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FOURTH INDUSTRIAL REVOLUTION (FIRe): IMPACT ON EDUCATION AND SKILLS DEVELOPMENT

by

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ABSTRACT

The paper explains about the Fourth Industrial Revolution (FIRe) and its frontier technologies. It discusses FIRe's potential and perceived impacts on the nature of work, and the entire labor market, as well as the future skills required for the Philippines' labor force. It also identifies ways forward to improve the country's preparation for the full impact of FIRe, particularly in human capacity development, aside from strengthening social protection for those who may have difficulty to cope with the emerging disruptions.

I. INTRODUCTION

The emerging Fourth Industrial Revolution (FIRe henceforth)[1] poses a huge challenge to human resource development as it brings about rapid technology change, which, in turn, spawns new business activities, and/or changes the nature of work. In theory, technology affects jobs in three forms: (a) technology replacing human labor, (b) new jobs being created because of technology; and (c) jobs being complemented by technology. The over-all net effect of FiRe in the labor market and the economy, will clearly depend on which effect is strongest. Some outlooks suggest that more jobs will be created than lost from FIRe, especially in Asia-Pacific (WB 2019; ADB 2018). Others (e.g. Butler-Adam 2018) suggest that more jobs will be displaced by technology compared to the number of jobs that artificial intelligence can create. In this light, it is deemed critical to have a better understanding of the FIRe and its frontier technologies which is a useful first step in formulating any strategies and interventions that will enable workers to cope with the challenges and also, take advantage of the opportunities that FIRe brings. This essay aims to explain about the FIRe and its frontier technologies. It discusses FIRe's potential and perceived impacts on the nature of work, and the entire labor market, as well as the future skills required for the Philippines' labor force. It also identifies ways forward to improve the country's preparation for the full impact of FIRe, particularly in human capacity development, aside from strengthening social protection for those who may have difficulty to cope with the emerging disruptions.

What is FIRe and what are its frontier technologies?

Throughout history, industry has had three periods where radical improvements were made by veering away from established production methods to employing cutting-edge technologies. These improvements have led to upheavals in production levels. in improving the accuracy and precision of manufacturing processes, and in reducing the cost of labor, thus getting dubbed as an industrial revolution (Landes 1969). The first three industrial revolutions involved the use of steam and water power (in the mid-1700s), then electricity and assembly lines (in the latter half of the 19th century), then computerization (toward the end of the last millennium). Now, we live in the era of the FIRe, which is marked by technological breakthroughs. What makes FIRe a revolution is not the technologies themselves, because these technologies (e.g., robots, computers, wireless connectivity, or digital platforms) have been there for some time. What makes this FIRe era special is that humans are getting to use these technologies to interact with each other in a way that humans have not done before. FIRe builds on the Digital Revolution (i.e., the Third Industrial Revolution), which involved computerization. It introduces cyber-physical systems that enable technology to be embedded within societies and even the human body. According to Klaus

[1] Also referred to as Industry 4.0

Schwab (Founder and Executive Chairman of the World Economic Forum), the FIRe is fusing the physical, digital and biological worlds (Schwab 2016). Thus, FIRe is expected to create a smarter, more connected world; to affect all disciplines, economies, and industries; and to challenge ideas about what it means to be human.

While there is no universally agreed definition of frontier technologies that are part of FIRe, the technologies that have been most commonly identified as frontier include artificial intelligence (AI) and robotics, 3D printing, and the Internet of Things (**Table 1**).

Table 1. FIRe Frontier Technologies Identified by Different Organizations

OECD	World Bank	World Economic Forum	McKinsey Global Institute	Institute of Development Studies	MIT Technology Review 2018
Internet of Things	Fifth-generation (5G) mobile phones	Artificial intelligence	Mobile internet	3D printing	3D Metal Printing
Big data analytics	Artificial intelligence	Robotics	Automation of knowledge work	Collaborative economy tools	Artificial Embryos
Artificial intelligence	Robotics	Internet of Things	Internet of Things	Alternative internet delivery	Sensing City
Neuro technologies	Autonomous vehicles	Autonomous vehicles	Cloud technology	Internet of Things	Artificial intelligence for Everybody
Nano/micro satellites	Internet of Things	3D printing	Advanced robotics	Unmanned aerial vehicles/drones	Dueling Neural Networks
Nanomaterials	3D printing	Nanotechnology	Autonomous and near-autonomous vehicles	Airships	Babel-Fish Earbuds
3D printing (additive manufacturing)		Biotechnology	Next-generation genomics	Solar desalination	Zero-Carbon Natural Gas
Advanced energy storage technologies		Materials science	Energy storage	Atmospheric water condensers	Perfect Online Privacy
Synthetic biology		Energy storage	3D printing	Household-scale batteries	Genetic fortune-telling
Blockchain		Quantum computing	Advanced materials	Smog-reducing technologies	Materials' Quantum Leap
			Advanced oil and gas exploration		
			Renewable energy		

Source: ESCAP (2018)

Frontier technologies of the FIRe can potentially solve many problems related to making growth and prosperity and development more inclusive and sustainable, i.e., from attaining food security, to improving the quality of health care, to caring better for the planet.

Furthermore, in today's world, placing orders, paying bills, listening to music, getting a ride, getting directions, and monitoring one's health can be done from the palm of your hand, using

smartphone. One of the FIRe technologies powering smartphones is AI, which also works in the background to power a wide variety of applications, from autonomous vehicles and robots to voice assistants and shopping bots. To get even more specific: AI powers the autocomplete feature on your phone; it also powers the recommendations you get from the websites where you buy clothing, music, or household goods; and, it enables FB to recognize your face in a photo posted by a friend and to tag you in your friend's post.

Two other significant frontier technologies of FIRE are (a) 3D printing that allows you to make a tiny statue of yourself riding a rainbow unicorn, or to print a transplantable organ, in a process called bioprinting; and (b) the Internet of Things (IoT) which is about devices connected to the Internet, and trillions of sensors communicate with these devices, and with one another. The connected devices, working with the sensors, monitor things like building elevators, checking them for current status and possible problems (**Table 2**). Even more, they use AI to predict failures before they happen. IoT-based systems are under development to manage manufacturing supply chains, remotely monitor a person's health, safely drive autonomous vehicles, and measure soil properties to yield better crops. New technologies can penetrate nearly every aspect of our lives by layering these capabilities into the physical world around us.

Table 2. Specific Examples of Selected FIRe Technologies

FIRe Tech	Specific Examples
Robotics and AI	•robots for building cars, assisting in surgery, and even vacuuming your floor while simultaneously entertaining your cat •autonomous vehicles and drones, voice assistants and shopping bots •autocomplete feature on smart phone, recommendations in websites when buying clothing, music, or household goods •ability of fb to recognize your face in a photo posted by friend and get tagged, and facial recognition in your Iphone X
IOT	•devices connected to the Internet, about trillions of sensors communicating with these devices, and with one another. The connected devices, working with the sensors, monitor things like building elevators, checking them for current status and predicting failures before they happen
3D-printing	•make a tiny statue of yourself with the Pope •print a transplantable organ, in a process called bioprinting •print engine parts for cars, materials for houses, and more

Note: Authors' summary

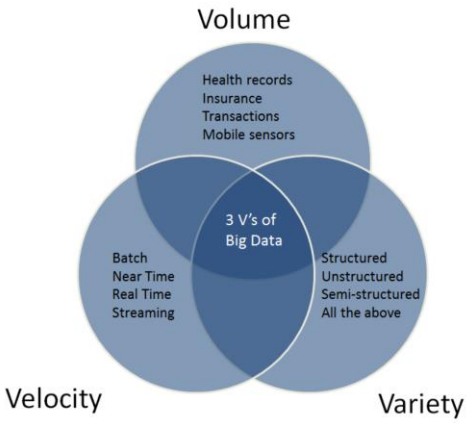
Another FIRe technology is big data, which can be thought of as the tsunami of various digital data by-products from use of electronic devices, social media, search engines, and sensors tracking devices (including climate sensors and global positioning system) as well as satellite imagery. The term big data was actually first used in mid-1990s in lunch conversations at Silicon Valley. The digital footprints we are leaving into the cloud is expanding at an exponential rate:

- Twenty-five years ago, the first SMS was sent. The world now sends 26 billion text messages every day—or 18.1 million every minute. We type 188 million emails, send 41.6 million messages on Fb messenger and Whatsapp, and enter 3.8 million queries into Google every 60 seconds.
- From the beginning of recorded time until 2003, we created 5 billion gigabytes (exabytes) of data. In 2012, data was reported to double every 40 months since the 1980s, with about 2.5 exabytes/ (2.5×10^{18} bytes) of data being created per day. That is, 5 exabytes were then being created every 2 days.
- In 2016, around 16.1 zettabytes of data have been produced — 1 zettabyte = 10^{21} bytes, enough to fill 80 billion 16GB iPhones (which would circle the earth more than 100 times).

20 exabytes were then being created every 10 minutes. By 2025, 163 zettabytes would be produced.

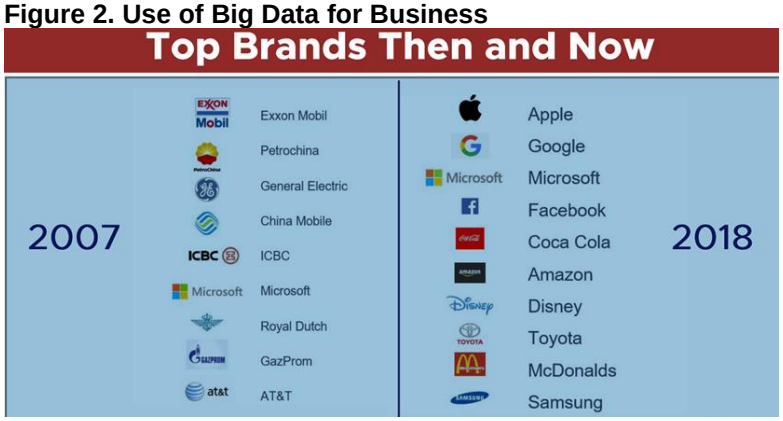
While big data cannot be fully defined, it is described by 3V's: (high) volume, velocity, variety (**Figure 1**); and there are now two extra V's: veracity and value. Business has been at the forefront exploiting the use of big data to understand customers, and customer needs, and develop products and services that fulfill these needs, from doing online purchases on Alibaba, to getting ride-sharing with Uber, Grab, or Angkas or accommodation rentals in AirBNB (**Figure 2**).

Figure 1. Features of Big Data



Source: Gartner (2001)

Figure 2. Use of Big Data for Business



Source: https://www.interbrand.com/best-brands/best-global-brands/2018/ranking/

Since big data has been arising out of digitization of business transactions, especially the use of platforms, business have been making widespread use of big data analytics. Some examples include:

- Predictive Modeling Association Rules and Collaborative Filtering: Amazon using its customer database to inform clients that "customers who bought Product A also bought Product B, and Product C."
- Sentiment Analysis: Social media data, such as tweets on Twitter, are scrutinized in terms of "polarity" (i.e., positive, negative, or neutral) of sentiments on a product.
- Text Analysis: In Japan call center, agents input "what customers say" and instructions are then given to call center agents on workstations on "what to say."

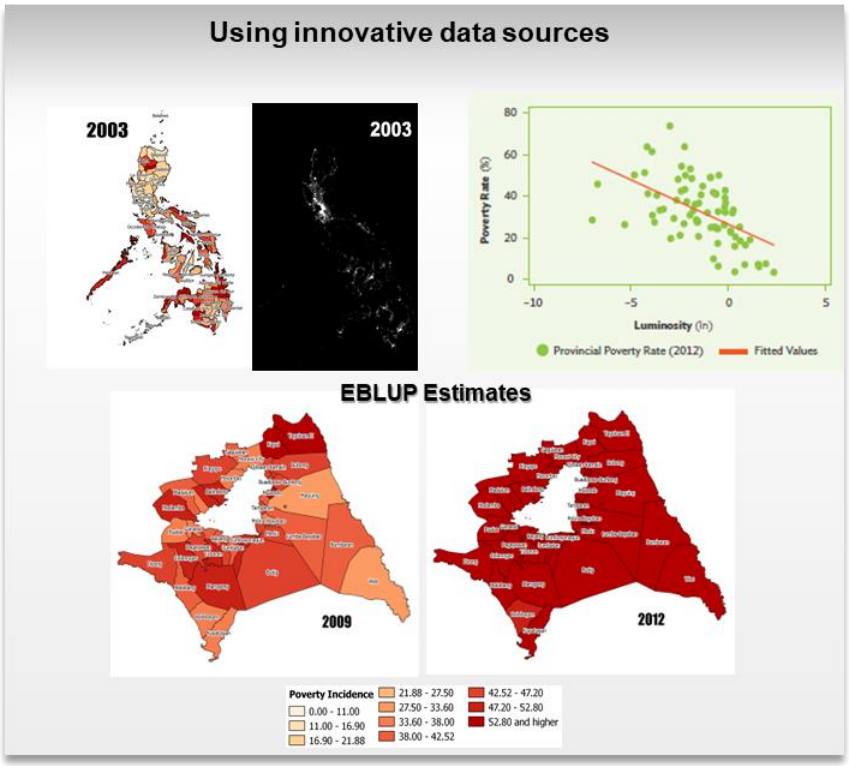
Big data applications have also been deployed for development purposes. In the Philippines, the PSA is starting to make use of integration of big data with traditional data sources. The PSA's poverty data is typically based on income data sourced from the triennial Family Income and Expenditure (FIES), and poverty thresholds representing the cost of basic food and non-food needs. Small area estimates have been developed that combine data from the FIES, with data on poverty correlates from population censuses, but even these small area estimates validation. In a presentation made at the 2018 World Data Forum, Albert (2018) showed that for Lanao Del Sur, estimates of poverty rated ranged from 40 to 50 percent in the period 2006 to 2009, but in 2012, the estimate increased to about 70 percent, a change of 20 percentage points. Here, it can be difficult to explain why poverty numbers changed considerably (**Table 3**). Nevertheless, big data, particularly luminosity data from satellite imagery, can be combined with the traditional data sources to improve data reliability, which, in turn, can help ensure better development outcomes (**Figure 3**).

Table 3. Example of Conventional Poverty Data

LANAO DEL SUR	2006	2009	2012	2015
Poverty Incidence	38.6	48.7	67.3	66.3
Coeff. of Variation	18.4	15.5	8.0	4.82

Source: Albert (2018)

Figure 3. Use of Big Data for Development Purposes



Source: Albert (2018)

Cognizant of the changing landscape in data, the Asian Development Bank (ADB) is assisting the PSA and the NSO of Thailand to integrate big data, specifically satellite data (and mobile data, subject to availability) with census and household survey data for yielding better quality small area estimates of poverty, employment and health conditions.

II. POTENTIAL AND PERCEIVED IMPACTS OF FIRe

a. Sustainable Development Goals (SDGs)

As mentioned earlier, various frontier technologies can solve many problems that range from attaining food security, to improving the quality of health care, to caring better for the planet. These concerns are part of the global aspirations to reach the Sustainable Development Goals by 2030 (i.e., from improving nutrition and healthcare, to reengineering transportation and supply chain management, to addressing issues about urbanization and climate change) [**Table 4**]. Even in the Philippines, the government has its own long term aspirations articulated in AMBISYON 2040. Smart systems are being used across homes, factories, farms, cities and nations to tackle many issues affecting the various goals and targets for achieving these long term national and global aspirations.

Table 4. Potential and Perceived Impacts of FIRe on SDGs

SDG	APPLICATIONS
Agriculture (SDGs 1, 2, 5, 8, 10 and 12)	Recent advances in image recognition allowed researchers to scan more than 50,000 photos of plants to help identify crop diseases at sites using smartphones with a success rate of over 99 per cent
Healthcare (SDG 3)	AI applications have been developed that substitute and complement highly educated and expensive expertise by analyzing medical images. 3D printing produce patient specific prosthetics, orthotic braces and customized medical implants.
Environment and climate (SDG 13)	AI and deep learning can help climate researchers and innovators test out their theories and solutions as to how to reduce air pollution

Source: ESCAP (2018)

b. Likely Unintended Consequences for the Philippines

While the FIRe will likely continue to bring a lot of good in the future, its technologies cause disruptions that carry some risks to our current ways of living. The FIRe frontier technologies can yield uncertainties and risks in their use (**Table 5**). Unintended consequences can result in the labor market causing technological unemployment, increased inequality, erosion of personal privacy, and weaponization of technology. The late physicist Stephen Hawking even suggested that AI provides an existential threat to humanity. Nobel laureate Joseph Stiglitz warns that current inequalities existing in society will become even larger as a result of the FIRe.

Table 5. Potential and Perceived Consequences of FIRe Technologies for the Philippines

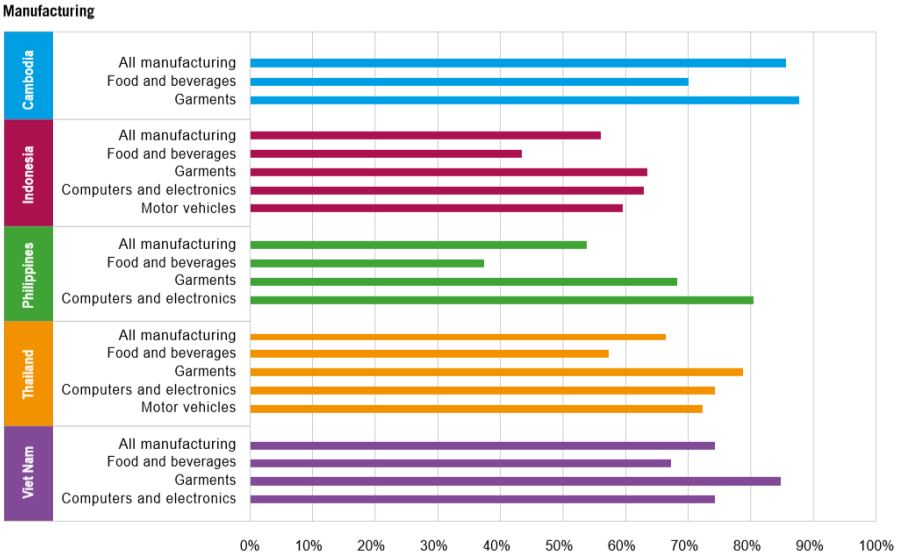
	Economic	Socio-Cultural	Political and Security
Robotics and AI	Technological unemployment Income inequality Disruption of traditional business models and global value chains	Rise of monopolies and oligopolies	Political polarization Instability Data and access security risks to automation Espionage, terrorism, autonomous warfare
Internet of Things (IoT)	Disruption of traditional business models	Erosion of personal privacy	Lack of trust in institutions Cybersecurity problems Data fraud
3D-printing	Disruption of existing business processes		Weapons proliferation Cyber-sabotage

Source: Albert *et al*. (2018)

c. Employment

A recent study ILO (Chang and Huynh 2016) suggests that nearly half (i.e., 49 percent) of our wage workers in the Philippines are at high risk of getting affected by AI, more women than men (i.e., 52 percent vis-à-vis 44 percent). Further those at high risk of getting affected tend to be those with low education who are in jobs that have repetitive tasks. In particular, those working as fishery laborers (580,000), waiters (574,000), carpenters (525,000), and office cleaners (463,000) face a high potential of being displaced. Across manufacturing, risks vary (**Figure 4**), and even in services. Around 89 percent of salaried workers in Business Process Outsourcing (BPO) sector fall into the high risk category of automation; many firms have begun to increasingly use chat bots and AI to replace services provided by person-to-person customer interfaces. Thus, BPOs are getting into other services that require critical thinking skills and complex decision making from its workforce.

Figure 4. Share of Wage and Salaried Employment in Key Manufacturing Subsectors at High Risk of Automation (In Percent)



Source: Chang and Huynh 2016

d. Changing Nature of Work

MIT Professor David Autor (2015) argues that the extent of machine substitution for human labor tend to be overstated by ignoring strong complementarities which increase productivity, raise earnings, and augment demand for labor. High risk of getting affected by automation does not necessarily mean loss of jobs. Consider the case of bank tellers. In the 1990s, automated teller machines (ATMs) were invented, and while there were concerns then that ATMs would displace the job of bank tellers, there are actually now more bank teller positions. These tellers are now taking on new responsibilities on customer relationship management. Thus, clearly, the nature of their work will change with repetitive tasks taken away.

Although computers substitute for workers in performing routine codifiable tasks, they also amplify the comparative advantage of workers in supplying problem-solving skills, adaptability, and creativity. Nevertheless, Autor (2015) also points out that even if automation does not reduce the quantity of jobs, it may affect the qualities of jobs that are available. This means that human capital investments are crucial and form the core of any long-term strategy for producing future skills that will enable workers to cope with the impact of technology on jobs.

According to the World Bank (2019), firms can grow rapidly through digital transformation, thus challenging traditional production patterns. Digital platforms enable firms to reach more people at a faster rate. Technology is changing the skills (e.g., complex problem-solving, teamwork, and adaptability) that employers seek. Moreover, how people work and the terms on which they work is changing (e.g., short-term work, online platforms). People may not need "job security" in the gig economy, but there may be a need for "income security." There are strong prospects of some jobs being replaced by technology, especially the jobs that have a lot of repetitive codifiable tasks. The classification of jobs is also rapidly changing (e.g., with AI and machine learning, what is not "codifiable" today may be "codifiable" tomorrow). But some jobs, especially those that involve a lot of soft skills, appear to be less at risk, at least for now (**Table 6**).

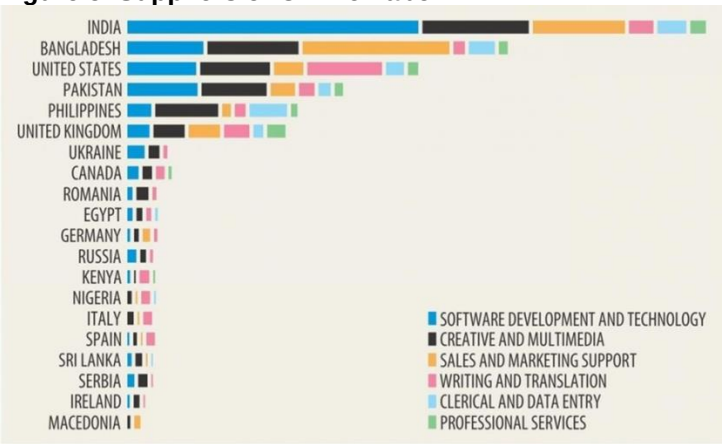
Table 6. Jobs at Risk and Safe (for Now)

10 jobs AI will replace	10 jobs that are safe… for now
Telemarketers (99%)	HR Managers (0.55%)
Bookkeeping clerks (98%)	Sales Managers (1.3%)
Compensation and Benefits Managers (96%)	Marketing Managers (1.4%)
Receptionists (96%)	Public Relations Managers (1.5%)
Couriers (94%)	Chief Executives (1.5%)
Retail Salespeople (92%)	Event Planners (3.7%)
Proofreaders (84%)	Writers (3.8%)
Computer Support Specialists (65%)	Software Developers (4.2%)
Market Research Analysts (61%)	Editors (5.5%)
Advertising Salespeople (54%)	Graphic Designers (8.2%)

Source: https://blog.hubspot.com/marketing/jobs-artificial-intelligence-will-replace

Disruptions in business models and in the labor market are both good news and bad news for those in businesses and our laborers. Good news because technological advances always create new jobs such as Grab and Angkas drivers, Airbnb hosts, social media influencers and even online paid trolls. New information on online jobs (see **Figure 5**) suggests that the Philippines is the fifth largest supplier of online jobs (Kässi and Lehdonvirta 2018). But the changing labor market is also bad news because new jobs are different from the jobs that have been displaced, and they require current (and future) workers to learn new and future skills.

Figure 5. Suppliers of Online Labor



Source: Kässi and Lehdonvirta (2018)

LinkedIn, in its Future of Skills 2019 Report (LinkedIn 2019) suggests that the top 3 skills supplied by Philippines are (i) social media marketing; (ii) frontend web developing 3. human centered design, which clearly are in the creative industries, which we should start monitoring (**Table 7**). The challenge for PSA to develop similar statistics, and monitor more closely the digital economy.

Table 7. Top Skills in the Philippines

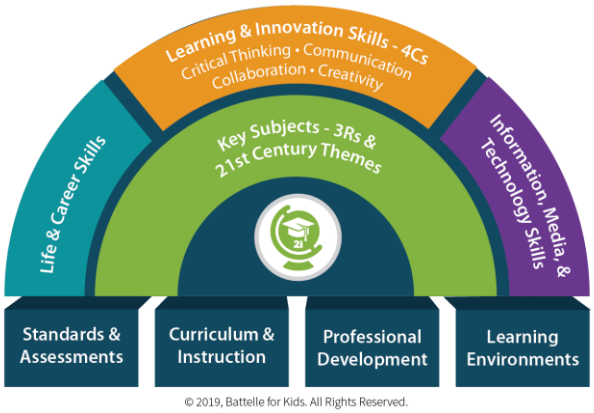
Top Skills in Phils	What do professionals with this skill do?	Demand VS Ave **	Top 5 Industries
1. Social Media Marketing	Promoting products and/or services through social media platforms to achieve business goals	4x	Marketing & Advertising Internet IT and Services Outsourcing/Offshoring E-learning
2. Frontend Web Developing	Converting data to a graphical interface to build websites or web apps	13x	IT and Services Computer Software Outsourcing/Offshoring Internet Financial Services
3. Human Centered Design	Developing solutions to problems with a deep focus of understanding the human perspective in all steps of the process	5x	IT and Services Marketing & Advertising Computer Software Design Internet

Source: https://business.linkedin.com/talent-solutions/recruiting-tips/future-of-skills-for-asia-pacific-2019

e. Desirable Characteristics of Human Capital

Since there are uncertainties about the future, it is deemed important to think of the specific characteristics that our workforce must have. While we cannot name all the new jobs in the next five to ten years, but we have a sense of what they will be like and what we must do to reskill the current workforce, and to future proof our future workforce. Technical skills, especially basic skills on the 3Rs (reading, writing, and rithmetic) are clearly important, as well as soft skills on the 4Cs (i.e., **C**ommunication; **C**ritical thinking and problem solving, i.e, including self-management, planning, and organizing; **C**ollaboration, i.e., team-work; and **C**reativity and Innovation, i.e., including initiative) are important to make our human resources flexible (**Figure 6**).

Figure 6. Desirable Soft Skills (4Cs)



Source: http://www.battelleforkids.org/networks/p21

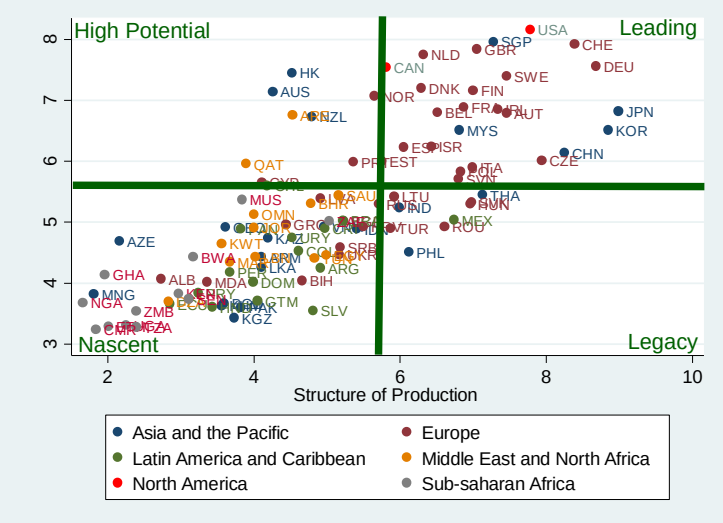
All workers especially in the Philippines should be trainable, creative and adaptable given the rapid and still emerging changes in the labor market. Part-time and self-employment are integral components of the emerging labor market; thus, policies should start getting out of paradigms based on ensuring job security, and move toward ensuring income security. Employees who are stuck in manual and clerical works will likely be laid off if they fail to equip themselves with future skills. Also, workers will likely keep moving from one work engagement to the next (with minimum costs). Many may even have a number of careers. EdSurge, a LinkedIn executive, claims that people will likely change careers 15 times over their lifetimes.

f. Innovation System

As far as our current innovation ecosystem, we have to start carefully looking into drivers of innovation. The World Economic Forum (WEF) has assessed the level of preparedness of 100 countries, looking into various aspects of the current structures of production, as well as the drivers of production. The seven ASEAN countries included in the WEF assessment are spread across three different archetypes: Leading— Malaysia and Singapore; Legacy—Philippines and Thailand; and Nascent— Cambodia, Indonesia and Viet Nam (**Figure 7**). Countries like Singapore and Malaysia, together with China and several rich economies, are assessed to be leading in preparations, and rightly so given all their prior investments in their respective innovation ecosystems. As a legacy country, the Philippines is found to have a strong production base today, but it is at risk for the future due to weaker performance across drivers of production, which include technology and innovation, human capital, global trade and investment, institutional framework, sustainable resources, and the demand environment. These are consistent with recent data on the Global Innovation Index that puts the country at 54th out of 129 economies (Cornell University et al. 2019). This is a rise in the global rank by 19 spots compared to the previous year's rank, but partly on account of methodological changes. Out of eight ASEAN member-states assessed with the GII, the Philippines ranks fifth, behind Singapore, Malaysia, Thailand, Viet Nam, but ahead of Indonesia, Cambodia and Brunei. The specific components of the GII that give the Philippines a relatively low rank in innovation (compared to ASEAN member states) include our market sophistication, institutions, human capital, and creative inputs. The country persists in poorly performing regarding ease of starting a business, the regulatory environment (particularly cost of redundancy dismissal), ease of getting access to credit, ease of protecting minority investors. Further, the Philippines spends very low on the education sector (at less than 3 percent of GDP), and the country has had a low number of Scientific and technical publications.

We have to get out of the mindset that we can leapfrog in technological advancement. Innovation does not happen overnight, and requires especially human resource investments for people to get into science, technology, engineering and mathematics (STEM) careers, especially science and research. Investments in Research and Development (R&D), hard and soft infrastructure, as well as capacity development of human resources and institutions are complementary factors for improving innovation ecosystem, i.e., ensuring inclusive development and for enhancing our readiness for future of production. We should learn from the experience of other countries (e.g., China's HR investments in 1978 and Singapore's Skills Future).

Figure 7. Drivers and Structure of Production



Source: WEF (2017)

We have to recognize the complementarity of innovation and competitiveness, aside from economic activity and productivity. Innovation is widely regarded as a major driver of economic output, productivity, and competitiveness. However, not all firms innovate in the Philippines (**Table 8**).

Table 8. Findings based on Previous Surveys*

Indicators	Philippines 2009 SIA	Philippines 2015 PIDS	Philippines 2015 World Bank Enterprise Survey	All Countries 2015 World Bank Enterprise Survey
Percent of firms that introduced a new product/service	37.6	30.7	32.9	36.6
Percent of firms that introduced a process innovation	43.9	30.6	40.9	34.2
Percent of firms that spend on R&D	40.3	26.7	21.9	16.9

*Authors' summary

III. WAYS FORWARD

a. Preparing the Ground (Education)

Borrowing the analogy articulated in a report of the World Bank on Innovation (WB 2010), government should be like a good gardener, that "prepares the ground" (i.e. building up human resources); "fertilizes the soil" (i.e. boosting R&D); "waters the plant" (i.e., providing financial

support for innovation); and "removes weeds and pests" (i.e., removing regulatory, institutional, or competitive obstacles to innovation.

Skills and competencies developed in school should be like LEGO blocks which can be used to create different figures using the same building blocks. Learners should not only be given technical but also soft skills. Given that production systems are evolving with technologies, a key characteristic of education and human capital development is continuous learning. There is a need for lifelong learning and continuous training and retraining. The only way to keep up is to continuously learn, unlearn, and relearn. A key skill is "learning how to learn." The pedagogy should go beyond transmitting knowledge into encouraging reconstruction of knowledge.

The World Economic Forum WEF (2015) lists and describes future skills required and clusters them into three groups, namely, (a) foundational literacies, (b) competencies, and (c) character qualities.

b. Ensuring Quality Learning for All

In the Philippines, the introduction of the K to 12 Program through the Enhanced Basic Education Act of 2013 (RA 10533) has provided the country the mechanism to radically change basic education. But are these changes enough to prepare our future workforce for the jobs of the future? Are all the curriculum changes even in technical, vocational, and higher education making our workforce future ready?

There are current issues that we should address. Basic education struggles to achieve mastery in core competencies (MPS < 50% in NAT). The early reading assessments suggest that students are not responding positively, perhaps because of implementation deficits in education reforms. Low passing rates in professional board examinations persist (i.e., at around 40 percent). Enterprise-based training, a critical component, is very insignificant (i.e., 3 percent of total graduates). Training Certificates are not valued by employers.

Recommendations to make our citizenry flexible for the jobs of the future

- We need to go back to basics (3Rs: reading, writing, 'rithmetic; science and 4Cs) in basic education; and ensure work-integrated learning in tech-voc, and "systems thinking" in higher education.
- Make education and training respond to needs of industry (e.g., creating new fields such as "data science") and experiment even with assessments (simulations, games) rather than traditional examinations that are geared more toward cognitive skills.
- We should provide incentives for enterprise-based training, and for industry to value "training certificates" (especially from well-known MOOC providers such as Coursera)
- We should start studying
  - What works and what does not to foster "flexibility" in workplace
  - Diagnostics for measuring "soft skills" - It is always easy to say we need soft skills, but what kind of skills, and how do we measure that these skills are truly being honed?
  - How to profile digital platform workers, and monitor the Platform Economy and the Creative Economy
- We need to have "whole-of-government" mechanisms across DepED, CHEd and TESDA for improved planning and for upscaling models that work (e.g. Dynamic Learning Program of Christopher and Ma. Victoria Bernido).

- We need to start building systems for life-long learning --- whether in the public or private sector.

Aside from human capital development, the World Bank (2019) suggests two other policy levers: strengthening social protection and mobilizing revenues for human capital development and social protection. Regarding strengthening social protection systems, we need to adopt progressive universalism, portable social protection systems, and start experimenting with universal basic income. But we also need revenues, especially taxation reform not just to support investments in physical capital, but in supporting those who need our help the most, and in "future" proofing everyone. While we need investments to construct schools, hospitals, roads, bridges, but we also need investments in people: particularly, in the quality and competence of teachers and health workers. While we need the Build Build Build (BBB) program, but we also need a People People People (PPP) program as well.

The effort to prepare the country for the opportunities and challenges of FIRe requires all stakeholders - the government, policymakers, international organizations, regulators, business organizations, academia, and civil society, the media and the youth - to work together to create a Philippines that aligns with common goals for the future. While the future is not fully predictable and knowable, but the future is certainly inevitable. Consequently, it is important for us to have a "whole-of-nation" action agenda to improve our readiness for the opportunity and challenges of the future today, otherwise, whatever great divides we currently have may become wider.

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