphasize the linkage between higher education and the labor market as it adopts employability as an indicator of higher education performance. Those six core competencies are discipline-crossing, innovativeness, employability, global mobility, information literacy, and civic engagement to improve future capacity of human resource.

Singapore has attempted to link education with work by integrating the traditionally distinct pre-employment education and post-employment training in the framework of lifelong learning. It is also important to strengthen the nexus among educational institutions, including higher education institutions and private training providers. For example, the vision of 'Thinking Schools, Learning Nation' seeks to create an education system that equips students with thinking and inquiring skills that are needed when they enter the workforce.

In the report on Thailand, it is asserted that higher education has a quality control system of EdPEx (Baldrige's Education criteria for Performance Excellence) but somewhat fails in its efforts to create and provide skilled labor force with qualified talents to the labor markets both locally and globally. So, Thailand's higher education is to be innovated to create an educated workforce with the ability to think critically and solve problems using a systematic approach and multicultural exposure by participating in the international communities.

In Vietnam, the imbalance between the education sector and the labor market is due to the discordance among government departments managing educational institutions and labor markets, and political ideology of the legal frameworks for educational quality management. Like Thailand, Vietnam emphasizes digital literacy with STEM (science, technology, engineering, and mathematics) education, technical skills, and general competency (leadership, problem-solving, creativity, critical thinking, teamwork, and time management). While Vietnam's vocational training highlights specific skills for an immediate application, innovative curriculum promoting general competency is to be introduced into higher education.

In Asian countries, various educational opportunities are provided through technology-oriented universities (universities of technology, polytechnics, vocational universities/colleges) to prepare human resource for the future society. Also, the employment rate is one of the important outcomes of higher education. They are seeking to establish a lifelong education system to integrate pre-employment and post-employment curricula for smooth transition from higher education to the labor market. Most of all, new technical skills and general competency are all emphasized in Asian higher education in line with the global economic trend of the Fourth Industrial Revolution.

Policy initiatives to make higher education more relevant to labor market

In most societies, the growth and transformation of higher education are heavily influenced by the nation's policies associated with its vision of industrial development. In response to demands for a skilled workforce in the future society, government authorities (e.g., the Ministry of Education, Ministry of Labor; the names vary by country) connect transformation plans of industrial development with various initiatives to reform higher education. The following is the summary of policy directions covered in this volume for educational innovation linked to each country's new economic development plan.

Make in India, Skill India, Smart Cities Mission, and Digital India Mission are the four major initiatives taken up by India since 2014. These aim to create jobs, develop skilled labor force, sustainable city environment, high-speed network system, and digital literacy. Among them, the objective of Skill India program is to bring together various skill training initiatives. The country has also designed Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) for undergraduates and lifelong learners to provide them with opportunities of access, equity and quality of education. The government aims to make available the best teaching and learning resources to all, and close the digital gap for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

In the Republic of China, the December 2013 White Paper on Human Resource Development presented the direction of higher education for future. Four objectives for education were specified: (1) cultivate excellent and dedicated teachers, (2) narrow the gap between learning and employment, (3) strengthen students' international competitiveness, and (4) redouble students' future productivity. Further, ten principles were laid out in support of the implementation of the vision; responding to the development of the world, aligning with human resource planning, emphasizing 'learning power' over credentials, valuing continuation and comprehensiveness of education, valuing equality in resource allocation, and encouraging the business sector to participate in talent cultivation.

In 2014, the SkillsFuture movement of Singapore made a distinct policy shift towards lifelong education and learning system to support the next phase of the nation's economic development. SkillsFuture is to bridge the gap between education and work, with the four key thrusts: (1) to help individuals make well-informed choices in education, training, and careers; (2) to develop an integrated high-quality system of education and training that responds to constantly evolving needs; (3) to promote employer recognition and career development based on skills and mastery; and (4) to foster a culture that supports and celebrates lifelong learning.

Thailand's Ministry of Higher Education, Science, Research and Innovation (MHESI), established on 2 May 2019, proposes a Master Plan focusing on knowledgeable and skilled human capital along with sufficient scientific and technological infrastructure and enabling factors vital to the creation of a thriving innovation system. Therefore, the MHESI strategies and measures are based on four strategic directions: (1) manpower and knowledge institution; (2) research development and innovation for grand challenges; (3) research development and innovation for competitiveness of strategic sectors; and (4) research development and innovation for area-based and local economy.

In Vietnam, Resolution No. 29-NQ/TW identifies education as the top priority, and investment in education is valued over other socio-economic development plans. With regard to higher education, the specific objectives include: (1) focusing on training skilled labor, cultivating talents, developing

learners' personal qualities and independent study capabilities, and creativity; (2) completing the network of higher education institutes with an occupation structure and qualifications in accordance with the national manpower development plan, some of which reach the regional or international level; and (3) diversifying higher education institutes to meet the demands for development of technology and industries, and the requirements for the national construction and defense, and international integration. Further, in the HE Strategy 2021-2030 the clear direction for higher education is to strengthen the quality of provisions, capitalize on life-long learning, the establishment of clear learning paths, and an equal access and enhanced inclusion, which is in line with the UN SDGs 2030 Goal 4.

As shown above, the Asian government policies for higher education is closely related to the economic development initiatives. Emphasizing the labor market relevant education for the graduates' transition to workforce, it proposes innovation of the university education program to cultivate comprehensive future competency and skills which are demanded in job tasks. As a concrete way to link higher education with the labor market, the capability of university faculties, the industrial sector's participatory curriculum, student learning engagement, domestic quality control system of higher education, and the adoption of international evaluation standards are emphasized in educational initiatives.

Overall Lessons Learned

The five APO member countries that underwent colonization and independence, political democratization, and economic liberalization have experienced rapid economic growth as well as the expansion of higher education since the mid-20th century. Though economic growth has decelerated in Asia nowadays, it is still projected to be the fastest-growing economy when compared with the global economic growth rates. However, globalization as well as a series of technological and demographic changes altered the context of the future society. Most of all, the education system and skill sets that greatly stimulated social development in the past no longer play the same role. Thus, they must be transformed in order to support the economy and its future growth requirements. Therefore, this skill mismatch is the task at hand that has to be accurately analyzed and resolved in terms of the accomplishment of higher education so as to enhance competitiveness and broaden job landscape in Asian countries.

The five countries involved in the study highlight the importance of human resource development and note changes in future knowledge-oriented society referred to as Industry 4.0. They are carrying on with various education reform initiatives despite their discriminatory socioeconomic conditions. In particular, evidence-based policy-making can play a crucial role in cutting down the negative effects of skill imbalances on students and employers, and also national economy. Therefore, comprehensive and coordinated public interventions are indispensable to ensure that the new technologies induce better outcomes for all. Based on the case studies of this volume, we would like to propose the following policy directions for educational practices for a future society.

First of all, policy endeavors to link universities and industries should be actualized by the implementation of specific educational programs. It is well known that higher education graduates with work experiences during their studies experience a smoother transition to the labor market. Since the industry sector is the ultimate consumer of skilled graduates, the standards of educational performance need to be developed in close cooperation with the industry and universities. For example, in India, as the direct form of industry-academic relations, National Association of

Software and Services Companies (NASSCOM), an organization of business associations, tries to provide employability-focused skills to the youth from tier-2 and tier-3 colleges. Funds have been utilized to train the young job aspirants on current and future industry skill needs such as big data, artificial intelligence, and non-voice customer relationship management.

However, government-led policies on linking the industry and education generally emphasize the legitimacy of industry-academic cooperation and are restricted to the level of financial support. The universities that will implement the policies end up lacking administrative experience and resources to seek practical links (e.g., collaboration on program design, staff mobility) with the industrial sectors. Policy endeavors have to support the dissemination of the best educational practices and mandate their implementation at the operational level. That is, practical curriculum models such as design thinking, hand-on projects, and work-based learning and internship must be promoted as mentioned in the report on the ROC (even though educational practices are limited to only one department in a prestigious university).

Second, it is necessary to thoroughly check on student participation in various teaching-learning activities delivered through industry-academy linking programs. Student-centered and active learning programs can produce graduates with the right mix of professional skills and the general competency. The accomplishment of the curriculum, linked to the industry aiming to prepare for a future society, can finally be assessed by the participatory activities of students. A student learning engagement activity can represent two critical features of collegiate quality. The first is the amount of time and effort students put into their studies and other educationally purposeful activities (where industry-academy linkages become relevant). The second is how the institution deploys its resources and organizes the curriculum and other learning opportunities to motivate students to participate in activities that decades of research studies show are linked to student learning.

For instance, student surveys such as National Survey of Student Engagement (NSSE), the representative student survey conducted in Canada and the USA, National Student Survey (NSS) of the UK, and Australia's Course Experience Questionnaire (CEQ) are utilized for constructing and evaluating concrete educational activities. They measure the application of numerous innovative education programs such as presentation activities, team project activities, club activities, field trips, community activities, and their student engagement level. After all, it is necessary to check objective information about educational activities including student-professor interaction and cooperative learning, for the university's educational achievement in preparation for the future society [1].

Third, there is a need to objectively examine students' competency and skills required in the future society. Also, work-based learning for specific skills and general competency can be encouraged through performance agreement between higher education institutes and public authorities. Given the importance of the university's quality which creates added values as an educational achievement, it is necessary to adopt a college students learning performance evaluation at the policy level, such as the recently developed Collegiate Learning Assessment (CLA) to promote a culture of evidence-based assessment in higher education in the USA. CLA is a computer administered, open-ended test of analytic reasoning, critical thinking, problem solving, and written communication skills which are needed when students get in the workforce [2]. The results of the university's value-added efforts for the labor market-relevant outcomes can be assessed more objectively, as it measures students' performance at the time of admission and graduation and compares the variance between the two points by university and country.

Furthermore, Assessment of Learning Outcomes in Higher Education (AHELO) focuses on what students at the end of their first degrees (bachelor level) know and are able to do [3]. In addition, Program for the International Assessment of Adult Competencies (PIAAC) gathers information and data on how adults use their skills at home, at work and in the wider community; more specifically, adults' proficiency in key information-processing skills, literacy, numeracy, and problem solving [4]. These are the OECD's cooperative activities as evaluation programs to measure the performance and preparation of college students and adults for the future society. Participating actively in the collaborative efforts carried out by the OECD, Asian countries' educational performance can be evaluated and compared at the international standards.

Fourth, cooperative efforts among Asian countries based on social, economic, and cultural proximity must be sought to build practical accreditation system to share experiences of innovative programs in higher education. As a result of drastic political and social change, Asian countries have faced rapid quantitative growth in higher education. Accordingly, the transition has increased their interests in the quality and accountability of education, including the performance of higher education, especially in its outcomes relevant to the labor markets. Various international accreditation programs have been utilized to judge the performance of higher education institutes as exchanges between countries under the global economic system have been vitalized. The popular university evaluation standards, represented by Quacquarelli Symonds (QS) and Times Higher Education (THE) rankings among others, provide important international criteria for evaluating research-oriented universities. On the other hand, they face limitations in assessing the quality of Asian universities with divergent establishment purposes and development process, which are somewhat different from those of the Western higher education system [5].

Therefore, we might refrain from providing ranking information on the reputation among higher education institutes with different purposes of establishment and educational practices. Rather, strengthened cooperation among Asian countries to analyze the actual curriculum and performance could lead to better outcomes of higher education. To be specific, each country's case study presented in this project would give others a chance to share the achievements and improve higher education standards. That enables its feasibility to be used as an opportunity for educational innovation to prepare for the future society.

The recommendations refer to the practical implementation of work-based learning programs, students' engagement activities as learning outcomes, skills and competency relevant to the labor market, and program accreditation standards for its own purpose. It means evaluative knowledge of how policy intervention improves labor market relevant outcomes of higher education and provides a sound basis for effective actions. Therefore, public initiatives adopted in Asian countries should be planned, evaluated, and adjusted by rigorously established objective evidence rather than common sense or an ideology [6].

Limitations of the Research and Suggestions for Improvement

This case study of the five Asian countries on the labor market-relevant outcomes of higher education is meaningful in that it provides a starting point for mutual sharing of the experiences for future education policies. However, its constraint lies in the fact that the analysis of higher education and economic policies has been made based on literature research, mainly public documents of national policies. This volume treats the overall situation of economic and educational conditions, the inconsistency between industries and education, and the necessary reform of higher education for the future society at a somewhat abstract level. Therefore, presenting more concrete results and

limitations of national efforts on the same subject will enable the sharing of meaningful experience among Asian countries. Accordingly, we propose further in-depth analyses of individual countries for a follow-up research. Moreover, as discussed in the previous section, objective data obtained by participating in international evaluation programs such as AHELO could be used as significant information to verify each country's current status and change of higher education by conducting cross-country comparisons.

It is important to refer to the exploratory rather than confirmatory nature of the country-level case studies in this volume. "The purpose of introducing a case study is to provide readers with the opportunity to develop insights applicable to their own context and the case studies presented in this volume are no exception," mentions Dr. Song in the report on the Republic of China. The APO, which has exercised excellent leadership for economic development and cooperation in Asia, should continue efforts to sponsor collaborated research and works that improve educational practices of higher education. Regional platforms initiated by the APO would contribute to build common grounds to take pilot approaches across countries and share labor market-relevant outcomes of higher education for the future industry.

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LIST OF ABBREVIATIONS

AACSB	Association to Advance Collegiate Schools of Business
ABET	Accreditation Board for Engineering and Technology
ACBSP	The Accreditation Council for Business Schools and Programs
ADB	Asian Development Bank
AHELO	Assessment of Learning Outcomes in Higher Education
AI	Artificial Intelligence
AICTE	All India Council for Technical Education
AIMA	All India Management Association
AISHE	All India Survey of Higher Education
AIT	Asian Institute of Technology
ASEAN	Association of Southeast Asian Nations
ASEM	Asia-Europe Meeting
APEC	Asia-Pacific Economic Cooperation
APO	Asian Productivity Organization
AU	Autonomous University
AUN-QA	ASEAN University Network, Quality Assurance
BFSI	Banking, Financial Services and Insurance
BOI	Board of Investment
BPM	Business Process Management
BRIC	Brazil, Russia, India, and China
CAE	Computer-Aided Engineering
CAGR	Compound Annual Growth Rate
CET	Continuous Education and Training
CEQ	Course Experience Questionnaire
CHE	Commission of Higher Education
CI	Centralized Institute
CIPET	Central Institute of Plastics Engineering and Technology
CLM	Collegiate Learning Assessment
CMBA	Professional Master's degree on Construction Management
CMTI	Central Manufacturing Technology Institute
CP	Communist Party
CPC	Communist Party Committee
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
CXO	Chief X Officer
DDU-GKY	DeenDayal Upadhyaya Grameen Kaushalya Yojana
DE	Distance Education
DGE	Directorate General of Employment
DQM	Department of Quality Management
EdPEx	Baldrige Education Criteria for Performance Excellence
EEC	Eastern Economic Corridor

EECI	Eastern Economic Corridor of Innovation
EECd	Eastern Economic Corridor (Digital Park Thailand)
ESDM	Electronics System Design and Manufacturing
ESDP	Entrepreneurship Skill Development Programme
EQA	External Quality Assurance
EV	Electric vehicle
EY	Ernst & Young
FICCI	Federation of Indian Chambers of Commerce and Industry
FTA	Free Trade Agreement
FY	Financial Year
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
GOI	Government of India
HCERES	High Council for Evaluation of Research and Higher Education
HE	Higher Education
HEI	Higher Education Institutes
HEP	Higher Education Provider
HERA	Higher Education Reform Agency
HES	Higher Education Sector
ICT	Information and Communication Technologies
IICPT	Institute of Crop Processing Technology
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISDS	Integrated Skill Development Scheme
ISO	International Organization for Standardization
ITC	Industrial Training Centers
ITE	Institute of Technical Education
ITI	Industrial Training Institute
ITM	Industry Transformation Map
ITP	Industry Transformation Program
IQA	Internal Quality Assurance
JC	Junior College
KAIST	Korea Advanced Institute of Science and Technology
KMT	Kuomintang
KVKS	Krishi Vikas Kendras
LMIS	Labor monitoring and information system
MARD	Ministry of Agriculture and Rural Development
MBA	Master of Business Administration
MBNQA	Malcolm Baldrige National Quality Award
MCY	Mahila Coir Yojana
MDP	Management Development Programmes
MHESI	Ministry of Higher Education, Science, Research and Innovation
MHRD	Ministry of Human Resource Development
MOE	Ministry of Education
MOET	Ministry of Education and Training

LIST OF ABBREVIATIONS

MoLISA	Ministry of Labor, Invalids and Social Affairs
MRO	Maintenance, repair and overhaul
MSDE	Ministry of Skill Development & Entrepreneurship
MSME	Micro, Small and Medium Enterprises
NASSCOM	National Association of Software and Service Companies
NATS	National Apprenticeship Training Scheme
NBCFDC	National Backward Classes Finance and Development Corporation
NCVT	National Council for Training in the Vocational Trades
NESDC	National Economic and Social Development Council
NESSF	National Education System Structural Framework
NIFTEM	National Institute of Food Technology and Management
NIST	National Institute of Standards and Technology
NIOS	National Institute of Open Schooling
NOS	National Occupational Standards
NSDC	National Skill Development Corporation
NSFM	National Food Security Mission
NSKFD	National Safai Karamcharis Finance & Development Corporation
NSQF	National Skills Qualification Framework
NSS	National Student Survey
NSSE	National Survey of Student Engagement
NTU	Nanyang Technological University
NTUCE	Department of Civil Engineering at National Taiwan University
NULM	National Urban Livelihoods Mission
NUS	National University of Singapore
ODL	Open and Distance Learning
OECD	Organization for Economic Co-operation and Development
OHEC	Office of Higher Education Commission
PET	Pre-employment Training
PIA	Project Implementation Agencies
PIACC	Program for International Assessment of Adult Competencies
PPP	Public-Private Partnership
PMKVY	Pradhan Mantri Kaushal Vikas Yojana
PSDA	Plan-Do-Study-Act
QA	Quality Assurance
QP	Qualification Pack
QS	Quacquarelli Symonds
RDI	Research Development and Innovation
RMSA	Rashtriya Madhyamik Shiksha Abhiyan
RMIT	Vietnam Royal Melbourne Institute of Technology Vietnam
RSETI	Rural Self Employment Training Institutes
SCA	Special Central Assistance
SCSP	Scheduled Castes Sub-Plan
SDG	Sustainable Development Goals
SEATO	Southeast Asia Treaty Organization
SEZ	Special Economic Zone

SGD	Singapore Dollar
SIT	Singapore Institute of Technology
SMU	Singapore Management University
SSC	Sector Skill Councils
SSG	SkillsFuture Singapore
STEP	Support to Training and Employment Programme for Women
STEM	Science, Technology, Engineering and Mathematics
STOU	Sukhothai Thammathirat Open University
SUSS	Singapore University of Social Sciences
SUTD	Singapore University of Technology and Design
SWAYAM	Study Webs of Active-Learning for Young Aspiring Minds
TAE	Training and Adult Education
TCS	Tata Consultancy Services
THE	Times Higher Education
TSA	Trilateral Student Activity
UC	Higher Education Institute Council
UGC	University and Grants Commission
UIS	UNESCO Institute for Statistics
UK	United Kingdom
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
VFX	Virtual effects
VND	Vietnamese Dong
VQF	Vietnam Qualifications Framework
WDA	Workforce Development Agency
WEF	World Economic Forum
WSQ	Workforce Skills Qualification
WTO	World Trade Organization

LIST OF TABLES

TABLE 1.1	Educational levels under the ISCED 2011 classification.....	10
TABLE 2.1	Growth of Higher Education Institutions and Enrolment in India.....	21
TABLE 2.2	Initiatives for Skill Development Initiated by Various Ministries and Departments.....	32
TABLE 3.1	Number of students in colleges and universities by field, 2019	47
TABLE 4.1	An overview of post-secondary education institutions in Singapore	63
TABLE 4.2	List of Key SkillsFuture Programs and Initiatives	67

LIST OF FIGURES

FIGURE 1.1	Core workforce skills	4
FIGURE 1.2	Terminology and description of skill mismatch	5
FIGURE 1.3	Key questions of the country level case analysis	9
FIGURE 1.4	Technologies Projected to be Adopted by 2022	12
FIGURE 1.5	Changing demands of skills for the workforce, 2018 to 2022	13
FIGURE 2.1	Overview of Education System in India	24
FIGURE 2.2	CSR Outlays of Top 10 Indian Companies in Education: 2017–18	25
FIGURE 2.3	Framework of Skill Development in India	26
FIGURE 2.4	Sector Skill Councils	28
FIGURE 2.5	Skill Ecosystem in India	28
FIGURE 2.6	Key Emerging Trends in Education Landscape	29
FIGURE 2.7	Key Findings on Future of Jobs in India	30
FIGURE 3.1	Percentage share of GDP by sector in the ROC	44
FIGURE 3.2	Occupational Employment in the ROC by Sector	44
FIGURE 3.3	Number of colleges and universities in the ROC	46
FIGURE 3.4	Student enrollment in the ROC: All levels, 1950–2019	46
FIGURE 3.5	Net Enrollment Rate in Higher Education	47
FIGURE 3.6	Student enrollment in the ROC: Higher education, 1950–2019	48
FIGURE 3.7	Fertility rate and number of births, ROC	49
FIGURE 3.8	Blueprint of white Paper on Human Resource Development	51
FIGURE 4.1	Age distribution of the resident labor force in Singapore (in %), 2009 and 2019	60
FIGURE 4.2	Education pathways in Singapore	62
FIGURE 5.1	Thailand's GDP Growth Rate during 2010–19 [5]	76
FIGURE 5.2	MHESI Strategic Directions	80
FIGURE 5.3	EdPEX Framework	82
FIGURE 5.4	Thailand 5 First S-Curve and 5 New S-Curve Industrial Clusters	83
FIGURE 5.5	Thailand Population Forecast	87
FIGURE 5.6	Student Enrollments in Thailand, 2015–18	88
FIGURE 5.7	Southeast Asia University rankings 2020	89
FIGURE 5.8	Global Citizenship Education	90
FIGURE 6.1	Number of University in Vietnam (2013–2018)	99
FIGURE 6.2	Number of Student in Vietnam (2013–2018)	100
FIGURE 6.3	Number of Faculty at Vietnamese HEIs (2013–2018)	101
FIGURE 6.4	Vietnam's Gross Domestic Product (2008–2018)	105
FIGURE 6.5	Labor Productivity in Asian Countries (1991–2017)	106
FIGURE 6.6	Overview of Higher Education Governance in Vietnam	108

