Reskilling Workers for Enhancing Labor Productivity in Asia

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Asian Productivity Organization

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RESKILLING WORKERS FOR ENHANCING LABOR PRODUCTIVITY IN ASIA

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Reskilling Workers for Enhancing Labor Productivity in Asia

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FOREWORD

The world of work is undergoing profound changes due to the rapid advances in technology, globalization, demographic shifts, and environmental challenges. These changes have significant implications for the skills and competencies that workers need to succeed in the labor market and contribute to social and economic development. Reskilling, or the process of acquiring new skills and knowledge to adapt to changing job requirements, has emerged as a key strategy to enhance labor productivity and employability in the face of these transformations.

Reskilling is not only beneficial for individuals, but also for employers, who can gain a competitive edge by having a more agile, innovative, productive workforce. Reskilling can also address some of the major challenges facing the labor market, such as skill mismatches, shortages, obsolescence, and gaps. By reskilling workers, employers can optimize their human capital, reduce turnover costs, improve customer satisfaction, and foster a culture of learning and development.

However, reskilling is not without its challenges. It requires a clear vision, strong commitment, supportive environment, and effective collaboration among various stakeholders. It also requires a sound understanding of the current and future skill needs of the labor market, best practices and methods of reskilling, and impacts and outcomes of reskilling interventions. These are addressed in this research publication.

National studies of reskilling workers to enhance labor productivity resulted from a research project conducted in six APO economies. Several case studies from different countries and sectors illustrate how reskilling has been implemented in practice and what results have been achieved. These case studies showcase innovative, effective approaches to reskilling that have been adopted by governments, employers, education providers, social partners, and civil society organizations. This volume on Reskilling Workers to Enhance Labor Productivity also offers insights and lessons learned from those experiences which can inform and inspire future reskilling initiatives.

This publication is a valuable resource for anyone interested or involved in reskilling workers to enhance labor productivity. It provides a comprehensive, evidence-based framework for understanding, designing, implementing, evaluating, and scaling up reskilling interventions. It also highlights some of the emerging opportunities and challenges for reskilling in the postpandemic era. It is hoped that this publication will stimulate further research, dialogue, action, and innovation on reskilling workers to enhance labor productivity in the changing world of work.

The APO extends its sincere gratitude to the chief and national experts who conducted the research and contributed to this publication.

Dr. Indra Pradana Singawinata Secretary-General Asian Productivity Organization Tokyo

VI | RESKILLING WORKERS FOR ENHANCING LABOR PRODUCTIVITY IN ASIA

ADAPTING TO CHANGE: MODELS AND POLICY INSIGHTS FOR LABOR RESKILLING IN DEVELOPING ECONOMIES

Introduction

This report provides examples of reskilling and upskilling issues and practices in five countries that are members of the Asian Productivity Organization. These countries are India, Indonesia, Malaysia, the Philippines and Thailand.

Reskilling and upskilling are important processes for improving productivity in an inclusive, dynamic economy. The need to reskill and upskill is driven by:

- technological changes
- environmental changes
- globalization
- demographic and behavioral changes

While the above drivers are ongoing and long-term, others can be relatively short-term but much more disruptive. For example, the COVID-19 pandemic is likely to be short-term because eventually we will have herd immunity, either because there will be a vaccine produced or enough people will acquire immunity through infection, but its effect is much more challenging for reskilling and upskilling because of the scale of the problem, as evidenced since the beginning of 2020.

For an individual, reskilling and upskilling can help to advance their career, improve wages and avoid redundancy. It ensures all members of society have opportunities to participate and contribute in the economic well-being of a country.

In the context of this paper, reskilling and upskilling are processes for human capital development as applied to the working-age population. It can be viewed as part of a continuum of lifelong learning. Reskilling is the process of learning new skills to enable a person to do their current job more efficiently, for example, by using new tools or machines, or to acquire new skills to do a different job, perhaps even in another occupation.¹ The process is relevant to current workers as well as those who are unemployed and looking for work. It is not necessary to reskill for the whole job, one can reskill for a particular task in a job. Electricians training to install solar photovoltaic panels and batteries for domestic electricity generation can be considered to be reskilling, although strictly speaking they are broadening their skills. Upskilling is more about skills deepening, whereby someone is learning more advanced skills than what they currently have. For example, a

¹ The term reskill can evoke a negative connotation for some people because of its frequent association with the retraining of workers who have lost their jobs (Probst & Schraff 2019).

nurse aide may upskill to become a registered nurse. Often, however, the distinction between reskilling and upskilling is blurred and may not be that important.

This introductory paper first provides the context that has stimulated the recent interest in reskilling and upskilling. Second, the paper discusses the various factors that are likely to drive the demand for reskilling and upskilling in the future. Third, it provides a brief discussion on the conditions that are conducive to successful reskilling and upskilling, including the modes of learning that can help the processes. The paper ends with a short summary.

Context

Over the last decade, a number of studies have warned of an impending shift in the labor markets of developed and developing countries toward the adoption of digital technologies, big data, and robotics (Industry 4.0). They warned that automation resulting from the adoption of these technologies will destroy jobs, the scale of which has caused fear and anxiety in some quarters. Some have suggested reskilling and upskilling as a policy response to this anxiety. Below I provide a historical perspective on technological anxiety followed by a discussion of the source of the current anxiety and whether it is justified or not.

History of technological anxiety

In *A Culture of Improvement: Technology and the Western Millennium*, Friedel (2007) argues that technological change comes largely through the constant pursuit of improvement—the deep-rooted belief that things could be done in a better way—and that this "culture of improvement" is manifested every day in the ways people undertake various tasks in life for different kinds of work, from raising children to waging wars.

As Mokyr, Vickers & Ziebarth (2015) observe in their excellent article, however, fear and anxiety have always accompanied the introduction of new technology, and this goes back many millennia. While the role of technology in economic progress is not in dispute, although its role in the improvement of the human condition can be argued to be mixed,² it is often seen to be the cause of "technological unemployment," as it is alien, difficult to understand, powerful, to be feared and out of control (Ellul 1967; Winner 1977; Cohen 1981).

The anxiety about technology can be traced back to ancient Greece, which at that time had primarily an oral culture. The philosopher Socrates declared that writing was a threat to society because it would "introduce forgetfulness into the soul of those who learned the skill."

Gutenberg's seminal invention of the printing press in the 1440s raised fears that the teaching of religion would be undermined by the false prophets of fake bible, More importantly though was the fear that many monks, whose job was to scribe the Bible, and other trained artisans, whose job was to painstakingly hand-copy and illustrate manuscripts, would become redundant. This for the first time raised the idea of machines "stealing jobs" from workers. By the end of the 15th century, the printing press had displaced almost all scribes and made their skillset obsolete but, in its wake, it spawned an entirely new set of jobs and occupations, including that of printers, typesetters and book sellers.

² For example, the creation of weapons of mass destruction would not have been possible had it not been for technology, and of the slave trade without guns and ships that could easily cross oceans. In current times, there is feeling, with some justification, of the corrupting influence of technology on the democratic process.

The beginning of the first industrial revolution in Britain in the late eighteenth century heralded the introduction of mechanized textile mills and the replacement of artisan weavers and textile workers, who had spent years learning their craft, with unskilled machine operators. Some aggrieved and desperate artisans, feeling their livelihood was being threatened, broke into factories and vandalized the textile machines. These workers called themselves "Luddites" supposedly after Ned Ludd, a young apprentice who was rumored to have sabotaged a textile machine in 1779.³

In 1930, in one of his essays, *Economic Possibilities for our Grandchildren*, John Maynard Keynes predicted technological unemployment (Keynes 1931). He wrote: We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come—namely, *technological unemployment*. This means unemployment due to our discovery of means of economising the use of labor outrunning the pace at which we can find new uses for labor.

In the mid-1960s, the rapid rise in productivity in the United States from technological change triggered concern that it might outstrip demand for labor. President Johnson even empaneled a Commission on Technology, Automation and Economic Progress to confront the productivity dilemma. The commission's report concluded that automation was not a threat to employment, but that didn't permanently close the case (Autor 2015).

Mokyr, Vickers & Ziebarth (2015) note that anxiety over technological change can take several forms and identify three of the most prominent concerns as follows. The first two assume technology will continue to progress and perhaps will even accelerate.

The first concern is that technological progress will cause widespread substitution of machines for labor, leading to unemployment and a further increase in inequality in the short run, even if the long-run effects are beneficial.

The second concern relates to the implications of technology on human welfare, particularly the dehumanizing effects of some types of routinized factory work.⁴ The argument is not for the elimination or substantial reduction of work, as these can be dehumanizing because there is a fundamental human satisfaction and self-respect that comes from contributing through work. The optimistic view is that interplay between machine and human comparative advantage allows machines to substitute for labor in performing routine and programmable tasks. This leaves humans tasks requiring problem-solving, adaptability, and emotional and caring skills, where humans have a comparative advantage. For many, this will mean work of better quality and rewards (Autor 2015). However, Goos & Manning (2007) argue that if automation could increase the number of "lovely" jobs, it also has the potential to create "lousy" ones. Humans working in tandem with machines could lead to greater monitoring and workplace stress. Sensors on Amazon stock pickers, for example, measure their productivity and location to a level of detail a human manager could not (Lawrence, Roberts & King 2017). If allowed to, new technologies could facilitate intensive "digital Taylorism" (O'Connor 2016).

³ Luddite is now often used to describe those people who disapprove of the use of technology.

⁴ Some types of work in the 'gig' economy, in which workers are denied the working conditions enjoyed by most workers in the traditional economy, can be dehumanizing.

The third concern assumes that the peak of major technological progress has passed. With slowing technological progress, economic and productivity growth will also slow and it will be insufficient to provide work for all and to meet rising living standards.

Current source of technological anxiety

The current technological anxiety stems from a series of futuristic reports forecasting disruption in the labor market from accelerating adoption of digital technologies, robotics and artificial intelligence. The development and deployment of these technologies has led some to declare the dawn of a new industrial revolution, variously called the second machine age, the fourth industrial revolution, or Industry 4.0. Any technological change will inevitably affect labor markets, but the scale of effects from the current and anticipated changes seem to have unnerved some policy-makers. It is, therefore, important to cast a critical eye on what has so far been reported, which I do below.

There are different views about the current pace of technological change. Some argue that we are in an epoch of accelerating technical change (Brynjolfsson & McAfee 2014; Ford 2015; Schwab 2016; Frey et al. 2016),⁵ while others, and equally forcefully, argue that the pace of technological change has not accelerated for more than 200 years, and on current evidence is unlikely to in the foreseeable future (Perez 2003; Atkinson 2004; Atkinson & Wu 2017). Atkinson and Wu note that change is generally more gradual than many people perceive. For anybody in the present, irrespective of the epoch the present represents, change will always seem faster now than it may have been in the past. A person in the early part of the 20th century, for example, would likely tell a story of rapid technological change, providing examples of amazing innovations, such as cars, electric lights and the telephone. In the contemporary period these innovations may no longer amaze us.

Frey & Osborne (2013) estimated almost half of all jobs, predominantly in low-skill, low-wage occupations, in the United States are at high risk of automation over the next two decades. Workers in these occupations, they argue, need to reallocate to work that is not susceptible to automation, such as that which requires creative and social skills. For this they would need to reskill. It is however unclear in the report how feasible it would be for all displaced workers to acquire creative and social skills. The report also assumes that there will be sufficient demand in the labor market in the future to absorb all such reskilled workers. The attention this study received was considerable, and as it often happens, the headline message of "jobs under threat from automation" bounced around uncritically in the media.

Others followed Frey and Osborne's method to examine how automation could affect the economies of other countries and regions. These include:

Deloitte (2014): one in every three jobs in London at high risk of being made redundant by technology over the next two decades, and low paying jobs (paying less than 30,000 pounds) are eight times more susceptible to replacement than high paying jobs (paying 100,000 pound or more)

- Bowles (2014b), Bowles (2014a): more than half of all jobs in the European Union at risk of computerization
- Pajarinen & Rouvinen (2014): one third of jobs in Finland at high risk of automation

⁵ Some futurists and techno-pundits make even bolder predictions (Atkinson & Wu 2017).

- Asian Development Bank (2015): 5-28% of jobs in nine selected Asian economies⁶ at high risk of automation
- Brzeski & Burk (2015): 59% of jobs in Germany at high risk of automation
- Durrant-Whyte et al. (2015): 40% of jobs in Australia at high risk of automation
- World Economic Forum (2016): current trends show a loss of 7.1 million jobs and a gain of two million jobs, with net job loss of more than 5.1 million jobs lost due to disruptive labor market changes over the period 2015–2020. Losses concentrated in routine white-collar office jobs and gains in jobs requiring computer, mathematical, architecture, and engineering skills⁷
- World Bank (2016b): two-thirds of all jobs in developing countries are susceptible to automation, but this is somewhat moderated if adjusted for the slower pace of technology adoption in these countries
- Frey et al. (2016): on average, 57% of jobs in OECD countries, 69% in India, and 77% in China, are at risk from automation over the next decades⁸
- Chang & Huynh (2016): more than half of all jobs in five Association of South East Asian Nations (ASEAN) countries⁹ are at risk of automation over the next two decades. High risk industries include 1) hotels and restaurants 2) wholesale trade 3) retail trade 4) construction 5) manufacturing; and low risk industries include 1) education and training 2) human health 3) social work
- Fuei (2017): 25% of jobs at risk of automation in Singapore.

The above studies show widely varying but significant numbers of jobs at risk from automation across many countries, which is not surprising given the differences in the structure of each country's economy. Different studies also seem to produce different results for the same country despite using similar estimation methods. For example, the Asian Development Bank (2015) reports 5-28% of jobs at risk of automation in nine Asian economies that include India, but Frey et al. (2016) report 69% of jobs at risk for India.

Arntz, Gregory & Zierahn (2016) argue that Frey and Osborne's method, by design, overestimates the number of jobs at risk of automation because the method is job rather than task-based and suggest caution in interpreting these estimates.¹⁰ They argue that it is not whole jobs that are automated in the real world, but rather the tasks that make up a job. Most jobs consist of a

⁶ Kazakhstan, Thailand, Fiji, Pakistan, Indonesia, Philippines, Cambodia, Vietnam and India.

⁷ This study uses data from an employer survey across 15 major developed and emerging countries. Altogether, 2,450 large corporations were targeted with 371 responding.

⁸ In this study, unlike previous studies by Frey and Osborne, a timeline for job losses is not provided.

⁹ Cambodia, Indonesia, the Philippines, Thailand and Viet Nam.

¹⁰ Frey and Osborne's statistical algorithm predicting the susceptibility of a job to automation depends on the information from the subjective assessment of 70 occupations for their susceptibility to automation by a group of engineers. The group assessed the automation possibility of all tasks in the occupation, conditional on big data and state-of-the-art computer-controlled equipment being available. Frey et al. (2016) add that "to the best of our knowledge, we considered the possibility of task simplification, possibly allowing some currently non-automatable tasks to be automated." Labels of automation or non-automation were assigned only to occupations about which the researchers were most confident. The meaning of "possibility of task simplification" is unclear. It is also unclear from the paper how the information about occupations for which the researchers were not "confident" was used in the algorithm. The weakness with this approach is that the process of determining what tasks are possible to automate in the future is subjective and possibly biased because the rule for making the decision is weighted towards finding a positive response for automation.

combination of routine and non-routine tasks. Given appropriate technology that may exist now or in the future, the routine tasks may be at risk of automation. But just because a routine task can be automated, it does not necessarily follow that it will be. Barriers to automation could include such things as capital investment and social norms. Using a task-based method, Arntz et al. find on average, across 21 OECD countries, only 9% of jobs have the potential for automation, ranging from 6% in Korea to 12% in Austria. For the United States, their estimate is 9%, compared to the 47% in Frey & Osborne (2013). The differences across countries, they note, reflect the differences in workplace organization, previous investments in automation technologies and the level of education across countries.

Since then others have continued to investigate the effects of automation on job displacement using a variety of methods:

- Manyika et al. (2017a,b); Manyika et al. (2017b): 75 to 375 million workers in 46 countries (3-14% of the global workforce) will potentially need to switch occupations and perhaps reskill or upskill by 2030, the numbers varying depending on country-specific factors (technical, economic and social) that affect adoption of the technologies; potential increase in productivity growth of 0.8 to 1.4% per annum; 5% of jobs at complete risk of automation and 60% of occupations have at least 30% of tasks that can automated
- PwC (2018): up to 30% of jobs at risk in the UK by the early 2030s, 38% in the United States, 37% in Germany, and 24% in Japan
- Bakhshi et al. (2017): 10% of jobs in the United States and in the UK are in occupations that are likely to grow and 20% are in occupations that are at risk of contracting over the next decade or two. Environmental sustainability, urbanization, increasing inequality, political uncertainty, technological change, globalization, and demographic change are the key drivers of change
- AlphaBeta (2017): 29% of all jobs in Australia at risk of automation by 2030, with potential benefits to the economy of as much as A\$2.2 trillion over this period subject to adoption of a strong policy framework that ensures displaced workers are deployed, presumably after reskilling, and more firms are encouraged to intensify their effort to automate
- Shook & Knickrehm (2018): revenue to increase by 38% and employment by 10% from 2018 to 2022 if firms were to invest in artificial intelligence and "human-machine collaboration" at the same rate as the top performing businesses
- Mercer (2019): employers expect 20% job losses in their firms from automation

The above review shows the effects on jobs and tasks from automation vary significantly across countries and between methods. This means one has to exercise caution in interpreting the scale of the effects in many of these studies. While some studies include a description of the data and methods they used for producing the estimates, others do not. Not many studies report the equilibrium effect on jobs from automation, which is probably more important than simply looking at jobs that will be destroyed. Furthermore, focusing on tasks, rather than jobs, when analyzing the effect of automation may be more informative for policy. The takeaway message from the above is that automation will destroy some jobs and create others, but knowing which jobs will be destroyed and which will be created in the future is difficult, and an inexact science.

What can we learn from historical data?

Others have looked at historical data to learn about the effects of technological change on employment, particularly the net job effect. Productivity gains arising from technological change in one industry can permeate through to the rest of the economy through lower prices, higher wages for the remaining employees or higher profits, and create new demand and associated jobs (Autor 2015). For example, Bessen (2015) observed that the numbers of automated teller machines (ATMs) in the United States, which were first introduced in the 1970s, increased from 100,000 to 400,000 from 1995 to 2010. It is natural to assume that the ATMs all but eliminated the job of a bank teller over this period. The labor force data, however, show the employment of bank tellers in the United States actually increasing from 500,000 to 550,000 from 1980 to 2010, although the numbers declined as a share of total employment. The ATMs were expected to replace bank tellers, so what are all these tellers doing? According to Bessen, there were two forces operating against each other. First, while the average number of tellers per branch fell by more than a third between 1988 and 2004, the number of branches increased by more than 40% as a result of deregulation of the finance sector. Second, as the manual tasks of tellers disappeared, new tasks of "relationship banking" of selling and promoting new banking products, enabled by information technology, emerged.¹¹ We are now witnessing the replacement of ATMs with touch pay card and mobile phone technology.

Labor displacing technological advances of the last century have not resulted in adverse effects for the Australian labor market. Productivity Commission (2016) shows Australia did not experience long-term decline in the employment rate nor a substantial increase in the unemployment rate, even as the labor force participation of women increased. Borland & Coelli (2017) also find little evidence to suggest computerization decreased the aggregate hours of work done by labor in Australia. They add that computerization is, however, changing the types of tasks workers do, but the pace of change in the composition of employment and in job turnover is no quicker now than it was in the period before computers. As Autor (2015) notes, automation may eliminate large numbers of job tasks yet increase job numbers.

Using historical data from three industries in the United States, Bessen (2018) shows that automation can and does often lead to growing employment in the affected industries. He shows that employment in cotton textile, steel, and motor vehicles initially increased rapidly in tandem with technological change for many decades (see Figure 1). Only later are sharp losses associated with automation observed. Traditionally, economists have appealed to productivity to understand the effect of technology on growth, for example, the faster productivity growth in manufacturing relative to other sectors leads to a declining share of employment in manufacturing. Bessen, however, argues that the key explanatory factor for the growth in manufacturing employment during the 19th century, even when manufacturing productivity was growing faster than other sectors, was the nature of demand. He writes: In a competitive market, reducing the amount of labor needed to produce a unit of output will reduce the price. If demand is sufficiently elastic, demand will increase rapidly enough so that employment will go up even if the amount of labor per unit declines. This is precisely what happened during the early years of the U.S. cotton textile, steel, and automobile industries.

Even if automation does not reduce the overall number of jobs, it may significantly affect the quality or distribution of jobs available. Analyses of data from a number of countries, but particularly the United States, reflect this distributional change as a "hollowing" out of the skill/

¹¹ Many bank teller jobs were rebranded as financial advisers.



wage distribution, with growth at the lower and upper ends of the skill spectrum and losses in the middle. Technology is however not the only cause of this transformation with globalization another factor (OECD 2017; Katz & Margo 2014; Autor & Dorn 2013; Bárány & Siegel 2018; Borland & Coelli 2017).¹²

¹² Such distributional changes are sometimes referred to as skill-biased technical change (Autor & Katz 1999).

Polarization of the labor markets of advanced countries is clearly evident in Figures 1 and 2. It is difficult to know whether the labor markets of emerging and developing countries will follow the same transformation as these countries adopt more advanced technologies in production. Figure 3 shows the labor market transformation for India and China over the first decade of this century. Not only is the transformation different from each other, but it is also less than that observed for advanced countries. In China, the growth in both middle- and high-skill employment is high, but growth in low-skill employment is even higher, resulting in the shares of middle and high-skill employment falling. In India, the shares of low and medium skill occupations have declined relative to high-skill occupations.

FIGURE 2

POLARIZATION IN THE U.S. LABOR MARKET: AVERAGE CHANGE PER DECADE IN OCCUPATIONAL EMPLOYMENT, 1940-1980 AND 1980-2010



Beaudry, Green & Sand (2016) show that much of the polarization of the labor market occurred in the decades before 2000, but since around the tech bust of 2000 there was a reversal in the demand for cognitive tasks, generally associated with higher education qualifications. According to them, this explains several of the poor labor market outcomes observed during the great financial crisis. The reversal in demand continues to have a direct effect on higher-skilled workers, and on less skilled workers as well. The response by higher-skilled workers to this change in demand was to move down the occupational ladder to perform jobs traditionally performed by lower-skilled workers. This de-skilling process, in turn, pushes lower-skilled workers even further down the occupational ladder and sometimes even out of the labor market altogether. Beaudry et al. show skill-biased technological change can cause a boom and bust in the demand for cognitive tasks. They suggest that information technology has perhaps reached maturity and can now be considered

FIGURE 3 POLARIZATION IN OECD LABOR MARKET: PERCENTAGE POINT CHANGE IN THE SHARE OF TOTAL EMPLOYMENT IN OECD REGIONS FROM 1995 TO 2015



FIGURE 4

POLARIZATION IN THE INDIAN AND CHINESE LABOR MARKETS: PERCENTAGE POINT CHANGE IN THE SHARE OF TOTAL EMPLOYMENT FROM 2000 TO 2010



a general-purpose technology.¹³ Compared to major firms of the IT revolution, the leading tech firms in the digital age are relatively small employers and have failed to provide opportunities in sufficient numbers to workers in surplus in the IT sector or to the increasing numbers of new higher

¹³ General purpose technologies are those that can affect an entire economy (usually at a national or global level) and have the potential to drastically alter societies through their impact on pre-existing economic and social structures. Examples include use of fire, the steam engine, railways, electricity, cars, computers, the Internet, and mobile phones.

education graduates. For example, in 2013, IBM employed 431,212 but Facebook's headcount was only 7,185 (Berger & Frey 2015).¹⁴

Most estimates of future job losses from automation, as already noted, do not correspond to the equilibrium effect. Even if the advances in technology materialize as expected, there is no guarantee that firms will choose to invest in them. Furthermore, the effect of new technologies is generally not confined to just the sector in which it is introduced because usually there is an adjustment in other sectors and occupations, which may expand to soak up the labor freed from tasks that are now performed by machines, and productivity improvements due to new machines may even expand employment in affected industries (Acemoglu & Restrepo 2020). Using a dynamic model, Acemoglu & Restrepo estimate one more robot per thousand workers reduces the employment to population ratio by about 0.18-0.34% (360,000 to 760,000 jobs) in the United States. With a more aggressive adoption of robots, say three more robots per thousand workers, they estimate the employment to population ratio to be lower by between 0.54 and 1%, and with 5.25 additional robots the ratio drops to between 0.94 and 1.76%. This suggests the net job effect from automation can be very different to the gross job losses.

Historical analyses of technological change of the past few centuries suggest some of the dire predictions of technological unemployment are unlikely to materialize (Mokyr, Vickers & Ziebarth 2015). This is quite an apt observation when viewed through the lens of Amara's law: *We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.* Furthermore, Mockyr et al. observe: ...technology will continue to improve the standard of living in many dramatic and unforeseeable ways; fundamental economic principles will continue to operate; and scarcities will still be with us, most notably of time itself. The law of comparative advantage strongly suggests that most workers will still have useful tasks to perform even in an economy where the capacities of robots and automation have increased considerably.

Mockyr et al. caution that adjustment may be disruptively painful for some workers and industries and may require public support to ameliorate the worst effects of dislocation. Public policy should also address any maldistribution of the returns that flow from adopting increasing automation and prevent any deterioration of current working conditions of those who have jobs. In fact, it should go further and ensure that working conditions actually improve.

Labor supply will adjust to changes that automation heralds. Human labor has always prevailed because of its ability to adapt and acquire new skills through education and training. Notwithstanding this unique human ability, there are emerging challenges of access, equity, quality, financing and distribution of education and training. Any long-term strategy of producing skills that are complemented by, rather than substituted by, technological change, must confront these challenges. Autor (2015) projects an optimistic outlook for middle-skill jobs: ...middle-skill jobs, combining specific vocational skills with foundational middle-skills levels of literacy, numeracy, adaptability, problem solving and common sense, should persist in coming decades. Many of the middle-skill jobs in the future will combine routine technical tasks with the set of non-routine tasks in which workers hold comparative advantage [in terms of] interpersonal [skills].

He adds, "...the issue is not that middle-skill workers are doomed by automation and technology, but instead that human capital investment must be at the heart of any long-term strategy for

¹⁴ In 2018, IBM employed over 350,000 compared to Facebook, which employed just over 35,000.

producing skills that are complemented by, rather than substituted by, technological change."

The future will bring new products that are currently barely imagined, but will be viewed as necessities by the citizens of 2050 or 2080, and these will usher in new associated occupations and services (Mokyr, Vickers & Ziebarth 2015). Technophobic dire predictions that suggest that computers and robots will have an absolute and comparative advantage over humans in all activities are nonsensical, and not reflected in history. Technological progress will continue as humanity is not on the verge of running out of pressing problems that need fixing, some of them resulting from previous technological advances. The most pressing problem facing humanity, climate change, is a classic example of past technological innovations creating problems needing new technological fixes as well as behavioral change.

Sources of Demand for Reskilling and Upskilling

Although the current anxiety is largely about the effect of automation on the labor market and the associated changing demand for skills, there are equally important other factors that will influence the demand for reskilling and upskilling. These factors will interact with technology and with each other to determine the overall demand. The magnitude of the effect of each factor will vary by each country's own circumstances.

Technological advances

New technologies, when ready, are generally not deployed instantly and uniformly across all countries. The speed at which a technology is deployed depends on consumers' preferences and the trust they have in the technology. Relative costs and the regulatory framework around the use of the technology are just as important factors and have the potential to slow the spread of the technology more widely with implications for reskilling and upskilling (Productivity Commission 2016).

Industry 4.0 technologies are not as widely deployed across countries as some people would like to believe. The deployment so far has been uneven across both countries and industries, and is likely to remain uneven in the foreseeable future.¹⁵ This is because the costs of widespread deployment are not insignificant and it would be difficult to see investment decisions of such magnitude over a short period especially when they involve decisions to retire existing capital, which would potentially increase the cost (Productivity Commission 2017). These technologies are thus not yet at a stage where they could be regarded as general-purpose technologies.

The deployment of any new technology, as already discussed, can lead to job losses for some workers and at the same time it can augment the skills of the remaining or new workers. For example, with the introduction of internet banking, some banking jobs were lost, but others, such as "relationship banking" and cyber security were created requiring a considerable amount of reskilling and upskilling. As another example, the use of telemedicine and automated diagnostics have allowed many more people, especially those in regional and remote areas, access to specialist doctors. The current COVID-19 pandemic has shown how quickly this technology can be deployed, although only further research will show whether there are equity issues in terms of access to services. No doubt, there has been upskilling involved for many in this, including doctors, nurses and health practice administrators.

¹⁵ The evidence for the slow diffusion of many technologies is from observing the divergence in the apparent productivity levels in given industries across businesses and countries (OECD 2015).

As another example, autopilot technology for passenger planes is already in use but it has yet to replace pilots, which it may do one day. For the present, because of community expectations for safety and the difficulty in overcoming the psychological threshold of fear, pilots are still required even though the autopilot is increasingly switched on for flying the plane.¹⁶ However, pilots have to upskill for any new technology that is introduced in a plane and constantly train to keep their manual flying skills current. In the current pandemic with air transport one of the most severely affected industries, air transport workers have to refresh their skills regularly so as to be ready for the post-pandemic, when demand for air transport returns.

Table 1 shows the World Bank's assessment of the impact so far and the potential future impact of digital technologies on different groups of workers and consumers. The personal welfare benefits of ICT are clearly substantial. Economic benefits tend to accrue relatively more to those who are already better off, who because of higher levels of education and skills are able to leverage technology to their economic advantage. The economic benefits to the poor from ICT it seems may be in terms of indirect jobs (World Bank 2016a).

TABLE 1

BENEFITS OF DIGITAL TECHNOLOGIES FOR WORKERS AND CONSUMERS: A SCORECARD

	Impact so far		Potential impact		
Channel	Poor	Nonpoor	Poor	Nonpoor	
Creating jobs					
In the ICT sector and occupations	Negligible	L	Negligible	L	
In sectors that use ICT	L	M	L	M	
Increasing worker productivity					
Increasing returns to human capital	L	M	L	H	
Connecting people to work and markets	M	н	H	H	
Benefiting consumers					
Increasing consumer surplus	M	н	H	H	

Source: World Bank (2016a)

Note. *Poor* refers to the bottom 20% of the welfare distribution. L = low, M = medium, and H = high. Qualitative assessment of the impacts by the World Bank staff team based on current evidence.

Generally, with technological progress some skills will become obsolete and workers will need to acquire new skills to complement the technology. Thus, there is a premium on skills that complement automation. The complementary skills will typically, but not always, be those that require advanced cognitive and socioemotional skills. Workers with the right blend of skills will be able to leverage technology to become more productive. As technology evolves and demand for skills change, updating skills will be a lifelong process for workers.

Investing in upskilling of workers must accompany any introduction of new technology by a firm. The alternative is to recruit new workers to operate the technology. Only then can the firm realize the potential productive benefits of the technology. Workers who cannot be upskilled and are retrenched should be given the opportunity to reskill in another industry or occupation. Here there is a clear role for governments to ensure employers discharge their duties to the retrenched workers appropriately by offering them transition packages. Without a good industrial relations framework,

¹⁶ In contrast, it seems there is less of a fear in boarding an underground driverless train, many of which now run in urban areas and between airport terminals.

there is always a risk that workers will fall through the cracks and end up unemployed for prolonged periods. As a last resort, the government should have a reskilling program for the retrenched workers, which could be funded by a training levy on all firms.

Environmental changes

Climate change is the largest of the environmental factors that will drive future demand for skills. It is a global issue and no country is immune to its effects. There are two things for each country to consider. First, it has to have mitigation strategies to slow, and eventually reduce, the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases (for example, the burning of fossil fuels for electricity, heat, or transport, and fugitive emissions from extractive industries such as natural gas) or enhancing the carbon sinks that accumulate and store these gases (for example, forests and soil).¹⁷ The amount of restructuring required to move toward a carbon-neutral economy will depend on each country's current emissions and the speed at which it wishes to meet its target.

Second, it has to consider strategies for adapting to the effects of climate change that are already in the pipeline. The aim of adaptation is to ameliorate some of the more harmful effects that are already evident (for example, sea-level encroachment, more intense extreme weather events, adverse health effects, and food insecurity). Adaptation also includes taking advantage of any positive effects from climate change (for example, longer growing seasons or increased yields in some regions).

Each country has its own comparative advantage in terms of the policies it adopts for both mitigation and adaptation. They will inevitably have an effect on its labor market, some jobs will be destroyed and others will be created. This is already evident in economies where mitigation policies are already in place. Jobs growth will follow where public or private investment occurs, but sound, consistent and long-term public policy is essential for attracting any investment. New investment will be accompanied by the adoption of new technologies that will require reskilling or upskilling of workers. If workers have strong general foundational skills, then there is no reason why firms cannot provide, and include in their business plans, the additional training of workers.

Countries endowed with natural resources in terms of forests have a comparative advantage in using the forests as carbon sinks. If this was one of the mitigation strategies adopted, then workers in the forestry industry would need to reskill to become custodians of forests. In some environments, this will be a challenging issue as it will require changing behavior from the practice of burning and clearing forests for monoculture cultivation to valuing forests as carbon sinks and biodiversity preserves.

The strategies each country adopts will depend on its geographic location. Strategies will be required for such events as sea level rises, ocean acidification, intense weather events, and generally higher temperatures. Workers will need to reskill or upskill to deal with many of these events, each of which will require a range of skills. For example, fighting bush and forest fires resulting from extreme temperatures will require emergency workers and firefighters with updated skills to cope with fires of unprecedented scale. New technology will certainly have a significant role but those who will use it will need training. While modern technology, such as fire-bombing aircraft, play a significant role in the fight against bushfires in Australia, indigenous Australians' skills for bush fire management, practiced over thousands of years, is being belatedly recognized as a possible

¹⁷ https://climate.nasa.gov/solutions/adaptation-mitigation/

future major fire prevention strategy. This means upskilling new Australians with ancient yet effective skills to manage bush fires.

The agriculture sector is a source of significant greenhouse gases. Changing farming practices thus has the potential to reduce emissions significantly. Reskilling and upskilling in this sector are enormous challenges, especially in developing countries whose agriculture workforces comprise of large numbers of workers with low levels of formal education.

There is growing realization of the ill-health effects of climate change, and also other environmental changes. These include respiratory illnesses from heavy air pollution from heavy traffic and forest and agricultural burning, the effect of which is already evident in many mega cities in Asia.¹⁸ Heatstroke will increasingly be a common complaint from higher temperatures. New diseases, such as those spread by mosquitoes, are likely to spread in areas, such as southern Australia, where they were uncommon in the past. Clearly, there are important implications from these trends on the skills base of the health workforce. As climate change advances, the health workforce will need to reskill and upskill on an ongoing basis to deal with the impending health effects.

The above provides just a few examples of the effects of climate change and how they will entail reskilling and upskilling. All industries will be affected in one way or another by climate change and will need to have plans for reskilling and upskilling.

Globalization

The world has been globalizing ever since humans started interacting with their neighbors. More recently, it has intensified with the assistance of bilateral and multilateral trade agreements, many of which have clauses to regulate not only the movement of goods and services but also of capital and persons. Over the last few decades, it has included the outsourcing of services and production across borders. Reskilling and upskilling are significant issues within this context.

Movement of people across borders can be permanent or temporary. With permanent movements, the sending country loses its stock of human capital in which it had made significant investment, from the time the person was born to the time the person leaves. While the private returns to the individual can be substantial as a result of this movement, the country as a whole generally tends to lose, except for some incoming remittances, which generally peter out over time. As a consequence, the sending country bears the cost of skilling the person and the receiving country reaps most of the benefits. The sending country is thus faced with the problem of skilling another person to replace the one that left. This may mean reskilling or upskilling. If there were equal two-way flows between two countries, then both countries, poorer countries are the net losers, although the private benefits to the individual migrants can be substantial.

Temporary movement of labor has become significant over the last few decades and now dwarfs permanent movements in its scale. Most temporary movements are, once again, from poorer to richer countries. There is a higher level of remittance flows associated with these movements. The skill level of the migrants involved is generally lower than of permanent migrants, although many high-skill workers do end up working in low-skill occupations. These workers generally have fewer opportunities to upskill in the receiving countries. The problem arises when temporary migrants

¹⁸ Cities in other parts of the world including Australia, Canada, Europe, and the United States, are no longer immune to pollution from bush and forest fires.

return home. What sort of reskilling is required to integrate them back into the local labor market?

The effect of offshoring of services and production presents a problem of a different kind. While in this scenario there are issues of reskilling and upskilling from where the services and production are offshored, the bigger problem however is with respect to workers whose jobs have been offshored. What opportunities for reskilling or upskilling are provided to them so that they can remain attached to the labor force?

The COVID-19 pandemic has raised questions about globalization. The pandemic has slowed, and in some instances, stopped the international movement of people, both permanently and temporarily. This has left some workers in developing countries who had trained to work overseas in limbo. What sort of retraining is, or will be, available to these workers, and whose responsibility is it to fund their retraining? The pandemic has shown that the global supply chains are fragile in emergencies, leading some countries to consider bringing the production of strategic goods onshore, especially those that are health-related. This will inevitably involve skilling workers in these production processes. The pandemic has affected some industries more than others, such as childcare, transport, tourism, hospitality, restaurants and accommodation, and retail. Many other sectors have adapted by going online and introducing working-from-home. While many are advocating reskilling and upskilling for those workers who have lost jobs during the pandemic, the strategy should be appropriately designed and targeted. Reskilling workers for jobs that don't exist now or in the near term will be futile.

Demographic and behavioral changes

Many developed countries are afflicted by demographic changes. If a country's population is ageing and in decline, then there will be increasing demand for a whole variety of aged care services, particularly, though not exclusively, in health and care sectors. As these services are labor-intensive, new workers will need to trained. Workers displaced from other industries could be reskilled to work in this sector. In some countries, for example Australia, aged care workers are poorly paid, which reflects their training and qualifications. Driven by community expectations of better quality, a recent inquiry into the sector has recommended upskilling of staff. In this instance it is community expectations of quality that are driving the upskilling process.

Behavioral changes resulting from consumer preferences can also drive the demand for reskilling and upskilling. Fast food and home food delivery trends have changed the nature of many jobs in the hospitality industry. Many workers who would have normally worked as waiters now deliver food on bikes or in cars. Others have to work in kitchens to prepare take-away food. While there may be some new skills to be learnt, in general, one could argue this is an instance of de-skilling.

The increasing trend in consuming fast foods and foods high in sugar, salt, and fats is associated with significant health problems, such as obesity and diabetes, to name a couple. This is no longer just a problem of affluent countries, as many emerging economies are following the trend, and often at a faster rate and with bigger populations. Another behavioral change causing health problems is the increase in the consumption of alcohol and tobacco, and in some countries the use of asbestos products. Increasing numbers of health and education workers will need to reskill and upskill to meet the anticipated additional health needs of the population.

Finally, one can argue the widespread urbanization into mega cities is a barrier to upskilling because of the lengthy commute times many people have to endure to go to work. When some

people have to spend three to four hours a day commuting, it leaves little time for upskilling, as well as physical exercise. The COVID-19 pandemic is, however, teaching us that telework is possible, thus reducing the need, to a certain extent, to commute.

Modes of Reskilling and Upskilling

The foundation of any good program of reskilling and upskilling is strong literacy and numeracy, and increasingly digital literacy. Employers often demand workers to be creative, think critically and systematically, be agile and resilient (for example, see Manyika et al. (2017a)) and to have science, technology, engineering and mathematics (STEM) and problem-solving skills. Careful and clever design and delivery of reskilling and upskilling programs can develop these attributes and skills in workers; however, tasks design and workplace organization are equally important in this respect. Providing a degree of autonomy to workers in their work is likely to yield positive results while excessive use of key performance indicators has the potential to stifle creativity as has the digital algorithmic monitoring of employees' performance.

Reskilling and upskilling can be undertaken through formal, non-formal or informal learning. Formal learning is structured and leads to a qualification. Non-formal learning is also structured but does not lead to a qualification and is often of a short duration. For example, non-formal learning could include structured on-the-job learning, teaching by supervisors or co-workers, seminars and workshops. Informal learning, in contrast, is unstructured and includes learning by doing, being shown or watching others to learn how to do a task whenever a need arises, and acquiring knowledge and skills through reading manuals and journals. Informal learning is probably underrated in its impact on a worker's skills development compared to formal and non-formal learning. As the need to skill becomes more frequent, and sometimes gets atomized in scale, informal learning is inexpensive but it does require the firm to create the conditions under which it can flourish. One option is to develop a community of practice among employees, whereby groups of employees teach and learn from each other.

New technologies and new ways of working are influencing how people learn. A self-directed online mode of learning and on-the-job learning are preferred modes over traditional classroom based learning, although online learning may not be universally accessible in many countries (Kovacs-Ondrejkovic et al. 2019). If these modes of learning are supported and combined with informal learning facilitated by a community of practice, then there is potential for a bigger impact on the learning experience of workers.

The funding of reskilling and upskilling should be the responsibility of individual workers, employers and governments, with the contribution proportional to the benefits each party obtains from the investment and the ability to pay. While there has been a lot of work on the returns to individuals from formal education and training, returns to employers is less researched and often understated. The large body of research on inequality suggests the returns to capital have risen substantially over the last few decades, while returns to labor have stagnated. Consequently, firms have a higher capacity to support the reskilling and upskilling of their workforces, although the capacity of individual firms may vary by their size, with larger firms better placed than smaller firms.

Globally, some firms have taken up the challenge of reskilling and upskilling seriously (for example, see Box 1 for the case of AT&T in the United States). Another major firm that has

embraced reskilling is IBM.¹⁹ It has created a Career Transition Centre, which serves to reposition the company in the labor market and teach staff new skills they can use within the company and elsewhere within its ever-changing context. The course offered is voluntary and includes six months of professional support and tools to help the employees boost their position in the labor market. It has a modular structure and is available globally to all IBM employees and yet has a structure to build an awareness of the local context.

BOX 1

RESKILLING AND UPSKILLING AT AT&T (UNITED STATES)

AT&T was instrumental in building the United States' telegraph and telephone infrastructure in the last century. It could once claim to be the company "where the future was invented." In 2013, it realized that there was limited growth remaining in its legacy business, which was becoming obsolete as the industry was rapidly moving from cables and hardware to the Internet and the cloud. To grow and remain competitive it had to reinvent itself. Its workforce consisted of 280,000 workers, most of who had trained in a different era, and the average tenure of the employees was 12 years (22 years if you don't count call center workers). Rather than hiring new workers to replace the existing workforce, AT&T chose to retrain the current employees and began the process to develop a culture of perpetual learning.

The new business model of the company required skills in cloud-based computing, coding, data science, and other technical capabilities. Many of these fields have been advancing so quickly that traditional methods of training and development cannot keep up and, therefore, rather than source skills from the market and pay a premium for it, the company choose the reskilling option.

Since 2013, when the initiative began, the company has spent US\$250 million on employee education and professional development programs and more than \$30 million on tuition assistance annually. About 140,000 employees are actively engaged in the program. In the first half of 2016, retrained employees filled half of all technology management jobs at the company and received 47% of promotions.

While it is still too early to evaluate the success of the program overall, productivity and efficiency have increased, with a reduction in the product development cycle time by 40% and accelerated time to revenue of 32%.

AT&T developed an online self-service platform to its employees, which provides a host of tools and processes for performance management, career development, and talent planning. It also offers workshops on a wide range of topics, such as virtualization and cloud computing. Some of the more popular tools include the career profile tool for assessing competencies, business experience, and credentials and a career intelligence tool for making informed career decisions by analyzing hiring trends within the company and profiles of different jobs (with target salary range and number of incumbents).

The company offered individual courses, 1.8 million of which were taken up by May 2016. Nanodegrees, curated course bundles, in high demand specialties, such as software development, coding and web development, and created by Udacity, were offered to employees. The employees paid US\$200 per month upfront for unlimited courses with no deadlines for completion. AT&T refunds all tuition costs when a course is successfully completed. Finally, the company teamed up with Georgia Tech and Udacity to offer online master's degrees in computer science. The cost to the employee is US\$6,600 but AT&T offers up to US\$8,000 in annual tuition aid per employee for degrees and nanodegrees, with a lifetime cap of \$25,000 for undergraduate degrees and \$30,000 for graduate degrees.

Source: Donovan & Benko (2016)

¹⁹ https://www.morningfuture.com/en/article/2018/07/23/ibm-career-transition-center-reskilling-education-competence-workandr/371/

Summary

Reskilling and upskilling are not new processes. People have always reskilled and upskilled with changing circumstances. The demand for reskilling and upskilling comes from a variety of sources, and automation is just one of them. Others are environmental changes, globalization and demographic and behavioral changes, and more recently the global pandemic. These drivers interact with each other, making analysis of the effect of each driver difficult to determine. Recent reports estimating job losses from automation should be viewed with caution because the results depend on a range of factors, including the method of estimation. As some have suggested the equilibrium effect of automation on net jobs would be a more useful analysis.

More micro level research is needed to understand the barriers and enablers to reskilling and upskilling from the perspective of the firm and employees, including that of the unemployed. The willingness to reskill and upskill will generally vary by age of the worker, with older workers reluctant, and often more challenged, with the adjustment (Shah 2017). Higher educated workers are more willing to upskill and are also more likely to be supported in this by the employer. Firm support for training is less likely to be available for part-time than full-time workers.

While countries believe that technology can improve productivity and the overall wellbeing of the population, investment in new technology will only happen if conditions are right. The confluence of low price for labor, poor employment conditions and an excess supply of labor can be a deterrent to investment because labor is relatively cheaper than capital, especially in the current economic climate with record low interest rates.

Appropriate policies and practices on reskilling and upskilling have the potential to improve the working lives of many workers. The policies should be informed by robust evidence. Each country can learn from the experience of others but should view these lessons with a local lens.

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RESKILLING INFORMAL LABOR IN INDIA

Introduction & the Context

1. Introduction

A large majority of workers in India work in the informal economy, meaning they do not have formal work contracts and are often not covered by employment laws. More importantly, these workers have very low levels of formal qualifications even though many of them have the skills for the tasks they are asked to perform. These skills are often acquired on the job or informally and are rarely formally recognized or certified.

India did not have an explicit skill development policy for informal workers until very recently. There are Industrial Training Institutes (ITIs) and Technical Colleges providing curriculum-based vocational training and technical education to 10th and 12th pass-outs respectively. However, there are not enough of these to cater to very large informal workforces. Moreover, the majority of such workers drop out from school early and do not fulfill the eligibility criteria for admission into ITIs and Technical Colleges.

This study will discuss the skill development initiatives for informal workers in India. India officially announced the National Skill Development Policy in 2015. It is a general skill development policy document that has components relevant to informal workers. This study will focus on those objectives outlined in the National Skill Development Policy that are relevant for informal workers. A few case studies will be used to showcase the skilling landscape and its efficacy for the inclusion of informal workers in skill development initiatives.

2. Dimension & Size of Informal Labor in India: The Context

The informal economy in India provides employment to more than 90% of the total workforce (Economic Survey, 2018-19). In terms of non-agricultural employment, the share of informal employment is 83.6% in India (ILO, 2013). Informality is found in both the traditional informal economy and increasingly through the growth of informality in the formal sector too. There has been a growing use of contract and casual labor in the formal sector over time. For example, in 2013-14, the wage gap between contract and regular workers in the organized manufacturing sector was 25%. This explains the dramatic rise in the proportion of contract workers in this sector from 12% in 1990 to 91 to 33.6% in 2013 to 14 (Jayaram, 2019).

There is no explicit employer-employee relation in such cases and these workers do not have access to any form of social security. Similar informal labor shares can be seen during the period from 2009-10, with Bangladesh at 88.5%, Nepal at 86.4%, Pakistan at 78.4%, and Sri Lanka, which significantly better at 62.1% (ILO, 2013). Comparable figures in developing countries like South Africa, China, and Brazil are 22.5%, 50% and 58% respectively during the early 2000s (Avirgan Tony, Gammage Sarah and Bivens Josh, 2005).

India has witnessed a steady informalization of the workforce over the years, particularly since 1991 when India started liberalizing its economy. Before the 1990s, the level of informality in general veered around the 80% mark during late 70s and 80s (NCEUS, 2007).

Broadly, in a structural sense, there are two reasons behind this phenomenon of increasing informalization. First is the quest of employers to minimize costs in a competitive environment. When India embarked on liberalizing its economy in 1991, the domestic economy experienced deregulation and had to compete with international establishments. Overall, the production structure gradually got decentralized to accommodate more and more informal labor. The apparent and explicit motive is to reduce the cost of production, particularly through economizing on the labor cost. And because informal labor is way cheaper than formal labor.

Second, over the last three decades, India's occupational distribution could not keep pace with changes in the sectoral distribution of national income. Over the years, the contribution of the primary sector to the national income declined steadily (presently its share is 14.2%) but it still engages an overwhelmingly large number of workers. The number of workers engaged in the primary sector did fall but not to the level it was expected to, falling from 52.45% in 2009 to 42.39% between 2018-19. Corresponding secondary sector employment increased from 21.18% in 2009 to 25.58% in 2019 (Economic Survey, 2019). Many workers continued in the primary sector as additional labor and the rest left the primary sector to look for employment in the secondary and tertiary sectors in urban areas. The majority of such workers found ways of survival in urban areas as informal workers in the secondary sector and particularly in the tertiary sector. These informal manufacturing and service sector workers are often employed as appendage workers of the formal sector, various extensions and non-core activities, petty economic and subsistence activities on the fringes like selling vegetables at the roadside, opening bicycle repair shops, hawking at the roadside and public transport, and domestic work, etc. As per the Periodic Labour Force Survey 2017-18, 52% of informal workers are self-employed and survive through precarious activities. The majority of such workers are unskilled or at best low-skilled.

In this study, the term 'informal labor' refers to all workers who don't have written job contracts and do not have access to any form of social security. This definition has also been used to define informal/unorganized labor by the National Commission on Enterprises in the Unorganized Sectors (NCEUS, 2007). The formal sector is defined as establishments that employ 10 or more workers and terms of employment and conditions of services are guided by existing labor laws and formal arrangements. However, there are informal workers who are also engaged in organized formal establishments in cases where these workers are engaged as contract/casual/outsourced workers without written job contracts. Such informal workers in formal establishments don't have access to any form of social security, unlike their regular counterparts.

The size of the formal sector is increasingly shrinking and the informal sector is expanding as formal activities are disintegrating into informal ones. According to the ILO's India Labour Market Report 2016, 'most of the new jobs being created in the formal sector are actually informal because the workers do not have access to employment benefits or social security.'

In India, the total labor force was 484 million in 2017. Out of this, less than 34 million are employed in the organized sector and the rest, i.e. 450 million workers (about 93%), are in the unorganized sector (Economic Survey, 2018-19). About 252 million workers are employed in agricultural and related activities, 55 million in construction, 48 million in manufacturing, 49 million in the service

sector, and the remaining 46 million in trade. The share of the unorganized sector in the total NDP at current prices has been over 60%, while three quarters are in the household sector in the total gross domestic saving (Economic Survey, 2018-19). This shows the significance of the informal sector in the economy.

3. COVID-19 Impact

The COVID-19 pandemic and subsequent nationwide lockdown have made the situation even more precarious and complex. There has been huge job loss during the last eight months of lockdown and partial lockdown. The unemployment rate was at an all-time high even before the lockdown, and now it is three times that level at 27%. This is an unprecedented crisis of very high magnitude. The growth rate has fallen to almost zero for the present quarter and the overall economy suffered a decline of 23.9% in the first quarter of 2020 (The Statesman, 2020). Educational institutions, including vocational education and training, have come to a standstill. There is uncertainty about when these will be revived. The specter of COVID-19 is still looming large with infection rates touching new heights every single day. All these will make skill development initiatives very tentative and uncertain physically as well as financially in the near future.

4. Research Objectives and Section Plan

This study proposes to critically analyze National Skill Development Policy documents and examine how those are related to the informal sector workers with the help of relevant case studies.

In section 2, the chronology of skill development in India will be briefly discussed. It also spells out objectives set out in the National Skill Development Policy. Section 3 cites a few case studies involving informal sector workers and highlights key learning points from those studies. Section 4 concludes this study.

Skill Development and National Policy in India

In India, the skills development infrastructure had been oriented towards the formal sector, however this approach has been reviewed and substantially modified since 2007. The new approach formulated by the National Mission on Skill Development was announced in 2015 (MSME, Govt. of India). Measures proposed include setting up new institutes and new courses, and introducing a modular structure. The policy places emphasis on demand-driven training, encouraging the involvement of private corporations and non-governmental organizations at various stages. The policy talks about setting up a dedicated fund to support training and encouraging convergence and coordination across ministries, departments, and between state governments and the central government. The policy intends to re-vamp the Technical and Vocational Education and Training (TVET) track in education in such a way that both horizontal and vertical mobility is possible and that equivalence can be established between 'general' and 'vocational' certification at all levels. This approach recognizes that wage employment will need to be supplemented with self-employment. It does not displace the existing infrastructure or ongoing schemes and training institutes, but seeks to introduce new additions to the system.

In 2007-08, along with significant credit extended to upgrade the infrastructure of ITIs, the National Skill Development Council (NSDC) was established to foster public-private partnerships in skill development. This was followed by the National Skill Development Policy in 2009. In 2013, a competency-based framework called the National Skills Qualification Framework (NSQF) was introduced to organize all qualifications according to levels of knowledge, skill, and aptitude.

Another scheme with a high budget outlay, the National Skill Certification and Monetary Reward Scheme, which offered financial incentives for the successful completion of approved training programs, was launched in 2013. The National Policy for Skill Development and Entrepreneurship was announced in 2015 and a Ministry of Skill Development & Entrepreneurship (MSD&E) was established. The government also introduced the *Pradhan Mantri Kaushal Vikash Yojana* (Prime Minister's Skill Development Scheme) to impart skills training to 24 million youth per annum.

India has had a long history of informal apprenticeship in the presence of a craftsman or a senior technician. However, the problem has been that there is no certification (recognition) for such learning, which disadvantages the worker in the labor market, and hinders labor mobility across jobs. A majority of workers in the unorganized sector have low levels of literacy, as they left school at early stages of education, and so they face difficulty in returning to schools or training institutions to improve their skills, as education or the TVET system does not facilitate them doing so. Being adults, such skilled but older individuals may feel uncomfortable if they return to a regular school. It may do well for India to consider using the infrastructure of existing secondary schools for adults after normal school hours in a second shift, so that such adults have access to Recognition of Prior Learning (RPL) through courses.

The National Skill Development Policy 2015 has identified thirteen policy objectives. Out of those, the following objectives are relevant for informal workers:

- 1. Ensure both vertical and horizontal pathways for the skilled workforce to grow further by providing seamless integration of skill training with formal education.
- 2. Focus on an outcome-based approach towards quality skilling that results in increased employability and better livelihoods for individuals, and translates into improved productivity across primary, secondary, and tertiary sectors.
- 3. Increase the capacity and quality of training infrastructure and trainers to ensure equitable and easy access for every citizen.
- 4. Recognize the value of on-the-job training, by making apprenticeships in actual work environments an integral part of all skill development efforts.
- 5. Ensure that the skilling needs of the socially and geographically disadvantaged and marginalized groups (like the Scheduled Castes (SC), Scheduled Tribes (ST), Other Backward Classes (OBC), minorities, disabled persons, etc.) are appropriately taken care of.
- 6. Promote increased participation of women in the workforce through appropriate skilling and gender mainstreaming of training.
- 7. Promote commitment and ownership of all stakeholders towards skill development and create an effective coordination mechanism.

Initiatives and measures undertaken by the State in recent years that are relevant to skill development of informal workers are as follows:

- 1. On the education front, the Right to Education Act, 2009, was introduced, which legislates compulsory education up to the age of 14 years (equivalent to standard VIII).
- 2. The NSQF was introduced from 2014 to facilitate the smooth transition from general education to vocational education and vice versa at all levels.
- 3. For the labor force already in the market without necessary education and training, Recognition of Prior Learning (RPL) was introduced in 2014. The objective is to get accreditation for the skills they already possess that can be used for upskilling or reskilling. The amendment to the Apprentices Act 1961 encourages even micro and small entrepreneurs to engage apprentices that would improve the availability of skilled manpower in later years.
- 4. Under the National Skill Development Mission 2014, the skill training of the heterogeneous labor force, consisting of youth, women, school drop outs, disabled, minorities, tribal groups, etc., is mandated.
- 5. Since employment opportunities are limited and not everyone would get the jobs, the MUDRA scheme that was introduced in the 2015-16 budget has been designed to help in entrepreneurship development through making refinance facilities available, which would enable medium, small and micro enterprises (MSMEs) access to cheap credit. There is also the National Bank for Agriculture and Rural Development (NABARD), which provides refinance facilities to cooperative lending institutions.

National Skill Development Policy Objectives and Skilling for Information Labor

A primary reading of the objectives as described in Section 2 reveals that goals set in the National Policy on Skill Development and Entrepreneurship 2015 are exhaustive in a normative sense. The policy objectives talked about accommodating informal workers within the broad skilling ecosystem and showed the right intent, but most of the objectives focus on different aspects of skill development in a formal setting. Imparting skills and vocational training for a vast number of informal sector workers is part of some of the objectives mentioned in the policy document, but it still did not receive enough attention. Policy makers still rely heavily on traditional formal arrangements. Almost five years have elapsed after the skill policy is declared, and a review is necessary to take stocks and make progress. However, not much data is available in the public domain, particularly with respect to the informal sector. Without data, assessments of the policy in terms of fulfilling the objectives set out in the plan would be difficult to achieve. There are a few interesting case studies that are relevant in assessing the efficacy of skill objectives. These will be discussed later in this section.

From whatever activities happened and those that could be mapped, it can be said that the skill development eco-system still suffers from serious limitations when it comes to the skilling/ reskilling/upskilling/ of the informal sector workforce. It is true that the number of vocational training institutes expanded both in the public and private sectors, but still, given the number of potential trainees, those are inadequate. As per the NSS 66th Round 2009-10 survey, data on the 'Status of Education and Vocational Training in India' revealed that 92.6% of the labor force did not receive any vocational training in 2009-10. According to the Planning Commission Report,
there were about 5,114 ITIs imparting training in 57 engineering and 50 non-engineering trades. Of these, 1,896 were State Government-run ITIs while 3,218 were private. The total seating capacity in these ITIs was 74 million (40 million seats in government ITIs and the remaining 34 million in private ITIs) (NSSO, 2005). Taking into account other vocational training institutes in existence and the increase in the number of ITIs over the last 15 years, aggregate training capacity comes to close to 2 million per year. Given the number of informal workers, such capacities are grossly inadequate. It might not be possible to train entire informal workers within the formal curriculum based on the vocational training eco-system. Recognition of prior learning and other non-conventional training options should be explored.

Designing roadmaps for skilling has become imperative for logical progress from basic manual skills to the higher order skills. For example: in the construction industry, which engages a large number of informal sector workers, the entry level job may be that of a mason or a bar bender but nothing should stop these people from upskilling and improving themselves to take up greater challenges and earn higher salaries. With proper incentives and encouragement, they can grow well in their jobs and aspire for better pay and better lives, even reaching levels of supervisors or quality assurance personnel. As they reach a higher level, they will realize that they can come up with innovative solutions and not just remain where they were in their first jobs.

The policy objectives clearly mention the Recognition of Prior Learning (RPL) as one of its objectives. The importance of RPL was recognized for the first time in the National Skills Policy 2015. It noted that 400 million workers were to be trained between 2015 and 2022, of which 300 million were to be provided RPL. However, there was no particular strategy laid out to extend RPL to these 300 million who were already in the workforce. The result has been that RPL certification is being provided as part of *Pradhan Mantri Kaushal Vikas Yojana* (PMKVY). However, modalities of certification are not transparent and standardized.

The majority of informal workers are still tied to rural areas and desperately searching for livelihoods in non-farming activities. The main support for skill development of informal workers in rural areas has been through self-employment programs which include a component of capacity building along with access to credit and income-generating assets. Existing self-employment programs have been restructured into one scheme namely the *Swarnjayanti Gram Swarozgar Yojana* (SGSY) in 1999, and then merged into the National Rural Livelihood Mission (NRLM) that was launched in 2009-10.

Rural Self-Employment Training Institutes are being set up in all districts in the country. The approach is broadly meant to organize groups of 10 to 15 people each (self-help groups), offer training and capacity building to those groups through linkage with banks and some subsidized credit, and encourage the acquisition of income-generating assets and the setting up of micro enterprises. Efforts have been made to include marginalized persons and female informal sector workers within the broader training ecosystem. The case studies that will be discussed now cover these elements of the embedded and inclusive skill ecosystem.

Case Studies

1. Tata Institute of Social Sciences-School of Vocational Education (TISS-SVE)

(https://www.sve.tiss.edu/)

Background and Activities: In December 2011, Tata Institute of Social Sciences set up the School of Vocational Education (TISS-SVE) to provide immediate and definite interventions to improve the skill levels of millions of youths through vocational training programs. The target beneficiaries include organized and unorganized workforces across industries.

The approach adopted by TISS-SVE is termed as the Work Integrated Training Programme (WITP). It has expanded steadily, and currently offers courses in 19 different fields across 90 locations spread over 22 states. The list of fields include agriculture, automotive, electronics, healthcare, media and entertainment, pharmaceuticals, printing and packaging, and renewable energy, as well as the more popular Banking, Financial Services and Insurance (BFSI) field.

TISS-SVE has succeeded largely in achieving its goal of keeping vocational education at a relatively low and affordable cost. Students receive stipends and salaries in some cases. TISS-SVE negotiates with Skill Knowledge Partners (SKPs) to provide them with a reasonable sum as stipends, and most students are able to cover their fees from their own stipends. The revenue generated from the student fees, which is collected exclusively on behalf of TISS-SVE, is shared with all the partners. Three year groups have already graduated between 2017 and 2019. The average placement is 85%.

Take-aways: This initiative enables those who have dropped out of the formal education system after 12th standard to pursue education in the vocational streams. It helps organizations upgrade the skill of their blue-collar workforces by giving them an opportunity to enroll in a recognized vocational diploma/degree program without having to leave their job.

2. The case of street food vendors

(https://ui.adsabs.harvard.edu/abs/2015IREdu..61..191P/abstract)

Background and Activities: Street vendors are among the most vulnerable groups of informal workers. Street vending is an integral part of most cities. Many people who move to cities in search of work are unable to find regular jobs, but are able to survive through street vending. This is a category of informal workers that is difficult to enumerate given the extensive mobility of the group.

India is one of the few countries with a national policy for street vendors. Responding to advocacy by the National Association of Street Vendors in India (NASVI), a National Policy on Street Vendors was formulated in 2004 and revised in 2009. The National Policy for Street Vendors states that 'Street vendors, being micro enterprises, should be provided with training to upgrade their technical and business skills so as to increase their income as well as to look for alternatives.'

It is found that street venders' skills development happens mostly through informal learning processes. Only one respondent, Gunasekaran in Coimbatore, reported that he had undergone a short course of training in preservation techniques with the Tamil Nadu Food Safety and Administration Department.

Street food vendors mostly acquired skills at home and learning on the job while working at restaurants, street food stalls, etc. They acquire skills from other family members and seniors/peers at places where they get the opportunity to work. Some of these workers later start their own business as street food vendors. It is possible to map and cluster street food vending areas. The next logical thing to do is to introduce customized, short-duration, flexible, on-site skill development programs. These would enhance skills as well as provide knowledge with respect to occupational health and safety.

Take-aways: This case study shows a context of informal learning that is broadly in line with the concept of 'learn by doing.' The existing informal workplace learning experiences highlighted in this study involve either learning within the family circle or within informal employment in businesses outside the family. These forms of learning are often described as 'informal apprenticeships' and are widely argued by various international organizations to be excellent ways of skilling informal workers (ILO 2011).

Here it can be pointed out that the provisions for street food vendors in India should link informal learning opportunities with more formalized ones. For example, short courses (of a few hours' duration outside main business hours) provided by NGOs could be offered over a period of a few weeks. These courses could be run in small groups in locations with large concentrations of street food vendors and in the immediate vicinity of participants' workplaces to preserve the authenticity of the working environment and also to avoid lengthy travelling times. In terms of content, courses would have to be geared to participants' levels of literacy and other needs. They would focus on basic knowledge and skills such as hygiene, occupational safety, product knowledge, or the basics of costing, pricing, and marketing. Participants' indigenous knowledge should be accounted for such that the approach gains acceptance amongst participants.

3. Development of Humane Action (DHAN) Foundation

(http://www.dhan.org/)

Background and Activities: The Development of Humane Action (DHAN) Foundation, with its headquarters in Madurai, is a non-profit organization and was registered as a public trust in 1997. It has multi-faceted developmental activities and believes in empowering the poor by forming community organizations and upgrading their skills through efforts by development professionals. It is a community banking program that seeks to empower by promoting alternative banking efforts through locally formed self-help groups of poor women in the informal sector, both in rural and urban areas, that are federated at the appropriate levels. A major part of the intervention comprises establishing linkages with local and apex banks as well as government schemes to promote employment generation. Another thrust of the program is to stabilize the income of its members by strengthening the existing activity base and skills by providing appropriate training inputs when needed.

The DHAN Foundation operates in an enabling and facilitating mode. Vocational or technical training is not an explicit priority. The objective is to empower the community, especially women, and then upgrade their existing skill base to enable access to better economic opportunities. Training in such an environment assumes a continuous process in which women build up their self-image and confidence and develop their social skills, often learning from each other rather than from persons outside the community. The DHAN Foundation employees create the necessary enabling environment and gradually withdraw until the community fully owns the process.

The DHAN Foundation also works among traditional artisans with the objective of building up groups and encouraging group solidarity so as to enable people to innovate and improve the efficiency of their operations. For instance, in Tirupati, it supports traditional artisans who make toys with papier-mâché. These artisans, who migrated from Tamil Nadu decades ago, have formed groups and are today thriving because, as groups, they have introduced small innovations in the traditional toy making. Regarding the informal apprenticeship that characterizes this sector, skill-building is done on the job, but innovations, including the use of new techniques of production, have been possible only because of group operation. Technologies and tools that would be very difficult for an individual to acquire have now become accessible to the group.

Take-aways: The DHAN Foundation example is about empowering women workers at the grassroot level. It is not about imparting explicit skill training. It is about grass root mobilization through the formation of self-help groups. Once self-help groups are formed and subsequently empowered, they organically learn livelihood skills, which can lead to paid employment as well as selfemployment. After initiation and empowerment, the DHAN Foundation withdraws from the process and self-help groups subsequently operate on their own. In this structure, availability of micro-credit plays a very important role. Micro-credit organizations are curated with appropriate skills and knowledge.

4. Movement for Alternatives and Youth Awareness (MAYA)

(https://guidestarindia.org/Summary.aspx?CCReg=121)

Background and Activities: The Movement for Alternatives and Youth Awareness (MAYA) is a Bangalore based development and training organization founded in 1989, working to address children's rights with a specific focus on the eradication of child labor. Adopting a holistic approach to this issue, of which vocational training forms an integral part, this organization has initiated several community-based initiatives in the 52 slums that it works in. The activities differ from one area to another, depending on the socio-economic conditions of the families, the employment patterns, the availability of basic amenities and the organization of the people in the area as a community.

Within the framework of its program to organize self-help collectives, MAYA has made major interventions in the traditional craft of lacquer work by trying to improve production methods and enable the artisans to get a better deal, in terms of both marketing their products and producing them better. The idea is that if the quality of production improves, it will be easier to sell the products.

Take-aways: MAYA follows a holistic approach towards providing vocational training and imparting skills. The technical training, be it in carpentry or motor maintenance and repairs, is pretty rigorous and comprises some of the latest knowledge in the respective fields. A lot of emphasis is placed on education, personality development, dealing with customers, team work and so on. At the time of entry, the youth trainees are mostly illiterate. Even if they have been to school, they have often forgotten what they learnt. A baseline assessment is made in which the students' aptitudes are tested and there are special classes for slow learners. For example, those who have been trained in motor repair, usually find jobs in regular vehicle service centers. Stipends are provided to the trainees.

5. Goodwill International Association

(https://www.saathire.com/Q0O/goodwill-international-association/)

The Goodwill International Association, based in Bangalore, was established in 1971 and registered under the Societies Act in 1982. Started by some industrial workers from various movements and trade unions, Goodwill International imparts skill training to unemployed youths and school dropouts. The programs range from functional literacy to vocational training in 16 slums of Bangalore.

Goodwill International provides both formal and informal courses for fitters, turners, electricians, plumbers, welders, tailors, and so on. The range is wide and a lot of emphasis is placed on the individual. There is not much emphasis on building up other necessary skills like marketing, accessing finance, etc. In terms of quality however, the technical skills imparted are better than in ITIs, with many dropouts from ITIs joining Goodwill International, doing well, and finding jobs. This is perhaps because of the individual attention given to the students.

6. Management of Enterprises and Development of Women (MEADOW)/The MYRADA

(https://myrada.org/mpis/)

Background and Activities: Management of Enterprises and Development of Women (MEADOW)/ The MYRADA is based at Dharampuri, Hosur, Karnataka. This is essentially a collaboration between the watchmakers Titan and MYRADA. The collaboration began with various women's groups assembling watch straps for the company in 1995. By 1998, the women formed themselves into a private limited company with a board of directors. MEADOW is an example of a successful collaboration between private industry and the people living in surrounding localities.

In the early 1990s, before the launch of the MEADOW/Titan collaboration, MYRADA experimented with organizing washerwomen into self-help groups who then took up laundry contracts with Titan in their Hosur factory. While formal training sessions on laundering were not organized, and the women, on the basis of day-to-day interactions with the Titan and MYRADA staff and with their peers, soon learnt the finer aspects of doing laundry for an industrial company. There were some elements that had to be taught to the women, such as the importance of timely deliveries or how to keep money away from drunken husbands. When the women saved enough money, they took a loan to match their own contributions and bought a van to reduce the drudgery of carrying the laundry to and from their village. A driver had to be hired initially but the women soon learnt to drive themselves. Bidding for tenders was another thing that they had to learn.

Take-aways: This case study demonstrates that a successful collaboration with a progressive corporate sector can also yield positive outcomes pertaining to skill formation for informal sector workers. This is an example of positive externalities emanating from industrial development and its subsequent backward and forward linkages.

The lessons from these case studies are as follows:

a. Training for holistic empowerment

If the size and diversity of the informal sector have to be addressed, it is necessary to redefine training as training for empowerment and not just for employment or a vocation. A major challenge of this is to build up a more realistic assessment of the informal sector, the diversity within it and mapping the diverse survival strategies inherent to the various sub-sectors. Formulation of training packages and approaches will have to be based on such understanding and go beyond narrow definitions of technical training only.

b. Creating an enabling environment

Training for empowerment necessitates creating an enabling environment that is a big challenge in itself. This has many facets but begins with building up the self-image and confidence of trainees. As the experiences of DHAN and MAYA show, training for empowerment and building social and negotiating skills and skills to enhance productivity cannot be a one-time intervention and need an appropriate enabling environment.

c. Training for empowerment

In training for empowerment and creating an enabling environment, external inputs, in the form of trainers, are needed but they have to play a facilitative role to enable the community to learn on its own and from each other. Highly skilled persons who constantly upgrade their own skills are required and they have to be accountable to the community. The pedagogy of this training process stresses co-learning and sharing with peers that brings about crucial linkages and contacts with markets and the supply chain. A major part of the capacity building, training and so on for these groups takes place on a day-to-day basis, where the members themselves set the agenda, according to their needs. Creating the necessary social spaces and enabling the workers to develop their own models of social security and support have to be a part of the capacity building process.

d. The role of change agents

Change agents have a critical role to play in this process. The success of the intervention crucially depends on his/her perception of the problem, the solution, and what is required in a particular context. This in itself has to be based on a thorough understanding and respect of the culture of the workers, their belief systems, and their dignity.

e. The intervention package

Essentially, training/skilling in the informal sector needs to be seen as an enabling device. The enabling environment can best be created through forming community organizations. The external support is there to facilitate the building of skills and survival techniques amongst group members. Techniques here include simple intermediate technologies as well as social and negotiating skills. Thus the female members of a savings and credit group need to know all about the opportunities and possibilities that are available to them including knowledge about sources of cheap credit and the labor laws applicable to them. Such skills/training processes for empowerment need to be owned by the community and over time the role of the external agent should become progressively marginal.

Overall, lessons from these case studies indicate alternative ways of skilling informal workers. The official approach has elaborate designs of skilling human resources in general. It does into take into account the needs of the informal workers in a holistic manner. Mostly, official plans are contemplated in a more centralized formal manner. Targets set in the official documents are very ambitious and roadmaps are not clear. Pathways indicated in national skill development documents are mostly traditional and formal. It does not adequately take into account the heterogeneity of the informal workers. Also, a significant number of informal workers are self-employed and reskilling these workers requires a different approach.

Case studies discussed above demonstrate that reskilling informal labor in India needs a more nuanced and decentralized approach. Reskilling in such a context entails the empowerment and creation of an enabling environment. Skilling in such cases is not always explicit and curriculum based. Rather it would have community participation and self-development. Emphasis is more on self-learning and self-development. Reskilling endeavors need to be more diverse and should explore ways beyond the traditional class-room based vocational training. Official skill development policy is exhaustive and normative but might not be adequate to cater to the entire informal labor force. As case studies show, official policy should be supplemented by a wide-ranging intervention of empowerment and the provision of an enabling environment.

Conclusions

India has huge informal labor force whose skill endowment is very low. Skilling/reskilling informal sector workers in a holistic manner is an important instrument of reaping 'demographic dividends' as India has a relatively young labor force and will have this advantage during the next 15 to 20 years. If India is able to skill its people with the requisite job skills or entrepreneurial skills within this period, the demographic advantage can be converted into the dividend wherein those entering or already in the labor market contribute productively to economic growth. Skill objectives set out in the National Skill Development Policy are broad and wide-cast. The basic structure, however, still remains skewed towards formal arrangements and relevant for a small section of the workforce. Inclusion and indigenous skill development objectives have been mentioned but roadmaps are not yet in place.

The few case studies that have been analyzed as part of this study showed that skill development should be holistic and cannot be a one-time affair. It is necessary to redefine training as training for empowerment and not just for employment or vocation. In training for empowerment and creating an enabling environment, external inputs in the form of trainers are needed, but they have to play a facilitative role to enable the community to learn on its own and from each other. Case studies further show that for skilling/reskilling to be holistically inclusive, conventional curriculum based skill education must be supplemented by grass-root level interventions that are multi-dimensional and go beyond the curriculum. This means forging partnerships at multiple levels.

However, because of COVID-19 and the subsequent lockdowns, the economy is in dire stress. Numerous jobs have been lost during the last few months, and wage earners as well as self-employed workers are finding it hard to earn a living. As most of the skill development measures that are initiated by the government target informal sector workers, the financial squeeze is going to hit such endeavors hard. Some of the skill development measures could go online, but there is apprehension that it would mostly exclude informal sector workers, and that progress made in skill development during the last five years might get pegged back to a certain extent in the prevailing COVID-19 context.

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PSYCHOLOGICAL AND SOCIAL FACTORS IMPORTANT FOR AN INDIVIDUAL'S PARTICIPATION IN TRAINING IN INDONESIA

Abstract

Despite considerable efforts by the Indonesian government to facilitate its labor force in improving their work competence through training programs, the quality of the labor force in Indonesia suggests that more needs to be done. Currently, there is a lack of understanding on what makes individuals willing to actively improve their work competence. Thus, this study aims to uncover psychological and social factors important for individual's participation in training, by using career construction theory. Employing a survey and psychological measurement with high internal consistency, 4,436 items of data were collected from all big islands in Indonesia. Structural equation modelling analysis demonstrates that (1) participation in training is predicted by three adaptability resources, namely perceived employability, awareness of the changing labor market, and career adaptability; (2) the critical role of proactive personality as the mediator between uncertainty avoidance and adaptability resources; and (3) several social factors, such as support from peers and family, as well as parental role models, show positive relationships with participation in training. This study advances understanding of what constitutes individual's participation in training, and provides some insights for the effectiveness and suitability of government provided retraining/upskilling programs.

Key words: participation in training, upskilling/retraining, career construction theory, Indonesia, changing nature of work.

Introduction

Globally, labor markets are experiencing rapid alterations in the nature of work and the demand for skills, which are partly caused by significant changes in technology and human resource practices. The rapid technological changes have put some jobs at risks, and at the same time, create opportunities for new careers and skills profiles (Frey & Osborne, 2017). McKinsey Global Institute (2018) predicts that though 23 million jobs in Indonesia will be lost in 2030, 46 million jobs will be gained, with 10 million of those jobs created from new occupations. The challenges for the future labor market in Indonesia are even more concerning given the grim pictures of Indonesia's youthful workforce. In 2018, around 58.22% of workers in Indonesia were classified as informal workers, meaning those who either ran their own business or were contingent/flexible workers (Statistics Indonesia, 2018). More worryingly, approximately 58.78% of workers in Indonesia only have a middle-school level education at best, and barely 12% have a diploma or university degree (Ministry of Manpower, 2018). Though access to schooling has dramatically increased, international assessments indicate that students in Indonesia are still behind most G20 countries, falling last in reading performance and second to last in mathematics and science performance (OECD, 2019).

To increase the readiness of the Indonesian workforce, especially contingent and flexible workers, the Indonesian government has provided several training facilities in many areas in Indonesia for

free (Deny, 2020; Kusumawardhani, 2021). This opportunity is allocated for workers who want to enter the labor market, those who have just been laid off, or those who want to change careers and feel the need for retraining and upskilling. Furthermore, the Indonesian government has also advanced a competency development and productivity improvement program through the assistance of training costs provided to all Indonesian citizens aged 18 and over and not in college or school. This pre-employment card, which can be used for offline and online training facilities, has considerably improved the access for training facilities in Indonesia. In brief, the Indonesian government has significantly improved supply, access, and facilities of retraining and upskilling programs in Indonesia. However, these training programs and facilities are made with the assumption that people will be ready to actively participate in determining future targets, career paths, and self-development. Unfortunately, this may not be the case.

Some individuals may not be ready to participate in the retraining/upskilling programs that are provided for them. Scholars argue that technological changes and the changes in the nature of work may contribute to the feeling of uncertainty or even distress for young people to plan for their futures (Di Maggio, Ginevra, Santili, Nota, & Soresi, 2020), that may have different impacts on different individuals. Some of them may be able to decide what training activities to take to develop their work competence. However, others, may be confused and unable to take an active role in developing their work competence. Although this topic is critical, research has just tried to uncover some important variables related to participation in training in the context of the changing nature of work (except for some, such as Akkermans, Paradniké, Van der Heijden, & De Vos, 2018; Di Maggio et al, 2020). This kind of research is even more limited in Indonesia.

Previous research indicates that individual's motivation for active learning and growth is influenced by psychological and social factors (Savickas et al., 2009). Variables such as career adaptability (Akkermans et al., 2018), traits and ability to understand systemic challenges (Di Maggio et al., 2020), as well as passion and future-time orientation (Riantoputra & Muis, 2019) are important factors for individual's growth in relation to their work. Furthermore, recognizing that individual's habits and actions in relation to their jobs and career are influenced by social interaction in their environment (Savickas et al., 2009), any effort to understand individual's participation in training needs to also consider social factors. Ignoring the role of psychological and social factors important in influencing participation in training may limit the full understanding of the issue. Therefore, the research question of this study is: What are the important psychological and social factors that affect individual's participation in training in Indonesia. We investigate the influence of these issues in this paper using the framework posited in Career Construction Theory (CCT).

The insights gained from this research may provide input for the Indonesian government and governments of similar countries in relation to ways to increase the effectiveness and suitability of government-provided retraining/upskilling programs.

Career Construction Theory

Career Construction Theory (CCT) is a sequential process of career adaptation involving adaptive readiness, adaptability resources, and adapting responses (Savickas, 2013). This structure provides a model for understanding vocational behavior of individuals as they adjust to life and environmental changes, including labor market shocks. CCT is particularly useful for the current study because it explains the behaviors individuals must do in order to fit into a changing environment, particularly in the context of careers. This framework as a career construction adaptation model has support from a meta-analysis of 90 studies (Rudolph et al, 2017).

Adapting Responses.

Adapting responses are the coping behaviors that help individuals to adapt to career tasks, development tasks, and occupational transitions. In order to meet the demands for adapting responses in a changing environment, a person needs to engage in five constructive activities, which are orientation, exploration, establishment, management, and disengagement (Savickas & Porfeli, 2012). One example, in the case of changing labor markets, would be when an employee is faced with the possibility of getting laid off. The employee may start orienting him/herself by seeking information related to said lay off, then proceed to explore alternative jobs and the requirements to get a new job. Then, the employee may start managing the situation by means of preparing themselves, including participation in training.

In this study, we chose participation in training as the adapting response, because it demonstrates a good fit between the person and the challenges in the environment. Participation in training is defined as the extent to which an individual participates in training, both formal (the ones that lead to a recognized qualification) and non-formal (such as conferences and seminars), in order to improve their work competence. This construct is measured through the dimension of formal and non-formal learning in the construct 'work-related learning' (Grosemans, Smet, Houben, De Cuyper, & Kyndt, 2020). Although Grosemans, Smet, et al. (2020), name their construct 'work-related learning,' their definition of this construct goes beyond training in the workplace. They understand learning activities as learning that is structured in terms of learning support, learning context, learning objectives, and learning time. It may occur in the workplace or outside the workplace, as long as it is related to increasing work competence. Their understanding fits our definition of participation in training.

Participation in training involves participation in a structured learning context and learning objectives that are typically provided by an education or training institution (Kyndt & Baert, 2013), which may take the format of formal and non-formal learning. As a construct that is important during change, participation in training is useful when graduate students transition to work, or when workers have to change careers and are required to master new work competence (Grosemans, Coertjens, & Kyndt, 2020). Participation in training has also been shown to predict job satisfaction (Grosemans, Smet, et al., 2020), and is thus an important construct to be considered as adapting results.

Adaptability Resources

Adaptability resources are psychosocial self-regulation resources that individuals draw on to cope with current or anticipated occupational tasks, transitions, and traumas (Savickas, 2013), which is useful to promote adjustment and changes in career contexts. Adaptability resources help individuals to form a strategy that directs the adaptive behavior so that they can adapt well.

Based on CCT, an important construct that may represent adaptability resources is career adaptability. Career adaptability consists of four coping strategies and resources: concern, control, curiosity, and confidence (Savickas & Porfeli, 2012). Concern involves being future-oriented and conscious about making plans for tasks and career challenges. Control involves the perception that an individual is able to make suitable career changes. It usually takes the form of shaping themselves and their environment by showing self-discipline, effort, and persistence. Curiosity arises in the form of a desire to explore opportunities and the future. Confidence is addressed through individual beliefs to realize career aspirations, being able to solve problems, and overcome obstacles (Savickas & Porfeli, 2012). These four dimensions are a source of career adaptability that will help individuals adapt to their careers.

Apart from career adaptability, in facing changes in the labor market, individuals may need an awareness of the changing labor market (ACLM) and perceived employability. ACLM, in this study, refers to an awareness of the changing trends in the labor market, which changes the demands for work competence. In line with Lewin's change theory, individual's willingness to actively participate in training requires a perception of necessity. Without awareness of changes in the labor market, individuals may not perceive disequilibrium in relation to their current skills and the skills needed for the future, and thus may not participate in training.

Perceived employability refers to an individual's perception of his or her job prospects or the employment possibilities in the labor market (Berntson & Marklund, 2007). Individuals with high employability think that they have more opportunities for getting new employment.

It is another personal resource that assists individuals in being more responsible in directing their career and improving competences or skills (Lo Presti, De Rosa, & Zaharie, 2021). Individuals with high perceived employability may have the motivation to increase their employability through retraining/upskilling programs.

Adaptivity

Adaptivity refers to traits of readiness and willingness to make changes when faced with transitional challenges (Savickas, 2013). In this study, adaptivity is captured by proactive personality, which refer to "the relatively stable tendency to effect environmental change" (Bateman & Crant, 1993, p 103). Individuals with a proactive personality will identify opportunities, show initiative, and take action to bring meaningful changes in the environment. They tend to anticipate changes, conducting planning, and persevere to career challenges (Seibert, Crant & Kraimer, 1999), characteristics that are central to face an uncertain environment. When individuals face uncertainty and need to adapt, they focus themselves on the future and take action to develop themselves (Parker, Bindl & Strauss, 2010), such as by finding a mentor (Turban et al, 2017) or by participating in training (Setti et al., 2015). These individual characteristics closely relate to adaptive readiness and can measure worker's approach towards employment-related problems.



Contextual Factor

Even though Savickas et al (2009) emphasizes individual agency, they recognize the complexity of social factors influencing individual's decision to improve themselves, and thus need to be considered. One social factor that has the potential to explain participation in training is uncertainty avoidance (Hofstede, 2011). We argue that this aspect is the context that influences individual career construction process (see Figure 1), since cultural factors are found to be related to an individual's adaptation process (Riasnugrahani et al., 2019). Therefore, this study expands CCT by taking into account cultural factors—particularly uncertainty avoidance—in the individual's adaptation process of their career.

Uncertainty avoidance refers to the level of the society's comfort or discomfort in facing a future uncertainty (Hofstede, 2011). Cultures with high uncertainty avoidance would establish rules, norms, and actions in order to avoid ambiguity and to make their situations clearer. Following Carson, Baker and Lanier (2014), in this study, uncertainty avoidance will be measured at the individual level (not at the societal level), because uncertainty avoidance may vary across individuals belonging to the same culture. Uncertainty-oriented individuals tend to be comfortable with the presence of uncertainty and do not put effort into overcoming it, while certainty-oriented individuals tend to be motivated with less uncertainty and incline to avoid it (Strite & Karahana, 2006). Uncertainty avoidance is important in this study since one of the key aspects in the changes in the nature of work is the feeling of uncertainty (Di Maggio et al., 2020) that may have different impacts on different individuals.

Study Hypotheses

Uncertainty Avoidance and Proactive Personality

Individuals with proactive personality tend to focus on changes and actions, so they would explore opportunities and mold the environments according to their needs (Tolentino et al., 2014). This trait is potentially influenced by uncertainty avoidance. In their research, Carson, Baker and Lanier (2014) demonstrated that individuals with high uncertainty avoidance tend to have proactive

personalities. They argue that individuals with high uncertainty avoidance tend to feel uncomfortable with uncertainties and changes, and thus put effort into managing them. These individuals feel that it is risky to be too rigid in facing changes, and find it safer to reduce uncertainty by, for example, trying to manage them by applying rules and planning for the future. In contrast, individuals with low uncertainty avoidance are comfortable with changes, and do not feel threatened by unknown situations. Consequently, they do not put considerable effort into managing changes. For this reason, when facing an uncertain situation, individuals with high uncertainty avoidance tend to actively find solutions to overcome the uncertainty, such as by finding more information so they can find alternative solutions.

Hypothesis 1: Uncertainty avoidance is positively related to proactive personality (H1)

Proactive Personality and Career Adaptability

Individuals with proactive personalities tend to be more aware of the changes in their environment and tend to be proactive in identifying opportunities and changing the environments (Bateman & Crant, 1993). They tend to engage in career exploration so they would be able to adapt easily and face various challenges in their career (Jiang, 2017), and be more prepared and resilient in facing a career change (Seibert, Crant & Kraimer, 1999). Empirical studies have found that proactive personalities predict career adaptability. In their research on 305 students in China, Cai et al (2015) demonstrated that a proactive personality predicts career adaptability. Tolentino et al., (2014) also found that a proactive personality positively related to career adaptability. Thus, we hypothesize, that:

Hypothesis 2: A proactive personality is positively related to career adaptability (H2)

Proactive Personality and Awareness of Changing Trends in Labor Market

Research shows that individuals with a proactive personality tend to confront the status quo and engage in information search to understand their environment. Turban et al., (2017) conducted research on 333 employees, and found support for the relationship between a proactive personality and a willingness to search for information in many places, including from their mentors. Seibert, Kramer and Crant (2001) found that individuals with proactive personality tend to find information that broadens their knowledge. They analyze their situation and take actions to master them (Bateman & Crant, 1993). Individuals who are concerned about the future of their career may be more prepared to face skill demands. For this reason, proactive individuals would have better awareness about the skills needed by the market and would do something to anticipate them.

Hypothesis 3: Proactive personality is positively related to Awareness of Changing Labor Market (H3)

Proactive Personality and Perceived Employability

Previous research shows that individuals with proactive personality would put some efforts into expanding their competence by maintaining a good relationship with people that may help increase their skills and competences (Li, Liang & Crant, 2010). Other research also found that proactive people search information about certain careers and training programs (Brown, Cober, Kane, Levy & Shalhoop, 2006). In their research on 213 older employees, Guilbert, Carrein, Guénolé, Monfray, Rossier, and Priolo (2018) demonstrated that a proactive personality influences perceived employability. These empirical works imply that a person with a proactive personality actively increases their knowledge and competencies, and thus increases their employability. Thus, we hypothesize that:

Hypothesis 4: Proactive personality is positively related to Perceived Employability (H4)

Career Adaptability and Participation in Training

Career adaptability assists individuals in coping with current and future vocational developmental tasks, including efforts to find jobs or career changes (Savickas, 2013). Individuals with high career adaptability are more concerned about planning the future, being responsible for their future career, exploring opportunities and various roles, and are confident in choosing and implementing their career goals (Savickas & Porfeli, 2012). Tabel and Blenkemeyer (2015) conducted research on 113 students about their skill development and career networking. They found that all four dimensions of career adaptability (concern, confidence, curiosity, and control) are related to career planning. They explain that the career adaptability stimulates individuals' curiosity about the future and causes them to prepare themselves, seek advice, and participate in activities that may develop their knowledge and skills. These individuals tend to be more confident, motivated, and proactively engaged in learning activities to acquire new skills (Taber & Blankemeyer, 2015). Moreover, Akkermans et al., (2018) highlight that personal resources such as career adaptability might serve as a tool for improving active learning behaviors and performance. Therefore, we hypothesize that:

Hypothesis 5: Career adaptability is positively related to participation in training (H5).

Awareness of Changing Labor Markets and Participation in Training

Individuals who are more aware of the changing trends in the labor market arguably will be more informed to what extent their work competence fits with the changing trends. Consequently, they will look for ways to improve their skillsets to match the required skills in the future. This is in line with Lewin's change theory, which suggests individuals' willingness to actively developing themselves will occur when they see the needs to do so. Awareness of the changing labor market is one way for workers to perceive disequilibrium in relation to their current skills and the required skills for the future. ACLM may stimulate individuals to take several ways to improve their competence, including seeking feedback from others and participation in training. In other words, employees may engage in managing their career when they perceive the necessity to do so (Smale et al., 2018). Therefore, we hypothesize that:

Hypothesis 6: Awareness of the changes in the labor market is positively related to participation in training (H6).

Perceived Employability and Participation in Training

Individuals with high-perceived employability tend to be more motivated in learning activities. In their research, Houben, De Cuyper, Kyndt, and Forrier (2019) demonstrate that employees with low-perceived employability tend not to participate in training. They explain that individuals with low-perceived employability tend to perceive that their efforts will not make much of a difference. In contrast, those with high-perceived employability tend to be more confident on their ability to master new knowledge and new skills, and thus tend to have higher participation in training. Further, Kyndt et al. (2014) conducted a research on more than 1000 employees from 21 organizations, and found that perceived employability is a strong motivator for an individual to participation in learning activities. Accordingly, we hypothesize that individuals who have high perceived employability will proactively engage in career building behavior, such as developing skills and expanding networks, and are more involved in formal and non-formal training.

Hypothesis 7: Perceived employability is positively related to participation in training (H7).

Methods

Participants

This study focuses on individuals who are living in urban areas and who are working or looking for jobs. We focus on urban areas because Indonesia is having a rapid transformation towards an urban economy faster than any other Asian country, with 4.1% growth rate per year (World Bank, 2016). Additionally, those who live in urban areas are more likely to have better access to the internet (Indonesian Internet Service Provider Association, 2018) and are more digitally literate (Katadata Insight Center, 2020). Therefore, they are more likely to participate in an online survey. We also focused on those who are looking for jobs and have a diploma-level degree or lower. These groups of people are particularly vulnerable against automation and thus will be in more need of retraining and upskilling (Chang et al., 2016; McKinsey Global Institute, 2018).

Procedures

The data collection for this study was conducted in partnership with Vokraf (a private training provider) and Balai Latihan Kerja (BLK) (government-owned upskilling/retraining provider). Participants were recruited either by mass mailing (Vokraf) or social media broadcast (BLK). For each recruitment process, participants received a short message containing the information of the study purpose and a survey link. Those who are interested in joining the survey can click the survey link, which sent them to an informed consent page. After providing their consent, participants would be asked to provide information regarding their sociodemographic characteristics and complete questionnaires that indicated their psychological characteristics.

Sociodemographic Factors

Respondents were asked to report sociodemographic data such as age, gender, residence location (i.e., province and city), monthly spending (as a proxy for socio-economic status), education background, and marital and employment status. These sociodemographic characteristics have been considered in previous research to be the antecedent of learning activities (Kyndt & Baert, 2013). Therefore, it is important to include them in our analysis.

We also asked participants to indicate their family background, family support, and experience in having achievements while in school. Specifically, in terms of family background, we asked participants to indicate their parents' education background and how often they saw their parents reading books or news. These factors reflect parental role models, which have been shown to play an important role in promoting the decision to become self-employed (Chlostas et al., 2012) and reduce career indecision (Mao et al., 2016). In terms of family support, participants rate their parents support to attend training programs and response towards their achievement in school. Both factors might affect participation in training by promoting confidence in completing studies (Kantamneni et al., 2016).

Lastly, we also asked participants to indicate whether they have or have not attended training programs in the past. Kyndt and Baert (2013) reviewed that prior participation in training programs is a strong predictor for later participation in formal learning activities. Houben et al. (2019) found a self-maintaining cycle in which prior participation in training programs increases the likelihood for later participation by increasing internal employability. Participants were also asked to indicate whether they had friends who have attended training programs. We argue that having friends who had participated in training programs might serve as a source of vicarious experience that indirectly affects individuals' motivation to participate in training programs by increasing their self-efficacy (Maurer et al., 2003).

Measurements

In this study, all scales were adapted from previous research, except ACLM. Each scale was translated into Bahasa Indonesian. To ensure readability of each item, we conducted a pilot study towards a group of people (n = 15) who have similar characteristics with the focus of our study, that is those who are a part of urban populations and are working or currently looking for jobs. From the pilot study results, some items were revised, and a few were dropped.

Participation in training. To measure the extent to which individuals participate in training, we adapted formal learning dimension from a scale developed by Grosemans, Smet, et al. (2020). Participants were asked to rate how often they engaged in formal learning activities during the last six months using a frequency scale ranging from 1 to 6 (1 = Never; 2 = A few times in the previous six months; 3 = Once a month; 4 = A few times each month; 5 = A few times each week; 6 = On daily basis). The Cronbach's alpha for this scale was .76, indicating adequate internal consistency (Kaplan & Saccuzzo, 2013). An example item is "In the previous six months, I took part in a seminar or conference."

Uncertainty Avoidance. We adapted four items from Srite and Karahana (2006) to measure the extent to which an individual feels threatened by unknown or ambiguous situations. Participant responses were rated using a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). A higher score indicates that participants put emphasis on clear instruction or standardized work procedure. A sample item is "Order and structure are very important in a work environment." The Cronbach's alpha for this study indicated a good internal consistency with Cronbach's Alpha of .84 (Kaplan & Saccuzzo, 2013).

Proactive personality. We used the Proactive Personality Scale (Seibert, Crant, & Kraimer, 1999) to measure proactive personality. We used nine of the ten original items. Each item offered responses ranging from 1 (strongly disagree) to 6 (strongly agree). A sample item is "I am always looking for better ways to do things." The Cronbach's alpha for this study was .84, indicating a good internal consistency (Kaplan & Saccuzzo, 2013).

Awareness of the changing trends in labor market (ACLM). To measure awareness about the changing trends of the Indonesian labor market, we constructed a new scale that measures: 1) the change that will happen; 2) the effects towards skills demand; 3) the speed of the change; and 4) the inevitability of the change. Each dimension consisted of two items. Altogether there were eight items. One example item is "In approximately 10 more years, a significant portion of all jobs in Indonesia will have been automated." The available answers were: "True," "False," "I don't know," or "Not relevant." The scale was subjected to pre-testing and item revisions before employed in the actual survey. To mitigate the risk of random answering, respondents were given a prompt that reads,

"The following are statements about changes in the Indonesian labor market. We know that some people are not aware about one or more aspects about this topic. Feel free to answer 'I don't know' if you do not know or 'not relevant' is you feel the statement doesn't impact you."

The current study demonstrates that the item difficulty index for ACLM yielded an average of 0.43, indicating medium difficulty level (Anastasi & Urbina, 1997). Using the extreme groups method (Anastasi & Urbina, 1997), we found the item discrimination index (IDI) for ACLM ranged from 0.31 – 0.73. IDI shows that each item on ACLM performed well in discriminating between those who have good awareness of the changing labor market and those who do not (Crocker & Algina, 2008).

Career adaptability. We use the Career Adapt-Abilities Scale – Short Form (CAAS-SF), which was developed and validated by Maggiori, Rossier, and Savickas (2017), to measure the psychosocial self-regulation capacities that help individuals to adapt. The CAAS-SF consists of 12 items in which each dimension of career adaptability (i.e., concern, control, curiosity, and confidence) is measured with three items. Participants rated each item using a 6-point Likert scale ranging from 1 = not a strength at all to 6 = greatest strength. Example items are "Realizing that today's choices shape my future" (concern), "Taking responsibility for my actions" (control), "Looking for opportunities to grow as a person" (curiosity), and "Performing tasks efficiently" (confidence). In the current study, the CAAS-SF showed a very good internal consistency with Cronbach's alpha of .89 (Kaplan & Saccuzzo, 2013).

Perceived employability. To measure this construct, we adapted the scale developed by Berntson and Marklund (2007). Each item was rated on a 6-point scale (1 = strongly disagree to 6 = strongly agree). An example item is "my competence is sought-after in the labor market." Cronbach's alpha for this study was .88, which indicates a good internal consistency (Kaplan & Saccuzzo, 2013).

Perceived COVID-19 impact. The COVID-19 pandemic has caused different regions in Indonesia to impose large-scale social restrictions (Sutrisno, 2020), and thus may hinder individuals from engaging in work-related learning activities. Taking this into consideration, we controlled perceived COVID-19 impact by employing a single item to measure to what extent had the COVID-19 hindered individuals from participating in work-related learning activities for the last six months (i.e., February until August 2020). Participants were asked to rate how much the COVID-19 had hindered them on a 6-point scale (1 = not hindered to 6 = very hindered).

Results

A total of 5,143 responses were collected from the online survey. After checking for incomplete responses, a final number of 4,436 responses were included in the main analysis.

Participants

The participants of this study came from all over Indonesia, with most of them coming from the Java Island (59.74%), followed by Sumatera (20.87%) and Sulawesi (7.98%) (see Table 1). Most participants were aged 25-34 years old (43.6%), followed by 15-24 years old (38.3%), while 78% of them were men. Most of the participants (90%) have a monthly spending below four million rupiah, with 34% having a monthly spending of just below one million rupiah. Only 30.75% of all participants held a bachelor's degree or above, while the rest were in the low education group with 54% having only a high school level education.

Based on the data from Labor Force Situation in Indonesia on February 2020 (Statistics Indonesia, 2020), our sample was somewhat representative of the population of the labor force in Indonesia (see Appendix A for comparison). The distribution of the labor force by residence in our sample closely mimics the national distribution of the labor force in Indonesia. However, compared by age group, our sample underrepresents those aged 45+. We argue that these numbers are justifiable since our data is collected from participants who have attended or are currently attending training programs, and younger people tend to participate more in learning activities (Grosemans, Smet, et al., 2020; Kyndt & Baert, 2013).

TABLE 1		
SOCIODEMOGRAPHIC DESCRIPTION		
Variable	М	SD
Frequency of seeing parents reading books/news	3.30	1.50
Frequency of achievements in school	3.58	1.34
Family responses to achievement	4.58	1.21
Family support for attending training	4.17	1.50
Interest in government's training program(s)	5.40	0.79
Perceived COVID-19 Impact	4.99	1.25
	n	% of sample
Age 15-24 25-34 35-44 45-54 55-64	1,679 1,936 647 148 8	38.3 43.6 14.6 3.3 0.2
Sex Male Female	3,478 958	78.4 21.6
Residence Java Sumatera Sulawesi Kalimantan Kep. Nusa Tenggara Kep. Maluku Papua	2,650 926 354 294 167 40 5	59.7 20.9 8.0 6.6 3.8 0.9 0.1
Monthly spending < Rp 1,000,000 Rp 1,000,000 – Rp 3,999,999 Rp 4,000,000 – Rp 6,999,999 Rp 7,000,000 – Rp 9,999,999 ≥ Rp 10,000,000	1544 2463 364 45 20	34.8 55.5 8.2 1.0 0.5
Education Background Junior High school Senior High school Diploma Bachelor's degree and above	297 2,395 380 1364	6.7 54.0 8.6 30.8
Employment Status Employed Unemployed	1,085 3,351	24.5 75.5
Marital Status Single Married Divorced (Alive) Divorced (Dead)	2,556 1,761 111 8	57.6 39.7 2.5 0.2

Variable	М	SD
Father's Education Level		
Primary	1,424	32.1
Middle secondary	694	15.6
Upper secondary	1,635	36.9
Diploma	234	5.3
Bachelor's degree and above	449	10.1
Mother's Education Level		
Primary	1,745	39.3
Middle secondary	792	17.9
Upper secondary	1,412	31.8
Diploma	174	3.9
Bachelor's degree and above	313	7.1
Have attended training programs before		
Yes	3,528	79.5
No	908	20.5
Have friends who attended training programs		
Yes	3,065	69.1
No	1,371	30.9

Note. N = 4436.

Three-quarters of participants were unemployed (75.5%), ranging from less than 6 months (65.7%), 7-12 months (20.4%), and more than one year (13.9%). A close examination within this group revealed that the majority of them came from the age group of 25-34 years old (42.9%), and the age group of 15-24 years old (40%). Furthermore, the bulk of participants within this group had senior high school level education (54%), followed by those who held a bachelor's degree and above (27.8%). The rest of the participants held a diploma degree (8.3%) or came from junior high school (7.3%). In addition, 78.1% of them had attended training programs prior to the survey.

Descriptive and Bivariate Analysis

Table 2 summarizes the means, standard deviations, and correlation between main study variables and participation in training. In the current study, on average respondents only participated in training for a few times in the span of six months prior to this survey (M = 2.33, SD = 1.15). Only a tiny proportion of respondents (n = 28 or 0.6% of sample) indicated that they participated in training on daily basis. Meanwhile on the opposite spectrum, 14.2% or 629 respondents indicated that they never participate in training activities. Additionally, participants' awareness of the changing labor market was quite low (M = 3.9, SD = 1.63), given the maximum score of 8. In other words, participants were only able to answer a little below 50% of the questions correctly. Thus, with a passing grade of 60%, most participants might not actually pass the test.

On the other hand, respondents showed a high level of proactive personality, career adaptability, and perceived employability. These results indicate that respondents tend to initiate actions to improve their current situations, have the resources to adapt, and see themselves as employable. They also showed a high level of uncertainty avoidance, which means that the respondents in this study tend to feel threatened when facing ambiguous situations.

Lastly, all psychological factors correlated significantly with participation in training from r = .106 to .317, p < .01). The correlation indicated that participation in training gets higher as psychological

factors increase. Several sociodemographic factors also showed significant correlation with participation in training (see Appendix B).

TABLE 2

ZERO-ORDER CORRELATION BETWEEN PSYCHOLOGICAL FACTORS AND PARTICIPATION IN TRAINING									
		М	SD	1	2	3	4	5	6
1.	Uncertainty Avoidance	5.16	0.61	-					
2.	Proactive Personality	4.80	0.65	.470**	-				
3.	ACLM	3.90	1.63	.128**	.086**	-			
4.	Career Adaptability	4.82	0.75	.465**	.505**	.130**	-		
5.	Perceived Employability	4.33	0.88	.393**	.590**	.068**	.340**	-	
6.	Participation in Training	2.33	1.15	.124**	.245**	.106**	.174**	.318**	-

Note. N = 4436. ACLM = Awareness of Changing Labor Market (score ranging from 1 – 8). All other score ranges from 1 – 6. "p < .01

Measurement Model Fit

Before testing our hypotheses, we applied confirmatory factor analysis (CFA) using LISREL to assess the fit of our measurement model. We used root mean squared error of approximation (RMSEA), comparative fit index (CFI), and the standardized root mean squared residual (SRMR) (Hu & Bentler, 1999) to assess the model fit. For $N \ge 250$ and more than 30 observed variables, values below .07 for RMSEA and SRMR complemented by a CFI close to .92 or above indicate a good model fit (Hair et al., 2014). The model fit for the six-factor measurement model was acceptable (CFI = .96; RMSEA = .026; SRMR = .105).

Structural Model Fit

As a part of the proposed model, several sociodemographic factors are controlled as covariates. These sociodemographic factors are: (a) age, (b) sex, (c) mother's education, (d) frequency of parents reading books or news, (e) frequency of achievements in school, (f) experience of attending training programs, (g) having friends who have attended training programs, (h) family support, and (i) perceived COVID-19 impact (see Appendix C).

We test our hypotheses by employing the same software, estimation method, and fit indices as described for CFA above. The proposed model fit was acceptable ($\chi^2 = 4167.86$, df = 1043, p < .001; CFI = .96; RMSEA = .026; SRMR = .098) with RMSEA and CFI fulfilling the cut-off criteria, while SRMR showed value approaching .07. Figure 2 shows the standardized parameters of the proposed model after controlling for sociodemographic covariates (see Appendix B).



Sociodemographic covariates in this model are (a) age, (b) sex, (c) mother's education, (d) frequency of parents reading books or news, (e) frequency of achievements in school, (f) experience of attending training programs, (g) having friends who have attended training programs, (h) family support, and (i) perceived COVID-19 impact (see Appendix C). **p < .01; ***p < .001

Figure 2 illustrates that all psychological factors in the proposed model were positively and significantly related, therefore supporting all proposed hypotheses (see Table 5). Uncertainty avoidance was positively related with proactive personality ($\beta = 0.62$). Ambiguous situations somewhat 'push' individuals to be more proactive in their approach to shape their environment. Individuals with high levels of uncertainty avoidance might feel that they need to be proactive in finding solutions and overcome the uncertain situations they are facing.

Moreover, consistent with Hirschi, Herrmann, and Keller (2015), a higher level of proactive personality (i.e., adaptivity) was related with higher levels of career adaptability, ACLM, and perceived employability. Proactive personality was strongly related with both career adaptability ($\beta = 0.62$) and perceived employability ($\beta = 0.67$). These results demonstrated that a proactive personality was important for individuals to build psychological resources to adapt to changes in the labor market and to promote employability. Proactive personality also was related to ACLM ($\beta = 0.25$), indicating that proactive individuals were more likely to be aware of the changes in the labor market because they tend to be more active in searching for information related to their career (Seibert, Kraimer, Crant, 2001). This relation, however, was somewhat weaker than with career adaptability and perceived employability.

Lastly, as hypothesized, higher levels of adaptability also were related to higher levels of adapting to results. Of all the adaptability variables, perceived employability had the strongest relation with participation in training ($\beta = 0.22$). This indicated that individuals who perceived themselves as employable were more motivated to engage in training, thus they participated in training more

frequently. Additionally, career adaptability and ACLM were also positively related with participation in training, indicating that individuals participated in training more frequently if they were highly aware of the changes and had adequate psychological resources.

TABLE 3

HYPOTHESIS SUMMARY

Нуро	thesis	β	p-value	Supported / Not Supported
H1	Uncertainty Avoidance is positively related with Proactive Personality	0.62	< .001	Supported
H2	Proactive Personality is positively related to Career Adaptability	0.62	< .001	Supported
H3	Proactive Personality is positively related to Awareness of the Changes in the Labor Market	0.25	< .001	Supported
H4	Proactive Personality Market is positively related to Perceived Employability	0.67	< .001	Supported
H5	Career Adaptability is positively related to Participation in Training	0.11	< .001	Supported
H6	Awareness of the Changes in the Labor Market is positively related to Participation in Training	0.14	< .001	Supported
H7	Perceived employability is positively related to Participation in Training	0.22	< .001	Supported

Discussion

The current study aims to identify important social and psychological factors for individuals' tendency to participate in training. Employing career construction theory, the current study discovers several potential psychological and social variables, which were tested in a sample of nearly 4,500 participants from almost all areas in Indonesia. Most of the participants are unemployed (75%), but some are employed (25%), making the results relevant for both groups of workers.

Before discussing the contribution of this study, it is outlining its limitations. In addition to the caveat of cross-sectional study, the data in this sample does not represent the Indonesian population (about 270 million people). Therefore, we should be careful in interpreting the generalization of this study. It should be noted, however, that not a lot of psychological research is able to get as many participants (nearly 4,500 people). Furthermore, the sample represents distribution of the labor force in Indonesia by residence (see Appendix A. Table 1), indicating a good representation of all big islands in Indonesia. The second limitation is that most of the participants are gained through training institutions (government and non-government), and therefore the data is limited by selectivity issues. In other words, the interpretation of the study should take into consideration that this sample may have special characteristics that could be different than the majority of workers in Indonesia. The third limitation is the measure for ACLM. Although the ACLM scale has medium difficulty level (0.43) indicating a good measure, it should be noted that this measure is a new measure that may need further scrutiny. In brief, the interpretation related to ACLM should be taken with care.

Although the study has several limitations, its strengths include the high internal consistency (i.e., reliability) of most of the scales, the relatively high number of samples (compared to most

psychological research), a good representation from all big islands in Indonesia, and the strong theoretical framework that enables sound analysis.

Contributions

The results suggest that this study has contributed to the discussion of individual's participation in training in several important ways.

First, the study advances current understanding on psychological factors important for individuals' participation in training. Using career construction theory, the current study demonstrates the importance of proactive personality in how individuals manage their careers in the face of many difficulties. The study shows that proactive personality, as an important trait, influences participation in training through three essential adaptability resources, namely ACLM, perceived employability, and career adaptability. Analysis shows that direct links between proactive personality and participation in training is weaker than the link between proactive personalities and three adaptability resources, and between these resources and participation in training. In other words, although proactive personality is essential, adaptability resources are significant resources that empower and direct proactive individuals to participate in training. The current research extends the literature on career construction theory by successfully choosing three important adaptability resources may have substantial impacts on policy making (see the implication for policy making).

Second, among the three adaptability resources, perceived employability shows the strongest relationship with participation in training, suggesting that participants' confidence in their prospect for getting employment is more influential in their decision to participate in training than their awareness of the changing labor market or their career adaptability. In line with Kyndt et al., (2014), the current study demonstrates that perceived employability is a strong motivator for learning activities. It should be noted, however, that most of the participants in this study are unemployed (75%), implying that it is the subjective feeling of career prospect that influences an individual's motivation to learn more, not the actual possibility for employment.

Third, the current study demonstrates the critical role of proactive personality as the mediator between uncertainty avoidance and adaptability resources. This result suggests one key factor to deal with the rapid change in the nature of work and the changing requirement for skills is trait (i.e., proactive personality). That is, certainty-oriented individuals tend to be able to exercise their adaptive resources, and then participate in training, when they have a proactive personality. Because a proactive personality is a trait that is relatively stable in human life, the current study implies that an effort to increase the quality of labor force should take a long-term view. A proactive personality cannot be shaped in a short time. The development of self-determined individuals that tend to set goals and initiate change should start early in life. This study highlights the importance of individual agency in career management, and provides insights that family support may be needed especially in individual's early life towards shaping their personality.

Fourth, through correlation analysis, the study demonstrates that some sociodemographic variables are strongly related to participation in training, namely sex, parental role models, and parental/peer support. In relation to sex, the current study pictures a grim reality that women are still less willing to commit to training activities. One possible explanation for this finding is related to the patriarchal culture in Indonesia, which compels women to focus on domestic duties instead of personal or professional development (Primagita & Riantoputra, 2019). Women who choose to engage in

entrepreneurial activities, for example, tend to have a sense of guilt for committing those activities and overcompensate the guilt with hard work that may lower their well-being (Riantoputra & Muis, 2020). Therefore, women may be less content to participate in training. However, it should be noted that the majority participants of this survey are men, and only 21.6% are women. Therefore, the data should be interpreted with care.

In relation to family and peer support, the current study shows that individual involvement in training activities is not solely influenced by a personal initiative but is also affected by their family and friends. Because the percentage of participants who are married and not married is nearly 50-50, family support here should be interpretated as parents or spouse. According to Whiston and Keller (2004), family support has a positive influence and facilitates career development because individuals are most likely to seek help with career decisions from family members. Recent findings by Mao, Hsu, and Fang (2016) demonstrated that family encouragement indeed reduced career indecision by enhancing individuals' efficacy in overcoming obstacles when learning or working. Furthermore, the current study reveals that peer support is positively related to participation in training. Altogether, the influence of family and friends in predicting individual's participation in training demonstrates that, for Indonesians, participation in training happens in a context of social support.

In relation to parental role models, this study demonstrates that the extent to which participants see that their parents frequently read books and news tends to influence their participation in training. Previous research supports the idea that parental role models influence individuals during their childhood and teenage years (Chlosta et al., 2012; Obschonka, Silbereisen, & Schmitt-Rodermund, 2011). The current study extends those findings by demonstrating that the impact of parental role models may well be significant in an individual's adult life. It could be said that seeing parents read books and newspapers when an individual is in their childhood or teenage years shapes that individual's idea that gaining knowledge and learning is an essential part of life. More research, especially longitudinal studies, need to be done to establish the influence of parental role models in an individual's early life on their attitudes toward training.

Implications for Policy Making

The current research demonstrates the importance of three career adaptability resources for individuals to improve their work competence through participation in training. These resources include ACLM, career adaptability, and perceived employability.

This current research demonstrates that the higher the ACLM score, the higher the tendency to participate in training. That is, participants who are aware of the changing nature of work tend to participate more in upskilling/retraining programs. Data, however, shows that most participants have a medium to low awareness of the changing of labor market. It seems that the topic of the changing labor market has been a discussion topic for academics and technocrats, but has not touched many people, especially those that need this information. Therefore, the current study urges the Indonesian government to socialize the changing nature of work to workers and unemployed people. This socialization needs to use down to earth terms to make sure that many people will understand this trend and are aware of alternative development strategies to mitigate this trend. As Di Maggio et al. (2020) argue that the changing nature of work may cause uncertainty and distress for young people, it is the responsibility of the government to ease uncertainty by conducting socialization about this matter.

Furthermore, the current study shows that career adaptability and perceived employability predict participation in training. This result may be beneficial for counselors in universities, colleges, and high schools in preparing their students (future workers). Counselors may want to increase the career adaptability of their students by improving their curiosity, concerns, control, and confidence about their careers, which are the elements of career adaptability (Savickas & Porfeli, 2012; Taber & Blankemeyer, 2015). The role of the government here is in empowering counselors to understand their role in developing adaptability resources of their students, not merely as people who direct students' career choice.

Finally, the current study points to the importance of parents as role models. Data indicates that having seen their parents' reading books/newspapers predicts whether workers have a positive tendency to improve their knowledge and understanding. This result implores decision making to see that improving the quality of the Indonesian work force should start at home. Providing retraining and upskilling programs is important. However, the effectiveness of these programs may be influenced by some factors that occur a long time before someone reaches adulthood. The ministry of labor may want to have a long-term view on how to improve the quality of their work force, and collaborate with other ministries to make sure that the quality of the workforce in Indonesia is suitable for the rapidly changing nature of work.

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Appendix A

TABLE 4

LABOR FORCE BY RESIDENCE IN FEBRUARY 2020

Desidence		Our Sample	Statistics Indonesia 2020		
Residence	n	%	N	%	
Java	2,650	59.7%	79,739,798	56.9%	
Sumatera	926	20.9%	30,100,914	21.5%	
Sulawesi	354	8.0%	9,886,679	7.1%	
Kalimantan	294	6.6%	8,664,985	6.2%	
Kep. NTT	167	3.8%	8,134,673	5.8%	
Kep. Maluku	40	0.9%	1,370,475	1.0%	
Рариа	5	0.1%	2,320,828	1.7%	
Total	4,436	100.0%	140,218,352	100.0%	

Note. Calculated by aggregating the total labor force in Statistics Indonesia Dataset: "Penduduk Berumur 15 Tahun Ke Atas Menurut Provinsi dan Jenis Kegiatan Selama Seminggu yang Lalu, 2008 – 2021"

TABLE 5

LABOR FORCE BY AGE GROUP IN FEBRUARY 2020

Age Group	O	ur Sample	Statistics Indonesia 2020		
	n	%	n	%	
15-24	1,697	38.3%	21,453,935	15.3%	
25-34	1,936	43.6%	33,415,565	23.8%	
35-44	647	14.6%	32,695,889	23.3%	
45-54	148	3.3%	27,789,717	19.8%	
55-64	8	0.2%	24,863,246	17.7%	
Total	4,436	100.0%	140,218,352	100.0%	

Note. Calculated by aggregating the total labor force in Statistics Indonesia Dataset: "Penduduk Berumur 15 Tahun Ke Atas Menurut Golongan Umur dan Jenis Kegiatan Selama Seminggu yang Lalu, 2008 - 2021"

Appendix B

TABLE 6

ZERO	ERO-ORDER CORRELATION BETWEEN SOCIODEMOGRAPHIC FACTORS, PSYCHOLOGICAL FACTORS, AND PARTICIPATION IN TRAINING									
	Variables	М	SD	16	17	18	19	20	21	
1.	Age	28.08	7.08	.036*	010	.068**	082**	027	129**	
2.	Sex ¹	-	-	.005	012	012	.075**	024	.033*	
3.	Monthly Spending	-	-	.028	.035*	.072**	.001	.049**	008	
4.	Education Background	-	-	.039**	.046**	.147**	.087**	.037*	.121**	
5.	Employment Status ²	-	-	.018	016	.061**	.011	.055**	.047**	
6.	Marital Status ³	-	-	.025	.006	.037*	063**	.009	101**	
7.	Father's Education Level	-	-	.034*	.028	.054**	.069**	.046**	.094**	
8.	Mother's Education Level	-	-	.011	.027	.040**	.049**	.059**	.125**	
9.	Freq. of parents reading books/news	3.30	1.50	.113**	.123**	.069**	.167**	.164**	.183**	
10.	Achievements in school	3.58	1.34	.180**	.206**	.131**	.215**	.207**	.222**	
11.	Family responses of achievement	4.58	1.21	.219**	.264**	.047**	.268**	.261**	.182**	
12.	Family support of attending training	4.17	1.50	.213**	.245**	.050**	.230**	.273**	.236**	
13.	Have attended training programs before ⁴	-	-	.096**	.063**	.099**	.078**	.075**	.223**	
14.	Have friends who attended training programs ⁴	-	-	.075**	.059**	.084**	.054**	.101**	.171**	
15.	COVID-19 Impact	4.99	1.25	.075**	.061**	.000	.053**	008	070**	
16.	Uncertainty Avoidance	5.16	0.61	-						
17.	Proactive Personality	4.80	0.65	.470**	-					
18.	Awareness of Changing Labor Market⁵	3.90	1.63	.128**	.086**	-				
19.	Career Adaptability	4.82	0.75	.465**	.505**	.130**	-			
20.	Perceived Employability	4.33	0.88	.393**	.590**	.068**	.340**	-		
21.	Participation in Training ⁶	2.33	1.15	.124**	.245**	.106**	.174**	.318**	_	

Note. N = 4436. 1 = Female, 0 = Male. 1 = Currently Employed, 0 = Unemployed. 1 = Married/Divorced, 0 = Not Married. 1 = Yes, 0 = No.

⁵1 = Answered True, 0 = False/Do not know/Not Relevant. ⁶ Measured on a frequency scale from 1 = Never to 6 = On daily basis.

*p < .05, **p < .01

Appendix C

TABLE 7

BIVARIATE CORRELATIONS BETWEEN ENDOGENOUS AND EXOGENOUS VARIABLES

	Endogenous Variables						
Exogenous Variables (Cov)	UA	РР	ACLM	CA	PE	PIT	
Age	0.023*	-0.021*	0.083***	- 0.075***	- 0.014	- 0.161***	
Sex ¹	- 0.061***	-0.005	0.043	0.028*	- 0.001	0.051**	
Mother's Education	0.010	-0.003	0.045**	0.018	0.022*	0.060***	
Freq. of parents reading books/news	0.088***	0.032**	-0.023	0.047***	0.031**	0.053***	
Achievements in school	0.205***	0.098***	0.093***	0.058***	- 0.002	0.109***	
Have attended training programs before ²	- 0.059	0.051**	- 0.015	- 0.068***	0.042**	- 0.304***	
Have friends who attended training programs ²	0.017	-0.016	- 0.075**	0.060***	- 0.030*	- 0.087***	
Family support of attending training	0.259***	0.187	0.056**	0.000	0.080***	- 0.001	
COVID-19 Impact	0.084***	0.036**	0.075	0.020	- 0.027**	- 0.059***	

Note. N = 4436. ¹1 = Female, 0 = Male. ²1 = Yes, 0 = No. UA = Uncertainty Avoidance. PP = Proactive Personality. ACLM = Awareness of Changing Labor Market. PE = Perceived Employability. PIT = Participation in Training.

p* < .05. *p* < .01. ****p* < .001

SKILLS CHANGE AND TVET ISSUES IN SMART MANUFACTURING

Abstract

Smart manufacturing is the integration of digital technologies with automation. The key to smart manufacturing is data collection and utilization. In this regard, this chapter aims to examine the status and changes of skills required by the spread of smart manufacturing and to bring about better solutions to the related education and training challenges.

It uses two surveys at the corporate level. The first is a survey on skill mismatch among incumbent workers with the introduction of smart manufacturing. The second is a survey focusing on the emergence of new tasks caused by smart manufacturing. They look at skill profiles from a multidimensional perspective, and present the skills requirements and education/training tasks from a comprehensive perspective. The derived interpretation from the two surveys is as follows: although a worker is regarded as over-qualified in terms of having higher skills than what they currently require, if the worker cannot address emerging tasks, then they are becoming deskilled in practice.

To cope with the contemporary technological transition in smart manufacturing, companies and governments need to provide continuous opportunities for education and training for current and new employees. The Korean experiences of emerging issues are reviewed and the derived implications are discussed, including practical issues in training programs, training opportunities, funding, etc.

Introduction

Manufacturing has been evolving continuously over time, especially in how it uses technology and labor. Smart manufacturing¹ [1, 2], the integration of digital technologies and automation of machines such as the Internet of Things (IoT), Big Data, and Artificial Intelligence (AI), is the latest phase in this evolution. Smart manufacturing maximizes the value of manufacturing by collecting and utilizing data on the entire process: planning, R&D, production, sales, and maintenance service of before- and after-production.

While the importance of manufacturing has been growing after the global financial crisis in the late 2000s, it is the shared opinion that a strong manufacturing base is directly related to sustainable prosperity. Korea has paid attention to smart manufacturing to solve the complicated challenges caused by trade conflicts and the population issue of low fertility and aging. Meanwhile, the COVID-19 pandemic will likely serve as a trigger for the early realization of digital transformation.² Advanced countries in America and Europe have already focused on digital innovation, which will be accelerated further in the post-COVID-19 era [3].

¹ The formal definition of smart manufacturing in Korea is "the process of moving toward a new manufacturing industry through increasing the linkage and integration across the value-added chain including production by collecting, analyzing, and reusing information across manufacturing activities, by applying the results of rapid technological development." (Jeong et al [1], 2019: 41-42).
² While smart manufacturing focuses on the industrial changes as part of digital transformation, digital transformation covers overall changes in the socio-economic paradigm. The scope of digital transformation extends beyond industry to cover the entire economic and even social and cultural changes. This chapter focuses on smart manufacturing, looking at the changes in the industry.
The Korean government has promoted smart manufacturing by implementing a financial support program known as the Smart Manufacturing Supportive Project (SMSP) [4]. The SMSP assists in the installation of solutions and interlocking facilities of smart manufacturing. The degree of development of smart manufacturing is divided into five levels based on the criteria from the Ministry of Small and Medium-sized Enterprises (SMEs) and Startups [5].

- Level 1 is the beginning stage of material identification and inspection.
- Level 2 is the intermediate stage where companies can collect data in real-time, and measure and verify the operations.
- Level 3 is the implementation stage where companies practically utilize the data collected.
- Level 4 is the optimization stage where Big Data is optimized and utilized.
- Level 5 is the final stage of customized smart manufacturing.

In Korea, while most of the companies participating in the project are in Level 1 or Level 2, the number of companies participating in the SMSP is about 8,000 to 9,000. This is less than 20% of 67,000 SMEs with 10 or more employees, and the overall status of smart manufacturing in Korea remains low [6]. Only a few leading companies in Korea are at Level 3. A small number of companies in the semiconductor field came close to Level 4. None have reached Level 5 so far.

The key to smart manufacturing is data collection and utilization. The higher the smart manufacturing level, the greater the importance of data. This chapter aims to examine the status and changes of skills required by the expansion of smart manufacturing to provide better solutions to the related education and training challenges, based on experiences in Korea. It starts with the following key research questions:

- What are the differences in the skills profiles of workers in smart manufacturing and other manufacturing?
- Are there requirements in education and training to fill in skills gaps?
- How should governments and education and training providers respond?

For the first and second questions, two kinds of surveys are conducted and their results are compared. The two surveys look at skill profiles from a multi-dimensional perspective and present the skills requirements and education/training tasks. After that, suggestions are made for the improvement tasks of education and training.

Before using the surveys, to clarify the definitions, the terms related to skills mismatch are reviewed. Following McGuinness et al. (2018) [7], *over-skilled* means the possessed skills exceed the requirements of the job, whereas *under-skilled* means the possessed skills fail to meet the requirements. In this chapter, the meaning of skill mismatch is distinguished from that of the origin of mismatch: *mismatch of under-skilled workers* and *mismatch of over-skilled workers*. The distinction between *under-skilled* and *mismatch of under-skilled workers* is described with a diagnosis on whether it is better to switch to another task that suits the ability or enhance work

performance through training. Similarly, the distinction between *over-skilled* and *mismatch* of *over-skilled workers* is described with a diagnosis of whether it is better to allow greater difficulty in current tasks or switch to tasks that suit the individual's abilities.

This chapter focuses on the results of the examination of the two surveys. The first survey is on the skill mismatch of incumbent workers, and it shows the high proportion of over-skilled workers in smart manufacturing. The second survey is about the emergence of new tasks, and it suggests the necessity of further education and training, including of over-skilled workers. At first, there seems to be a contradiction. If it is necessary for further education and training despite the abundance of over-skilled workers, why and how could the requirements be met by the over-skilled workers? The result of the surveys is interpreted and compared. Next, possible solutions for education and training challenges are developed.

Survey on Skills Mismatch of Incumbent Workers

Structure and scope of survey

The survey on the skill mismatch of incumbent workers attempts to show the influence of smart manufacturing on the existing work. The subjects of the investigation are technicians on the field but the survey is executed by their supervisor (field manager) to avoid subjective self-surveying. To compare smart manufacturing and non-smart manufacturing, a matched sampling design is used to consider the industrial sector and the number of employees. In September 2019, 413 smart manufacturing workers and 428 non-smart manufacturing workers were sampled with stratified mapping.

After 22 responses from 413 smart manufacturing workers and 123 responses from 428 non-smart manufacturing workers, the overall comparison between smart manufacturing and non-smart manufacturing was taken into account.

SectorNo. of Responses3D printing2Home appliances6Displays3Robotics13Bio-Tech4Semiconductors10Smart grids3Food4
3D printing2Home appliances6Displays3Robotics13Bio-Tech4Semiconductors10Smart grids3Food4
Home appliances6Displays3Robotics13Bio-Tech4Semiconductors10Smart grids3Food4
Displays3Robotics13Bio-Tech4Semiconductors10Smart grids3Food4
Robotics13Bio-Tech4Semiconductors10Smart grids3Food4
Bio-Tech4Semiconductors10Smart grids3Food4
Semiconductors10Smart grids3Food4
Smart grids3Food4
Food 4
Engineering 4
Clothing/Textiles 8
General machines 28
Vehicles 25
Shipbuilding 12
Steel 7
Advanced ceramics 4
Communication devices 9
Chemistry 3
Total 145

TABLE 1

Source: Self-Survey results

The questionnaire starts by asking whether the technicians have any difficulties in performing their current jobs. Depending on the first question, the second question is divided, as shown in Figure 2.

- If a worker's current skill level creates difficulties and they require further education and training to satisfy job demands, they are considered under-skilled. This may persist due to a lack of education and initial training or due to recent technological developments (skills obsolescence).
- If the under-skilled workers cannot respond for their current job through education and training, a transition to a job with fewer requirements is inevitable and it is considered a mismatch of under-skilled workers.
- On the other hand, if the answer is 'no problem in performing current tasks' without additional training, the questionnaire moves toward the distinction of properly skilled, over-skilled, and mismatch of over-skilled workers.
- If a worker has no difficulty in performing an even more demanding job than their current job, they are considered over-skilled. If the transition to a more difficult job is the proper solution rather than remaining in their current job, it is considered to be a mismatch of over-skilled.



Main results

The proportion of mismatch of over-skilled workers is higher in smart manufacturing (22.7%) than in non-smart manufacturing (8.9%). Overall, the percentage of mismatch of over-skilled workers (11.8%) is greater than that of mismatch of under-skilled workers (2.8%). This is clear in smart manufacturing.³

TABLE 2

SKILL MISMATCH: SMART MANUFACTURING VS. NON-SMART MANUFACTURING

	Total		Smart manufacturing		Non-smar manufact	rt uring
	145	100%	22	100%	123	100%
Under-skilled	29	20.0%	4	18.2%	25	20.3%
Mismatch of under-skilled workers	4	2.8%	0	0.0%	4	3.3%
Proper skills	55	37.9%	8	36.4%	47	38.2%
Over-skilled	41	28.3%	5	22.7%	36	29.3%
Mismatch of over-skilled workers	16	11.0%	5	22.7%	11	8.9%

The survey on the skills mismatch of incumbent workers does not imply a lack of skills in smart manufacturing. Although it may be argued that the problem of 'under skills' has not yet been fully raised, since companies that have introduced smart manufacturing are still in the early stages, the current survey results show that incumbent workers are over-skilled and that adjustments are necessary. It is necessary to consider that the mismatch of over-skilled workers is likely to lead to skills obsolescence when matching to an appropriate task is not realized. It is because they will face 'deskilling' when they cannot properly utilize their skills.

Interpretation and implication for the skills mismatch in workers

The survey on skills mismatch raises a question about the trend of high-skilling following technological change. On the other hand, this survey implies that, while over skilled mismatches are becoming larger in smart factories, it is necessary to switch jobs in smart factories to resolve this issue. If such personnel continue to engage in jobs they are overqualified for, then not only is it a waste of talent and inefficient skill allocation, but it will also lead to a decline in skills in the long run. To prevent this, it is necessary to move the respective employee from their current job and to one that matches their level.

³ There is a shortcoming from the limited responses of the surveys. In the current survey, the number of responses is still not enough to allow for sectoral differences, etc., and the change in job profiles is not rigorously verified. Further examination of changing job profiles in accordance with expanding smart manufacturing is still necessary.

Survey of Smart Manufacturing Data Utilization

Structure and scope of survey

The survey focuses on emerging tasks caused by smart manufacturing. The number of observed samples is 259 companies that participate in the SMSP. The survey was conducted by Korea SMEs and Startups Agency in June 2020 [9].

It was developed using basic data related to small and medium manufacturing data centers by investigating data usage generated in smart manufacturing and demand for Big Data analysis. In addition to smart factories, the survey also draws attention to the emergence of data collection, management, analysis, and utilization, and raises the necessity to secure related human resources and retrain the incumbent workers. The main questionnaires are showing in Table 4. Multiple choice answers were included, so the sum of responses can exceed 100%.

TABLE 3

SAMPLE OF SURVEY OF SMART MANUFACTURING DATA UTILIZATION

Industry	No. of Responses
Food & Beverage/Cigarettes	38
Textiles/Clothing/Leather	22
Wood/Pulp/Coke/Rubber/Plastics/Furniture	27
Chemicals/Pharmaceuticals	17
Non-Metals/Primary Metals/Metals	48
Electronic Parts/Medical/Precision/Electrical Equipment	38
Vehicles/Transportation Equipment	18
Other Machines/Products	51
Total	259

Note. Korea SMEs and Startups Agency (2020) [9]

TABLE 4

SURVEY QUESTIONNAIRES

Background Information	Region / No. of employees in 2019 / Total sales in 2019 / Main product
	a. Current main content of smart manufacturing
	b. Storage of manufacturing data
	b1. Way of data collection / and its importance
Questionnaires	b2. Reasons for not storing manufacturing data
	c. Needs of data analysis
	c1. Purpose of data analysis
	c2. Reasons for not using data analysis

Main results

As the number of survey samples is not large, it is difficult to find a significant difference by industry. The results are examined with a focus on the response rate in the entire 259 samples.

a. The current main content of smart manufacturing: Looking at the current main content of smart manufacturing, Manufacturing Execution Systems (MES) such as real-time automation show the highest percentage (82.2%). This is followed by Enterprise Resource Management (ERP) (22.8%),

and Supply Chain Management Optimization (SCMO) (5.8%). In the following, multiple responses are allowed for each answer, so the sum of the answer rates may exceed 100%.

b. Storage of manufacturing data: For storage of manufacturing data, most companies (232) store manufacturing data generated in a factory for analysis purposes, but others (27) do not store occurrence data.

b1. Way of data collection and its importance: Among companies that store manufacturing data (total 232), the most common method was entering the data generated in the process into a system using a PC/tablet (68.5%). It appears that automatic data collection through sensor equipment/ systems (64.2%) and data accumulation through manual writing such as journal writing and excel input (44.4%) were the norm.

b2. Reasons for not storing manufacturing data: Among companies that do not store manufacturing data (total 27), the first reason given was that they had no storage system for manufacturing data (44.4%). The second was that automatic collection was not possible and handwriting input was difficult (33.3%). The last reason given was a shortage of proper personnel suitable for data management (33.3%) and no need for storing manufacturing data (14.8%).



c. On the willingness to analyze data among the 259 companies, strongly willing was 22.4%, willing 42.5%, moderate 23.9%, unwilling 10.0%, and strongly unwilling 1.2%. 88% of companies were willing to conduct data analysis (230 companies) from the total of strongly willing, willing, and moderate. 12% were unwilling (27 companies) from the sum of unwilling and strongly unwilling.

c1. Among the companies willing to conduct data analysis (total 230 companies), the most general purpose of data analysis was for production optimization (55.2%). It was followed by detection of

error cause (53.5%), statistical process analysis (44.3%), quality prediction (30.9%), analysis of facility utilization rate (29.6%), and demand prediction (19.1%).

c2. Among the companies showing no need for data analysis (total 29 companies), their reasons are lack of proper data (58.6%), lack of appropriate manpower (37.9%), and lack of understanding (34.5%).



Interpretation and implication of smart manufacturing data utilization

Most companies participating in smart manufacturing have just started to establish data bases. On the other hand, data collection, management, analysis, and utilization, which are the core tasks of smart manufacturing, are newly emerging job areas and are expected to continue to expand.

Some companies have already managed and utilized data before smart manufacturing such as from production plants. These companies will expand their existing data management and utilization and play an important role in smart manufacturing. The development of smart factories will continually demand data-related jobs and strengthen the area.

In addition to recruiting new personnel, companies need to reeducate and train current employees. If a foundation for linking this training with existing work is needed, they must work to retain currently incumbent workers because there is a limit to recruiting new personnel. On the other hand, while many of the currently employed lose their jobs, there is also a demand to maintain the existing workforce by accepting newly required work.

While smart manufacturing drives data-related jobs, failure to secure appropriate personnel prevents smart manufacturing from expanding. The need for reeducation and training for current employees has increased. Also, cultivating new human resources for data collection and management is necessary.

Comparing Results from the Two Surveys

Is the message from the two surveys consistent? Based on the result of the survey on skills mismatch of incumbent workers, incumbent workers face the need to match their skills and their work. On the other hand, the survey on the emergence of new tasks showed the emergence of new jobs in line with smart manufacturing. If skill discrepancy issues could be resolved by assigning over-skilled workers to the new tasks presented by smart manufacturing, the results of the two surveys could be compatible.

However, if changing the roles of over-skilled workers to match the new tasks in smart manufacturing does not resolve the issue, the two results are inconsistent. The problem is that new jobs in smart factories are mainly data-related and cannot be covered by incumbent workers. While the over-skilled employees in existing jobs may not be able to meet the requirements of new tasks, it is necessary to have the ability to perform those tasks related to data. Although a worker is regarded as over-skilled in terms of having higher skills than what they currently perform, if the worker cannot address the emerging tasks, then they are becoming deskilled in practice.

Discussion and Conclusions

Emerging issues in smart manufacturing

Even though, by existing work standards, workers may be over-skilled, they still need to meet the new skills demanded by change. As a response to this, training new workers and utilizing existing workers have to occur together. In particular, it is important for existing workers to respond to the new working processes because it is not possible to respond by simply hiring new workers. An interview by LS Electric, regarded as an excellent case for smart manufacturing in Korea, shows that smart manufacturing-related education and training are needed for personnel with on-site know-how. "There is a limit to field applications for only technical knowledge related to smart manufacturing without understanding the existing processes. Some smart manufacturing experts may be recruited as new workers and much of the data analysis may be performed by external consultants, but current workers who can incorporate smart manufacturing based on know-how about the production process are also needed." (2019, Interview with LS Electric) [6]

The various demands and work contents of smart manufacturing such as data accumulation, management, and utilization cannot be successfully achieved without combining the incumbent's existing knowledge, which are the task-specific skills or know-how embedded in the process. The most needed in the practical field is to connect such contents with the existing domain knowledge.

To utilize existing workers and help them gain new skills required in smart manufacturing, companies have to provide education and training. For this, companies should develop education and training programs according to the levels of current workers. Also, companies should develop strategies and methodologies for teaching and training considering each company's environment and situation.

For this, companies should support employees with systems and finance. The government should also provide opportunities and financial support for various education and training courses to encourage lifelong education. On the other hand, even when cultivating new human resources, companies should prepare for continuous learning.

For the development and transformation of these jobs, mid- and long-term advanced courses as well as basic ones through short-term intensive training for existing workers are required.

Inevitably, some existing workers may not remain in their current work during the conversion process through retraining.

While the number of workers who can remain in smart manufacturing through education and training is limited, the problem of workers who cannot remain is another issue that needs to be addressed from a different level.⁴

Korean experience of the emerging issues

To cope with the contemporary technological transition in smart manufacturing, companies and governments need to provide continuous opportunities for education and training for current and new employees.

Company-led education and training are provided by large companies such as POSCO [6]. Along with recruiting new talent, Korean companies offer various educational and training opportunities, such as short-term general education, mid-term in-house professional education, (long-term) commissioned higher-education, and many other educational and training opportunities (recommending participation in seminars and conferences, etc.). The Korean government uses some subsidies for such education and training, but the overall financial burden is on the company.

In government-led education and training, SMEs are limited in self-educational training due to manpower size and budget constraints. In response, the Korean government directly provides education and training in various ways. In addition to traditional lifelong learning, education for the incumbent workers, etc., education and training are provided to support new high-tech industries [10, 11, 12]. All of this government-provided education and training are operated using government budgets and the Employment Insurance Fund, while corporate and personal burdens are not imposed. The efficiency of free education and training is now being considerately reviewed. Partial self-payment is a solution considered today.

On the other hand, it has been pointed out that providing such a curriculum and related financial support is not sufficient. Rather than direct financial support for education and training, the provision of opportunities to receive education and training is regarded as a more important matter, and whether education and training count as part of working hours is also an important issue. Furthermore, in SMEs with a small number of employees, government financial support is also required for alternative personnel to compensate for the loss of work due to employee participation in education and training during working hours.

Implication from the Korean experience

In Korea, various smart manufacturing support programs are being implemented. In particular, it is encouraging that mid- and long-term support programs, in addition to short-term courses in manpower training programs related to smart manufacturing, are being operated. However, there is still a problem of diversification of education and training levels and methods. Providing three-month intensive courses for incumbent education is certainly significant development. However, more diversification is still expected to allow heterogeneous needs from different jobs.

In the process of operating advanced courses for current workers, it is very important to develop the contents and delivery methods according to each recipient's level, background, and needs.

⁴ The issue of transition to other jobs is not covered in this research and requires further research.

Companies and trainees are expected to choose an appropriate curriculum among various programs. Providing additional incentives to excellent educational and training institutions may be another solution to advance the quality of education and training.

If higher education institutions such as universities are more actively involved in education and training, program participants can have more opportunities to attend competitive programs than now. Companies and workers would be able to make choices according to their needs and levels and promote the quality of contents and delivery of education and training. Additionally, regional restrictions to education and training in current programs can be reduced by local universities engaging in education and training.

To diversify the education and training, it is also necessary to expand the opportunity of education and training and reform the financial support scheme of education and training. To allow the education and training of the current workers in most SMEs, further support for the operation of alternative workers is also necessary.

To finance education and training, it may be more efficient for trainees or companies to pay a certain amount of the total tuition themselves than using 100% government support, because free education training may cause a side-effect of lowering the concentration on education and training. Trainees' partial payment can lead trainees to more carefully choose education and training courses. Providing additional incentives to excellent education and training institutions can induce the trainees to select better education and training institutions through self-payment.

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UPSKILLING AND RESKILLING WORKERS TO ENHANCE LABOR PRODUCTIVITY IN MALAYSIA

Introduction

Human capital development is a critical enabler for driving and sustaining Malaysia's economic growth and supporting the transition of all economic sectors towards knowledge-intensive activities. An efficient and effective labor market is also necessary to attract investments into Malaysia and enable everyone to participate in and enjoy the benefits of economic growth [1]. However, a dynamic labor market where some jobs will be destroyed and some will be created due to fast changing technologies requires continuous human capital development through either reskilling or upskilling.

The Malaysian Government, under the Eleventh Malaysia Plan (2016-2020), continues to promote the creation of human capital that is equipped with the right knowledge, skills, and attitudes to thrive in a globalized economy. Lifelong learning is essential to enable Malaysians to continuously reskill and upskill themselves to meet the ever-changing demands of the labor market.

In addition, raising human capital and helping workers transition to new jobs will enable workers to increase their productivity and earnings through self-employment that will open new job opportunities in the country. This will require improvements in foundational human capital through early childhood development and supporting the acquisition of job-relevant skills to prepare young workers through vocational education and on-the-job training.

This paper will highlight the current Malaysian Government policies on reskilling and upskilling of the labor force during the pre- and post-COVID-19 eras. It will also focus on the programs carried out by various agencies and examine their effectiveness, as well as provide recommendations based on various local and international practices.

Upskilling and Reskilling Policy in Malaysia

Malaysia aspired to become an advanced nation by 2020, driven by knowledgeable and skilled human capital with good ethics and morality. The initiatives under the Eleventh Malaysia Plan are projected to generate approximately 1.5 million new jobs by 2020, of which 60% require TVET-related skills. Lifelong learning for skills enhancement is one of the focus areas to be strengthened. Lifelong learning is essential in enabling Malaysians to continuously reskill and upskill themselves to meet the ever changing demands of the labor market. This market involves Malaysians 15 years old and above, who have dropped out of formal education, as well as those who are currently employed, unemployed, or retired (Figure 1).



The government intended to widen lifelong learning access and raise the quality of existing programs through two main strategies: improving the effectiveness of programs to meet learning needs; and improving regulatory and funding support to broaden access [1]. Industry-based upskilling, entrepreneurship-related training, and industry relevant skills are among the programs to be strengthened in order to upgrade the skills of existing employees, youths, and communities.

The role of the Human Resource Development Fund (HRDF), an organization under the Ministry of Human Resources that constantly invests in various upskilling and capacity-building programs for all sectors, particularly small- and medium-sized enterprises (SMEs), has been enhanced with the amendment and expansion of the PSMB Act 2001 (Act 612) in 2017. The coverage has been expanded to include more subsectors under the services and agriculture sectors that will be effective from 1 March 2021. The expansion is expected to increase the number of employees that are eligible for training under the HRDF from the current 2.5 million in 2020 to 6.1 million from March 2021 [2].

TABLE 1

COMPARISON OF HRDF ACT COVERAGE BETWEEN 2010, 2014 AND 2018

		2010			2014			2018	
Sector	Sub-sector	Employers	Employees	Sub-sector	Employers	Employees	Sub-sector	Employers	Employees
Mining and Quarrying	-	-	-	2	14	2,710	2	209	20,969
Manufacturing	23	6,946	920,324	23	7,009	957,172	23	11,145	1,071,508
Services	21	7,170	759,387	38	7,450	805,610	38	14,927	1,198,170
Total	44	14,116	1,679,711	63	14,482	1,765,492	63	26,281	2,290,647

Source: Human Resources Development Fund (HRDF)

The demand for skilled employees continues to increase as economic activities become more complex, particularly with the advent of new technologies. According to a report in Malaysia Productivity Blueprint, the number of employees with specific skills and expertise remains insufficient, especially in the priority subsectors such as Electrical and Electronics (E&E), Machinery and Equipment (M&E), Professional Services, and ICT [3]. It was reported that the industry is experiencing a shortage of engineers and technicians, especially in E&E and M&E, due

to a lack of necessary skills to meet industry requirements. Thus, it is critical to upskill and reskill the employees to meet this demand gap.

Based on Global Competitiveness Report in 2019, Malaysia ranked 8th out of 141 economies in the extent of staff training, and 11th in ease of finding skilled employees. In terms of the skillsets of graduates that indicate the availability of graduate skills required by the businesses, Malaysia ranked 17th (Table 2). This shows that the business leaders consider them less adequate to meet their needs, as the score is about 5.4% lower than last year, dropping 11 places. Although, these skill indicator rankings shows that companies in Malaysia are competitive, the rankings have dropped as compared to 2018. Improvement measures should be in place to improve the skills and training needs to enhance the quality of the skilled employees as required by the industries, that later would improve business productivity and competitiveness.

JLOBAL COMPETITIVENESS REPORT ON SKILLS SOB-INDICATORS									
Skills		2018			2019		Best Performer		
	Value*	Score	Rank	Value*	Score	Rank			
Skills		74.2	24		72.5	30	Switzerland		
Extent of Staff Training	5.4	72.6	4	5.3	71.0	8	Switzerland		
Skillsets of Graduates	5.3	71.8	6	5.1	67.9	17	Switzerland		
Ease of Finding Skilled Employees	5.3	71.4	4	5.1	67.9	11	United States		

TABLE 2

Source: The Global Competitiveness Report 2020

*Value refers the value range between 1 to 7 [1 = not at all; 7 = to a great extent]

In order to improve the quality of skills and training, focus will be given to upskill and reskill local workers by providing training on soft and hard skills to boost the quality of workers. The skills acquired will promote marketability and raise the income level of the workers, thereby increasing productivity. The policy under the Eleventh Malaysia Plan, with the theme of "Anchoring Growth on People," shows the importance of human capital in generating wealth. As one of the main factors that contributes to productivity growth, challenges faced by human capital need to be addressed holistically at national, sectoral, and enterprise levels. Realizing this, the government's approach to productivity has shifted from primarily government-driven initiatives at the national level to targeted actions across the public sector, industry players, and individual enterprises. It has been further highlighted in the Malaysia Productivity Blueprint (MPB), an implementation document that focuses on improving productivity in a cohesive manner, where the private sector will drive the productivity agenda in partnership with the government.

The Blueprint has identified five main challenges to productivity growth, namely talent, technology, incentive structure, business environment, and productivity mindsets. Both talent and technology challenges are related to the human capital that need to be upskilled in order to raise the number of highly skilled employees that can meet the demands of the future economy by adopting and exploiting technology and digital advantages such as the Fourth Industry Revolution. At the sectoral level, nine productivity nexuses were established to address the wide variation in challenges for different sectors and industries for productivity improvement. The nine nexuses are Electrical and Electronics, Machinery and Equipment, Chemicals and Chemical Products, Agrofood, Tourism, Retail and Food & Beverages, Digital, Professional Services, and Private Healthcare, which all

together contributed to 30% of Malaysia's GDP and 40% of total employment. The nine nexuses, under the purview of the Malaysia Productivity Corporation, drive industry champions from main industry associations. There are 43 initiatives across subsectors and 10 focus on talent and workforce (Table 3).

TABLE 3

WORKFORCE INITIATIVES UNDER MALAYSIA PRODUCTIVITY BLUEPRINT BY NINE PRODUCTIVITY NEXUSES								
Electrical and Electronics Produc- tivity Nexus (EEPN)	 Strengthen collaboration between industry, government, and universities to ensure supply of industry-ready engineers Up-skill workers to prioritize innovative thinking to foster productive culture 							

Machinery and Equipment	 Set up partnerships between government and industry
Productivity Nexus (MEPN)	associations to upskill existing employees
Chemical and Chemical Products	 Deepen collaboration between industry players and
Productivity Nexus (CPN)	education institutions offering chemical-related courses
Agrofood Productivity Nexus	 Establish industry-led collaboration with educational
(AFPN)	institutions
Tourism Productivity Nexus (TPN)	 Strengthen collaboration efforts between industry and academia to match industry needs
Retail and F&B Productivity Nexus (RFBPN)	Strengthen Retail and F&B competencies
Digital Productivity Nexus (DPN)	• Strengthen collaboration between industry and academia to reduce mismatch of supply and demand of workforces
Professional Services Productivity	 Provide input to colleges and universities to ensure
Nexus (PSPN)	curriculum and training are industry-relevant
Private Healthcare Productivity Nexus (PHPN)	 Review policies to ease foreign skilled healthcare professionals work in the subsector Strengthen coordination between medical schools and industry to ensure supply/demand match of professions

In addition, to support a fast-paced technology advancement across sectors, especially the manufacturing sector, the government has launched Industry4WRD, a national policy on Industry 4.0 in 2018. The policy focused on three shift factors, namely people, processes, and technology, to transform the manufacturing industry towards Industry 4.0. The people factor focuses on strategies towards creating differentiated talent acquisition, developing the required human capital, and retaining existing talent by providing companies with the right support. In term of the processes, strategies focus on improving the manufacturing and whole business processes by encouraging smart and strategic public-private partnerships. For technology, the government aimed to make Industry 4.0 technologies accessible to SMEs [4].

Intensifying Skills and Human Capital Development

The government has continuously increased funding or grants to level up human capital from lowskilled labor to high-skilled labor, as well as to create job opportunities among Malaysians by introducing various schemes to upskill and reskill employees. There are two main funds available for upskilling and reskilling: the Government Special Fund and the monthly HRDF Levy. The Government Special Fund is an allocation provided by the government to benefit employers who apply for related schemes offered by the HRDF through 4,025 registered training providers from both private and public sectors. Under PSMB Act 2001, companies who fall under the 238 sub sectors and employ a minimum of 10 Malaysian employees are compulsory to register with HRDF. The Monthly Levy is charged at a rate of 1% of the monthly wages of employees. Companies with five to nine Malaysian employees are given the option to register with the HRDF with a levy rate of 0.5%. In 2019, the number of qualified employers who registered increased to 29,701, from 26,281 in 2018, with a levy collection of RM890.38 million. This indicates that more employees are eligible for training using the levy fund. However, the numbers of employers who have access to those funds are still limited to achieve the target set by 2020, due to the current Pembangunan Sumber Manusia Berhad (PSMB) Act of 2001, which only covers 63 subsectors under the three main subsectors.

The number of training places increased by 16%, from 873,355 in 2018 to 1,017,240 in 2019. The total number of trainees trained also increased by 14%, from 526,891 in 2018 to 600,801 in 2019. The increase in numbers for both trends indicates an overall increase in the number of registered employers in 2019.

Table 4 shows the training performance for 2018 and 2019 by three main subsectors. Out of 29,701 employers registered, only an average of 25% of employees participated in the training in 2019. The percentage is relatively small, where manufacturing, mining and quarrying were the only sectors that contributed 25% of participants, respectively, while the services sector contributed to 24%.

The duration per trainee for the subsectors varies, where mining and quarrying registered the highest training days compared to manufacturing. This was due to the Petroleum and Gas Extraction industry, which had trained more employees on average at 31%. In manufacturing, petroleum refineries (38%), products of petroleum and coal (33%), industrial chemicals and other chemical products (31%), transport equipment (31%), and electrical machinery, apparatus and supplies (27%), are among the top five percentage of employees trained. This is in line with the training opportunities ratio (Number of Training Places/Trainees Trained) of 1.6% while manufacturing subsectors are the lowest at 1.8%.

The statistics show that the training places offered by the HRDF have only been taken by between 56% to 60% of the industry and have yet to achieve its fullest potential.

TRAINING PERFORMANCE DT SUDSECTORS, 2010 – 2019								
	Manufacturing Sector		Services So	ector	Mining & Quarrying Sector			
	2018	2019	2018	2019	2018	2019		
Employees Trained (%)	24	25	22	24	23	25		
Duration per Trainee (Day)	3.3	3.2	3.0	3.7	3.8	4.0		
Training Opportunities Ratio (Number)	1.8	1.8	1.5	1.6	1.5	1.6		
No. of Training Places (Number)	448,747	508,358	417,245	499,851	7,363	9,031		

TABLE 4

TRAINING PERFORMANCE BY SUBSECTORS, 2018 – 2019

Source: Human Resources Development Fund (HRDF)

Based on the number of approved places by skill areas, safety and health is the most popular, followed by quality and productivity and team building (Table 5). These three skill areas are relatively general courses as compared to the other specific skill areas related to the job scope than

can be applied across the subsectors. The general courses such as safety and health, and team building or motivation, do not really improve employees' technical skillsets. The selection of the training courses is dependent on the employers and employees have no right to choose any training programs that suit their skill enhancement.

Skills	Training Places	Percentage (%)
Safety and Health	204,989	19.93
Quality and Productivity	104,150	10.12
Team Building or Motivation	97,906	9.52
Management or Strategic Management	82,265	8.00
Computer and Information Technology	56,049	5.45
Education or Training	45,498	4.42
Process and Operation	33,886	3.29
Maintenance or System and Control	32,403	3.15
Public Relations or Customer Service	31,814	3.09
Food and Beverages	30,428	2.96

TABLE 5

Source: Human Resources Development Fund (HRDF)

The HRDF has introduced Strategic Initiatives (SI) schemes to empower the quality and employability of Malaysian talent through upskilling and reskilling initiatives (Figure 2). The schemes focus on the pre-employment market, employment market, SMEs, and dedicated target groups for people with disabilities, housewives, single mothers, and Malaysians who earn an income of less than RM4,850 per month. There are currently 11 schemes offered to employers for the benefit of employees, and those schemes are continuously enhanced to meet industry demand. The schemes are divided into two categories: HRDF Levy and Government Special Fund. Companies can apply for schemes provided by the HRDF to attend any programs recognized by the HRDF using the HRDF Levy. However, for the Government Special Fund, companies can only apply to related schemes offered by the HRDF, such as RiSE4WRD for Industry4WRD. RiSE4WRD for Industry4WRD is an SI program by the HRDF in collaboration with the Ministry of International Trade and Industry. This scheme is designed to support the national agenda of accelerating technology by providing a platform for SME manufacturing companies and the related services that have participated in the Readiness Assessment (RA), a program under the Industry4WRD initiative by the Ministry of International Trade & Industry.

Collaboration between industry, government, and academia has been emphasized in the MPB's sectoral initiatives to improve the skills and competencies gap among young talent and the existing workforce. To ensure the programs are viable and meet industry demand, recently the HRDF, in collaboration with industry associations and agencies such as Malaysia Productivity Corporation (MPC) and Malaysia Digital Economy Corporation (MDEC), has co-produced the Industrial Skills Framework (IndSF) upon request from industry. The IndSF provides current skills and competencies that are in demand within the industry through a series of engagements with industry players and subject matter experts and is endorsed by the Sectorial Training Committee (STC). The STC is established as an advisory and consultative committee of the HRDF for training needed by the industry.



This framework was created to offer a continuous learning ecosystem in which industries, job seekers, and educators move forward together progressively. The IndSF was set up to be a reliable identification of training needs based on one's qualification and knowledge and complements existing frameworks such as the National Occupational Skills Standard (NOSS) and Malaysian Qualifications Framework (MQF).

In addition, the programs will be frequently updated to reflect the latest trends and best practices to grow human capital development across all industries and subsectors within the Malaysian workforce. Currently, six IndSF have been established from the Plastics, Machinery and Equipment, Digital Technology, Hospitality, Oil, Gas and Energy, and Wholesale and Retail industries. IndSF for the Machinery and Equipment subsector is one of the MEPNs under the MPC initiatives in collaboration with the HRDF and the Machinery and Engineering Industries Federation (MEIF). RFBPN and PHPN are also collaborating with HRDF and related associations to produce such frameworks.

Apart from HRDF, upskilling and reskilling programs are also offered by other agencies such as MDEC, the National Entrepreneurship Institute (INSKEN), and the Social Security Organisation (SOCSO). There are also open online training platforms, such as Upskil.my and Malaysia Massive Open Online Courses (MOOCs).

INSKEN is an agency under the Ministry of Entrepreneur Development and Cooperatives (MEDAC) that offers entrepreneurship development initiatives through its training and coaching programs. The programs are executed through smart collaboration with industry practitioners, professionals, and government agencies in order to strengthen the national entrepreneurship ecosystem. The programs are focused on micro-, small-, and medium-sized enterprises (MSMEs) in the services sector, mainly in the Wholesale and Retail, F&B, and Hotel and Tourism Industries.

In realizing the need to enhance the capability of MSMEs in the services sector, INSKEN has introduced a specific industry-based coaching program called the INSKEN Business Coaching &

Business Enhancement Programme, which started by focusing on five industries: Homestay, Spa, Access to Retail, Postnatal Care, and Food Trucks. The IBC Programme is one of INSKEN's signature programs and has been successful in scaling up the MSME entrepreneurs to a higher level. In 2019, 288 entrepreneurs participated in the program, focusing on seven industries: Ecotourism, Bakeries, Car Workshops, Sewing, Wedding Planning, Cafes and Restaurants, and Hostels. More than 50% of participating enterprises have registered 20-100% sales increases and created 251 new jobs [5].

Harnessing Human Capital Towards Industry 4.0

The advent of the Fourth Industrial Revolution (IR 4.0) demands industries change their activities towards digital transformation. Artificial intelligence (AI), augmented reality (AR), robotics, the Internet of Things (IoT), 3D printing, and drones are rapidly assimilating into a working environment that requires a technological shift towards sustainable growth. This transformation requires employees to change both their mindsets and skillsets.

RiSE4WRD is one of the schemes that supports the Industry4WRD policy in accelerating technology by providing a platform for SME manufacturing companies and related services. The training grant will be offered to companies who have participated in the Readiness Assessment (RA) to plan and train their employees in the required knowledge and skills prior to high technology adoption, which will lead to productivity improvement. The RA provided companies with a readiness score index for Industry 4.0 and identified areas of improvement in terms of people, processes, and technology, via a comprehensive readiness report. The report would enable companies to propose intervention programs and apply for financial incentives. Under this scheme, several courses were offered by trainers to enhance the understanding and technological knowhow of companies in manufacturing and services industries. These courses included Overview of Enabling Technologies for Industry, Data Generation, Machine Data Logging and Visualization, Overall Equipment Effectiveness (OEE), and Data Analytics Essentials.

In ensuring Malaysia makes the digital leap into IR 4.0, MDEC has continuously offered digital programs and initiatives to all Malaysians to upskill employees in the digital era. With professional upskilling initiatives, Malaysians can access the necessary tools and knowledge in many of the major sectors of the digital ecosystem such as data analytics, AI, and cybersecurity.

In providing professionals with the opportunities to gain new knowledge and move to another emerging tech field related to cybersecurity, MDEC has introduced a cybersecurity professional upskilling program that started in 2018 in collaboration with Protection Group International (PGI) UK and Asia Pacific University of Technology and Innovation (APU). In 2020, the program offered the opportunity to be upskilled in domains such as cloud security to develop a sustainable cybersecurity talent pool in Malaysia.

Apart from cybersecurity, MDEC also offer programs such as eRezeki, eUsahawan, GLOW, eCommerce, and the Digital Transformation Acceleration Programme (DTAP), designed to open up additional income avenues, provide new skills training and offer opportunities to thrive in the new digital economy (Table 6).

TARIE 6

DIGITAL ECONOMY PROC	RAMS AND INITIATIVES BY MDEC
Program	Descriptions
eRezeki	The eRezeki program enables citizens, especially low-income groups, to generate additional income by doing digital assignments via online crowd-sourcing platforms. eRezeki participants will be matched with digital work in line with their respective skills.
eUsahawan	A training program conducted via online entrepreneurial platforms such as Go-eCommerce. Topics covered include business management, financial management, copywriting, websites, Facebook, Instagram, email marketing, and mobile apps.
GLOW	Global Online Workforce (GLOW) is a national program designed to enable Malaysians to become part of the online global workforce and earn income independently, This blended learning encompasses physical training, e-learn- ing, and mentoring
eCommerce	Provides guidance on selected topics such as eUsahawan, Go-eCommerce, Digital Free Trade Zone, MYCyberSale
Digital Transformation Acceleration Pro- gramme (DTAP)	DTAP is an outcome-driven program that aims to provide Malaysian compa- nies with the necessary tools to help kickstart their digital transformation journey. The goal of the program is to help businesses achieve their digital transformation goals

Source: Malaysia Digital Economy Corporation (https://mdec.my/digital-economy-initiatives/)

The nexuses play an important role in bridging the skills gap among employees in line with the current needs of the industry. Several customized upskilling programs have been arranged for specific industries under respective nexuses. The programs are designed and developed by industry technical experts to bridge the technology gaps among industries. Most of the upskilling programs conducted by various nexuses are based on proof-of-concepts and are demonstrated to small target groups to verify whether the concept has practical potential to the industry. Through this process, the nexuses are not only providing training to existing employees on the application of the Industry 4.0 concept but also assistance and guidance to the companies on technological knowhow. All companies need to showcase their achievements upon completion of the three-month programs.

EEPN has conducted the Advance Engineering Programme on Industry 4.0 through its upskilling initiatives, where 15 employees from 15 companies were trained. The EEPN also conducted proof of concept programs on Plugfest 1.0 Internet of Things and Plugfest 2.0 Artificial Intelligence Machine Vision to System, for 132 engineers from 67 companies and 45 engineers from 25 companies respectively. EEPN has also conducted industrial upskilling for yet-to-be-employed engineering graduates with the objective of keeping engineers employed. The program was commenced in 2018 and completed in 2019, and in that time it trained 185 graduates, 100% of whom were employed.

MEPN on the other hand has introduced the Visualisation of Overall Equipment Effectiveness Programme to 11 employees from eight machinery and equipment companies. The six-day training program was developed by MEPN industry experts in collaboration with the Skill Development Centre. Using similar proof-of-concepts, the companies need to present their project cases and achievements through sharing platforms such as webinars and seminars. Some of the cases have been documented and shared through the Benchmarking Online Networking Database (BOND) developed by MPC.

Impact of COVID-19 to Malaysian Upskilling Landscape

The tragedy of the COVID-19 pandemic is having a profound effect on the lives of millions of people around the world including Malaysia. The pandemic has evolved into a health, socioeconomic, and humanitarian crisis of unprecedented scale and impact. The Malaysian Government has made available several economic stimulus measures intended to preserve citizen welfare, support businesses and strengthen the economy. The *Prihatin Rakyat* (Caring for People) and PENJANA (National Economic Recovery Plan) packages were immediately introduced to cushion the unemployment impact.

The COVID-19 pandemic forced businesses to change and innovate for survival. Many businessas-usual approaches to serving customers, working with suppliers, and collaborating with colleagues would have failed. They had to increase the speed of decision making, while improving productivity, using technology and data in new ways, and accelerating the scope and scale of innovation [6]. The phenomena created opportunities for rapid change in day-to-day operations and urged businesses to make their future outlooks more efficient by adopting digital technologies towards Industry 4.0. New technologies are going to necessitate new roles and encourage new skills, witnessed through the changes of new mindsets, behaviors, and values in the new rapidly changing workplace. The world's response to COVID-19 has resulted in the most rapid transformation of the workplace. Working from home has become the new normal, and an urgent digitalization of the relationship between firms and customers and between employers and employees has taken place [7]. Fast-tracking trends such as automation, digitalization, and innovation become a priority to businesses.

The above scenarios have also been supported with findings from a study carried out by Randstad's Malaysia called the 2020 COVID-19 Labour Pulse Survey [8] on 531 locally-based working professionals. The study revealed that 91% of respondents intend to upskill or reskill in the next 12 months. There are five reasons why upskilling and reskilling are required, and they have been ranked in order of importance:

- 1. Prepare for how automation and digitization will affect the future (55%)
- 2. Consider changing career or industry (21%)
- 3. Fear of losing current jobs due to redundancy (13%)
- 4. Current employer is not financially stable enough (8%)
- 5. Significant change in job responsibilities (4%)

In line with the study findings, all the government upskilling and reskilling initiatives have shifted towards promoting adoption of digital technologies. Under PENJANA, training incentive programs were introduced to highlight how generating job opportunities and training play a critical part in Malaysia's fight to get back on its feet in the wake of the peak of unemployment and employability issues caused by COVID-19. Unemployment rates increased to 5.3% in May 2020 as compared to an average of 3.3% for over 10 years. Through both the PRIHATIN and PENJANA Initiatives, the unemployment rate reduced to 4.7% in August 2020. Given strong demand for the requisite digital and information technology skills to migrate existing businesses to e-commerce platforms, complementary skill-matching and job placement initiatives enable job seekers to find suitable

employment and vice versa. Until January 2021, 134,137 participants have benefited under PENJANA upskilling programs [9].

New jobs are being created as macro-trends shift and technology advances. Many Malaysian graduates and youths do not have the skills and behavioral aptitude to face the market. Budget allocations can be made to centralize efforts in identifying skills that the market needs and create programs that emphasize new skills such as programming, data analytics, and social media analysis.

Apart from that, the Government has also introduced new schemes such as the Employment Generation Guarantee Scheme or JanaKerja, which are expected to create 500,000 new job opportunities in 2021 [10]. The government also continued providing the Hiring Incentive Programme or Penjana Kerjaya under the SOCSO in 2021. This program provides monetary incentives to both employers and employees, and provides fully funded reskilling and upskilling training including placements and training based on the requirements of the employers. The Penjana Kerjaya program allows employers to hire new employees, and upskill or reskill their newly appointed talents. This program helps organizations groom future-ready talents with the data science and analytics skills for business to brace the challenges towards digitization. Companies can enroll newly hired analysts in courses such as big data analytics and efficient data analysis on data retrieved from a variety of file types.

These efforts will be implemented through collaborations with various ministries and agencies. The HRDF and SOCSO seek qualified partners in delivering the initiatives crafted as part of the short- to medium-term COVID-19 economic recovery plan, specifically related to job placement, entrepreneurship, self-employment, and market-driven IR 4.0 training.

Recommendations and Way Forward

The Mid-Term Review Lifelong Learning program under the Malaysia Blueprint on Enculturation of Lifelong Learning (2011-2020) benefitted 2.3 million participants in 2016. The number of employees eligible for training under the HRDF increased from 1.8 million in 2015 to 2.1 million in 2017. The HRDF also collaborated with SME Corp to provide training to SMEs not covered under the PSMB Act 2001, which benefitted 6,697 employees in 2016 and 2017 [11].

Inadequate financial support and minimal tax incentives result in less employers sending their employees for training. Less than 60% training places offered by the HRDF have been used between 56% to 60% by the industry and so have yet to achieve their fullest potentials. Apart from that, overlapping lifelong learning activities and programs lead to inefficiencies in the utilization of public funds. The following sections are recommendations for initiatives that could be implemented and considered as a way forward in addressing the challenges of upskilling and reskilling in Malaysia.

1. Centralize Coordination and Monitoring Bodies for Malaysia Upskilling and Reskilling Initiatives

Malaysia's national policies on reskilling and upskilling need to be reviewed and policy formulation must involve all level of stakeholders including the private sector, who are the real players on the fields. The establishment of the Blueprint on Enculturation of Lifelong Learning for Malaysia only involved 42 stakeholders from ministries, agencies, and academic institutions, and the present industry associations as holistic representatives is still debatable. The main challenges that have been identified still fail to be addressed.

Despite high participation rates in lifelong learning programs, there is a clear lack of coordination and management at the national level, where there is no central body that coordinates and evaluates lifelong learning activities. This makes it difficult to assess the impact of the upskilling and reskilling programs that have been conducted. In fact, the number of employees eligible for training and the number of employees attended for training is something to be debated. What needs to be evaluated is the number of employees who attended programs so that the impact can be measured. In addition, although the HRDF is the main coordination body for upskilling and reskilling initiatives, there are many independent agencies or organizations that are not under HRDF purview. This makes coordination and evaluation more difficult due to decentralized data and information.

There is an urgent need for datasets to monitor and evaluate KPIs and achievements, and connect them to ultimate objectives of long-life learning to improve productivity of the citizens and employees of Malaysia. Furthermore, this system will need to strategically integrate key stakeholders, including teachers and training intuitions, companies and employers, government regulators and ministries, and learners themselves to continue to shape the system and work collaboratively to provide high quality reskilling and upskilling opportunities [12].

2. Mixed Financial Support Approaches

In terms of financial support, the Government tends to allocate budgets for formal education and industries cannot rely on Government grants and incentives any longer, especially during the economic downturn. RM1 billion was allocated under Malaysia Budget 2021 for reskilling and upskilling programs, which is expected to benefit 200,000 trainees. Out of this, 10% will be channeled to the HRDF, and the remaining will be allocated to other government agencies to upskill graduates for professional certificates, workforces that lost their jobs due to borders closing, and veteran soldiers.

For the HRDF, an employer must make any claims against the fund within 24 months otherwise the levy will become ineligible, and the employer is not entitled to receive any financial assistance or other benefits. A total of RM1.35 billion and RM46.4 million were recorded for both the HRDF and government grants in 2019. Out of the RM0.9 billion levy collected, only 1% was unclaimable. However, such funding only benefited the levy contributors that mainly come from medium and large companies and those companies under the HRDF Coverage Act 2001. Most small companies, especially those with less than 10 employees, are not eligible for the levy and cannot gain any benefits from this fund.

Beside the HRD Levy imposed by the HRDF, other financial support alternative practices by other countries that can be benchmarks are setting up learning endowment funds to help smooth funding cycles and provide medium-term certainty for resource planning. For instance, Singapore set up a Lifelong Learning Endowment Fund in 2001 to emphasize its commitment to securing resources for lifelong learning over time. Singapore uses the interest from this fund to support its initiatives that promote the acquisitions of skills.

Apart from that, instruments for businesses should be provided, such as payroll taxes that are dedicated to subsidizing training opportunities, income tax deductions for businesses, special taxes to be paid if a minimum training budget is not disbursed, and public grants for subsidizing training, especially for smaller-sized firms. Such instruments would encourage co-funded coalitions between employers and the Government to conduct successful learning programs. In the Netherlands, tax deductions have been found to be particularly efficient and effective in fostering participation in

adult training [12]. Incentivization through tax deductions could be a practical approach for businesses to encourage upskilling programs as employers always reward employees based on the performance rather than qualifications due to on-the-job training. Hence, recognizing and promoting on-the-job training opportunities and maximizing informal learning opportunities could help to accelerate the numbers of employees being trained with minimal government financial support.

3. Bridging the Skills Gap through Co-creation Programs

Co-creation programs between registered training institutions and industry associations need to be further enhanced in order to meet the industry talent requirement. Co-creation programs create and distribute a brand-new curriculum on co-design between industry players and training by providing a set of valuable design skills that have gained increased relevance in recent years. The curriculum will allow training institutions to provide their students with all the hands-on knowledge they will need to apply this process to their future professional practice.

The Sectoral Productivity nexuses based on nine priority sectors are expected to play a role in bridging the gaps of demand and supply among government agencies, training providers, and industries. These nine nexuses are driven by industry champions and are continuously brainstorming and co-designing critical skills required by industries. Among the co-creation programs introduced by the nexuses in partnership with industry associations and TVET Institutions are Industry Internet of Things (IIoT) Plugfest, Artificial Intelligence for SME (AI4S), Visualization of OEE for Smart Manufacturing, Structured Industry Apprenticeship Programme (SIAP) for IC Design, Industry Lean Apprentice and Cluster Farming Model, and Chemical and Process Engineering.

Co-creation programs should focus on shorter learning modules that foster continued learning. Learning methods across all formats and timeframes should foster curiosity, creativity, and imagination, build confidence in continued learning, and inspire a desire for continued growth and development. The learning should be a flexible, learner-centered approach by providing both foundational and experiential learning, and empower learners to shape their individual skills acquisition trajectory. Through the nexuses, this proof-of-concept training, such as AI4S and OEE training, is formulated by combining both foundational and experiential learning to stimulate creativity and interest towards Industry 4.0. However, this approach is still in the pilot stage before it is enrolled nationwide, except for IioT Plugfest, which is expected to benefit 5,000 employees by the end of 2021.

Co-creation programs are not a new concept, and they have been practiced by other TVET institutions in Malaysia. The difference is the programs are designed based on the requirements of individual companies to tailor their skills enhancement and are not being shared to the public at large. Unlike others, initiatives under the nexuses are driven by associations and industry champions, and the programs will benefit all the members across their value chain.

4. Harness the Power and Scalability of Blended Online Courses

Blended online courses, also known as hybrid or mixed-mode courses, are courses where a portion of the traditional face-to-face instruction is replaced by web-based online learning. The power of online courses in reaching learners at no or low costs has created breakthroughs in access to digital learning content and fostering digital citizenship, information management skills and self-directed learning skills. MOOCs have improved the scalability and reach of adult learning courses through the advent of dedicated learning platforms such as Coursera, Udacity, and edX. In 2015, over 4,200

MOOCs were operating on major platforms around the world, representing courses from over 500 universities from around the globe, with over 35 million learners enrolling in these courses [13]. However, the existence and importance of online courses had yet to be realized when the world was seriously impacted by COVID-19. People are forced to use technology and online systems for their daily operations including online training, lest they be behind.

The Let's Learn Digital campaign under MDEC provided free access to 3,800 courses including professional certificates for unemployed workers until 31 December 2020. In partnership with the global online learning platform Coursera, this campaign will rally action for digital reskilling of the Malaysian workforce. The campaign aims to encourage Malaysians to take up online courses on digital and data skills, especially those who were recently affected by the COVID-19 pandemic. Digital and data skills are trending and creating demand for courses for upskilling and reskilling as the job market evolves. Among the courses offered are Google IT Automation with Python, SAS Programmer, and Intel Introduction to Deep Learning, as well as career paths that can be accessed by students such as data analysts, cloud architects, and software developers.

The HRDF has also introduced new schemes to support online learning. With the new HRDF schemes, employers can encourage their employees to attend online training courses to enhance their knowledge and skills. The schemes allow employers to claim online training fees and even support access to facilities and equipment for online training. There are four types of online training that are eligible for the HRDF schemes: Full eLearning, Blended eLearning, Mobile Learning, and Remote Online Learning, also known as virtual classroom learning.

As online training has grown significantly on a global scale over the past few years due to its flexibility and its increasing relevance in view of the current situation, this online training will be continued as one of the main training platforms in the future. In fact, the cost of online training is relatively cheaper compared to physical training and it can generate cost savings to the employees, employers, and the Government.

Conclusion

The Malaysian Government continues to emphasize the importance of upskilling and reskilling as one of key enablers in generating quality and skilled human capital to boost Malaysia's labor productivity. Most economic policies, such as Malaysia Plans, Industry4WRD, and the Malaysia Productivity Blueprint, have incorporated elements and implementation plans for human capital development where a significant portion of budgets are allocated for this purpose. The expansion of the HRDF Act 2001 to cover all economic sectors shows the government commitment towards building a skilled workforce in Malaysia.

Upskilling and reskilling programs should prioritize digitalization to cater to the pressing demand of the new business world, where connectivity and remote access to information has become more important for business sustainability. Basic fundamentals on technical skill theory must be emphasized to nurture creative and innovative workforces that are able understand the challenge and work toward finding an effective solution. Ultimately, the workforce needs to acquire both technical skills and soft skills for them to compete in this highly competitive global work environment.

Collaboration among the Government, training institutions, and industry associations needs to be strengthened to bridge the skill gap by innovating and developing training and upskilling programs

currently in demand. Government agencies must assume a vital role to promote, fund, and facilitate partnerships through various initiatives and agreements in gathering resources and expertise from diverse sources. Industry associations must provide direction on the industry skills requirement to training associations so that they can co-design and co-create effective training programs. In this regard, the sectoral nexus collaboration and upskilling approaches need to be emulated to benefit other subsectors in Malaysia.

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UPSKILLING AND RESKILLING: THE CASE OF THE BPO WORKERS IN THE PHILIPPINES

Abstract

Ample qualified labor supply, affordability, excellent infrastructure, good performance history, and government support have made the Philippines one of the top destinations of Business Process Outsourcing (BPO) companies. This paper looks into the training practices, enablers and obstacles to upskilling and reskilling of workers, and the effects of Industry 4.0 to 15 BPO companies operating in the Philippines.

The results show that major influences on the training practices of the 15 BPO companies in the study emanate from their headquarters and from their clients. Organizational culture, financial support and leadership support create an enabling environment for upskilling and reskilling BPO workers, while organizational, behavioral, and personal circumstances of BPO workers serve as obstacles.

In terms of the effects of Industry 4.0 on the BPO industry, some view it as an opportunity for the company to grow, but others see it as a potential threat of massive unemployment. Be that as it may, getting BPO workers ready for the impact of Industry 4.0 requires the concerted effort of all stakeholders, including the Philippines' national government, the BPO industry in general, the BPO companies in particular, and the BPO workers themselves.

Introduction

This study investigates reskilling and upskilling in the Business Process Outsourcing (BPO) industry sector, which refers to the practice of companies engaging an external service provider to supplement their business functions. This is important because of the dynamic nature of the industry, which is being transformed by the rapid digital transformation, sometimes referred to as Industry 4.0.

The outsourced services can either be technical or nontechnical, such as payroll, accounting, telemarketing, data recording, social media marketing, and customer support. BPO services can also be classified either into back-office services, which are internal business processes, or front-office services, which deal with the customers of the contracting company. For example, billing or purchasing are back-office services, while marketing or technical support are front-office services. [1]

Depending on the location of the vendor or service provider, BPOs operate either offshore, nearshore, or onshore, or combine the three to optimize processes. Offshore are those service providers that are located outside of the company's own country. Nearshore are providers located in a neighboring country. And onshore are providers operating the same country but may be located in a different city or state. [1]

As human capital is the main driving force to the success of organizations, the skills and knowledge of workers are crucial. Hence, this research aims to document programs and practices on upskilling and reskilling of workers in selected BPO companies in the Philippines, determine their gaps, and recommend strategies to better prepare workers for the changes and challenges brought about by Industry 4.0. Specifically, the study looks into:

- a. training practices of BPO companies in terms of their rationale, identifying employees for upskilling and reskilling, determining the type of training to offer, the training programs offered, delivery, provider, financing arrangements, training time, effect on wages, career and promotion of workers, and evaluation;
- b. enablers and obstacles to implementing effective and efficient upskilling and/or reskilling of workers; and
- c. effects of Industry 4.0 on the BPO industry in general and on BPO companies in particular.

Business Process Outsourcing in the Philippines

Through the years, the Philippines has become a country of choice for BPO companies. In 2005, it acquired a 3% share of the global BPO market. Since 2010, the country beat its closest rival India and became the global leader in the voice and call center sub-sector. [2] In 2018, places such as Manila (2nd), Cebu (11th), Davao (75th), Sta. Rosa, Laguna (87th), Bacolod (89th), and Iloilo (92nd) made it to the top 100 global outsourcing destinations as reported by Tholons, an advisory firm on global outsourcing and investments. [3]

The steady increase in the number of BPO companies operating in the country can be attributed to qualified labor supply, affordability, excellent infrastructure, good performance history, and government support for the industry. [4] For example, the Philippine government allowed them to register in ecozones that provide for special privileges like the exemption of payment from local and national taxes. Section 24 of Republic Act 7916 (the Special Economic Zone Act) only requires companies operating in the ecozones to pay a measly 5% tax of their gross income. [5] Filipinos also have the competitive edge because of their deeper understanding and appreciation of the Western culture and their multilingual skills, which serve the Hispanic, Japanese, and European clients well. [6] They are also inherently friendly and have high commitment to their work. Lastly, the Philippines is also considered an ideal country for investors because of its expanding and stable economy and, being located in the heart of Asia, it is accessible geographically. [7]

As one of the biggest and fastest job generators in the Philippines, the operation of BPOs is considered a sunshine industry. According to the Philippine Statistics Authority (PSA), there are 851 registered BPOs as of 30 June 2016. 96% are engaged in call center activities. 64.7% of that figure is a young workforce aged between 15 and 30 years old, and more than 54.3% are female. The majority, 99.6%, are full-time workers, and 33.2% work in the evening or graveyard shifts. [8] Table 1 shows that the biggest customers come from the U.S., though there is increasing demand for BPO services from Australia and New Zealand. [5]

FOREIGN DIRECT INVESTMENTS IN THE IT-BPO INDUSTRY, 2005-2011.										
Source	Percent Share to Total Equity									
	2005	2006	2007	2008	2009	2010	2011			
USA	86.0	81.0	73.2	67.6	73.1	80.0	76.4			
Europe	7.1	10.1	9.6	9.0	6.9	9.9	10.9			
Japan	3.2	3.2	9.6	16.2	14.3	3.6	3.8			
Australia/ New Zealand	1.3	0.7	0.5	1.1	3.3	2.0	5.1			
Others	2.4	5.0	7.1	6.0	2.4	4.5	3.9			

TABLE 1 FOREIGN DIRECT INVESTMENTS IN THE IT-BPO INDUSTRY, 2005-2011.

Source: Bangko Sentral ng Pilipinas. http://www.bsp.gov.ph/.

The BPO industry is also a major economic driver in the Philippines. With a steady flow of investment, the Oxford Business Group (OBG) reported that it has become a key component of the Philippine economy. [9] In 2016, revenues generated reached \$25 billion, which is much higher than the \$21.5 billion revenue in 2015. [10] From a mere 0.75% contribution to the GDP in the Philippines in 2000, it increased significantly in 2016 to 7%. As reported by Outsource-Philippines, in 2019, the contribution of the BPO industry in the GDP of the country stands between 12 and 15%. [11] By 2022, the consulting firm Everest Group projects a \$32 billion revenue for the industry to the country and an estimated 280,000 more jobs generated between 2020-2022. [12]

The growth of the BPO industry in the country has also created a ripple effect to the telecommunications sector, real estate, exports, and transportation. For example, growth in the real estate sector was evident as the need for office spaces and buildings increased. BPO employees on nightshifts have spurred the rise of businesses that operate 24/7. [13] The expansion of BPO operations outside Metro Manila, such as those in Baguio, Clark, Naga, Iloilo, Cebu, Bacolod, Puerto Princesa, and Davao, has likewise driven the real estate growth and economic development in these areas. Considered as the next wave cities, the presence of BPOs is seen to hasten urban development in these provinces. [14] Clearly, the impact of the BPO industry on the Philippine economy is undeniably significant and extensive.

However, with Industry 4.0, jobs are at risk of automation. According to the ILO, 89% of Filipinos who work in the BPO industry have a high risk of being impacted with automation as it has replaced the routine tasks of back-office work. [15] The BPO industry has been driven to utilize cloud technology and robotic process automation (RPA) to ensure overall business effectiveness and efficiency. As a result, the industry had to shift to a more specialized and knowledge-based BPO format known as knowledge process outsourcing (KPO). This time, having good communication skills in English is no longer enough, as services are now focused on fraud analytics, data integration, project management, research and development, mergers and acquisitions valuation, product profitability analysis, etc. [15]

In recognition of the need to produce a globally competent workforce, future proof its human capital, and maintain if not strengthen its comparative advantage, the Philippine Labor and Employment Plan (2017-2022) emphasized that intensifying skills training, upgrading, and retooling programs are necessary. [16] This is very evident in the BPO industry considering that a higher skilled workforce is vital to the expansion and diversification of the following BPO high-value services of its various subsectors: [17]

Contact Center and BPO subsector

- Engineering Services Outsourcing (ESO)
- Data Analytics
- Performance Management
- Legal Process Outsourcing (LPO)

Information Technology Services subsector

- Application Development Management (ADM)
- System Integration
- Automation Enablement
- IoT-enablement languages (e.g., Python programming)

Health Information Management subsector

- Preventive Health
- Remote Healthcare Management
- Provider Services

Animation and Game Development subsector

- 3D animation
- Augmented & Virtual Reality (AR/VR)
- Gamification Global In-house Center subsector
- Industry specific services for Telecom, Healthcare, Insurance and Pharmaceutical

With the COVID-19 pandemic, the government is optimistic that the BPO industry will fill the gap because of the decline in remittances from overseas Filipino workers (OFWs). Benjamin Diokno, Governor of Bangko Sentral ng Pilipinas (BSP), stated that the industry is stable as it is still operating even during the pandemic. [18] David Leechiu, Chief Executive Officer of the Leechiu Property Consultants (LPC), shares the same view. He explained that the BPO industry can save the country from the economic shock caused by the pandemic just like what happened during the global financial crisis of 2008-2009. [13]

Owing to its significant contribution to the Philippine economy, Republic Act 11469 (the Bayanihan to Heal as One Act) exempts BPO workers from mobility restrictions during the pandemic. This decision shows the government's overwhelming support for the BPO industry. In fact, BPO employees were accommodated in approximately 13,287 hotel rooms in the National Capital Region (NCR). [19]

Research method. The study utilized both primary and secondary sources of data. For the primary source, key informants were identified using referrals from the network of the researcher. Interviews were conducted with key informants currently employed in a BPO company and with knowledge of the programs and practices of upskilling and reskilling of their company. Data gathering from key informants ran from February to April 2020. Using an interview guide question, virtual one-on-one interviews were conducted through Zoom and MS Teams, or else the interview questions were answered through email correspondence. The following served as guide questions during the interviews:

1. What are the demographic and work characteristics of BPO employees?

- 2. What are the training programs being offered to them?
- 3. Is this formal or non-formal training?
- 4. What is/are the rationale(s) behind these training programs?
- 5. What information do you use to determine the type of training to offer?
- 6. How long have these training programs been in place?
- 7. Is there a regular evaluation of the effectiveness of the policy? If so, how often is it done? Is the evaluation internal or independent?
- 8. How do you identify groups of workers for upskilling or retraining? What are the characteristics of workers who receive the training?
- 9. What are the financing arrangements for upskilling or retraining?
- 10. Is there a cost-sharing arrangement? How is it done?
- 11. Do workers get time off from work to undertake the training or is all training in their own time?
- 12. Is the training undertaken offsite or onsite?
- 13. How do the training effect workers' wages, career and promotion?
- 14. Who provides the training for your workers?
- 15. Who evaluates the training providers?
- 16. What do you think are the effects of Industry 4.0 in your industry in general and in your company in particular?
- 17. What are the challenges/issues/concerns of your company with regard to Industry 4.0?
- 18. Are the current skills of your workers in alignment with future skill needs? If not, what are the barriers and the possible solutions to overcome them?
- 19. What skills do you think will be relevant in the future?
- 20. How does your company respond to the effects of Industry 4.0? How do you prepare your workers?
- 21. What is your strategic policy direction? What measures have so far been taken, and what are the plans of the company for the workers who will be affected?
- 22. What are the necessary and sufficient conditions for your strategies to be successful?

- 23. What are the enablers and barriers to effectively and efficiently implementing upskilling and/or retraining of workers? Are there social, legal, institutional, financial, or pedagogic barriers?
- 24. What other recommendations do you have in mind to better prepare your workers for the effects of Industry 4.0?

Other data obtained from the key informants are:

- 1. General profile of workers (age, educational attainment, average length of service in the company, etc.)
- 2. Number of workers (male, female)
- 3. Attrition rate
- 4. Usual reason for leaving the company
- 5. Number of years the company has been in the industry

In sum, 15 BPO employees who serve in various capacities under the Human Resources Department of their respective companies served as key informants. Those who participated in the study hold strategic positions in their respective companies as Vice-President, Senior HR Manager, HR Manager, Employee Relations Partner, Site Director, Chief People Officer, Recruitment and Sourcing Supervisor, Recruitment Director, HR Operations Manager, and Compensation and Benefits Officer. However, except for two key informants, most of them did not give consent to disclose their names and company identities in the study. In keeping with the request of the key informants and for consistency, all companies involved in the study are instead assigned letters for identity.

The following profiles of the 15 BPO companies are taken from their respective website.

TABLE 2			
BRIEF PROFILE OF 15 BPO COMPANIES IN THE STUDY.			
Company	Descrip	ption	
A	Provid differe hospit energy	es end-to-end business support from consultancy to managed IT services to nt industries such as media and entertainment, telecommunications, travel and ality, retail and ecommerce, banking and financial services, insurance, technology, y and utilities, healthcare, and automotive.	
В	A US-b over th	based global contact center that caters to the customers of their company clients ne phone through web chat.	
С	A US e client,	-commerce firm that is an in-house call center that exclusively manages the sales, and creative services of big fashion brands and large retailers.	
D	Has be nies. It ed bus pharm	en in business for more than 140 years with operations in more than 2,000 compa- was established in the Philippines in 2007 because of a merger. It provides integrat- siness solutions to automotive, industrial, retail and semiconductors, healthcare, na, and electronics, among others.	

E	A relatively young company with eight years of existence in the industry. Its client-centric paradigm promises to deliver state-of-the-art solutions and high-caliber services and prod- ucts to satisfy its diverse customers. It provides technical support, inbound and outbound services for sales and revenues, and multilingual services for all online marketing needs, etc.
F	With operations in more than 100 countries, the company prides itself on being the global leader in financial services. It first began its operations in the Philippines in 1961 and today it is the global service center that supports its various business needs in corporate and investment banking, commercial banking, equity, sales and trading, and treasury services.
G	A culture built on teamwork is at the core of this US-based company. Its Philippine opera- tions are considered its largest offshore branch in the world with highly trained and experienced staff. The Philippine team provides accounts receivable management in the US, end-to-end collection solutions to clients in different industries, customer relations management, customer service, sales, and retention support to one of the biggest hotel chains in the US.
Н	It has global operations providing accounts receivable management and student loan servicing solutions. Its clients range from those who belong to Fortune 100 corporations, educational and financial institutions, healthcare providers, government organizations, and small and medium enterprises.
I	It provides innovative rapid diagnostic tests for improved clinical and economic healthcare mainly on cardiometabolic disease, infectious disease, and toxicology. In 2015, it had already reached one billion tests for healthcare professionals and patients.
٦	A global company with more than 50,000 employees worldwide, it offers services to the clients of some of the world's most iconic brands. Communication is done either digitally, on the phone, or via chat or text to solve problems and give essential services. To cater to its customers from various parts of the world, interaction is made easier as they have employees who can speak in different languages other than English.
К	It prides itself on being a company that does more than just answer calls, social media, or emails. Instead, it focuses on building brands through customer care, e-commerce, sales, and fulfillment of their partners to represent their brand.
L	A contact center outsourcing services, it caters to healthcare, travel and entertainment, telecommunications, financial services, retail, and energy sectors. It offers domestic, nearshore and offshore solutions to its clients.
Μ	It has more than 4,200 site operations, employs 35,000 workers in nine countries with 12,000 of them based in the Philippines. It started business in the country in 2001 and now operates in selected six locations locally. It provides product and customer support solutions such as customer care, receivables management, product diagnostics, and repair services.
Ν	A Philippine-based shared service organization, it started operations in 2014. It serves its subsidiary firms based in the US and focuses on lead generation and data-oriented solutions and marketing strategies. It offers back-office support services to its various clients.
0	It has been operating in the country since 1997. It prides itself on being the first call center to operate outside Metro Manila. To date, it has over 15,000 employees who support its clients from various industries such as communication and technology, healthcare, transportation, financial services, and leisure.

For the secondary data source of the study, relevant literature from various websites of both the government and private sectors was used.

Guided by the research objectives, all data gathered was carefully analyzed, and commonalities, differences, and practices in reskilling and upskilling of the BPO companies in the study were all considered. The paper is descriptive in nature where themes, patterns, and ideas by the key informants were analyzed based on their content, discourse, and significance to the study. Given

the inherent limitation of any case study, findings cannot be generalized to represent the whole BPO industry in the country.

Data Analysis

Demographic Characteristics of BPO Employees. Based on the 15 BPO companies in the study, more than half of their employees are female whose ages range between 18 and 65 years old. They come from different educational backgrounds, from senior high school level to graduate degree holders. Most of them however are college graduates. Their average length of service in a BPO company is usually just over two years, although there are those who stay longer in the organization. Based on the companies in the case study, the attrition rate is between 2% to a high of 38%. The reasons given for leaving the company are because of compensation and benefits, competition in the market considering that there are a number of BPO companies operating in the country, better opportunities outside the company, career advancement and growth, career shift, schedule problems, opportunities for day shifts, personal or family reasons, health, company violations like attendance, inability to perform, and simply because their contract has ended.

Upskilling and Reskilling Praxis

The following narrative shows the commonalities and differences in the training strategies, programs, and practices of BPO companies in the study.

Training rationale. Cognizant of the fact that human capital is their best asset, BPO companies invest in upskilling and reskilling programs. The key informants explained that for employees, trainings: a) equip them with the right skills and knowledge needed for work, such as being able to correctly answer queries of customers and provide services on behalf of the client-company; b) are a function of their professional growth and development as they have a better chance for promotion; c) are essential to the onboarding process of new hires; d) keep them engaged; e) ensure that they are aligned with the culture of the customers they talk to; and f) ensure smooth leadership succession.

For organizations, training addresses the skills and capability requirements of the business, reinforces conduct policies of the company, and strengthens its internal promotion initiative. For both employees and organizations, trainings keep them updated with the current trends in the business, give them a competitive advantage, and significantly improve the performance of both.

Identifying employees for upskilling or reskilling. Generally, all employees receive training. These can be required like the annual compliance training, elective like online training courses, and can sometimes be limited to supervisors and managers. However, a refresher course or retraining is required for those who do not achieve the performance score or the desired goals and when there is a product or system update or upgrade. The performance of a worker, client request, worker potential, and role demand determine whether one goes through upskilling or retraining. The performance of workers is measured using the Key Performance Indicators (KPI) such as employee values, productivity, quality, and reliability. It is recorded using a monthly scorecard. For Company E, they developed a matrix to identify and measure the competencies and the level of skills per position. It helps them determine the worker's suitability for the role in terms of business acumen, leadership, creativity, communication, and analytical skills.

Workers that require training are also identified based on their roles. For employees requiring vocal-based work, it is based on performance, but for others it is based on training needs to comply with skills requirements. The result of a succession plan can likewise serve as the basis for identifying employees who need to undergo training, taking into consideration their competencies, experience, and performance. Immediate supervisors usually give the recommendation for upskilling in Company D based on the parameters set that will help them identify who has high potential. As part of their succession plan, those who undergo upskilling training should be ready to take on a bigger role in the future. Meanwhile, retraining is based on performance evaluation and performance improvement plans of the employee.

The need to undergo training can also depend on the need to transfer employees to another tier by skill level or when there is redeployment. Here, the account/program or campaign where employees belong is considered. Upskilling is necessary for more technical accounts where "tiered accounts" come in. Workers who belong to Tier 1 accounts (basic customer service, order taking, etc.) are considered for upskilling when they get profiled to Tier 3 accounts (technical, troubleshooting, remote service, etc.). Workers who receive upskilling have zero to little experience in technical account services or in being a technical service representative (TSR).

In the case of Company A, they offer Flagship Programs, Customized Programs, Special Programs, and External Training. Its Flagship Programs are offered to their high-performing employees who get a 3.5 rating or higher. Training under the Customized Programs is specifically requested by clients based on feedback and observation. The target audience of the programs are middle and bottom performers. However, if requested by their client, the training can be a sweep for all employees concerned. Special Programs like team building are offered to all except for external training since this is technical in nature, it is usually given to those in the IT Department.

However, training programs may not be targeted to any specific group of workers. Since training is defined from a global and regional standpoint, training programs are usually standardized to address the common needs of the specific regions and locations.

Determining the type of training to offer. The trainings offered depend on various considerations. It can come from the request of the company client, determined by the global leadership, the result of training needs analysis, based on job requirements or demand of accounts, information from the performance of the employee based on one's metrics score or key performance indicators, feedback from supervisors and managers, observation, results from customer survey, employee pulse survey, focus group discussion, and future needs of the organization.

If the request comes from the company client, the training program is implemented for all workers who support their particular line of business. For Company F, the global leadership usually determines the type of training to be offered. It is made available through an online facility and this depends on whether the employee wants to make use of the program or not. This is because training takes time to complete, which can significantly reduce the productive hours of an employee.

Another source of training information comes from the business leaders. They would request training to address the needs of their team in case there is no online training readily available. In addition to their new hire integration and product training, Company H offers refresher training for employees who have issues in meeting their production or quality goals.

When it comes to meeting future needs of the organization, employees identified to have potential to become team leaders or mentors undergo upskilling such as leadership and/or training on coaching.

Training programs. Both hard and soft training are offered. These are:

- a. Basic Customer Service
- b. Coaching and Mentoring
- c. CompTIA Trainings for IT (advanced Excel, Data Analytics and Big Data)
- d. Conflict Management
- e. Culture Training
- f. Effective Business Writing/English Communication (Written and Verbal)
- g. Personality Improvement
- h. Problem-Solving Skills
- i. Product/Account-related Training
- j. Six Sigma
- k. Team Leader/Leadership Training
- 1. Telemarketing

However, it is worth noting that this list is not complete, as some BPO companies did not disclose the training programs they offer to their employees and some key informants expressed discomfort in revealing this information.

Training delivery. Training offered is a combination of formal and non-formal. Company M gives non-formal training to its agent-level workers while support teams normally participate in formal training. For example, the IT Department would send its staff to undergo a Cisco Certified Network Associate (CCNA) training for certification. Front liners or agents undergo formal training in Company C while mid-managers in Company J undergo both formal and informal training. Since there is no certification needed for their in-house trainings, Company L considers their trainings offered to be of the informal type. Formal and intensive trainings are usually offered exclusively to supervisors and managers in Company F who comprise only about 20% of their total workforce. Otherwise, training is mostly web-based short-courses or online courses that can be taken at the employee's own pace.

Depending on the type of training, it can either be undertaken offsite or onsite. Training available within the organization is conducted onsite. But for those with certification or license requirements, it is usually offsite or even outside the country. Aside from the business need, offsite training given
to employees of Company G depends on the availability of funds. In the case of Company B, offsite training offered is a self-learning type where employees undergo training whenever and wherever they are. And these trainings are undertaken outside an employees' office hours. For their classroom type of training, a schedule is followed and this forms part of the employees' work hours.

Training provider. Trainers can come from within the organization or from third-party service providers or third-party vendors. Trainers may come from the company itself, from the head office abroad, or be sent by the company client. For those that require certifications/licenses or when there is no subject matter expert in the organization, external trainers are tapped or outsourced. These may be organizations such as CISCO, Salesforce, People Management Association of the Philippines (PMAP), IT and Business Process Association of the Philippines (BPAP), or government agencies like the Social Security System (SSS), PhilHealth, Bureau of Internal Revenue (BIR), among others. The Training Department oversees all in-house training.

Training financing arrangement. BPO employees do not pay for their training. It is their company or the client company that bears the cost. External training can also be funded by the company for as long as it is authorized or permitted by the company. Sometimes, employees initially pay for the training cost subject to reimbursement by their company.

However, there are instances where there is cost sharing. For example, if a team of IT professionals wants to attend training to meet a requirement for certification and this is not covered in the budget, they are then asked to justify the need for such training. Depending on the management's decision, costs can be shared 50-50 or the company can fully cover the cost of training. But in the latter case, there is a return service requirement. This means that employees need to work for a certain number of years with the company depending on the cost of training. The higher the cost, the longer the employee needs to stay with the company.

The practice of having a bond is implemented in Company I. Usually, training costs are subsidized by the company. However, for training outside the country, a bond is required. If the employees leave the company before the bond expires, they need to pay for the remaining months left based on the total amount of the bond divided by the total number of months they are supposed to render return service. This is also the case for Company A where external training is attended by their employees and costs are covered by a Training Service Agreement. The service bond is 12 months and costs between P20,000 and P100,000. For Company F, the bond is applicable to their tuition assistance program for employees who wish to undertake external upskilling. The degree taken must be related to the employee's current role or career developmental goal and the concerned employee must be of good standing. The amount covered is up to P100,000.00 subject to a 2-year bond. Otherwise, the employee shall reimburse the company for the expenses covered.

Training time. Time spent on training is considered worked days and is done within an employee's work schedule. Those attending training outside the company can take time off from work, but they are not considered absent from work. For online courses, employees can complete them at their own pace.

Training is also taken during an employee's own time. If it is an external training, an employee will use their vacation leave, which should be approved ahead of time. For general employees, online training is usually not counted as working hours each session is shorter in duration.

Effects of training on worker's wages, career, and promotion. Trainings can positively impact employees. Attendance and completion of trainings can result in better performance, which can lead to retention and promotion and hence increase in salary. Trainings become a prerequisite for promotion as it further establishes the credibility of an employee. In the case of Company A, completion of a training program has no immediate, direct impact on the wage of their workers. But those who were able to effectively apply their knowledge and new skills to their work have better chances of career progression and receive better prioritization for promotion. Training experience of employees is also useful in succession planning.

For Company M, training is part of an employee's annual Individual Development Plan (IDP), which is a career development initiative of their company. It does not entail wage increase as training is undertaken to build the competency of employees, particularly new hires.

Refresher training in Company H is expected to improve employee performance. If they manage to keep high scores, their annual appraisal will be the basis how much increase in salary they will get. High performance scorers are also able to enhance their credentials, which can work to their advantage when they apply for a higher-level post. Their company does not promote people by selection, as everyone can apply for the post to be fair, and to provide an equal opportunity to all employees.

Training evaluation. A regular evaluation on the effectiveness of all training initiatives is done regularly internally, people from the head office abroad, program leaders, talent executives, the Learning and Development Team/Training and Development Team/Training Department/Talent and Development Department, supervisors, and line managers.

Compliance training is evaluated every year in Company G while online training courses are being tracked per module accomplishment. Company O has various levels of evaluation range from internal effectiveness to external consultations. For Company F, it is done from a global and regional standpoint. Feedback is provided by Company D to the trainer and the content of the module is measured to determine its applicability to the work of the target participants.

The training and development team in Company N updates the effectiveness of the telemarketing training and updates modules depending on operational needs and available data. For the non-speaking roles, they look at the re-echo plan and its impact on productivity. The key informant for Company L explained that typically, in the BPO industry, if there is a low pass rate or high attrition in training, trainers and the training efficacy are reviewed and analyzed. Training heads usually conduct the root cause analysis and this is shared with the Operations Department.

Company K and Company C have disclosed that they have not yet conducted any evaluation on their trainings. Though they have a set of training that all workers need to undertake, there is no formal evaluation of their training programs. This is the same with Company H as they rely on the feedback from their customers, clients, other departments, or the employees themselves. If there is a complaint from a client, the company checks if a refresher training is necessary. There are times though when training managers evaluate the trainers or account managers observe the trainings by sitting-in, after which, feedback is provided. Aside from this, they do not have a specific scorecard for trainers.

Enablers and Barriers to Upskilling and Reskilling

Organizations must be resilient as change is inevitable. One way to achieve resiliency in organizations is by strengthening their learning and development program. Creativity and flexibility to adapt to internal and external changes in organizations depend to a large extent on the level of skills their human resources possess. Hence, creating an enabling environment in the organization that encourages and promotes reskilling and upskilling is essential.

In the case of the BPO industry, its business continuity is threatened by Industry 4.0. To ensure industry survival, its human resources should be at least a step ahead of the changes in technology, the changing demands of clients, and the changing processes or the way work is done. Considering this inherent nature of organizations, it then puts to question the enablers and barriers to reskilling and upskilling of BPO employees.

Enablers. According to Schermerhorn, organizational culture is the shared values, beliefs, and actions by members of an organization. [20] Behavior is controlled as it provides employees meaning and direction. [21] Given these, **organizational culture** can both serve as an enabler and barrier to upskilling and reskilling of employees. In the case of Company D, the culture of continuous improvement is embedded in their company. Their workforce is encouraged to engage in continuous learning through training and development programs relevant to the industry. Awards are also given to employees who made significant contributions to the company under their continuous improvement program. These initiatives of the company motivate employees to upgrade their skills. The rewards given to employees whether intrinsic or extrinsic provide a huge boost in their quest to self-develop.

Training and development undertakings need **financial support**. Having sufficient budget for these, and knowing that everyone can benefit from the funds, give employees the feeling that they are being valued by their company. **Leadership support** of course is of primary importance. Without this, no skilling program will prosper as leadership means guiding and directing the behavior of people at work. [22]

Barriers. Despite the threat of Industry 4.0 to the survival of the BPO industry, it seems that upskilling and reskilling its workforce is not a priority considering the numerous barriers it is confronted with. Foremost of which is the lack of financial support from the company where training is perceived as a cost rather than an investment. Management does not allot enough budget to truly train its workers. For example, to save on cost, training is done by in-house trainers instead of using the services of a licensed or certified agent. No budget is allotted for outsourced training. The lack of policy on the required trainings and the absence of a clear training program of the company are also barriers as they lead employees to complacency. As profit is the priority, the obsession to hit the target is always there, which makes it difficult for companies to spare time for training their employees. The Performance Improvement Plan of employees for example gives priority on meeting the metrics instead of thinking of ways to upskill employees. As a result, training is delayed as its schedule is continually moved to another date. The obsession to hit targets has also resulted in a lack of supervisor or leadership support to allow or encourage their staff to undergo training. A majority of managers do not actively offer training to their staff as headcount and certain productive hours will be lost if utilized by employees, especially the call center and back-office agents who keep the operations running.

Trainings can positively impact on an employees' career and can be a step towards promotion.

However, the **problematic rewards system** does not encourage employees to undergo training as they believe that they do not get anything from their efforts after all. The **workload of employees** is another barrier. As multi-tasking is practiced, the workload of employees inevitably increases. In the process, they have no chance to participate in training. It was also identified that the **lack of trainers** vs the number of agents that need training and the **insufficient physical resources** such as training rooms, computers, and unstable internet connection hinder employees from engaging in training and development programs.

For training offered by the company, the **social status of employees** becomes a determining factor of whether an employee will use it or not. Those who have a family of their own and with children to raise find it hard to attend training as this means extended hours of work to be able to complete the program. The **optional nature on using internal training** likewise contributes to the lack of motivation of employees to reskill or upskill themselves. This training is not proactively encouraged as it depends on the discretion of employees if they want to use the program or not. Thus, employees are not able to fully benefit from the internal trainings offered by their company. In the same manner, the **lack of necessary resources** like computers and internet connection at home hinder employees upskilling or reskilling themselves.

Another major problem is the **attitude of employees**. This is manifested by their resistance to change, lack of willingness to learn new skills or to assume new roles, their 'what's in it for me' mindset, the inability to adapt to new technology, and simply their lack of interest. As one key informant puts it, "Skills are learned, but the attitude of today's workers and their misplaced opinions and values about life and work make it difficult to convert them into key talents."

The **educational attainment of employees** also acts as a barrier for their upskilling and reskilling. Since an undergraduate degree is not required to be hired in certain positions in the BPO industry, the question on how they can address upskilling is a major concern because in the first place they lack the necessary foundation for them to progress.

Enablers and barriers to upskilling and reskilling can be generally categorized as both organizational and personal. These can either be the push or the pull factor as in the case of organizational culture. Hence, upskilling and reskilling of the workforce should be a common goal of both organizations and their human resources. Otherwise, it could spell the demise of the organization.

Effects of Industry 4.0

Based on a study done by the ILO on ASEAN-5, it was found that nearly three in five jobs in Cambodia, Indonesia, the Philippines, Thailand and Vietnam are at risk of automation. In the Philippines, it translates to a 49% share of total jobs in general but a high of 89% in the BPO/Call Center industry in particular. [15] However, in a forum on "Technology for Inclusion," Ambe Tierro, Accenture Philippines Senior Managing Director, was optimistic. She said that based on their research, only 16% of jobs in the BPO industry will be affected by automation because new technologies will create new industries and new markets. [23] The conflicting views on the effects of Industry 4.0 on the BPO industry are illustrated in Figure 1 below.



Low-skilled workers will be affected but at the same time it will generate new jobs. These opposing views on the effects of Industry 4.0 to the BPO industry are also manifested by the points raised by the key informants.

New technologies in the workplace can reduce turn-around time, can lead to optimization of tools and products, and can increase efficiency. For example, in Company D, recruitment processes will be faster. With automation, the average number of hours to process applicants, which is six hours at present, will be shortened significantly. Also, it is perceived that automating the system would mean a more objective scoring system for applicants. Though there are scoring metrics that guide recruiters, their subjectivity to a certain extent in their decision-making will always be a constant concern. In terms of big data and the use of analytics, these are seen to help companies improve productivity and better understand their industry, clients, and employees.

With regard to the issue whether Industry 4.0 will mean more job loss than job gain, Company A's key informant explained that the potential increase in job automation and use of artificial intelligence would mean that certain skills will grow in importance as technology becomes more stable. Company F's key informant believes that Industry 4.0 will not cause a major impact in the whole BPO sector unlike in the banking and financial sectors. However, service provider locations such as India and the Philippines will be affected, specifically those who perform administrative tasks and non-core functions of the business. These tasks will eventually be irrelevant as these can easily be automated. In fact, this is even the focus of streamlining in their company at present. According to her, this is not something new in the country. Certain groups and divisions are dissolved leading to the redundancy of employees as processes are streamlined or it was decided globally that the coverage is no longer needed. Likewise, Company O's key informant explained that job losses will not happen in the near future except in certain areas like tech accounts and self-service options, where redundancy will more likely take place. However, he believes that this is a far stretch in the realm of customer service.

The idea that Industry 4.0 will not affect the BPO industry is also shared by other key informants. Company C has already started using AI to receive calls and orders and that based on their experience, AI yields higher sales than their employees. However, the company would still like to maintain its workforce because customer satisfaction is high based on their survey. It was explained that robots cannot express empathy to customers and cannot replace excellent customer services. Most of their clients still prefer to talk to a real person who can resolve their issues and escalate concerns to proper venues. For Company K, it was disclosed that at present, they have not yet lost a client due to voice prompt automation services. Company I's key informant believes that their company will not be affected as their line of business is in healthcare. The effect on business is also minimal in Company N as they tend not to hire much for roles that are low-skilled and they have plans for providing services that require higher skilled BPO workers. Indeed, based on the projection shown in Figure 2, it is clear that employment in the industry will continue to increase until 2022.



This view however is not the same for the other key informants. It is believed that Industry 4.0 will greatly affect their industry in the next three to five years. Rapid advancements in technology will leave thousands of workers looking for a different job, as automation technology will replace a number of workers. For Company G, the automation in the customer service and technical support side of the BPO industry is already in place. They are slowly transitioning in response to the demands posed by Industry 4.0. For the past two years, their Skip Tracers are slowly transitioning to become collectors. Their company has decided to invest and develop technology that will be more efficient in looking for their clients' debtors. They have also removed manual dialing and opted for automation.

Company M's key informant disclosed that in a previous BPO company he was connected with, its workforce was reduced due to the development of a text to speech software. The software can perform voice recognition and can translate languages to English, meaning bilingual telephone service representatives were affected. In his current BPO company however, they have not yet experienced any threats from Industry 4.0. He sees it coming soon though, specifically, the reduction of customer service representatives as they will be replaced with touchscreen technologies and intuitive blueprints. This view is also shared by other key informants who believe that chat

bots will eventually take over basic customer service inquiries and other systems that can replace quality control. In fact, in Company D, this is the direction they are heading in as it is perceived to significantly improve operations and cost efficiency. As their company is now heavily investing in automation, this would create redundancy, and consequently, a reduction of their workforce.

Challenges/Issues/Concerns on Industry 4.0

With the inevitable effects of Industry 4.0 on the BPO sector in the Philippines, it certainly appears that the **threat of account pull outs** is the highest major concern. This is not farfetched as clients can readily transition to available digital reinventions in customer services capable, for example, of converting speech to text and artificial intelligence that could troubleshoot using algorithms.

Stiff competition for talent in some roles, particularly in IT, is another issue. This is underpinned by the **unavailability of talents knowledgeable in automation**. Company D is facing this challenge at present considering that they have a hard time looking for talents who can do automation. Their staff that are competent enough to do the work are thinly spread throughout the company, and they can hardly cope with the demands of their work.

Meanwhile, those who have been trained are poached or pirated by other companies. For example, the key informant from Company D shared that they were the first company to implement a centralized pricing system. Soon, other logistics companies happen to notice it, which led to the piracy of the head of that department, who in turn brought almost half of his staff to his new employer. The situation prompted them to talk to the other company requesting them not to pirate or hire staff from Company D. However, it was also disclosed that Company D pirates staff from their competitors. The practice of **talent piracy** is indeed common in the BPO industry making talent acquisition difficult and costly. As a result, the **retention of highly valued employees** becomes a huge concern.

In Company C, there is **no discussion on the effects of Industry 4.0** like levelling of expectations or if it should be included in the training program. Also, the company has no continuity plan. With no concrete actions taken yet to date to cushion the effects of Industry 4.0 and the lack of coordinated programs to address the effects of the COVID-19 pandemic on its employees serve as proof of the **absence of a continuity plan.** Employees should be well informed so that they are ready to face the consequences of these major events and make plans on their own.

Readiness of employees and applicants to Industry 4.0 is a challenge. For example, many of them do not know how the internet works. The reality is that not everyone is technologically savvy. This situation becomes more complicated with older employees. There are employees who know basic computer applications but when they undergo product training, which will expose them to several system tools, the **older ones have difficulty adjusting to the new system**. This is a relevant and urgent issue as it is projected as shown in Figure 3 that high-skilled tasks will be in high demand in the future while there is a significant decrease in the demand for low skilled tasks workers.



Reliability of the system that will replace workers is one concern. The question of whether it is a sound idea to replace workers with technology will always be present considering that the BPO is a service-oriented industry. In addition to the reliability of the system, in the case of Company E, the technology that is best suited to their requirements has always been an issue to them. Despite advances in technology, **not all tasks can be automated** such as critical decision-making.

Integrating privacy and data security of clients without compromising the various collection laws in the US was the concern raised by the key informant from Company G. The challenge of **engaging employees in the technology** the Company is developing in the event they fully automate their operations was also mentioned.

Looking at the majority of the population that is comprised of call center agents and back-office workers doing administrative tasks, the **outlook in relation to the future skills needed is not bright**. The focus of the business has always been improving the processes and providing better customer experience among others. However, taking certain developmental training is not even part of a general employee's performance evaluation each year.

Summary and Conclusion

Based on the 15 BPO companies in the study, it was clear that the main objectives of training programs are to address the skills and capability requirements of both the employees and the company. Undergoing training can result in improved performance and consequently retention and promotion. It can also boost their qualifications especially if the BPO employee is aiming for a higher post.

Employees undergo training depending on their performance, demand of their position, and if it is a requirement of the company client. Determining the type of training to offer is based on performance of employees, requests from clients, information from business leaders, and the future needs of the company. Training can either be formal or informal, offsite or onsite, and trainers may come from the organization or from third-party service providers. When it comes to time spent for training, it is considered working hours except for online training programs, which are short in duration. Training evaluation is done either internally or externally like those who come from the head office abroad. However, two BPO companies disclosed that they have not yet done any evaluation on the training programs they conducted.

Generally, BPO employees do not pay for the training they attend. However, cost sharing is also practiced particularly if the training program is not in the approved training program for the year where budget was already allocated. Depending on the arrangement, employees may pay 50% of the total cost of training or the company can fully cover the cost in exchange for a return service agreement where employees enter into a bond with their company. This means that should employees who are still under a bond resign, they shall pay the company for the training cost.

An enabling environment that supports the upskilling and reskilling programs of BPO companies has been identified by the key informants as requiring an organizational culture, financial support, and leadership support. However, barriers exist that stifle the upskilling and reskilling of BPO employees. These are: a) lack of financial support from the company; b) lack of policy on what training employees need to undergo; c) absence of a clear training program; d) the obsession to hit the target leaving employees no time to attend training programs; e) absence of supervisor or leadership support; f) problematic rewards system where employees do not see the benefit of undergoing training; g) heavy workload on employees; h) lack of trainers; i) insufficient physical resources; j) social status of employees where married employees find it hard to attend training as this means longer work hours; k) the optional nature us using internal training; l) lack of necessary resources like computers and internet connection; m) attitude of employees as manifested by their resistance to change or learn new skills; and n) low educational attainment of employees as some of them are not college degree holders.

Considering its employment generation capacity and its contribution to the Philippine economy, the BPO industry has become one of the most significant sectors in the country over the years. However, the emergence of Industry 4.0 is perceived either as a threat or as an opportunity for the industry. On the one hand jobs are at risk of facing the displacement of workers, while on the other new jobs are created. A paradigm shift is inevitable as jobs are transformed because of rapid developments in information and technology. In addition, the effects of Industry 4.0 are not just confined to job loss or job gain. There are far-reaching, deeper consequences in organizational structure, processes, systems, and operations, thus making upskilling and reskilling an urgent and significant concern.

Facing the challenges posed by Industry 4.0 is indeed an uphill battle to the BPO sector, made more difficult by the COVID-19 pandemic. Be that as it may, organizational resiliency is vital and the swift action of companies to enhance their human capital through upskilling and reskilling are at the heart of this matter. All stakeholders including governments need to act fast. Flexibility, adaptability, agility, and creativity are essential ingredients for BPO workers to thrive and BPO companies to survive and harness technology to their advantage.

Recommendations

To ensure readiness and cushion the impact of Industry 4.0 on all stakeholders, BPO companies and workers alike should future-proof themselves.

At the individual level, BPO workers should realize that they can keep up with the rapid developments in technology by **investing in education** through training and development programs. This will address the problem of job mismatch or the lack of competent workers who are ready to face the challenges Industry 4.0 brings to the BPO sector. As Figure 4 shows, upskilling and reskilling of existing BPO workers are necessary as jobs will be redesigned because of advances in technology.



A **change in mindset** is likewise imperative. There is no room for complacency at this point and no other way but to accept the changes happening. Industry 4.0 is a reality that beacons us to a big change. To make BPO workers still relevant in the future, technological know-how is not enough. The **right attitude, willingness to retool, and the drive for continuous learning** are keys for them to survive. Now is high time to also reflect, rethink, and explore other career opportunities. In this case, **career counseling** is essential. It is important to plan, look for other options, and prepare for the worst especially now that the world is facing the COVID-19 pandemic and many establishments have closed for good. As of October 2020, the unemployment rate in the Philippines is estimated at 8.7%, meaning that 3.8 million Filipinos who are 15 years old and over will be unemployed. [24]

At the organizational level, BPO companies should have a **solid strategic policy** to address the challenges of Industry 4.0. Planning and risk mitigation policies must be given priority. **Investing in human resources** through programs in reskilling, upskilling, and cross-skilling is extremely necessary. Having the right skills will definitely address the job-skills gap and ensure that there is a talent pool who can take on new roles. Related to this, the issue of talent piracy must not be

ignored. Employees stay in organizations not only because of compensation and benefits. For example, **there must be culture fit** between an organization and its employees to ensure that values are aligned. Organizations must also **actively carry out engagement programs**. Employees must feel that the company cares for them, that they are a team, and that there are programs where their concerns and various needs are attended to.

Beyond technical skills however, **continuously enhancing the soft skills** of employees should not be forgotten or undervalued. Communication skills, emotional intelligence, attitude, and other personal attributes of workers can spell success or failure of organizations. Aside from this, **investment in systems and facilities** are also needed for improved work performance and better service to clients.

Top management must **communicate with employees** for them to be informed as to the direction the company will take, the plans, the changes that will take place, etc. Engaging in real dialogue will help assure BPO workers of their status at work, make them feel valued by their employer, and most of all, amply prepare them for any possibilities.

Since individuals have different ways of coping with change and have different learning capabilities, programs that will **mentor and coach workers** who will engage in new job roles will provide them with adequate knowledge and facilitate learning and change. Related to this, having a **succession plan** in place is essential to ensure that there are competent human resources to replace those who resigned, retired or died. Considering that changes on how work will be done is inevitable, it is expected that organizations **redesign work processes** to optimize the benefits of new technologies and systems and hence achieve maximum organizational productivity.

Furthermore, it is crucial to have **top management support**. Not only this, **leadership must be equipped with the right personal and leadership skills** to be able to manage change and transition in the organization successfully.

However, given that both workers and BPO companies are prepared for Industry 4.0, the support of the Philippine government will ensure the survival of the BPO industry. The government can **fund training programs** that will develop the skills needed by the industry in the future. The Philippine educational system can also help prepare the future generations of workforce. **Curriculum revision with greater emphasis on science, technology, engineering and math (STEM)** in both public and private schools is in order without sacrificing the soft skills. **Collaboration with the academia through partnerships** in internship and apprenticeship can be harnessed for this. To be able to achieve a strong learning environment, **teachers must undergo continuous training** to make them competent to teach new subject matters. Moreover, to harmonize actions and be able to make concrete plans, the Philippine government, through its agencies like the Commission on Higher Education (CHED), Technical Education and Skills Development Authority (TESDA), Department of Labor and Employment (DOLE), and other relevant government agencies, must hold **continuous dialogue or consultations with various stakeholders**. Lastly, the Philippine government must **continue to protect the incentives the BPO industry enjoys** at present.

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RESKILLING THAI WORKFORCE: FROM CONCEPT TO ACTION

Introduction

The purpose of this research paper is to investigate the impact of automation on the labor market in Thailand. Automation means some workers will become redundant while others will need to either reskill or upskill. This paper takes a micro approach to learn from the experiences of a sample of firms as they develop strategies to reskill and upskill their current workforce and their plans, if any, for workers who would become redundant.

This research aims to seek answers to the following questions:

- 1. What are the drivers of change? (e.g., introduction of new technology, reorganization of new skills and work practices, etc.)
- 2. How do firms identify the necessary future skills?
- 3. Do firms conduct an audit of workers' current skills, and how do they do that?
- 4. How do firms identify which workers would need reskilling/upskilling?
- 5. How do firms organize the reskilling and upskilling of the selected workers? (internal or external, formal/non-formal/informal method, who pays, etc.)
- 6. What plan do firms have for redundant workers?

Reviewed literature tells us that robots and machines are replacing routine jobs in factories (manufacturing jobs), but now white-collar jobs in finance & banking, insurance, healthcare, and retail sectors are becoming automated as well. Some labor economists predicted that millions of people could lose their jobs and could be replaced by robots or AI. These technologies create many other new jobs that require different or new skills. At the same time, the current skills continue to be in demand. In building new skills and improving the current skills, reskilling and upskilling are becoming a learning approach (pathway) to enhance workers' skills and to ensure that they have opportunities to expand and continue their work.

In this regard, business leaders and human resource management teams in Thailand embrace the idea of reskilling and upskilling, and are working together to make it possible and productive. More urgently, the COVID-19 pandemic put huge pressure on companies to start extensively reskilling and upskilling their workforce to enable them to work in the so-called "new normal" working environment. There is an increased demand for new skills and technology due to the proliferation of remote workforces. As such, the role of learning and development teams is becoming more critical and crucial as they are expected to come up with strategic plans and roadmaps to fully develop and advance the workforce in order to meet a growing demand for new

skills and diverse competencies. In response, major efforts to retrain and improve the skills of employees at Thai firms, corresponding to both their current and future business needs, will require them to undergo organizational transformation to grow their businesses and to remain profitable and competitive as well. This movement also responds to the nation's industrial policy "Thailand 4.0" and the Thai National Strategy (2018-2037) on Developing and Strengthening Human Capital that focuses on the development of Thai people to become adaptable, skillful, and competent people. So far, reskilling has been widely mentioned as a process of human resource development, but the question is how to start the learning journey. Henceforth, the most important objective of this research is to address how the reskilling and upskilling concept is implemented and delivered in the workplace and practiced widely in Thai companies.

Context

The extent and nature of work are being forcefully and inevitably transformed by disruptors such as technological progress, robotics, automation, and ageing populations. According to a survey and research conducted by the World Economic Forum¹ (WEF) on the future of job reports under the title "Drivers of Change" [1], technological disruptions are seen as very significant drivers of industrial change. Using advanced technology, business leaders create a new business model and new forms of work. New categories of jobs and occupations will change the skill sets in most industries and lead to new management challenges. The World Bank's 2019 World Development Report on "The Changing Nature of Work" examines how technology shapes the relative demand for certain skills in labor markets. The report found that technologies and robotics enable firms to automate, replacing labor with machines to become more efficient and innovative in expanding the number of tasks and products. In view of workforce skills, the report stated that "Technology is reshaping the skills needed for work. The demand for less advanced skills that can be replaced by technology is declining. At the same time, the demand for advanced skills such as cognitive skills, socio-behavioral skills, and skill combinations associated with greater adaptability is rising" [2].

The changing demand for new skills challenges human resource teams and line managers to identify future skill sets needed for their work. Investing in people is the priority for top management to prepare the workforce with the skill sets required in both existing and new jobs. In this respect, workers gain new skills and leverage their existing ones through substantive reskilling and upskilling programs and activities. At the core of workforce preparation, leaders and HR professionals play a key role in creating a conducive environment for learning and development, and cultivating a new culture of learning, as well as to develop strategies and new ways of working to keep learning ongoing.

Current Status of Automation Adoption in Thailand

Adoption of Robotics Automation and Artificial Intelligence in Thailand

In Thailand, the rise of technological advancement has accelerated the pace of disruption to varying degrees by industries. Over the past two decades, technological uptake by enterprises in Thailand has mainly been in the automobile industry. Data from the International Federation of Robotics (IFR) [3] shows Thailand's annual acquisition of industrial robots in Thailand since 2012, as illustrated in Figure 1. It is estimated that the annual acquisition of robotics increased from 5,000 units in 2019 to 7,000 units in 2021.

¹ The survey covers the Association of Southeast Asian Nations (ASEAN), Australia, Brazil, China, France, Germany, the Gulf Cooperation Council (GCC), India, Italy, Japan, Mexico, South Africa, Turkey, the United Kingdom and the United States.



In addition, the Center of Robotics Excellence estimated that the number of robots used in Thai industries rose to 5,000 in 2020 [4]. Recently, service robots have also been used in accommodation and food services – preparing, cooking and serving food, including laundry robots, as well as in healthcare – hospitals use robot-assisted surgery and robots to distribute medicines or food to patients. According to the Institute of Field Robotics, King Mongkut's University of Technology Thonburi reported that robots and automation used in healthcare reached 40% in 2019 [5]. On a global level, with the increased demand for service robots, McKinsey Global Institution (MGI) [6] anticipates that the average automation potential will reach 90% by 2055. These statistics tell us that the use of robots and autonomous systems in the country will continue growing. The factors that drive the adoption of more automation include the cost of robots declining, making them more affordable, performance is improving, robots are becoming easier to install and easier to use, innovative applications, the creation of high-value-added products, satisfying consumer demands, and replacing low-skilled tasks [7].

The Thai government's push for the adoption of automation and robotic systems including robotics innovation is evident from its national strategies and policies. The Board of Investment (BOI) [8] has offered incentives under the Measures for Improvement of Production Efficiency for enterprises that upgrade their technology and machinery for manufacturing.² Incentives include exemption of import duty on machinery and raw materials used in the production of export products and corporate income tax exemption. Besides the tax policies to provide incentives for advanced technology adoption, there are other supporting factors such as research centers for automation and robotics,

² In order to be considered for incentives, enterprises must submit an investment plan for the development of the automation system being either partially or fully integrated into the production process. Eligible projects may be either BOI or non-BOI promoted projects. For more details of exemption of import duty and corporate income tax exemption and supporting factors, visit https://www.boi.go.th/upload/content/automation, titled "Thailand's Automation & Robotics: The Rise of Automation and Robotics Industries."

namely the Institute of Field Robotics (FIBO) and the Regional Center of Robotics Technology (RCRT), the Center of Robotics Excellence (CoRE) promoting collaboration among domestic and international networks, Automation and Robotics Programs where many universities provide support for research and development and human resource training as well as offer specific programs mainly focusing on robotics and automation engineering.

Impact of Technology on Employment in Thailand

Advanced technology has a great impact not only on labor-intensive manufacturing, clerical, retail, and services occupations, but also on highly skilled service sector occupations, such as in financial services, healthcare, law, and education & human resources. Automation, now going beyond routine manufacturing activities, has the potential to grow and expand at an exponential rate in service sectors, typically deployed in retail, financial services, healthcare, and hospitality. Business leaders have realized these technologies will generate significant benefits for businesses and users [9], such as enabling businesses to improve corporate performance by reducing human errors, improving quality and speed, lifting productivity and economic growth, reducing risks, income growth, and in some cases having fewer highly skilled laborers. As the President of the Electronic and Computer Employers' Association (ECEA), Thailand [10] stated: "Top management creates a vision and strategy for technology adoption. The adoption of AI and Machine Learning are firstly applied to important tasks; engineering quality and customer service, that have a great impact on business success. This includes tasks that show empirical results in operation performance, fast financial return, and customer satisfaction." The adoption and adaptation of automation technologies will affect almost all jobs to a greater or lesser degree, depending on the type of work and activities the employees perform. This creates concerns among workers about their job security. As reflected in Linda Gratton's statement [11] "The consequences of technology on work were becoming clearer, with some labor economists making predictions that millions of people could lose their jobs and potentially be replaced by AI or robotics." In November 2016, the Fiscal Policy Office (FPO), Ministry of Finance, Thailand, revealed that artificial intelligence (AI) has a great impact on unemployment in Thailand and ASEAN countries especially concerning low-skilled workers. With the increased demand for automation technology, in the next two decades, it is estimated that about 140 million workers in ASEAN countries could be unemployed. According to the International Labour Organization (ILO)'s assessment of automation risk of occupations in ASEAN-5, including Cambodia, Indonesia, Philippines, Thailand and Vietnam [12], around 56% of all employment has a high risk of automation. For Thailand, it is estimated that 44% of employment, or over 17 million jobs, will face a high risk of automation. Workers in the automotive & auto parts, electrical & electronics (E&E), and textiles, clothing, and footwear (TCF) sectors could be greatly impacted by technological advances. In contrast, occupations facing a low risk of automation include education and training, human health, social work activities, and information and communication technology (ICT).³ These jobs require significant cognitive and social intelligence, creative intelligence, and expertise in decision making, planning, or involving the development of novel ideas.

The outbreak of the COVID-19 pandemic impacted both businesses and labor markets extensively. Many businesses have no other option but to close their offices. Meanwhile, workers have experienced new ways of working, including working from home. This phenomenon put pressure on the companies to accelerate technological adoption, transform tasks, create new jobs, and

³ Among these three sectors, 73% of salaried workers in automotive & auto parts, 75% in E&E, and nearly 80% in TCF face a high risk of automation. The service sector, including shop sales assistants (991,501), food service counter attendants (623,800), cooks (606,000), and more than 800,000 office clerks and accounting associate professionals are also facing high automation risk.

upgrade skills. Workers have to develop their digital skills as well as task management to expand their works and deliver fast and accurate results.

So far, the debate on the impact of technological advancement and digital transformation has been polarized between those who see the potential job destruction and those who believe new technology can create new job positions. In fact, the reality is likely to be specific to the industry and the organization's ability to adapt to change. Job creation and the need for multi-skilled workers will increase due to the new forms of work [13], especially technologically skilled workers. In line with this, the World Economic Forum Report "The Future of Jobs 2020" [14], indicates that with the adoption of advanced technologies such as artificial intelligence, big data analytics, cloud technology, and highspeed mobile internet, "85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labor between humans, machines and algorithms." At the same time, there would be a significant shift in the quality, location, and format of new roles. Under this situation, some companies could reduce their full-time workforce and choose to use temporary freelancing workers or specialist contractors while others may extend their workforce to new productivity-enhancing roles [15]. In addition, in countries with aging populations like Thailand, a shortage of qualified labor is arising as more older workers retire. In this instance, some companies may hire qualified skilled people or young talent to fill vacancies, or those jobs may be replaced by automation. On the other hand, many businesses realize that they cannot hire all the new skills they need, while many industries still cannot find qualified candidates to fill a vacancy or new role despite an abundant labor pool in the market. On a similar note, the OECD Employment Outlook 2019 on the Future of Work highlighted that "while certain jobs and tasks are disappearing, others are emerging and employment has been growing. As these transformations occur, a key challenge lies in managing the transition of workers in declining industries and regions toward new job opportunities. They are also concerned about job quality" [16].

Currently, many industries are experiencing worker shortages or unqualified existing workers for new roles or higher-skilled jobs in the new business setting. Several companies put up plans to develop the required new skills, including retraining and improving existing ones. Indeed, some organizations in Thailand have launched reskilling and upskilling programs to close the skill gaps and expand the ability of their employees. This approach is not only good for morale, as employees can continue to have opportunities to work, but also economic imperative for future businesses. This important action calls for commitments from management teams to prioritize making people development strategies. At the same time, human resource teams must proactively identify the required skills and take steps to expedite the process of learning and development, focusing on reskilling/upskilling the existing workforce. Similarly, the workforce is required to make commitments to learn and develop themselves accordingly. In addition, at the national level, leveraging workforce ability for future needs and demands requires mutual commitments from both companies and the government to work together to make talent strategy a key priority and take quick steps now to facilitate, develop, train, and reskill/upskill the existing workforces in every sector and industry across the country.

People Development Strategies, Thailand 4.0, and the 20-year National Strategy

This section highlights the essence of Thailand 4.0, unveiled in May 2016, and the 20-year National Strategy (2018-2037) which will move the country towards digitalization. As the Minister of Commerce, Mr. Sonthirat, said at the seminar on the Fourth Industrial Revolution (4IR), initiated

by the Department of Trade Negotiation in Bangkok [17], "The Thai government has introduced the Thailand 4.0 policy with the aim of transforming the economy into a value-based one driven by technology and innovation. The policy also places emphasis on supporting dimensions including human capital development, especially technical capabilities to cater to the transformation, having a clear vision for future development... The Thailand 4.0 model focuses on production factors that are based on information and knowledge. The goal is to advance the economy using technology and innovation by building a smart city based on three dimensions: smart city, smart industry, and smart people." In short, the Thailand 4.0 policy places more emphasis on high productivity and innovation creation from advanced skilled workers to be able to cope with the 4IR. Figure 2 illustrates the Thailand 4.0 model's aim to build a SMART Thailand based on three dimensions: smart city, smart industry, and smart people. The smart city strategy aims to narrow the digital gap through the development of digital infrastructure, such as a nationwide broadband network. For smart industry, the focus is on the development of 10 targeted industries, five of which are existing industries (First S-Curve) and another five are new industries (New S-Curve) as a new growth engine as shown in Figure 3. As for smart people, policies are planned to enhance human capacity to create "super workers" with proficiency in advanced technologies and robotic automation, as well as upskilling and reskilling the existing workforce [18].



Figure 3 presents S-curve industries as a new growth engine. S-curve industries include those that already exist but need to further develop and become more competitive. The existing industries that already have a solid foundation include Next Generation Automotive, Smart Electronic Affluent, Medical and Wellness, Tourism, Agricultural and Biotechnology, and Food for the Future. The new S-curve industries are Robotics, Aviation and Logistics, Biofuels & Biochemical, Digital

and Medical Hub. These new S-curve industries will be developed to accelerate growth and support future competitiveness. Moreover, the Thailand 4.0 model will transform the country's traditional farming to smart farming, traditional SMEs to smart enterprises, and traditional services to high-value services, under the concept of "less for more" rather than "more for less." In addition, unskilled workers will be transformed into knowledge workers/high-skilled workers, by switching from buying technologies to making technologies.



Thailand 4.0 broadly complements the 20-year National Strategic Plan for 2017-2036. The 20-year National Strategy focuses on key structural, economic and social reform to end poverty and boost prosperity. Figure 4 depicts the vision and key strategies of the 20-year Thailand National Strategy. Through its vision of "stability, prosperity, and sustainability," Thailand will become a developed country by 2037 through various developments based on the sufficiency economy philosophy. The vision is designed to lift Thailand to greater added value, technologically advanced sectors and activities, in an increasingly innovative, knowledge-based economy [19]. The vision can be achieved through six national strategies. Developing and strengthening human capital is one of the key essential factors to propel the country's development in every dimension to become a developed country, driven by wisdom and innovation. Accordingly, the national strategy on human capital development in response to 4IR and digital transformation, places emphasis on promoting human development at all stages of life or life-long learning, improving learning processes to accommodate changes in the 21st century, and promoting conditions that encourage human capacity development.



Developments following this strategy will help promote modern innovators, thinkers, entrepreneurs, farmers, and so forth based on personal skills and abilities. Innovation and creativity require individuals capable of critical thinking as well as communication. Another interesting enabling factor is promoting the involvement of the public and private sectors, local administrative organizations, families, and communities in human capital management [20].

Reskilling and Upskilling to Enhance Productivity

It is safe to say that the key to Thailand 4.0 and Thailand's vision 2037's success lies in improving human resources by reframing and improving human resources' development of the right mindset and new skills both in and outside of schools. Therefore, every business sector must step forward together to engage in human capital development by instilling a culture of continuous learning and training, upgrading the capabilities of their people and equipping them with new skills. As the demand for new skills and skilled talents continues to grow, companies continue to invest heavily in reskilling and upskilling to develop and expand the new skills they need for their workforce. Meanwhile, employers should take advantage of the slow-down of the domestic and worldwide economy due to COVID-19 lockdowns to expedite efforts at retraining, reskilling and upskilling their employees to ensure that everyone has all the required skills to meet existing and future market demands. The importance of reskilling is reflected in the initiative called "the Reskilling Revolution" launched at WEF's meeting at Davos in 2020, in which both companies and governments pledged to reskill and upskill one billion people across the world by 2030 [21].

So, what is reskilling and upskilling? A review of publications and reports related to this matter suggests that reskilling focuses on improving the collective skill set of workers or giving new skills and capabilities so that workers can do a different job or take a new job for the future workplace. Upskilling focuses more on improving worker's skills or teaching additional skills to enhance a worker's abilities so that he/she can work within the same job [22, 23, 24]. Interestingly, Shah

(2019) in his paper on "Reskilling and upskilling to enhance labor productivity" explains: "Reskilling and upskilling are important processes for an inclusive, dynamic economy. Reskilling and upskilling are processes for human capital development...Reskilling is the process of learning new skills to enable one to do their current job more efficiently, for example, by using new tools or machines, or to acquire new skills to enable one to do their current job more efficiently, perhaps even in another occupation...It is not necessary to reskill the whole job, one can reskill for a particular task in a job...Upskilling is more about skill deepening, whereby one is learning more advanced skills than what they currently have. For example, a nurse aide may upskill to become a registered nurse." [25]

Both upskilling and reskilling are the process of learning new skills to achieve new thinking and better performance. To ensure that everyone has the right skills, it is crucial that training and development programs for workers keep up with new skill requirements. This research reveals that several types of skills are needed in Thai organizations alongside technical and professional skills. Generic skills are for workers to be able to use digital technology, while technical specialist skills are for those who take key roles in creating and operating digital properties and supporting digital infrastructures. Soft skills such as leadership, interpersonal communication, teamwork skills, analytical skills, and problem-solving skills are also required skills that complement technical skills. The report on Future of Jobs 2020 [26] reveals that emerging skills in high demand within Thai companies are analytical thinking and innovation, complex problem-solving, active learning and learning strategy, critical thinking and analysis, leadership and social influence, troubleshooting and using experience, resilience, stress tolerance and flexibility, and technology design and programming. In addition, self-management such as active learning, resilience, stress management, and flexibility are also being seen as demanded skills.

Learning is a vehicle for exploring and exploiting new knowledge, utilizing past experiences, adapting to environmental change, and enabling future success. Learning and Development teams (L&D teams) should work out how to best accommodate reskilling and upskilling activities to ensure the training and development effectively engages learners and delivers desired results. Adaptive learning, generative learning and personalized learning should be utilized to facilitate the reskilling and upskilling of workers. According to Senge [27], adaptive learning processes address the need to change and adjust business practice, while generative learning enhances the ability to create. In this sense, generative learning is inspired by the possibility of change in the future while adaptive learning space and positive learning experiences that reflect diverse activities, opportunities and support for learning. Personalized learning provides instruction tailored to an individual based on their interests, experience, preferred learning methods, learning pace, job role, or other factors [28]. In addition, learning tools and technology-based learning also play an important role in stimulating workers' desire to learn. As Marquardt [29] reiterates, technology is being utilized to optimize both learning and productivity.

In this undertaking, management must ensure that learning occurs continuously and becomes part of an organization's normal practices [30]. In such a working environment, individuals learn, apply, adapt, and learn again to meet skill requirements. Consequently, management and workers need to cooperate in driving change in the learning and development system, and focus more on continuous learning. The challenging task for companies is to develop strategies, policies, systems, and practices that promote and provide for learning at work [31]. Fiol and Lyles [32] suggest that strategy influences learning by providing a space and a boundary to learn, make decisions, and interpret the environment. In this connection, the OECD suggests that "skill policies should seek to strengthen initial learning, anticipate and respond better to changing skill needs, and increase the use of workers' skills" [33].

Considering reskilling and upskilling as a critical component of preparing workers for the future workplace, this research will explore and discuss how Thai companies translate the concept of reskilling and upskilling into action and what approach they use to reskill and upskill their workforces to build and expand employee skills critical for responding positively to changes and staying competitive in the Thai context.

Focus and Scope of This Research

The intent of this research is to present the impact of automation on the labor market in Thailand, and to learn from the experiences of a sample of firms on how as they develop strategies to reskill and upskill their current workforce. It is hoped that the information provided in this paper will serve as a guide that organizations (both private and public) can likewise use and apply in preparing and arranging learning and development to reskill and upskill their workforce.

The scope of the research covers the impact of technological advancement on people transformation in the workplace. People transformation is especially necessary at a time when automation requires new skills for new jobs and upgraded skills for current jobs relative to new business settings and demands. In short, workers are required to develop capabilities to keep pace with the fast-changing business environment and a new way of working as well. Capability development likewise occurs through the learning and development process, a core area of human resource (human capital) development. The importance of learning is shown in Dibella & Nevis's comment, which states that the most critical core competence is not what makes organizations successful today, but their ability to learn about and adapt to change so they can compete tomorrow [34]. Moreover, increasing individual, team, and organizational capabilities for future success requires organizations to explore and learn new methods while concurrently exploiting what they have already learned [35].

The concern for business leaders is how workers should prepare themselves to be ready for the evolving requirements of their organizations. The challenge for workers, knowing that many jobs are changing, is to update their knowledge and skills to meet the relevant demands in their new jobs. In view of human capital development, learning can facilitate change in the organization and act as a bridge for the organization to achieve its business targets. Crucially, leveraging workers' capabilities to meet the demands of new jobs and organizational success requires all workers to learn new skills and, at the same time, to reskill/upskill their current skills. As learning is vital to an organization's ability to obtain needed skills [36], workers are required to commit and engage in reskilling and upskilling themselves. Most importantly, learning must occur constantly and continuously, and become a part of the organization's normal practices [37].

Research Method

It is essential for this study to explore and gain insights into the information needs and information requirements on the impact of automation and the practices of reskilling and upskilling workers to improve productivity and increase efficiency in the Thai corporations. To gain these insights, a

qualitative methodology is employed as a research method for this study. The approaches of data collection include Focus Groups and In-depth Interviews. Focus Groups are an approach to generate members' insights into shared experiences and social norms through group discussion. In-depth Interviews are used to explore individual experiences, perceptions, and/or practices in details.

Data Collection

Focus Groups

Two rounds of Focus Groups were organized under the management of The Personnel Management Association of Thailand (PMAT). The objectives of the Focus Groups was to collect first-hand information and to understand (1) the current and future state of automation adoption in various industries, (2) the impact of automation on human resource management in the workplace and (3) training and development provided for their employees to develop new skills. Participants in the first Focus Group included experts from business sectors, public organizations and importers of automation and robots. Participants in the second Focus Group were HR executives from various organizations and academics from Institutions/Associations. (A list of participants in both Focus Groups is shown in Appendix 1).

In-depth Interviews

Besides Focus Groups, another method used to collect data is In-depth Interviews. The purpose of an interview is to explore individual ideas, perceptions, and life experiences on the research subject, and to get the details in depth from the respondents. The interviews were conducted with 11 respondents: six executives from institutions and public agencies and five HR executives from several companies of different industries/sectors. (A list of the interview respondents is shown in Appendix 1).

The questions for In-depth Interviews are meant to explore (1) What are the drivers of change? (2) How do firms identify future skills needed? (3) Do firms conduct an audit of workers' current skills and how they do that? (4) How do firms identify which workers would need reskilling/upskilling? (5) How do firms organize the reskilling and upskilling of the selected workers? and (6) What plans do firms have with respect to redundant workers?

The Significance of This Study

It is my hope that this study will provide clear and photographic learning from an insider's view as elaborated and illustrated herein below for future knowledge exchange as well as for the development of organization learning across industries in Thailand.

Outcome from Focus Groups and In-depth Interviews

1. Outcome from Focus Groups.

- 1) The current situation of the adoption of automation in Thai Industries
- All participants asserted that advanced technology like robots and AI is impacting most of the businesses, not only in manufacturing but also in other business sectors such as services, banking, insurance, and healthcare. These technologies are constantly changing the way they operate their businesses. By automating routine tasks, it helps to execute work processes efficiently with minimal or no errors.
- However, the decision to adopt new technology depends on the benefits gained from such technologies and the cost of investment.

- In conclusion, adopting automation/new technologies is essential. Especially when COVID-19 is spurring an adoption of new technologies.
- 2) The key factors contributing to the adoption of automation in industries (including manufacturing, automotive, healthcare, finance & banking, retail, and utilities) are as follows:
- Market competition: Competition in the market puts too much pressure on the businesses. It is difficult to survive in an environment where competitors use automation and innovative technology to optimize business processes, to improve product quality, and save time. In such a situation, companies have no choice but to use intelligent automation to streamline business operations and to improve the accuracy of all business operations in order to remain profitable and competitive in the market. As technological advances lead organizations to automate, many tasks will still be done by humans. In this situation, companies need a talented workforce under the newly designed work approaches. Therefore, skills development is an essential and urgent task to tackle.
- Increasing cost pressure: The cost pressures are from (1) a raise in minimum wages every year, (2) from waste resulting from manufacturing processes, and (3) from human errors. So, business owners decide to use automation and robots to perform repetitive tasks, to replace manual administrative and paper-based work that consumes time and energy. The automation of work processes helps improve productivity by reducing or eliminating errors and reducing variabilities, and cuts manufacturing costs as well. In addition, it replaces increasingly expensive people with ever cheaper machines.
- Some participants said 'even small errors in the workflows can be costly, we have to spend time and resources to repeat the same tasks.' As such, automation reduces human errors and saves time. Purchasing automation is costly at the beginning but it does save costs in the long run in terms of increased revenue and profits. This is consistent with McKinsey's report [38] that says "as robot production has increased, costs have gone down. Over the past 30 years, the average robot price has fallen by half in real terms, and even further relative to labor costs. As demand from emerging economies encourages the production of robots to shift to lower-cost regions, they are likely to become cheaper still."
- The semi-and-skilled labor shortage: Participants in this Focus Group posited that they are facing difficulty finding qualified workers. Causes contributing to the shortage of skilled labor include (1) Retirements, where the baby boom generation of skilled workers reach retirement age and there will not be enough new skilled workers to fill these jobs, so finding replacements is becoming increasingly difficult; (2) Foreign workers from neighboring countries return to their home due to job opportunity becoming available in their own countries. For example, the political stability in Myanmar after the second election in 2015 attracted entrepreneurs to invest in Myanmar and many new factories arose rapidly. These factories wanted experienced Myanmar workers who worked in Thailand to return and work for them. At the same time, Thai exporters were reeling from the domestic economic downturn and baht appreciation. This caused many factories in Thailand to close down. Moreover, both Thai and foreigners investors moved their investment to Vietnam. Inevitably, these companies have to replace human labors with robots and automations. In this situation, it is essential that workers have to develop and leverage their skills to become more efficient

workers in the new workplace. Workers who fail to adapt to changes and to improve their skills will find their jobs at risk.

- The government's tax incentive for digitization: The government established an economic corridor in eastern Thailand called "Eastern Economic Corridor" (EEC). The EEC is a mega project for the economic development of Thailand's Eastern seaboard, in supporting the country's ambitious industrial transformation under the Thailand 4.0 policy and 20-year National Strategic Plan.⁴ The Corridor consists of Rayong, Chonburi and Chachoengsao provinces. To support the EEC in achieving its successful transformation, the government has launched two measures: In the first measure, the government offers greater investment incentives. Investors in the EEC are eligible for income tax breaks for up to 15 years. In addition, offering a reduced personal income tax rate of 17% and a further 50% reduction in income tax rates over a maximum for five years. The second measure is to undertake infrastructure investment projects through public-private partnership platforms. The projects include the development of public utilities, transportation systems, logistics, human resources initiatives and the promotion of the use of digital technology. The big investors in Thailand have been responding positively to the government's policy, and dozens of global high-tech corporations have also committed to invest in the EEC.
- 3) Preparation prior to the adoption of automation in the corporations
- Communication from the management: The Focus Group members agreed that human resource professionals must take the initiative to partner with executives in communicating with and convincing their employees that automation and robots will not take over their jobs. Rather, it gives them an opportunity to develop new skills so that they can work in harmony with robots and AI. However, it is the workers choice to either learn new skills or find new jobs.
- Preparing workforces for the future: Organizations need employees who can carry out tasks such as automation system integration, system design, process design, and cloud computing, which are currently hard to find in the market. At the same time, they must help employees realize and respond to the coming new wave of change. They must develop their skills, improve work processes, discover new ways of working, and utilize new technology, as well as collaborate with others across the company.
- Demand for robots and automation: Businesses estimate the demand for robots and automation will increase, and are forecasting their potential in meeting the needs for quality products and services across the expanding market in the future. This valuable information helps businesses to evaluate the cost effectiveness of robots and automation for production and other tasks, and consider the workforce needed to work effectively alongside machines to keep operations running smoothly.
- The role of education in preparing graduates for the future: It is expected that educational institutions will play an important role in supplying qualified graduates for the diverse business organizations. Business leaders must urge educators to design curriculums relevant to the needs of industries and prepare students for both changes and the unknown. Especially in the fields of digital, technology, and engineering, the curriculum must contain the

⁴ The government's ambitious 20-year strategy to accelerate Thailand's development to a more advanced level is designed to strongly promote and support innovation, creativity, research and development, advanced technologies, and green technologies.

knowledge, skills and competencies (both hard skills and soft skills) that students need to master to enter the corporate world with confidence. Academic lecturers and tutors should apply teaching methods to encourage students' participation and interaction with others, create learning activities to motivate critical thinking and problem solving, and facilitate and coach the students' life skills and growth mindset. In essence, business leaders want creative/smart workers to help drive and grow their businesses.

In addition, the EEC project requires a workforce skilled in advanced technology to support the huge industrial plan and attract potential investors from both local and foreign firms. To meet the demand for skilled workers, vocational education institutions and universities are required to develop and produce more adaptable and highly skilled graduates.

4) Impact of automation on the workforce and human resource management

Here are responses from the Focus Groups:

- Clearly, automation, AI, and smart machines affect jobs and workforce. The Focus Group participants have been talking a lot about how many jobs are at risk of being automated. But machines taking over human jobs is not new. Automation has been taking place for many years in some expanding factories. Now, it is not only happening in manufacturing, but in other industries like services, hospitals, banking, etc. The fact is that most jobs being automated require different skill sets. The challenge is to make sure that workers who are displaced by machines can continue working in the new working environments. Companies must be responsible for helping their employees learn new skills.
- Automation accelerates a shift to a more skilled workforce. The adoption of automation and AI creates an awareness among employees that they have to prepare themselves for the challenges happening now and in the immediate future. They have to start developing new sets of skills demanded by new types of jobs and the environment where human and machine work in collaboration to achieve the common goal.
- However, some organizations are ahead of the game. For example, an HR executive from a bank said that with the rapid development and innovation in technology, the bank is facing many threats. These include greater competition in retail banking, such as a shift in customer behaviors using internet banking, mobile banking instead of going to the bank and a new financial service selling current and new deposit customers on wealth management services. To deal with these challenges, the bank needs to reform itself with a new vision and operating models. Banks redesign work in the branch such as setting up a Branch Academy so employees are reskilled to enable the smooth implementation of a new business model. Another example involved two companies from the manufacturing sector. They also need to redesign work and have to reskill their workforces with both technical knowledge and new skill sets. One of the two companies stressed that it is essential to also build up digital skills among employees so as to create a lean automated digitalization organization.
- There is a demand for new or different skill sets. Reskilling and upskilling are included in the learning and development strategy that transform the learning experience, developing workforce skills and capabilities to match the current business needs and emerging opportunities in the near future.

- Automation reduces labor disputes. In Thailand, there is a growing tendency for minimum wage increase requests each year. Therefore, the use of automation reduces the labor disputes on minimum wage and overtime pay. It reduces labor costs and related expenses. It also deducts operating expenses such as the cost of uniforms. In addition, there are no concerns or dispute over employee leave and its effects on the business operations.
- The negative impacts of automation in the workplace include loss of certain jobs and reducing the workforce. Employees, especially in manufacturing (production), who handle the day-to-day or routine work and cannot adapt themselves to the new work environment will lose their jobs. As for office workers, certain categories of activities are easily automated. The application of automation tools reduces manual work, increases work efficiency, and saves money on labor costs. As a result, there is absolutely a high tendency for workforce reduction and downsizing. This situation has happened in a finance department where job vacancies for day-to-day work are not being filled or replaced. New recruits are only for data analytic jobs.

5) Learning and development provided for employees to develop new skills

Participants reiterated that as organizations undergo some degree of business transformation triggered by technology or digitization, HR needs to work in partnership with the business leader and senior management team to ensure that the transformation is sustainable and successful. HR plays a vital role in workforce development as demand for new skills and capabilities must match the new business model and practices. In preparing the workforce for the future, it is important to rethink learning and development programs to help employees fit into the new roles. Promptly, HR needs to organize specific training to reskill and upskill employees, including technical and soft skills, so that they are well-prepared and ready to meet the future demand.

In summary, the responses from Focus Groups confirm that the adoption of new technologies is essential in all industries now and in the near future. The adoption of technologies in most companies is driven by market competition, cost pressure, skilled labor shortage, and government support to the businesses through tax incentives for automation and digitization. Besides, another important driver that will enable digital transformation in organization is people. Demand is growing for skilled and competent workers to keep the business running and to cope with the unforeseen challenges ahead. Ensuring employees gain new skills is critical to the new business model, so companies must start reskilling and upskilling their workers' technical/digital skills and cognitive abilities. In the light of all these, it is interesting to explore how companies organize such learning and development programs through the following In-depth Interviewing process.

2. Outcome from In-depth Interviews

The information from the Focus Groups is analyzed and formulated into specific questions for an in-depth interview with HR executives and academics from selected institutions/organizations.

Here are the answers from the respondents:

 Asking about the impact of automation on business and organization change, all respondents agreed that the introduction of new technology has a great impact on their businesses and workers. The new technology has disrupted both the business process and cost. They need to automate their work processes to be more agile, cost effective and improve quality and productivity. They have to reorganize the work practices and reskill/upskill their workers to enable them to work in a new environment. In practice, companies have undertaken a strategic review of their businesses to clarify the key areas of opportunities and challenges to make sure an organizational transformation will be achieved as planned.

- 2) In respect to the future skills needed, business leaders and HR identify two skill sets that will drive their business growth and success. The first skills set is the 'hard skills set,' which focuses on technical skills such as data engineering, data management, data processing and technical skills related to these jobs. The second is 'soft essential skills,' which includes growth mindset and thinking skills such as systems thinking, creative thinking, critical thinking and decision making, complex problem solving, collaboration, communication, and learning skills. However, the first and most important skill that employees should develop is the 'growth mindset.' The development of growth mindset will help employees to develop self-motivation, positive thinking, and a love for learning. In these areas, HR themselves need to acquire and develop these skills, even before other workers. Here is a quotation from one of the respondents: "We indeed identify the required new skill sets in response to a new business strategy, feedback from CEOs and top management, and also from our customers. We want to make sure that we have people with the right skills, be flexible and adapt to change, and most importantly, work in collaboration to grow our businesses."
- 3) Workforce reskilling and upskilling is considered very essential as a critical component of preparing workers to have the ability to confidently and quickly adapt to the changing work environment. A common approach to reskill and upskill the workforce starts with what skills and jobs are most likely to be affected by new technology disruption. In identifying skill gaps, management conducts an audit of the workers' current skills by having all employees perform self-assessment based on competencies required in both technical and soft skills. Results from the skill gap analysis will determine individual development, whether to develop new competencies or to broaden the existing skills. Both types of development will help employees' transition to take on new roles and responsibilities or to master the new skills they need for their new jobs today. Different companies may need different skill sets depending on their business strategy and the new skills needed.
- 4) In identifying which workers would need reskilling/upskilling, two HR executives shared how their approaches and practices as follow: "After gap analysis, we categorized people into 4 groups: (1) workers who are able to continue with the current jobs with less technology usage; (2) workers who are able to work well with new technologies; (3) workers who are also able to create new work processes or new tools using new technology; and (4) workers who are able to create new and better technology for the organization." Workers in the third and fourth group that already possessed digital skills will be reskilled to acquire new skills specific to do their current jobs or new jobs more efficiently. Workers in the second group will be upskilled to learn advance-level skills in order to do the current job better. For the first group, workers with less technical skills will be upskilled for a particular task to maintain their expected level of performance. However, if workers in the future. In contrast, some organizations conduct an audit of workers' current skill by using the "Digital Assessment" comprising (1) Digital (workplace) Maturity assessment to

assess 'the maturity of the organization against the vision of the future' and (2) Digital (workplace) Literacy to assess skill sets needed by the employees. Digital maturity is about digital culture, data driven, digital operations, and digital technology. Digital literacy is about awareness, creativity, and innovation, data access and data analytics, problem solving, ability of individuals to use digital tools and facilities, knowledge about digital safety and security, communication, and collaboration. Normally, companies hire a consulting firm to conduct audit assessments, analyze the assessment results, and propose recommendations for organization and people development.

5) In respect to implementing the education, reskilling, and upskilling of the selected workers, human resource teams take full responsibility in designing training courses and learning methods by organizing the reskilling/upskilling including conducting an evaluation and follow-up as and when required. Common learning methods found from the In-depth Interviews are a mix of formal and informal learning. Formats of formal learning include structured training programs, on-the-job learning and web-based learning or e-learning. Informal learning activities are self-directed learning, coaching and mentoring, networking, and learning through daily social interactions, such as participation in group activities, projects and problem-solving. Figure 5 summarizes the respondents' opinions about formal and informal learning activities for reskilling/upskilling their workforce.

FIGURE 5

RESPONDENTS' VIEWS REGARDING FORMAL AND INFORMAL LEARNING FOR RESKILLING/ UPSKILLING WORKFORCE Formal Learning or Informal Learning or Organized Learning Experiential Learning Self-directed learning Classroom training (self-initiative, self learning, Competency-based training and self study, self practice) development Social interactions On-the-job training/Job rotation (Problem solving, social networking, Web-based learning, online or storytelling, discussion, conversation computer-based learning/ in meeting, experience sharing, Learning programs on the observation) intranet, Learning Lap Coaching & Feedback process Learning from mistakes

Most importantly, a clear communication of vision, mission and strategy on reskilling/ upskilling should be executed officially and consistently. Business leaders together with HR teams should address and elaborate the purpose and benefits of new learning initiatives to make the workers understand the importance and needs for reskilling/upskilling and how they can cooperate to achieve a common goal. Communication methods that HR team used are "Department/Company-wide Town-hall meeting," "Meet and Discuss with top management," internal memos, and one-on-one conversation. Management encourages open communication, feedback, welcoming questions and suggestions. Open and honest communication gradually creates trust across the organization. In regard to communication, one respondent emphasized that management should communicate to all employees and be honest with them. He said, "Communication in the workplace is important. We build a communication team. We plan our communication and prepare for question-answer sessions. It is an interactive session where employees could share their views and ask questions. We, the management team, are transparent with them. If we don't have the answer or we can't answer the question, we honestly tell them that we do not have the answer now, and we will answer it later."

That being said, people want recognition and rewards for their efforts. In the implementation of reskilling and upskilling activities, management adopts 'reward and recognition' programs to raise employees' morale and motivate them to continuously learn and develop their skills. Recognition programs are designed to thank employees for their achievements. They are rewarded such as by rewarding a top performer in a training session, rewarding employees who demonstrate self-efficacy, rewarding learners and those who apply their acquired skills in their work, perform and get good results. Rewards and recognition have a positive impact on motivation and achievement.

Creating the learning environment is another factor that contributes to learning, reskilling, and upskilling in the workplace. The dominant contributing factors found from the Indepth Interviews are 'work environment,' 'leadership,' and 'culture.' An enabling learning environment refers to working conditions and practices that are likely to promote learning, meaning an environment where individuals and teams are able to explore and exploit knowledge, and to engage and interact in various activities to develop their capabilities. To generate a dynamic learning environment, managers apply a positive approach through activities such as 'coaching' and 'mentoring,' in which people are encouraged to talk and share their views. In addition, technologies for learning are provided and available to all employees any time they are needed. At the same time, leaders play important roles in building and influencing learning at all levels in organizations. When leaders involve themselves in the learning process, they are perceived as good role models for workers who want to do the same. Leaders must ensure that the learning process for reskilling and upskilling is on-going and smooth. Culture is also equally important. A culture that encourages people to learn is a culture of openness and where one is safe to speak, take risks to allow creativity, collaborate, and are not blamed.

6) Certain workforces may be made redundant at any time of organizational transformation. Companies always give justification or reasons before deciding to declare worker redundancy. Redundancy can occur if certain jobs are totally replaced by technology or worker's performance is below standard requirement or lack of needs for particular skills. With respect to redundant workers, companies provide a severance pay in accordance with the Labor Protection Law. For some cases, severance packages may include extended benefits such as medical expenses or health insurance for a given period. In addition, company must make sure that redundancy programs meet legal requirements, so it is important to consult a lawyer who can help management to manage the redundancy procedures correctly.

Information from Focus Groups and In-depth Interviews illustrate a framework for reskilling and upskilling workers in Thai companies as illustrated in Figure 6.



Figure 6 demonstrates a reskill/upskill framework deriving the information obtained from Focus Groups, In-depth Interviews, and document reviews. Reskilling/upskilling are all parts of a learning process. Both learning and development initiatives provide growth opportunities for employees across the company. They integrate people, culture, strategy, processes and technology to enhance employee capabilities and the effectiveness of the organizations. This is indeed a challenging task for both management and its employees to achieve. Individuals have critical roles to play in learning new skills or developing the current skills so they can do their jobs better. While leaders support and create opportunities and conditions to motivate, support, and enhance learning, employees as members of the organizations need to adopt a positive learning mindset, collaborate and interact with others to make learning to 'reskill and upskill' meaningful and rewarding. Human resource professionals create an open learning system to create space for social interaction, imposing a less defensive attitude and craft an environment that will encourage and support learning and innovation in the organization. Reward-based systems should be used to encourage positive and conducive behavior for continuous learning.

Ultimately, today, automation and advanced technologies have transformed both our lives and the world in which we live and work. Only organizations that can transform themselves into more intelligent, proficient beings [39] and agile entities will succeed and survive in the new environment where there is a constant shift in customers' demand for high quality products and services, convenience, time, and innovation. There is a major change in the workforce from manual workers to the new workforce that is "knowledge workers" [40].

Conclusion and Recommendation

In conclusion, this paper confirms that automation has a great impact on the labor market in Thailand. New technology, reorganization of work practices, government incentives for technology development and shortage of semi-skilled labor are drivers for change. Advanced technology changes the way businesses operate and the rearrangement of skill building programs and activities. The approach to reskilling and upskilling workers presented in this paper comes from participating companies, mainly in the banking industry, who have embarked on a reorientation of their strategic direction. They took initiatives to reskill and upskill their workforce by creating effective approaches to upgrading individuals' skills and capabilities in line with demands, starting by identifying specific skills needed for the future, and thereafter conducting an audit of workers' current skills and classifying them into different skill groups. Human resource teams then select workers for reskilling and upskilling. Various learning methods, formal and informal learning, are used to facilitate the reskilling and upskilling activities. The reskilling and upskilling initiatives have been growing in importance lately. Moreover, as the COVID-19 pandemic crisis has accelerated the adoption of technology and digitalized approaches, it has also sped up reskilling/ upskilling in many other organizations and expanded as part of their business strategy.

On the other hand, there are still some companies working on restricting and reducing their workforce by introducing further technology/automation and increasing the use of contractors for certain specific work.

Recommendations

- 1. Preparing the future workforce, organizations must create a clear framework and roadmap for comprehensive training and development in reskilling/upskilling their workforces. The framework is not just a collection of ideas, but rather a plausible plan of action for the future.
- 2. This study informs us that many organizations are reorganizing and working on reskilling/ upskilling for both skilled and semi-skilled workers. Still there are many low-skilled and unskilled workers who are practically illiterate and their jobs are easily automated. This leaves Thailand with the problem of what to do with the existing workers who cannot be retrained or upskilled, what to do about the gap, and how to transform them. It is recommended that the Ministry of Labor, a government body in charge of labor administration and protection, skill development, and the promotion of employment of people, should radically speed up reskilling of displaced workers and put them in proper jobs.
- 3. The long-term strategy for human resource development will depend on schools/ educational institutions and young people who will be the workforce for the future. It is the right time for businesses, government agencies concerned, and other key players to reposition themselves and invest in ideas and approaches to skilling young people for the future work. Most importantly, all stakeholders must work in a coordinated and committed fashion.
- 4. A glimpse of what is on the ground is that robots or machines do not have social skills and acumen per se. They can't empathize, they can't detect morale, and they can't envisage futures. What this suggests is that the more fully automated, the higher possibility of stagnation. So, we have tireless machines that can operate 24/7 efficiently and consistently

but they cannot envision or imagine their own demise as and when the business might change. Therefore, the biggest transition will be for leaders and managers to socially interact with and listen to the staff to connect and engage them in working together towards common goals, and to help them understand the business and every part of the operation to sharpen up their skills consistently.

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Appendix 1

In the first focus group, the participants are experts from business sectors, public organizations, and importers of automation and robots, as follows:

- 1. Chairman, Thai Automation and Robotics Association (TARA)
- 2. General Manager, Yaskawa Electric (Thailand) Ltd. (Automation Solutions and Support)
- 3. Research Director, Labor Development-Human Resources Policy, Thailand Development Research Institute (TDRI)
- 4. Advisor, Management Automotive Club (MAC)
- 5. Representative, Office of the National Economic and social Development Board (NESDB)
- 6. Vice President, Human Capacity Building Institute, the Federation of Thai Industries (FTI)
- 7. Chairman, Eastern Personnel Management Association (EPMA)
- 8. Committee member, Artificial Intelligence Association of Thailand (AIAT)

In the second focus group, participants are HR executives from various organizations, and academics from institutions/associations, as follows:

- 1. President, Artificial Intelligence Association of Thailand (AIAT)
- 2. Research Director, Labor Development, Department of Human Resources Policy, Thailand Development Research Institute (TDRI)
- 3. Chairman, Eastern Personnel Management Association (EPMA)
- 4. Director, Center for Manufacturing Automation and Robotics, Thai-German Institute
- 5. General Manager, Yaskawa Electric (Thailand) Ltd. (Automation Solutions and Support)
- 6. Senior Specialist, Strategy and Policy Department, Government Saving Bank (GSB)
- 7. Senior Executive Vice President, Human Resource and Administration, Mitsubishi Motors (Thailand) Ltd.
- 8. Senior Director, CT Bright, Charoen Pokaphan Group (C.P. Group)
- 9. Vice President Organization Effectiveness, PTT Global Chemical Public Company Ltd.
- 10. Head of PMS Office, Corporate HR Office, Siam Cement Group (SCG)
- 11. Advisor, Management Automotive Club (MAC)

12. Academician, Civil Society Empowerment Institute

In-depth Interviews

Besides the focus groups, there are in-depth interviews with HR professionals, executives from associations/institutions, and academics and public agencies concerned.

Associations and Institutions

- 1. President, Human Capacity Building Institute, the Federation of Thai Industries (FTI)
- 2. President, Artificial Intelligence Association of Thailand (AIAT)
- 3. Chairman, Thai Automation and Robotics Association (TARA) and the importer of automation and robotics
- 4. President, Electronic and Computer Employers' Association (ECEA)

Academics and related public agencies

- 5. Research Director, Labor Development, Department of Human Resources Policy, Thailand Development Research Institute (TDRI)
- 6. Senior Advisor, Policy and Planning, Office of the National Economic and social Development Board (NESDB)

Human Resources

- 7. Senior Specialist, Strategy and Policy Department, Government Saving Bank (GSB)
- 8. First Vice President, Strategic People Solutions Department, Human Resource Division, Kasikorn Bank
- 9. Assistant Chief Executive Officer, Human Resource Management, CP All Public Company Limited
- 10. Senior Executive Vice President, Central Huan Resource Management, Bangkok Dusit Medical service
- 11. Human Resource Manager, Good Year (Thailand) Public Company Limited

Appendix 2

Three levels of automation

Level 1: Robotic Process Automation (RPA) software is a powerful tool to perform manual, timeconsuming, rules-based office tasks more efficiently by reducing cycle time and at lower costs than other automation solutions. PwC estimates that 45% of work activities can be automated, and this automation would save \$2 trillion in global workforce costs.⁵

Level 2: Intelligence Process Automation (IPA) is a software automation tool that automates routine tasks such as data extraction and cleaning through existing user interfaces. It is an emerging set of new technologies that combines fundamental process redesigning with robotic process automation and machine learning. IPA promises radically enhanced efficiency, increased worker performance, reduction of operational risks, and improved response times and customer journey experiences.⁶

Level 3: Artificial Intelligence (AI) consists of multiple technologies that can be combined in different ways to sense, comprehend, act, and learn. The more cycles of sensing, thinking, and acting an intelligent machine goes through, the smarter it becomes. AI technologies are expected to impact business by increasing labor productivity by up to 38% and enabling people to make more efficient use of their time.⁷

⁵ Source: PWC. Organize your future with robotics process automation, July 2016. https://www.pwc.com/us/en/services/consulting/ library/robotics-process-automation.html, assessed on 1 June 2020.

⁶ Source: Federico B., Graeme N., Giambastista T., Rob W. The engine is at the core of the next-generation operating model. McKinsey Digital 2017. https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/intelligent-process-automation-the-engine-at-the-core-of-the-next-generation-operating-model, accessed on 28 May 2020.

⁷ Source: Mark P., Paul D. How Al Boost Industry Profits and Innovation. https://www.accenture.com/fr-fr/_acnmedia/36dc7f76eab44 4cab6a7f44017cc3997.pdf, accessed on 2 June 2020; Peter B., Daniel H., Holger H. Artificial Intelligence- How advanced analytics and smart machines will change the way we work 2018. https://www.mckinsey.de/publikationen/leading-in-a-disruptive-world/artificialintelligence-how-advanced-analytics-and-smart-machines-will-change-the-way-we-work#, accessed on 2 June 2020.

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