TVET SKILLS INSIGHTS REPORT

ISSUE NO. 1 | SERIES OF 2025

BEYOND AUTOMATION:
THE AGE OF 5TH INDUSTRIAL REVOLUTION

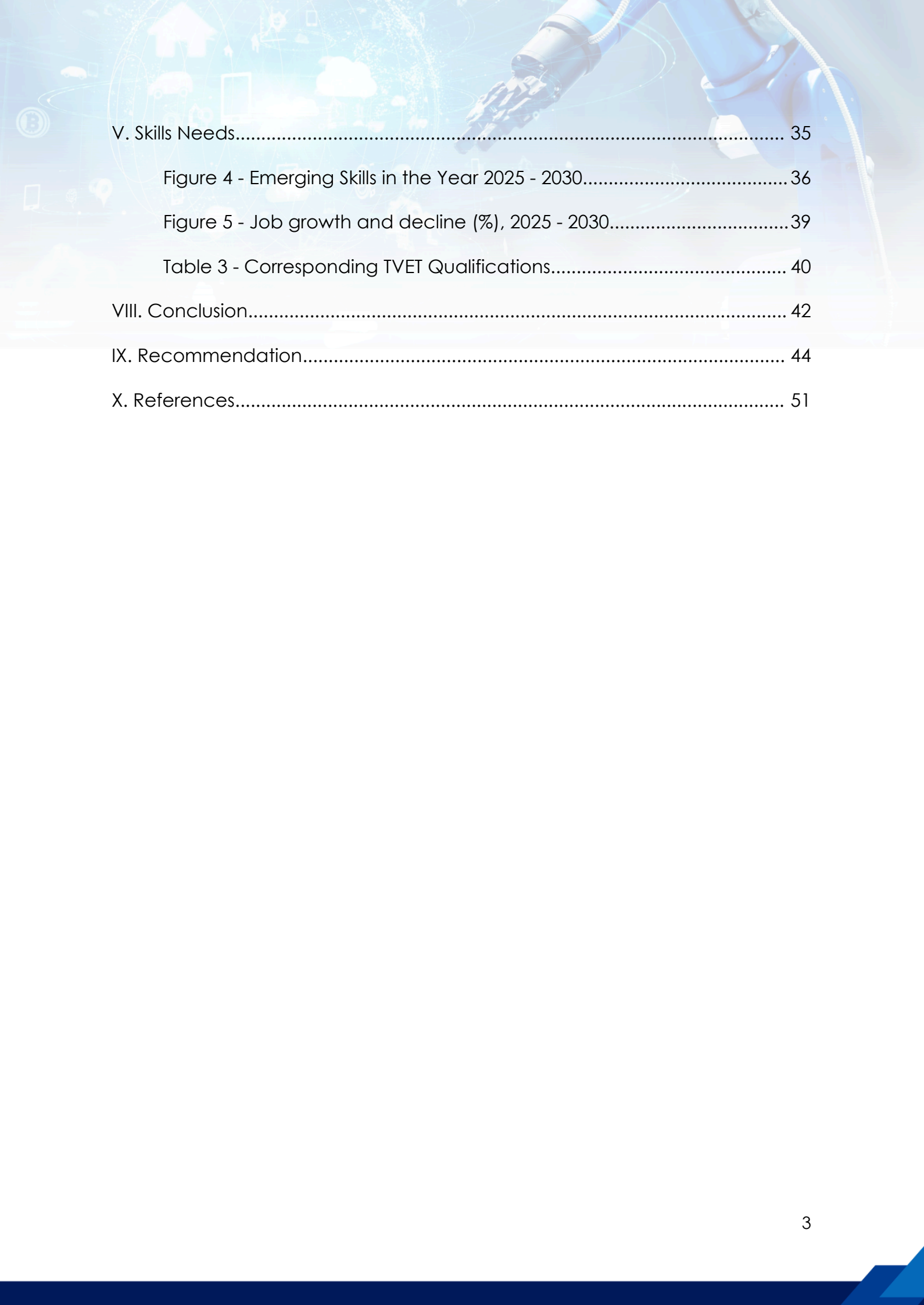TVET Skills Insights Report | Issue No. 1 | Series of 2025

Table of Contents

I. Executive Summary

The 5th Industrial Revolution, often referred to as Industry 5.0 or 5IR, is a concept that builds upon the technological advancements of the 4th Industrial Revolution (4IR). While the 4IR focused on automation, artificial intelligence (AI), and the Internet of Things (IoT), the 5IR takes a more human-centric approach.

The 5IR prioritizes human-machine collaboration, leveraging AI to enhance human capabilities rather than replace them, and fostering collaborative relationships between humans and robots to improve efficiency and safety. Sustainability is another key aspect, with a focus on eco-friendly practices, resource efficiency, and circular economy principles. Ethical considerations are also crucial, including the development of fair, unbiased, and transparent AI systems, as well as the protection of personal data.

In the Philippines, the transition to the 5IR presents opportunities to address pressing challenges such as climate change, inequality, and a shortage of skilled workers. By investing in education, digital infrastructure, and sustainable practices, the Philippines can position itself as a leader in human-centric innovation while addressing existing labor market gaps. This report explores the economic contributions, employment projections, skills needs, and demand-supply dynamics essential for navigating the 5IR.

II. Background

A. History

Understanding past industrial revolutions helps explain the 5IR. Each revolution, from the use of metal tools to steam power and automation, has reshaped how we work. The 5th revolution, driven by AI, is about more than efficiency—it's a fusion of human creativity and machine intelligence, enhancing decision-making and problem-solving. This partnership opens new possibilities for innovation and human achievement.

It is often said that the industrial revolution was another of those extraordinary jumps forward in the story of civilization. To which, according to the article by fingent.com titled "How the 5th Industrial Revolution is Advancing Humanity at Workplace".

Figure 1 - A Phenomenal Journey Towards the 5IR
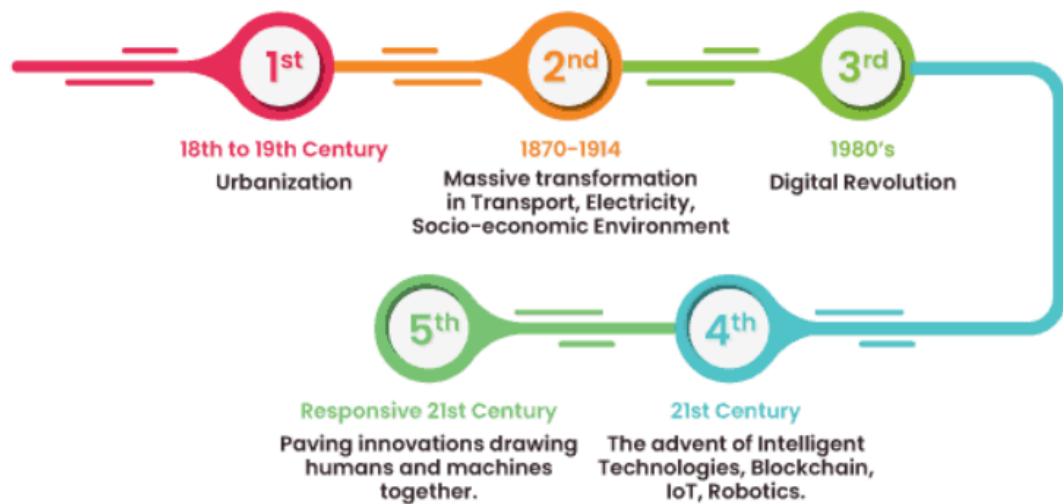
Source: Fingent.com—A Phenomenal Journey Towards the 5th Industrial Revolution

Figure 1 Illustrates that over the course of the previous industrial revolutions, there has been many improvements to life. Beginning with the 1st industrial revolution, with its utilization of steam engines and advancements in mechanization, communities around the world have been urbanized. The 2nd industrial revolution, meanwhile, witnessed the emergence of 1) electricity, 2) the telegraph (predecessor of the telephone), and 3) mass production techniques. The 3rd industrial revolution, on the other hand, paved way for the digital revolution through computers and automation. The 4th Industrial Revolution introduced cyber-physical systems (CPS), which integrate physical and digital technologies to operate intelligently and in a coordinated manner, along with advanced automation.

Meanwhile, an article online by Dr. Catherine Ball shows a simplified version of the evolution of the Industrial Revolutions.

Figure 2 - The Progression of Industrial Revolutions
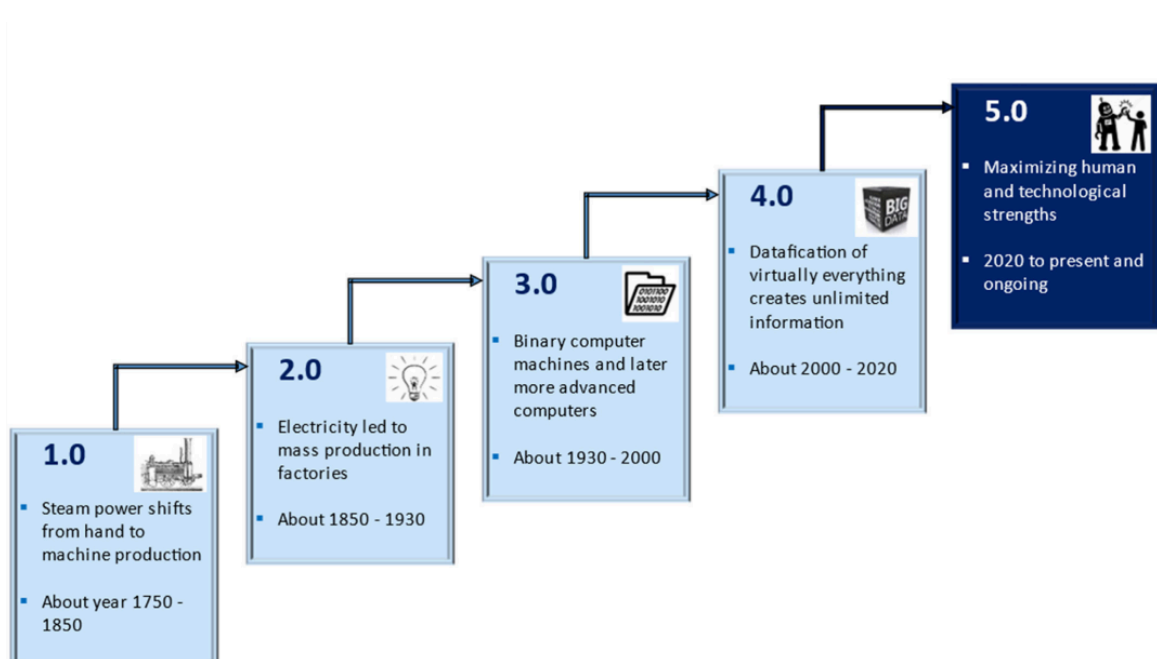
Source: The Fifth Industrial Revolution: How Harmonious Human-Machine Collaboration is Triggering a Retail and Service [R]evolution (2022).

These significant milestones in technological advancements reshaped global economies and labor markets. An analysis of historical trends reveals how each revolution has fundamentally transformed production systems, workforce roles, and technological integration:

1st Industrial Revolution (Late 18th Century - 1780s) - The advent of steam power revolutionized industry by mechanizing production. Steam engines powered machinery in factories, enabling mass production and changing transportation with steamships and locomotives.

2nd Industrial Revolution (Late 19th Century - 1870s) - Electricity, alongside advancements in steel production and telecommunication, enabled mass manufacturing. The division of labor and assembly line techniques were introduced, significantly increasing productivity and efficiency in industries.

3rd Industrial Revolution (Mid-20th Century - 1960s) - The rise of computers and digital technology transformed industries. Automation, computing, and information technology (IT) systems enhanced precision, productivity, and data-driven decision-making, marking the beginning of the digital age.

4th Industrial Revolution (Early 21st Century - 2000s to present) - The fusion of physical, digital, and biological systems, driven by innovations like the IoT, AI, and advanced robotics. Sensors became smaller, more interconnected, and more intelligent, enabling the real-time data exchange and automation that are reshaping industries today.

5th Industrial Revolution (2020–Present) - The current and emerging phase—the 5IR—is distinguished by the harmonious integration of human and technological strengths. Unlike its predecessor, which emphasized automation and digitization, the 5IR focuses on human-centric innovations where humans collaborate with

advanced technologies, such as AI and robotics, to create sustainable, ethical, and inclusive solutions. This era prioritizes enhancing societal well-being through personalized and responsible technological advancements.

B. Current Situation

5IR is now approaching. Unlike its predecessors (as shown in Figure 2), which focused on productivity, this new phase emphasizes sustainability, human-centered approaches, and environmental concerns (Murata Manufacturing Co., Ltd., 2023). This shift arises from the fact that, in the relentless pursuit of higher production yields and streamlined processes, the concept of sustainability had been overlooked.

Table 1 Differences between the 4IR and 5IR

		4IR	5IR
Human-technology focus	Maximization Strategy	Maximizing the number and scope of technologies and their interconnectedness	Maximizing the strengths of both technology and humans by understanding where each excels
	Competition vs	Humans compete with machines for jobs	Humans and machines dance

		collaboration		together, metaphorically
				Humans harmoniously collaborate with machines
Well-being focus	Environmental Emphasis	No environmental emphasis		Well-being of all of humanity and the planet
		Prioritization of technological progress (e.g. smart factories)		Focus on sustainable and renewable resources
		Pursuit of Profits		Pursuit of profits with a purpose
	Pushing the boundaries of technology	Need to trust technology		Humane uses of technology

Source: The Fifth Industrial Revolution: How Harmonious Human-Machine Collaboration is Triggering a Retail and Service [R]evolution (2022).

Additionally, the journal states that, when social and technical factors interact (intended or not), maximizing only either human or

technological factors, without regard for the strengths and weaknesses, creates a suboptimal outcome. Hence, the sociotechnical theory proposes maximizing the strengths of both social (e.g., empathy, problem solving, creativity) and technology (e.g., speed, efficiency, automation) factors consistent with the ideas put forth for the 5IR (Noble et al., 2022).
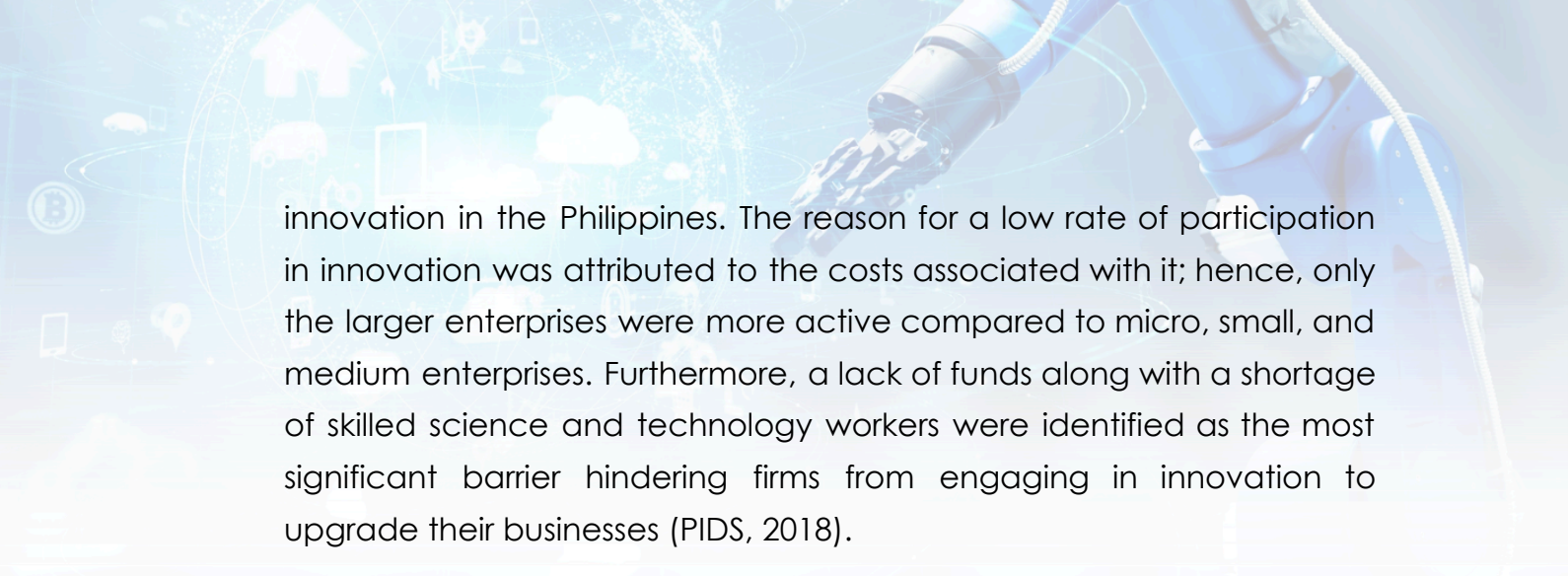
As shown in Figure 3, the 5IR synergistic maximization approach applied to retailing and services. The most precarious position in the chart is the lower left quadrant where it does not fully utilize the strengths of both social and technological aspects.

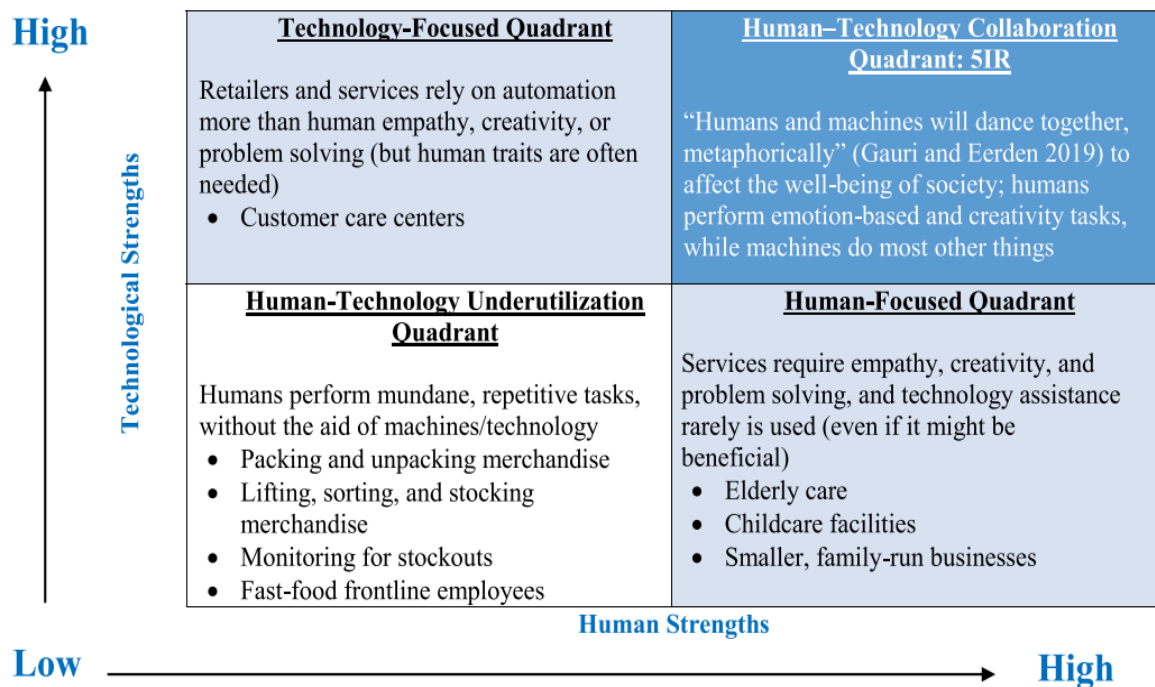**Figure 3 - Maximizing human and technological strengths in the 5IR.**

Source: The Fifth Industrial Revolution: How Harmonious Human-Machine Collaboration is Triggering a Retail and Service [R]evolution (2022).

Although the Philippines is still in the midst of catching up with the trends of the 4IR, According to a 2018 study by the Philippine Institute for Development Studies (PIDS), less than half (42.9%) of the local firms were actively innovating, a figure that highlights the barriers to

innovation in the Philippines. The reason for a low rate of participation in innovation was attributed to the costs associated with it; hence, only the larger enterprises were more active compared to micro, small, and medium enterprises. Furthermore, a lack of funds along with a shortage of skilled science and technology workers were identified as the most significant barrier hindering firms from engaging in innovation to upgrade their businesses (PIDS, 2018).
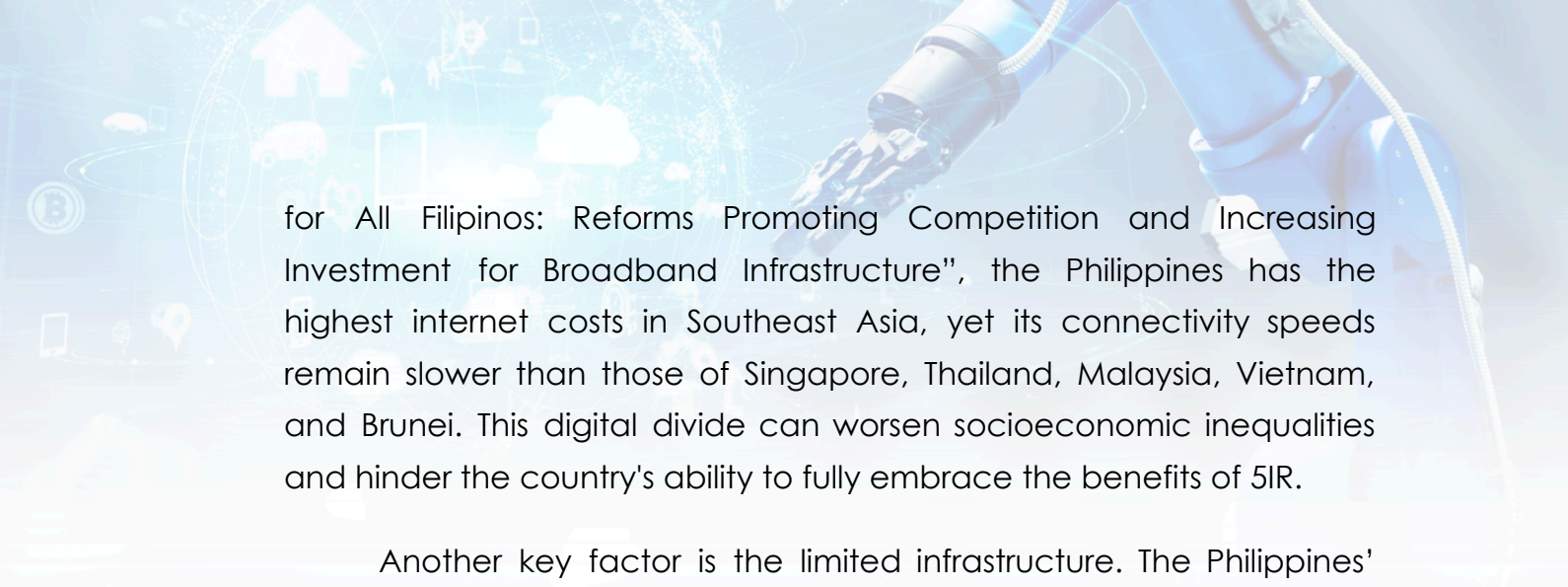
C. Issues

The 5IR is a paradigm shift that prioritizes human-centricity, sustainability, and advanced technologies. Unlike previous revolutions, 5IR aims to create a harmonious balance between technological advancement and human well-being. While the global landscape is still evolving, countries worldwide are actively preparing for this new era. For example, automation, a key application of these advanced technologies, is transforming across various sectors, including healthcare, education, and agriculture. According to GetAhead Supply Chain Solutions, the Philippines is also positioning itself as a tech hub in Southeast Asia, attracting both local and international investors.

In the Philippines, the government is driving digital transfer and nurturing a thriving startup ecosystem. To equip the workforce for the future, the Philippines is investing in education and skills development, focusing on digital literacy, AI, and data science.(National Economic and Development Authority, 2023; Asian Development Bank, 2023)

However, there are still few challenges such as the digital divide which refers to the unequal access to information and communication technologies between different groups of people. According to the 2022 Global System for Mobile Communications Mobile Association (GSMA) Connectivity Index, the Philippines ranks third lowest in terms of mobile data affordability, scoring a mere 47.01 out of 100. Access and internet speed fall sharply in rural regions, leaving many communities disconnected from the online world's opportunities (Serafica et al., 2024). According to the 2024 World Bank report entitled "Better Internet
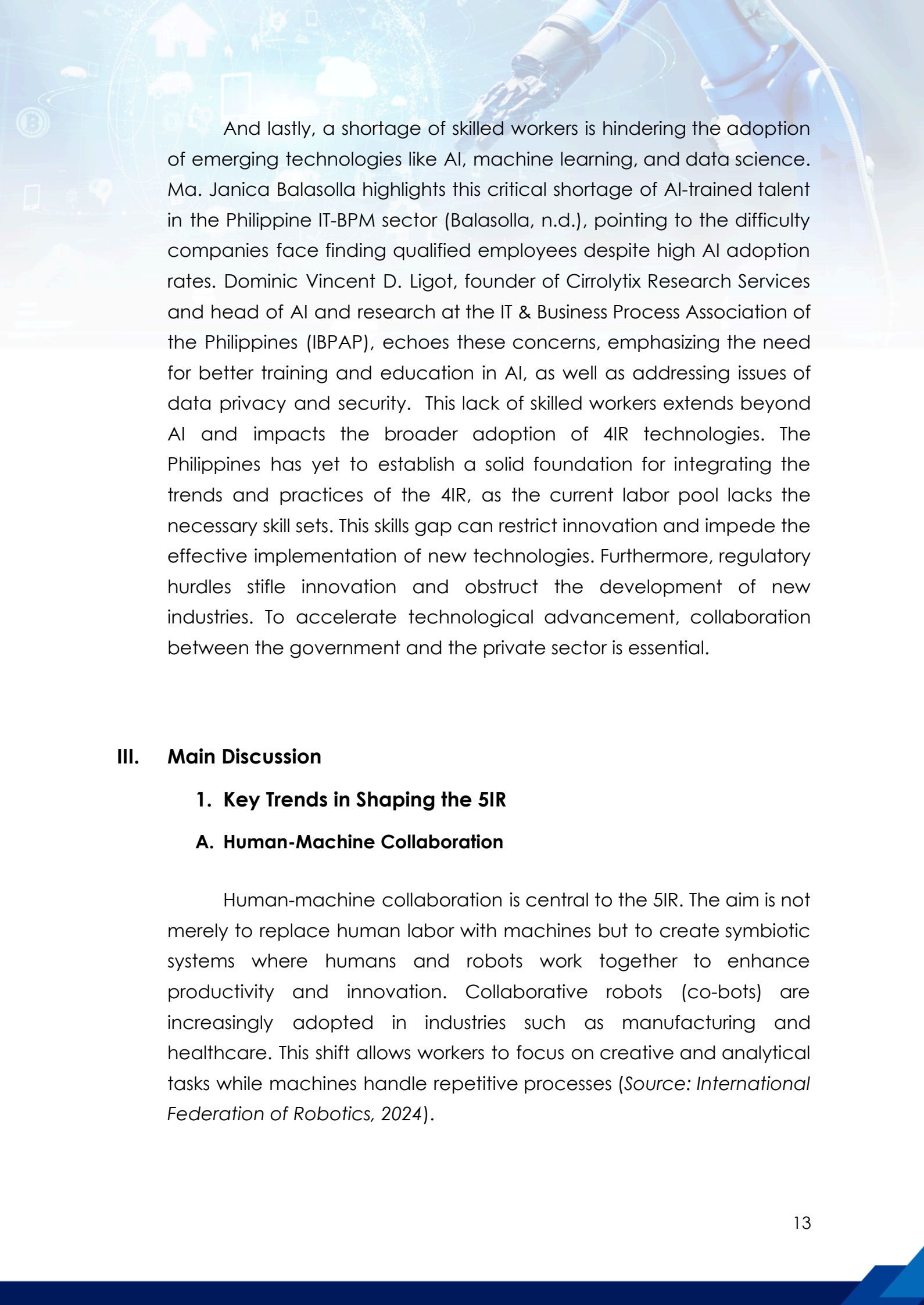
for All Filipinos: Reforms Promoting Competition and Increasing Investment for Broadband Infrastructure", the Philippines has the highest internet costs in Southeast Asia, yet its connectivity speeds remain slower than those of Singapore, Thailand, Malaysia, Vietnam, and Brunei. This digital divide can worsen socioeconomic inequalities and hinder the country's ability to fully embrace the benefits of 5IR.

Another key factor is the limited infrastructure. The Philippines' infrastructure, particularly in terms of transportation and energy, needs significant improvement to support the demands of 5IR. The Philippine Development Plan (PDP) 2023-2028 states that infrastructure facilities and services remain inadequate in terms of accessibility, quality, safety, and affordability. Inadequate infrastructure can hinder the efficient movement of goods and services, increase costs, and limit economic growth.

The high cost of energy in the Philippines significantly affects the country's ability to adapt to the 5IR. In a recent committee hearing, Baguio Lone District Representative Mark Go underscored this issue, noting that electricity in the Philippines is priced at USD 0.18 per kWh, compared to USD 0.13 in Thailand, USD 0.10 in Indonesia, USD 0.08 in Vietnam, and just USD 0.03 in Malaysia (ABS-CBN, 2024). According to Lu (2024), these elevated energy costs have far-reaching implications, including reduced economic competitiveness, increased production costs, and a decline in the standard of living for many Filipinos.

For businesses in the Philippines, high energy costs pose a significant challenge, particularly for industries reliant on energy-intensive operations. Energy is a critical input for production, and its price directly impacts operational expenses. This is especially problematic for large-scale manufacturing companies that depend heavily on stable and affordable energy to remain competitive. As a result, businesses are burdened with higher costs, reducing profitability and limiting their capacity to invest in innovation and technological advancements crucial for the 5IR.
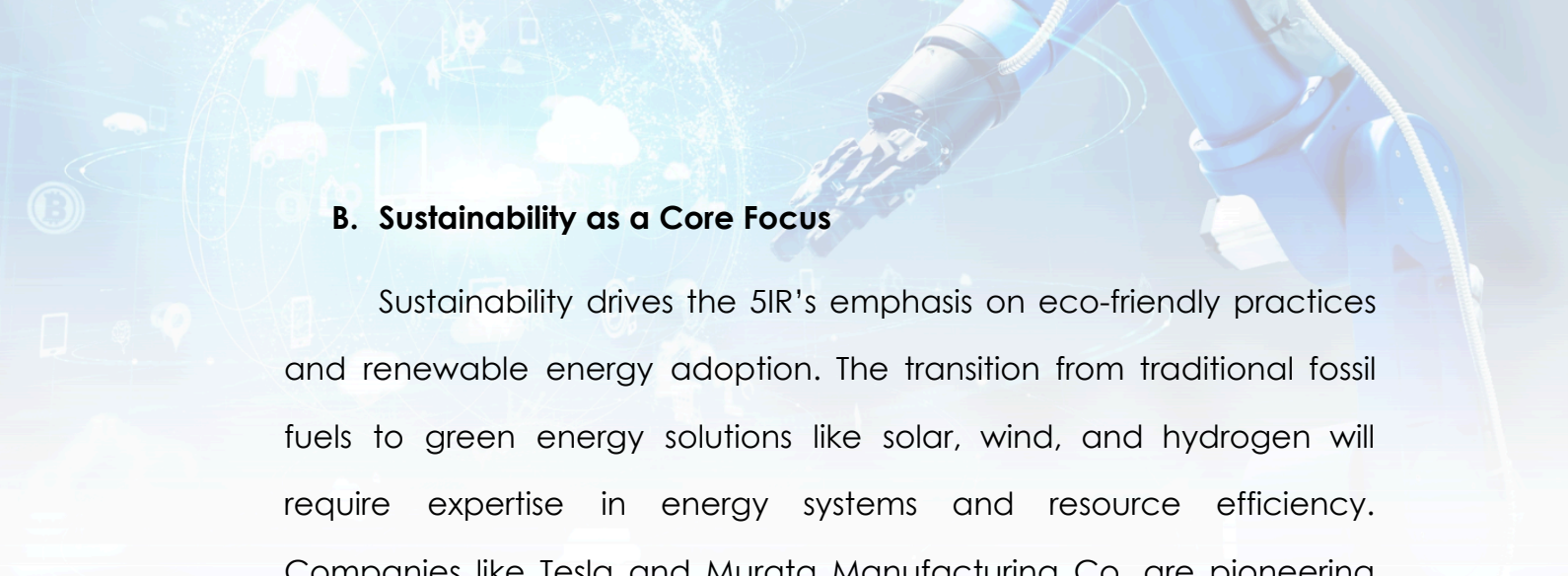
And lastly, a shortage of skilled workers is hindering the adoption of emerging technologies like AI, machine learning, and data science. Ma. Janica Balasolla highlights this critical shortage of AI-trained talent in the Philippine IT-BPM sector (Balasolla, n.d.), pointing to the difficulty companies face finding qualified employees despite high AI adoption rates. Dominic Vincent D. Ligot, founder of Cirrolytix Research Services and head of AI and research at the IT & Business Process Association of the Philippines (IBPAP), echoes these concerns, emphasizing the need for better training and education in AI, as well as addressing issues of data privacy and security. This lack of skilled workers extends beyond AI and impacts the broader adoption of 4IR technologies. The Philippines has yet to establish a solid foundation for integrating the trends and practices of the 4IR, as the current labor pool lacks the necessary skill sets. This skills gap can restrict innovation and impede the effective implementation of new technologies. Furthermore, regulatory hurdles stifle innovation and obstruct the development of new industries. To accelerate technological advancement, collaboration between the government and the private sector is essential.

III. Main Discussion

1. Key Trends in Shaping the 5IR

A. Human-Machine Collaboration

Human-machine collaboration is central to the 5IR. The aim is not merely to replace human labor with machines but to create symbiotic systems where humans and robots work together to enhance productivity and innovation. Collaborative robots (co-bots) are increasingly adopted in industries such as manufacturing and healthcare. This shift allows workers to focus on creative and analytical tasks while machines handle repetitive processes (*Source: International Federation of Robotics, 2024*).

B. Sustainability as a Core Focus

Sustainability drives the 5IR's emphasis on eco-friendly practices and renewable energy adoption. The transition from traditional fossil fuels to green energy solutions like solar, wind, and hydrogen will require expertise in energy systems and resource efficiency. Companies like Tesla and Murata Manufacturing Co. are pioneering sustainable innovations, setting global benchmarks (*Source: McKinsey Sustainability Report, 2023*).
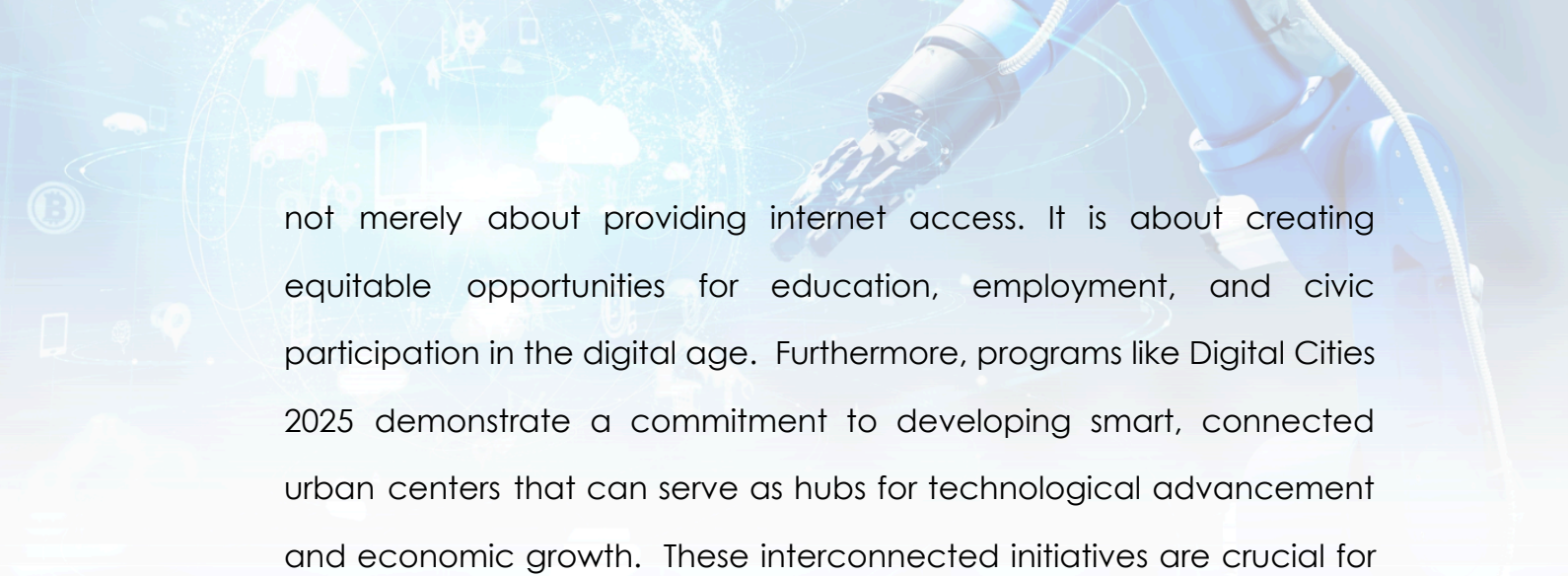
C. Addressing the Digital Divide

The digital divide remains a critical issue in the Philippines. According to the GSMA Connectivity Index (2022), the country ranks low in mobile data affordability and internet penetration, particularly in rural areas. Bridging this divide is essential for equitable access to 5IR opportunities, enabling widespread participation in digital innovation (Source: Serafica et al., 2024).

2. Opportunities

Digital Transformation as a Catalyst for Change

The foundation of the 5IR rests upon robust digital infrastructure and widespread access to technology. Recognizing this, the Philippine government has embarked on ambitious initiatives to bridge the persistent digital divide and cultivate a culture of innovation. A pivotal example is the push for universal broadband access, aiming to connect even the most remote communities and empower citizens with digital literacy. This initiative, as highlighted in a PIDS study (2023), is

not merely about providing internet access. It is about creating equitable opportunities for education, employment, and civic participation in the digital age. Furthermore, programs like Digital Cities 2025 demonstrate a commitment to developing smart, connected urban centers that can serve as hubs for technological advancement and economic growth. These interconnected initiatives are crucial for laying the groundwork for a thriving 5IR economy. However, the success of these programs hinges on addressing challenges such as affordability, digital literacy training, and ensuring equitable access across all socioeconomic strata.

The Green Shift: A Source of Employment and Sustainable Growth

The 5IR is inextricably linked to the global push for sustainability. The transition to renewable energy sources is not only an environmental imperative but also a significant driver of job creation. The IRENA Renewable Energy Outlook (2024) projects the creation of millions of green jobs worldwide, and the Philippines, with its abundant natural resources, is well-positioned to capitalize on this trend. This transition will require a skilled workforce capable of designing, installing, maintaining, and managing renewable energy infrastructure. Beyond direct employment in the energy sector, the shift towards a green economy will also stimulate demand for related skills in areas like sustainable agriculture, eco-tourism, and green manufacturing. To fully realize this potential, the Philippines must invest in training and education programs that equip workers with the necessary skills for these emerging green industries. This proactive approach will ensure a just transition, maximizing employment opportunities while minimizing the

social and economic disruptions that can accompany rapid technological change.

Public-Private Partnerships: A Collaborative Approach to Progress

Successfully navigating the complexities of the 5IR requires a collaborative approach. Public-private partnerships (PPPs) are essential for mobilizing resources, expertise, and innovation to address the multifaceted challenges of this era. As emphasized by the World Bank (2023), PPPs can play a critical role in driving investment in crucial areas like infrastructure development and education reform. These collaborations can facilitate the development of cutting-edge educational programs that align with the evolving needs of the 5IR labor market. Furthermore, PPPs can foster innovation by creating platforms for knowledge sharing, technology transfer, and collaborative research and development. By leveraging the strengths of both the public and private sectors, the Philippines can accelerate its transition to a 5IR economy, ensuring that its workforce is prepared for the jobs of the future. However, effective governance frameworks, transparency, and accountability are crucial for ensuring that these partnerships are mutually beneficial and contribute to inclusive and sustainable development.

3. Economic Contributions and Employment Projections

A. Economic Contributions

The 5IR is set to reshape the global economy, driving growth, innovation, and sustainability in ways that the previous industrial revolutions could not. While much of the focus has been on the technological advancements that accompany automation and AI, the 5IR is also expected to provide substantial economic contributions by fostering new industries, improving productivity, and enhancing the quality of life.

One of the most significant economic contributions of the 5IR is its potential to create higher-value jobs. As automation takes over routine tasks, human workers can focus on more creative, analytical, and strategic roles. For instance, workers in manufacturing and other industries can shift from repetitive production work to roles that involve designing and customizing products, solving complex problems, and engaging with customers in more meaningful ways. This transition not only improves productivity but also leads to higher job satisfaction, as employees are freed from mundane tasks and can engage in work that requires human judgment and innovation (TWI Ltd., 2024). According to reports, this shift is especially evident in sectors like advanced manufacturing, AI governance, and ethical machine learning design, where the demand for skilled professionals continues to rise (World Economic Forum, 2024).
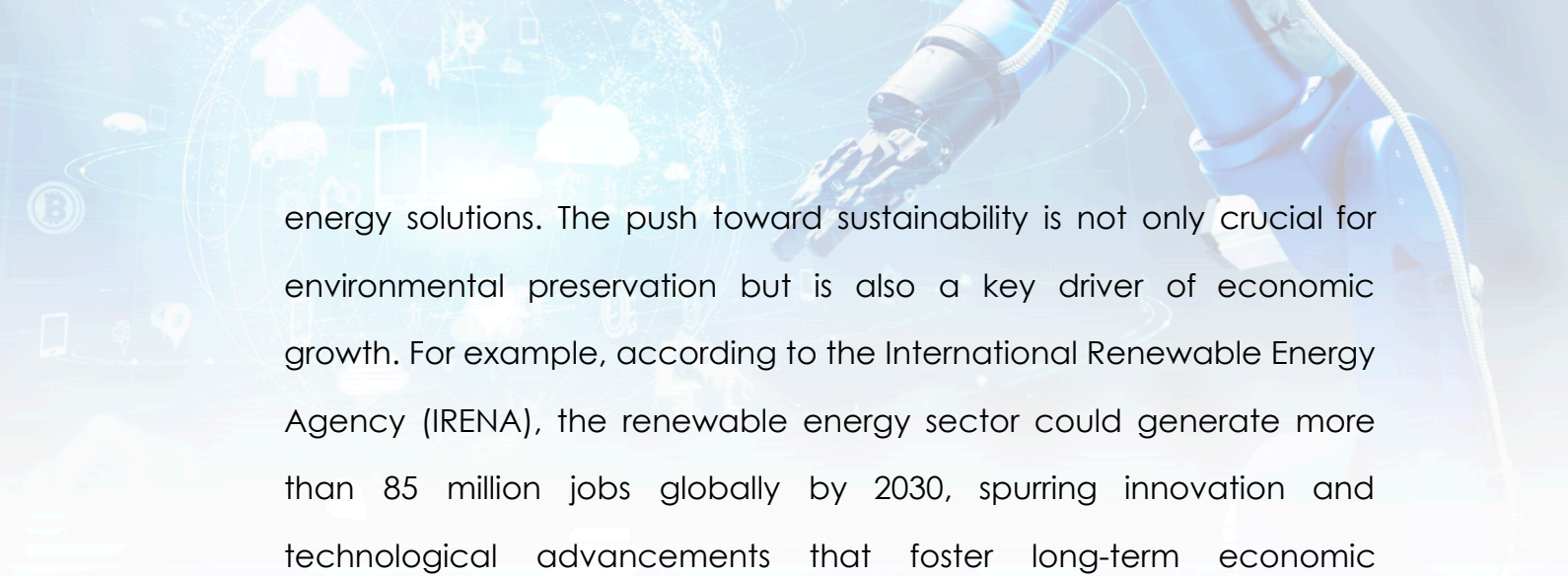
The manufacturing sector stands to benefit greatly from the 5IR, especially with the rise of "smart factories" and advanced

manufacturing technologies. Automation and AI enable manufacturers to produce customized products more efficiently and at lower costs. As robots handle tasks such as assembly and quality control, human workers can focus on higher-level activities like product design and process optimization, which can lead to both increased profit margins and more competitive products in the marketplace. This shift enhances customer satisfaction by delivering tailored goods that meet specific consumer demands, creating a more dynamic economy that is responsive to market needs (TWI Ltd., 2024).

Similarly, the agriculture sector is poised for transformation. The integration of AI, drones, and other automation technologies allows farmers to adopt precision agriculture techniques, which optimize the use of resources, reduce waste, and increase crop yields. As these technologies evolve, new economic opportunities are emerging in fields such as sustainable farming, agricultural robotics, and smart irrigation systems. By automating routine tasks like planting, watering, and harvesting, farmers can focus on data-driven decision-making that increases efficiency and sustainability, contributing to both higher agricultural productivity and long-term environmental benefits (McKinsey & Company, 2024).

In addition to these specific sectors, the 5IR is driving growth in sustainability-focused industries. As the global demand for cleaner, renewable energy increases, the 5IR contributes to the growth of green technologies such as solar energy, wind power, and electric vehicles. These industries are expected to create millions of new jobs in roles related to the development, installation, and maintenance of clean

energy solutions. The push toward sustainability is not only crucial for environmental preservation but is also a key driver of economic growth. For example, according to the International Renewable Energy Agency (IRENA), the renewable energy sector could generate more than 85 million jobs globally by 2030, spurring innovation and technological advancements that foster long-term economic resilience (IRENA, 2024).

Furthermore, the 5IR is driving significant improvements in resource management and efficiency across industries. Through the use of AI, IoT devices, and big data analytics, businesses are able to track and optimize their use of raw materials, energy, and labor. This results in a reduction of waste, lower costs, and increased profitability, all of which contribute to stronger, more sustainable economies. As automation takes over routine tasks and decision-making processes become more data-driven, businesses can streamline operations and deliver more value to their customers, leading to overall economic growth.

The healthcare sector is also poised for economic transformation due to the rise of AI and automation. AI-driven diagnostics, personalized medicine, and robotic surgeries are enhancing the efficiency and accuracy of healthcare delivery. These innovations have the potential to reduce healthcare costs, improve patient outcomes, and create entirely new markets for healthtech products and services. Additionally, the rise of telemedicine and AI-powered health apps is creating a demand for tech-savvy healthcare
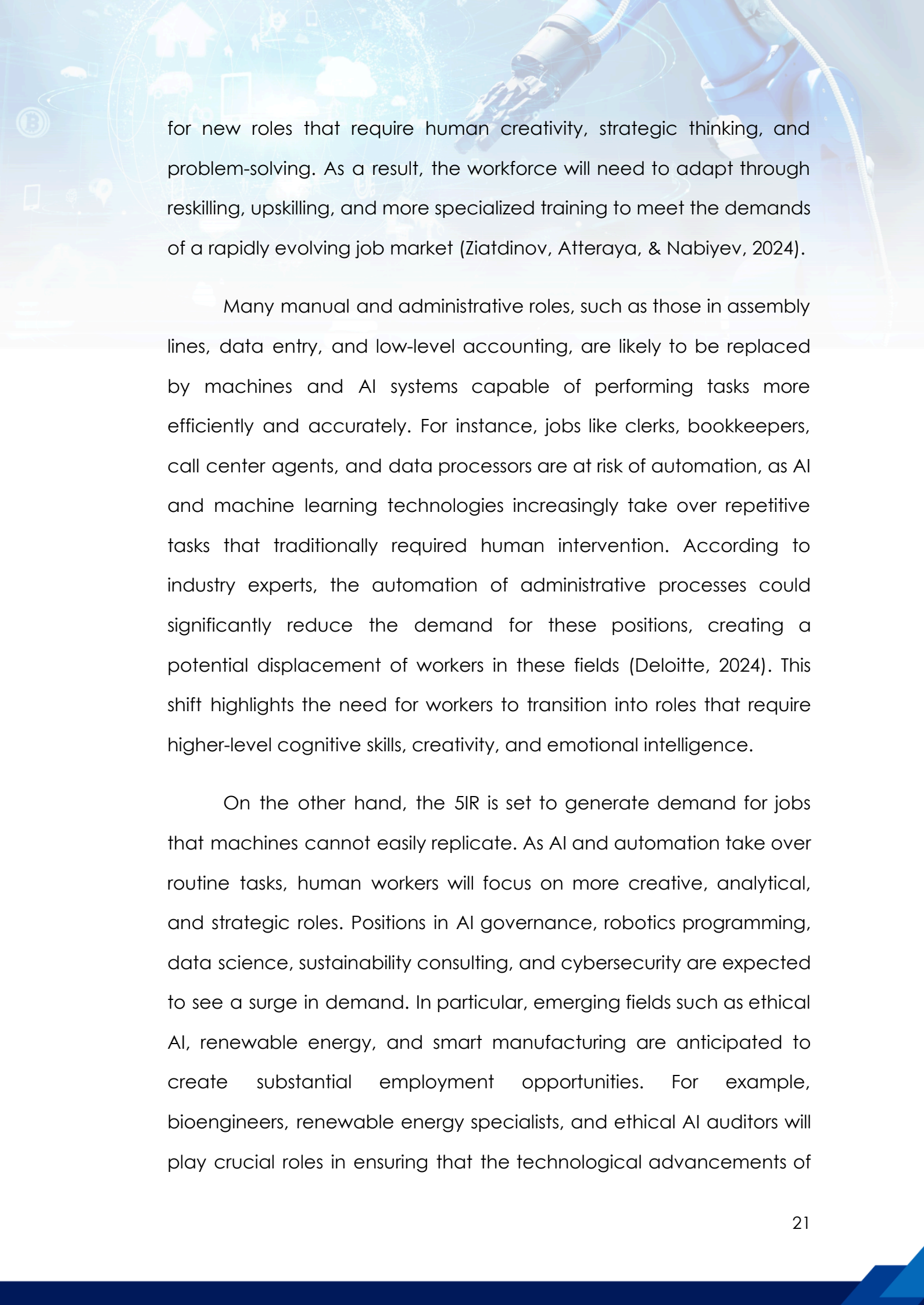
professionals, contributing to job creation and economic growth in the digital health space.

As industries evolve, the role of Technical Vocational Education and Training (TVET) becomes increasingly crucial in ensuring that the workforce is prepared for the new economic landscape. In the Philippines, agencies such as TESDA are taking steps to address the skills gap created by the 5IR. While TESDA has already introduced a competency standard for generative AI, this is just the beginning. To fully harness the economic potential of the 5IR, TVET programs need to expand to include training in advanced manufacturing, AI ethics, renewable energy, and other emerging fields. By equipping workers with the skills necessary for these high-demand industries, TVET can help ensure that workers are not left behind in the shift to a more automated economy. In this way, TVET programs are not only preparing individuals for better job opportunities but also fostering a more competitive, innovative workforce that can drive economic growth (TESDA, 2024).

B. Employment Projections

As automation, AI, and other advanced technologies become increasingly integrated into various industries, the employment landscape is undergoing a profound transformation. In the 5IR, the convergence of human intelligence and machine learning is expected to drive significant changes in the nature of work. The adoption of automation will result in the decline of certain jobs, particularly those centered around repetitive, routine tasks, while creating opportunities

for new roles that require human creativity, strategic thinking, and problem-solving. As a result, the workforce will need to adapt through reskilling, upskilling, and more specialized training to meet the demands of a rapidly evolving job market (Ziatdinov, Atteraya, & Nabiyev, 2024).

Many manual and administrative roles, such as those in assembly lines, data entry, and low-level accounting, are likely to be replaced by machines and AI systems capable of performing tasks more efficiently and accurately. For instance, jobs like clerks, bookkeepers, call center agents, and data processors are at risk of automation, as AI and machine learning technologies increasingly take over repetitive tasks that traditionally required human intervention. According to industry experts, the automation of administrative processes could significantly reduce the demand for these positions, creating a potential displacement of workers in these fields (Deloitte, 2024). This shift highlights the need for workers to transition into roles that require higher-level cognitive skills, creativity, and emotional intelligence.
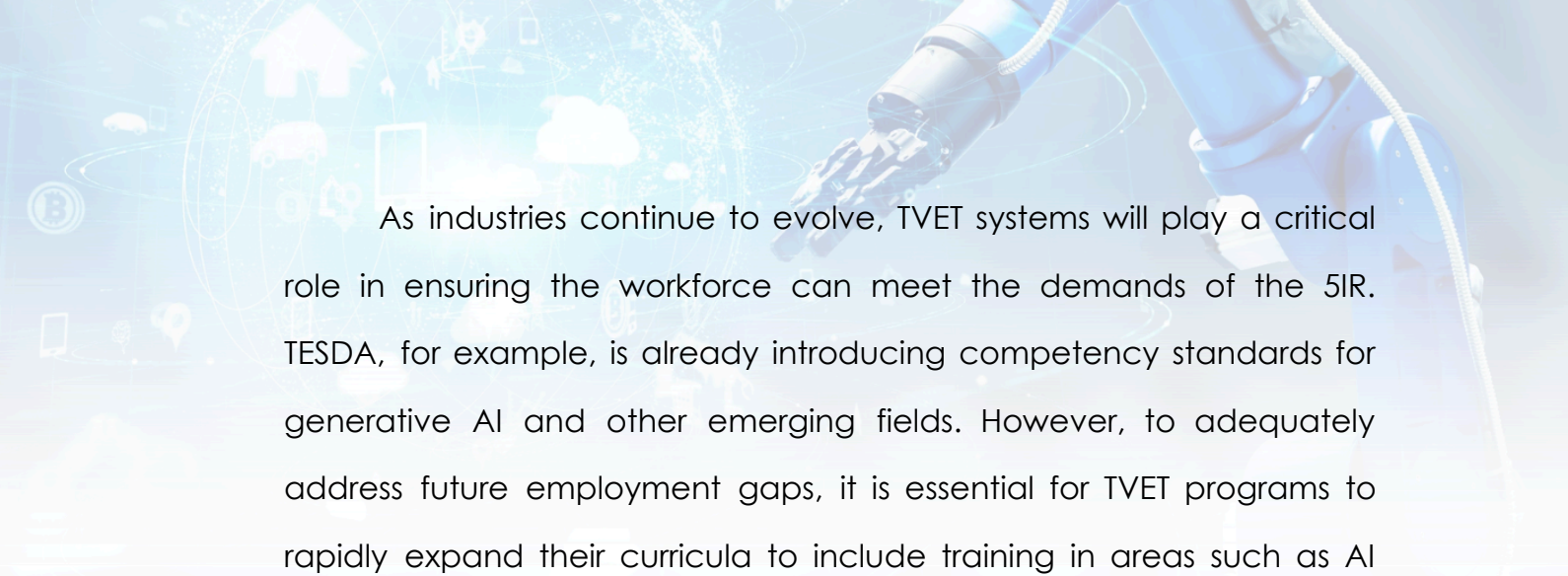
On the other hand, the 5IR is set to generate demand for jobs that machines cannot easily replicate. As AI and automation take over routine tasks, human workers will focus on more creative, analytical, and strategic roles. Positions in AI governance, robotics programming, data science, sustainability consulting, and cybersecurity are expected to see a surge in demand. In particular, emerging fields such as ethical AI, renewable energy, and smart manufacturing are anticipated to create substantial employment opportunities. For example, bioengineers, renewable energy specialists, and ethical AI auditors will play crucial roles in ensuring that the technological advancements of

the 5IR are aligned with ethical standards, environmental sustainability, and human well-being (World Economic Forum, 2024).

The healthcare sector is also experiencing a shift in employment demands, as AI and robotics become increasingly integrated into medical practices. AI-driven diagnostics, robotic surgeries, and telemedicine are transforming healthcare delivery, leading to new job opportunities for professionals in healthcare technology, medical AI, and digital health management. These jobs require a unique blend of healthcare expertise and technical knowledge, offering workers a chance to play a critical role in shaping the future of medicine (McKinsey & Company, 2024).

Futurist Michio Kaku has emphasized that the future job market will consist primarily of roles that machines cannot perform. Jobs requiring human creativity, judgment, and nuanced decision-making will remain in demand. For example, gardeners, construction workers, and artists will continue to find work because their tasks involve creativity, problem-solving, and personalized services—traits that are inherently human and not easily replicated by robots. In contrast, routine white-collar jobs such as those held by low-level accountants, brokers, and agents are more vulnerable to automation. As robots take over tasks like bookkeeping, tax preparation, and even basic legal services, the demand for these positions will decline, while higher-level roles in strategic decision-making, project management, and innovation will grow (Kaku, 2024).

As industries continue to evolve, TVET systems will play a critical role in ensuring the workforce can meet the demands of the 5IR. TESDA, for example, is already introducing competency standards for generative AI and other emerging fields. However, to adequately address future employment gaps, it is essential for TVET programs to rapidly expand their curricula to include training in areas such as AI ethics, advanced manufacturing, renewable energy technologies, and sustainable agriculture. Through these programs, workers can gain the specialized skills necessary to thrive in the evolving job market, ensuring that they are prepared for the high-skill, high-value roles of the future.

In addition to TVET, other education and training systems will need to evolve to provide workers with the cross-disciplinary skills required for new, high-demand fields. Critical thinking, emotional intelligence, and complex problem-solving are expected to become core competencies for workers in the 5IR. The increased importance of soft skills, such as communication, adaptability, and teamwork, will create a need for continuous learning and development throughout individuals' careers.

Looking ahead, some key projections for employment growth in the 5IR include:

- Green Technologies: With a growing emphasis on sustainability, jobs in solar energy, wind power, electric vehicle manufacturing, and climate change mitigation are expected to soar. According to the International Renewable Energy Agency (IRENA), the

renewable energy sector could create more than 85 million jobs by 2030 (IRENA, 2024).

- **AI and Automation:** The demand for professionals in AI development, AI ethics, and machine learning will rise. As companies integrate AI into their operations, the need for experts who can design, manage, and ensure the ethical application of AI technologies will be crucial.

- **Cybersecurity:** As more businesses move online and digital infrastructure grows, the need for cybersecurity experts will expand. Protecting sensitive data and systems from cyberattacks will require a new generation of highly skilled professionals in cybersecurity.

- **Advanced Manufacturing:** With the advent of smart factories and additive manufacturing (3D printing), there will be a growing demand for professionals skilled in robotics, IoT systems, and smart product design. These roles will be crucial to building the next generation of intelligent manufacturing systems.

- **Healthcare and Biotechnology:** As the healthcare industry embraces AI diagnostics, robotic surgery, and telemedicine, new employment opportunities will arise for individuals skilled in both healthcare and advanced tech

Job Growth and Decline: The World Economic Forum's Future of Jobs Report 2025 highlights key trends from 2025 to 2030. High-growth roles include Big Data Specialists, AI Professionals, and Cybersecurity Experts, driven by the increasing reliance on technology, digital transformation, and sustainability. However, jobs in areas like data

entry, administrative assistants, and transportation are expected to decline due to automation (World Economic Forum, 2025).

IV. Relevant Policies in the 5IR

The Philippines is making substantial efforts to adapt to the changing dynamics brought about by the 5IR. From fostering innovation and digital transformation through the Innovative Startup Act and Philippine Innovation Act, to promoting the reskilling of the workforce via TVET policies and the Continuing Professional Development Act (CPD Act), the country is laying a foundation for a future-ready workforce. In addition, cybersecurity and smart governance initiatives are crucial for ensuring the safe and effective integration of emerging technologies across sectors. With the right policies in place, the Philippines is well-positioned to leverage the opportunities offered by the 5IR while ensuring that workers are equipped with the skills needed to thrive in an increasingly tech-driven economy.

1. **PHILIPPINE DEVELOPMENT PLAN (PDP) 2017-2022 and 2023-2028**

The PDP is the country's primary guiding framework for achieving inclusive growth and sustainable development. It emphasizes the need for digital transformation, innovation, and technological advancement to enhance productivity and efficiency across sectors. This report highlights the following relevant provisions in the plan:

(1) Digital Economy and Innovation: Under the PDP, the government outlines strategies for advancing the digital economy by fostering digital infrastructure, e-commerce, and emerging technologies such as AI and blockchain. The plan also focuses on boosting local innovation ecosystems and entrepreneurship through public-private partnerships. (2) Skills Development: Recognizing the challenges posed by technological disruption, the PDP includes efforts to improve education, training, and skills development to equip workers with the necessary capabilities to thrive in the digital economy. This is particularly important in light of automation, which may eliminate certain jobs but also create new ones in high-tech industries.

2. **INNOVATIVE STARTUP ACT 2019**

Republic Act No. 11337, otherwise known as the Innovative Startup Act of 2019, is designed to create a conducive environment for the growth of startups and innovation-driven enterprises in the Philippines. The Innovative Startup Act aims to boost the country's digital economy by providing support to entrepreneurs working on disruptive technologies like AI, automation, and blockchain. This report highlights the following relevant provisions from the law:

(1) Incentives for Startups: The law provides various incentives such as tax breaks, funding support, and market access to Filipino innovators and entrepreneurs. These incentives are essential to encourage the development of technologies that will play a central role in the 5IR.
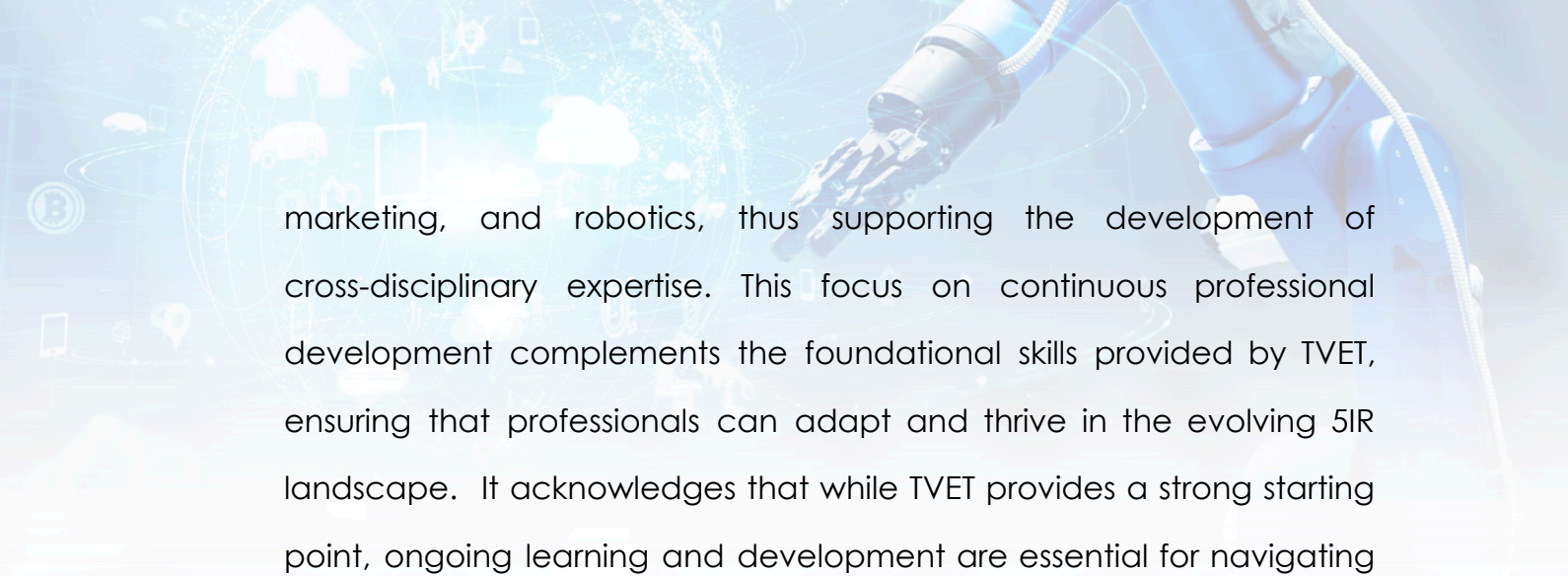
(2) Startup Ecosystem: The Act facilitates the growth of technology-based startups and nurtures an ecosystem that encourages collaboration between the government, academia, and the private sector.

3. PHILIPPINE INNOVATION ACT 2018

The Philippine Innovation Act or the Republic Act No. 11293 provides the legal framework to foster an innovation ecosystem in the country. The law acknowledges the increasing importance of advanced technologies in driving economic development and addresses the need for innovation-led growth. It creates a National Innovation Council tasked with developing and promoting strategies that harness innovation and technology for economic and social development. This includes fostering the integration of emerging technologies like AI, robotics, and clean energy into various sectors of the economy. The law advocates increased investments in R&D, especially in fields related to digital technology and sustainable energy, which are key pillars of the 5IR.

4. CONTINUING PROFESSIONAL DEVELOPMENT ACT (CPD) 2016

Recognizing the rapid pace of technological change in the 5IR, the CPD Act (Republic Act No. 10912) emphasizes the importance of lifelong learning for professionals in the Philippines. In this era of increasing automation and AI integration, continuous upskilling and reskilling are crucial for maintaining professional relevance. The Act encourages professionals to engage in learning activities, including those related to emerging technologies like AI, data science, digital
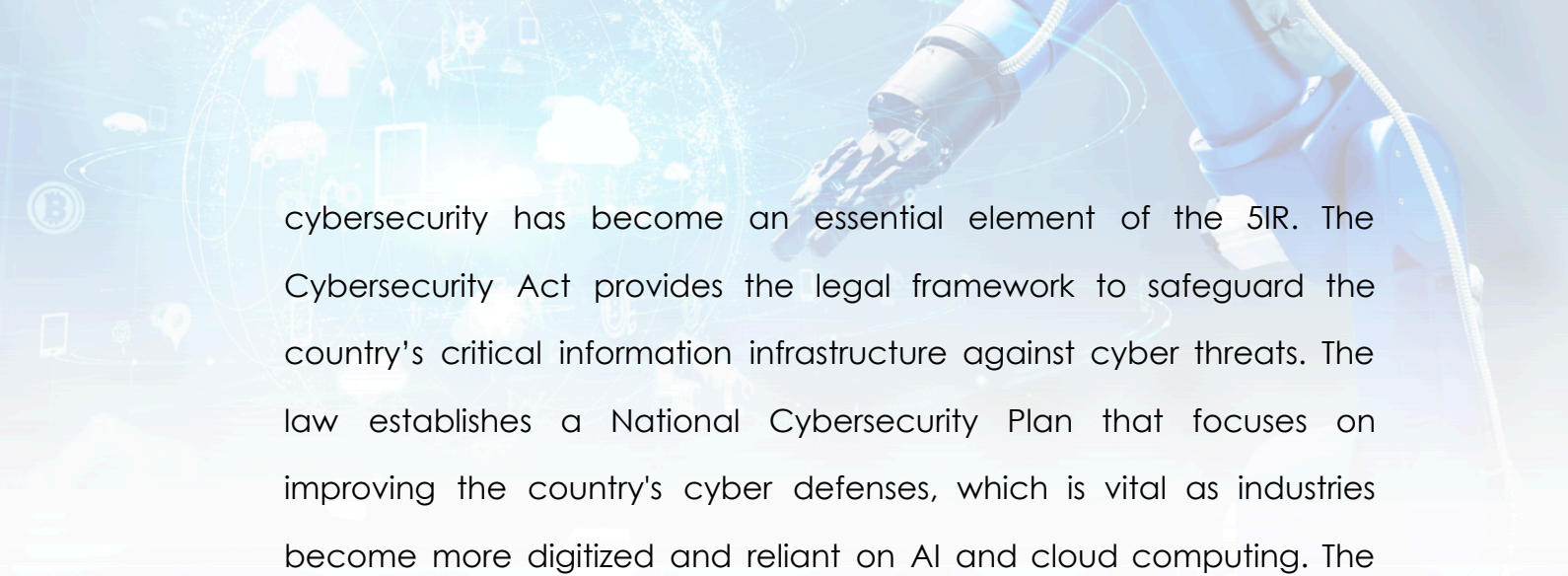
marketing, and robotics, thus supporting the development of cross-disciplinary expertise. This focus on continuous professional development complements the foundational skills provided by TVET, ensuring that professionals can adapt and thrive in the evolving 5IR landscape. It acknowledges that while TVET provides a strong starting point, ongoing learning and development are essential for navigating the changing nature of work and maximizing career potential in a tech-driven world.

5. NATIONAL DIGITAL TRANSFORMATION STRATEGY

Launched by Department of Information and Communications Technology (DICT) in recent years, the National Digital Transformation Strategy aims to transform government services, industries, and society through digital means. This policy serves as a roadmap for leveraging emerging technologies to foster greater inclusivity, efficiency, and innovation across all sectors. The strategy promotes the adoption of AI, cloud computing, and big data analytics in government agencies to improve service delivery, transparency, and decision-making. The policy also focuses on building the necessary digital infrastructure to support smart cities, e-governance, and other advancements that align with the principles of the 5IR. This includes upgrading telecommunications infrastructure and expanding broadband access across the country.

6. CYBERSECURITY ACT OF 2012

Republic Act No. 10175, or the Cybersecurity Act of 2012, addresses the growing reliance on digital platforms and technologies,

cybersecurity has become an essential element of the 5IR. The Cybersecurity Act provides the legal framework to safeguard the country's critical information infrastructure against cyber threats. The law establishes a National Cybersecurity Plan that focuses on improving the country's cyber defenses, which is vital as industries become more digitized and reliant on AI and cloud computing. The development of secure digital environments is key to fostering the continued growth of the 5IR. The law supports the establishment of programs that will train and develop a workforce skilled in cybersecurity, a critical area of expertise in the 5IR economy.

7. UNIVERSAL BROADBAND ACCESS STRATEGY

The Universal Broadband Access Strategy is a crucial initiative aimed at providing nationwide access to affordable and reliable internet connectivity. This strategy is essential for bridging the digital divide, fostering economic growth, and enabling the integration of emerging technologies in education, business, and governance. The strategy supports TVET programs by ensuring digital accessibility, which is necessary for online learning, remote work training, and digital upskilling initiatives. Additionally, improved broadband infrastructure enables the expansion of smart cities, IoT applications, and AI-driven services, aligning with the goals of the 5IR.

8. IRENA RENEWABLE ENERGY OUTLOOK (2024)

The IRENA Renewable Energy Outlook (2024) presents a vision for the Green Shift and Transition to Renewable Energy, emphasizing its dual role as an environmental necessity and a job creation
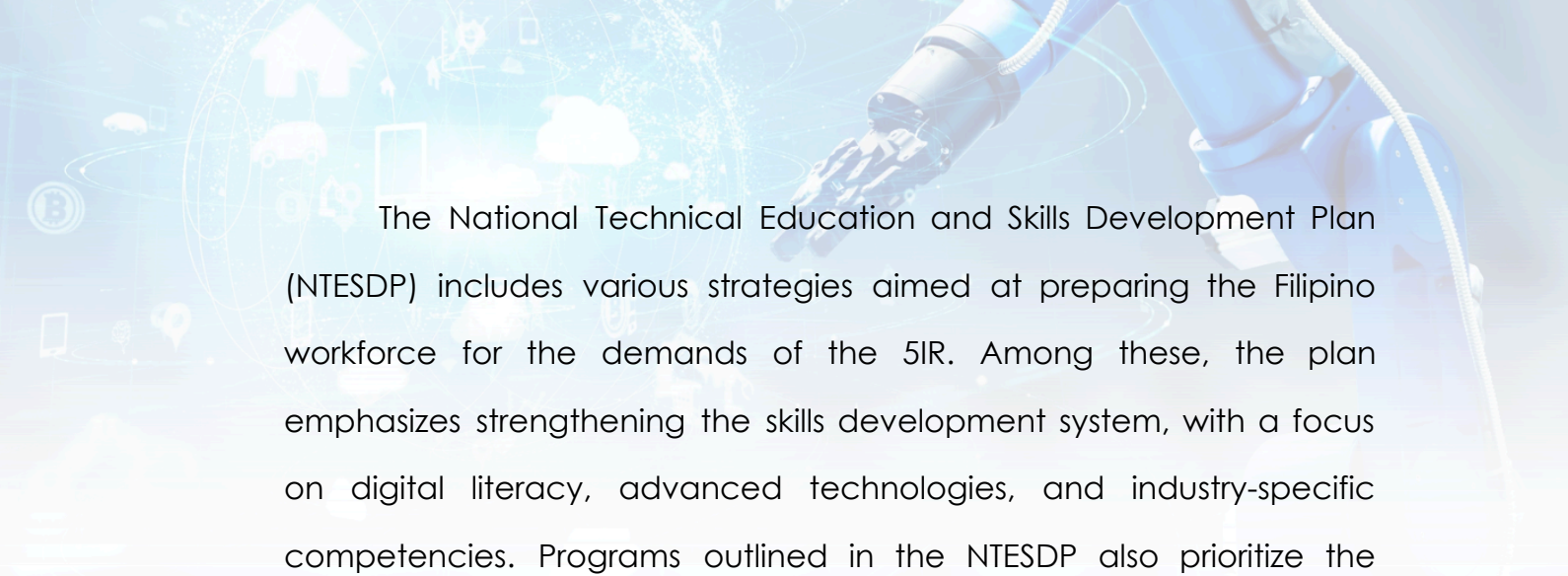
opportunity. This report projects an increase in employment opportunities in key areas such as renewable energy infrastructure, sustainable agriculture, eco-tourism, and green manufacturing. To support this shift, investment in workforce training and TVET programs is essential to equip workers with specialized skills in solar energy, wind power, biofuels, hydrogen energy, and circular economy practices. The transition to renewable energy aligns with the Philippines' commitment to sustainability and the development of a future-ready workforce.

9. **PUBLIC-PRIVATE PARTNERSHIPS (PPPs) IN THE 5IR**

As emphasized by the World Bank (2023), Public-Private Partnerships (PPPs) are critical for mobilizing resources, expertise, and innovation in key sectors such as infrastructure, education, and technology. These collaborations facilitate the creation of cutting-edge TVET programs, align curricula with industry needs, and foster technology transfer and collaborative research and development. PPPs also play a role in advancing digital transformation efforts by enabling investments in smart infrastructure, cybersecurity, and AI-driven solutions. However, to maximize their potential, strong governance frameworks, transparency, and accountability must be in place to ensure that these partnerships drive inclusive and sustainable growth in the 5IR economy.

10. **NATIONAL TECHNICAL EDUCATION AND SKILLS DEVELOPMENT PLAN (NTESDP) 2023-2028**

The National Technical Education and Skills Development Plan (NTESDP) includes various strategies aimed at preparing the Filipino workforce for the demands of the 5IR. Among these, the plan emphasizes strengthening the skills development system, with a focus on digital literacy, advanced technologies, and industry-specific competencies. Programs outlined in the NTESDP also prioritize the integration of emerging technologies, such as AI, into the education and training frameworks to ensure that the workforce is well-equipped to meet the challenges and opportunities of 5IR.

In line with these strategic objectives mentioned above. TESDA plays a critical role in preparing the Filipino workforce for the evolving demands of the 5IR. One notable accomplishment is the introduction of the Competency Standards (CS) on Generative AI, a crucial skill set that aligns with the growing demand for AI expertise in various sectors. This initiative is part of TESDA's ongoing efforts to update and enhance its TVET programs. Additionally, TESDA is working to incorporate advanced manufacturing, robotics, and AI ethics into its curriculum development, ensuring that Filipino workers stay competitive in an increasingly tech-driven world and are able to meet the needs of new industries shaped by 5IR.

Gap Analysis

The advent of 5IR, characterized by the convergence of human and AI, presents both opportunities and challenges for the workforce. While this new era promises increased efficiency and innovation, it also necessitates a significant shift in the skills required for success.

Consequently, existing technical and vocational education and training (TVET) frameworks and programs face a critical juncture. Currently, these systems often lag behind the rapidly evolving demands of the 5IR, creating a potential skills gap that could hinder economic growth and social progress. This section will delve into the specific policy and regulatory adaptations needed to bridge this gap, ensuring that TVET equips individuals with the competencies necessary to thrive in the 5IR landscape.
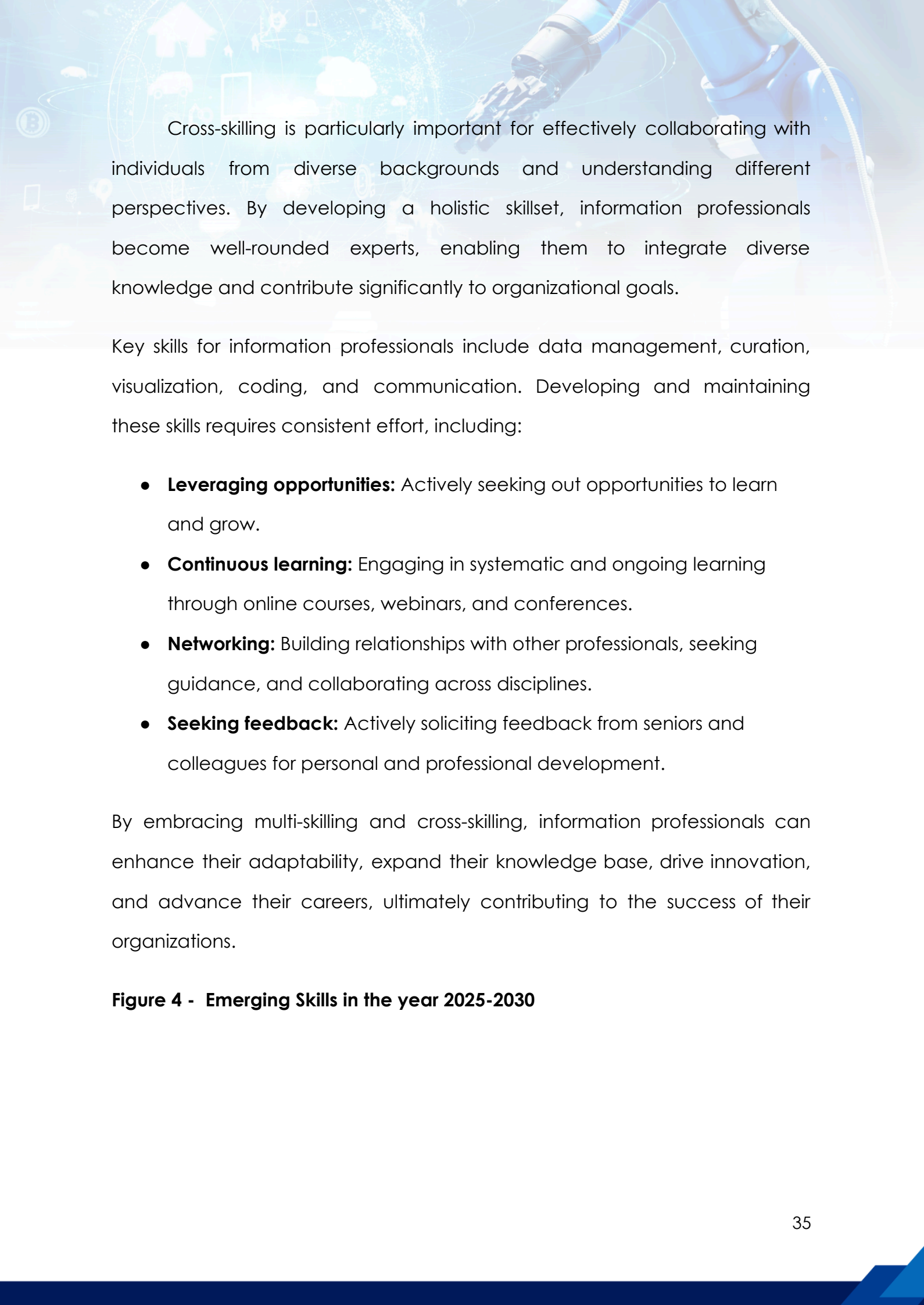
Table 2. Gap Analysis

Policy / Initiative / Law	Description	TVET Related Gap
PHILIPPINE DEVELOPMENT PLAN 2017-2022 & 2023-2028	National framework for inclusive growth, emphasizing digital transformation and skills development.	Lacks detail on specific 5IR skills needed.
INNOVATIVE STARTUP ACT 2019	Supports startups and innovation, providing incentives and fostering a startup ecosystem.	Does not address skills needed to scale startups. Lack of TVET programs that address the specific skills required for startup management, innovation, and entrepreneurship in emerging tech sectors.
PHILIPPINE INNOVATION ACT 2018	Fosters an innovation ecosystem, emphasizing advanced technologies and R&D.	Missing link between innovation and TVET skills.
CONTINUING PROFESSIONAL DEVELOPMENT ACT 2016	Mandates continuous learning for professionals.	Limited focus on offering flexible, accessible upskilling opportunities in TVET for professionals, particularly in fast-evolving fields like AI and cybersecurity.

NATIONAL DIGITAL TRANSFORMATION STRATEGY	Transforms government, industries, and society through digital means.	Unclear articulation of TVET's contribution to digital transformation.
CYBERSECURITY ACT OF 2012	Safeguards information infrastructure against cyber threats.	Need for specialized cybersecurity TVET programs.
UNIVERSAL BROADBAND ACCESS STRATEGY	Aims to provide nationwide access to affordable and reliable internet connectivity, bridging the digital divide and supporting economic growth.	While Broadband Installation (Fixed Wireless Systems) NC II exists, there is a need to expand training accessibility, particularly in rural areas, and ensure alignment with emerging broadband technologies like fiber optics and satellite internet.
IRENA Renewable Energy Outlook (2024)	Highlights the Green Shift/Transition to Renewable Energy as both an environmental necessity and a job creation opportunity, emphasizing the need for renewable energy infrastructure development. The report projects increased demand for skills in sustainable agriculture, eco-tourism, and green manufacturing, requiring investments in training and education programs.	No TVET Related Gap
Public-Private Partnerships (PPPs) in the 5IR	As highlighted by the World Bank (2023), PPPs are crucial for mobilizing resources, expertise, and innovation to support infrastructure development and education reform. These partnerships can help develop cutting-edge TVET programs aligned with 5IR labor market needs, foster technology transfer, and drive collaborative	No TVET Related Gap Although, there's no direct gap, strong governance is necessary for this initiative

	research and development. Effective governance, transparency, and accountability are necessary to maximize their impact.	
NATIONAL TECHNICAL EDUCATION AND SKILLS DEVELOPMENT PLAN (NTESDP) 2023-2028	TESDA's plan for workforce preparation, including AI competency standards.	While NTESDP 2023-2028 includes initiatives to integrate emerging technologies into TVET programs, challenges remain in implementation, industry alignment, and scalability. Ensuring curricula stay current with rapid tech changes requires further curriculum expansion in emerging tech fields (e.g., AI ethics, smart manufacturing, renewable energy technologies, cybersecurity in industrial automation, and sustainability practices).

V. Skills Needs

According to Oladokun et al., In the age of Generative AI, information professionals play a vital role in organizations by managing the entire lifecycle of information – from collection and processing to dissemination and archiving. To succeed, they must be adaptable and possess a diverse skill set. This requires both multi-skilling, the ability to perform multiple tasks within their specific area, and cross-skilling, the ability to acquire skills from other fields and apply them to their work.
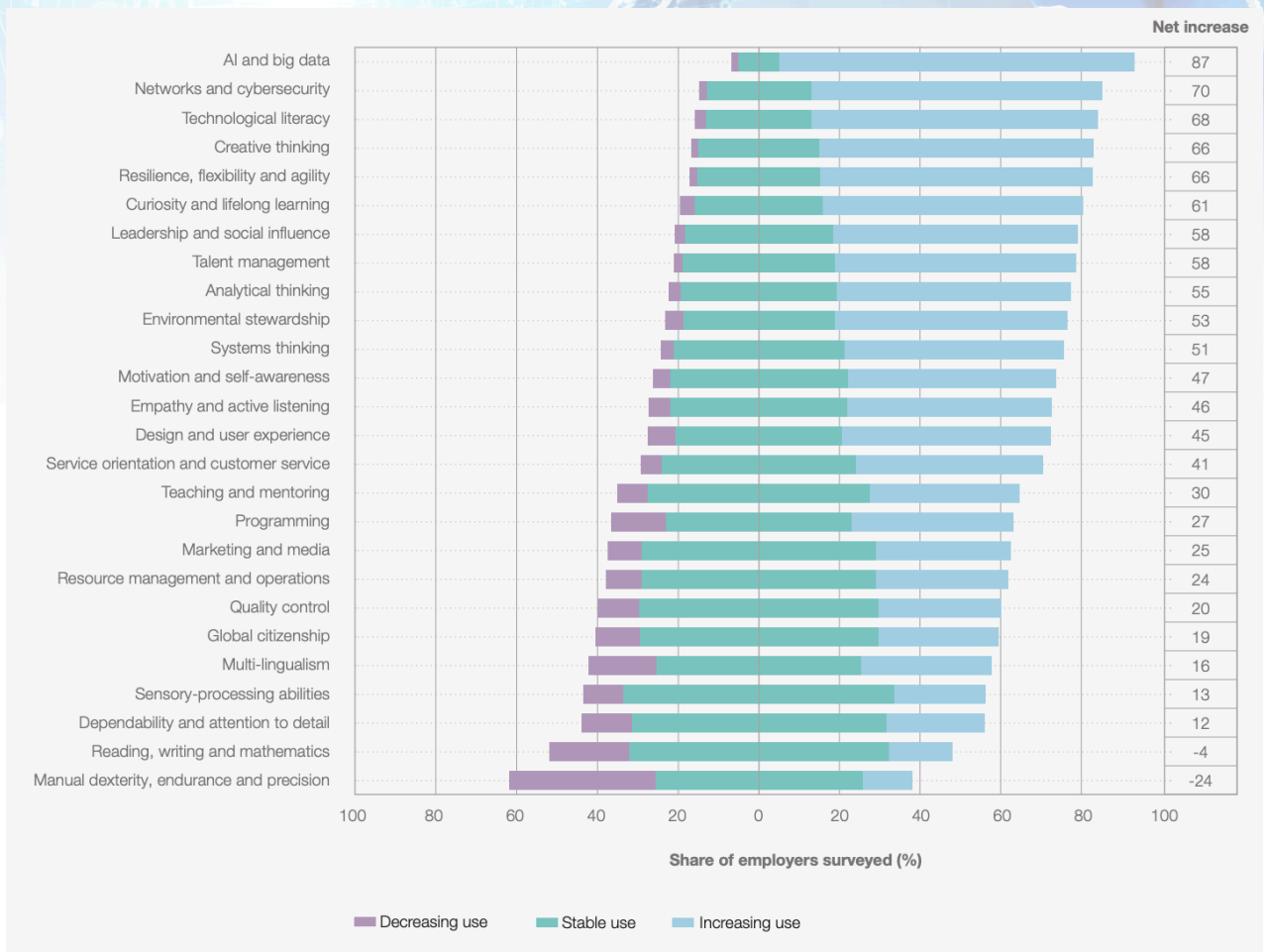
Cross-skilling is particularly important for effectively collaborating with individuals from diverse backgrounds and understanding different perspectives. By developing a holistic skillset, information professionals become well-rounded experts, enabling them to integrate diverse knowledge and contribute significantly to organizational goals.

Key skills for information professionals include data management, curation, visualization, coding, and communication. Developing and maintaining these skills requires consistent effort, including:

- **Leveraging opportunities:** Actively seeking out opportunities to learn and grow.
- **Continuous learning:** Engaging in systematic and ongoing learning through online courses, webinars, and conferences.
- **Networking:** Building relationships with other professionals, seeking guidance, and collaborating across disciplines.
- **Seeking feedback:** Actively soliciting feedback from seniors and colleagues for personal and professional development.

By embracing multi-skilling and cross-skilling, information professionals can enhance their adaptability, expand their knowledge base, drive innovation, and advance their careers, ultimately contributing to the success of their organizations.

Figure 4 - Emerging Skills in the year 2025-2030

	Net increase
AI and big data	87
Networks and cybersecurity	70
Technological literacy	68
Creative thinking	66
Resilience, flexibility and agility	66
Curiosity and lifelong learning	61
Leadership and social influence	58
Talent management	58
Analytical thinking	55
Environmental stewardship	53
Systems thinking	51
Motivation and self-awareness	47
Empathy and active listening	46
Design and user experience	45
Service orientation and customer service	41
Teaching and mentoring	30
Programming	27
Marketing and media	25
Resource management and operations	24
Quality control	20
Global citizenship	19
Multi-lingualism	16
Sensory-processing abilities	13
Dependability and attention to detail	12
Reading, writing and mathematics	-4
Manual dexterity, endurance and precision	-24

Share of employers surveyed (%)

■ Decreasing use   ■ Stable use   ■ Increasing use

Source: World Economic Forum, Future of Jobs Survey 2024.

According to the World Economic Forum's Future of Jobs Report 2025, employer expectations indicate a significant shift in the importance of various skills over the next five years, as depicted in Figure 4. Technological skills are anticipated to experience the most rapid growth in importance, with AI and big data leading the way. This is closely followed by networks and cybersecurity, and technological literacy. In addition to these technical skills, creative thinking and socio-emotional attributes such as resilience, flexibility, agility, curiosity, and lifelong learning are also expected to gain prominence.
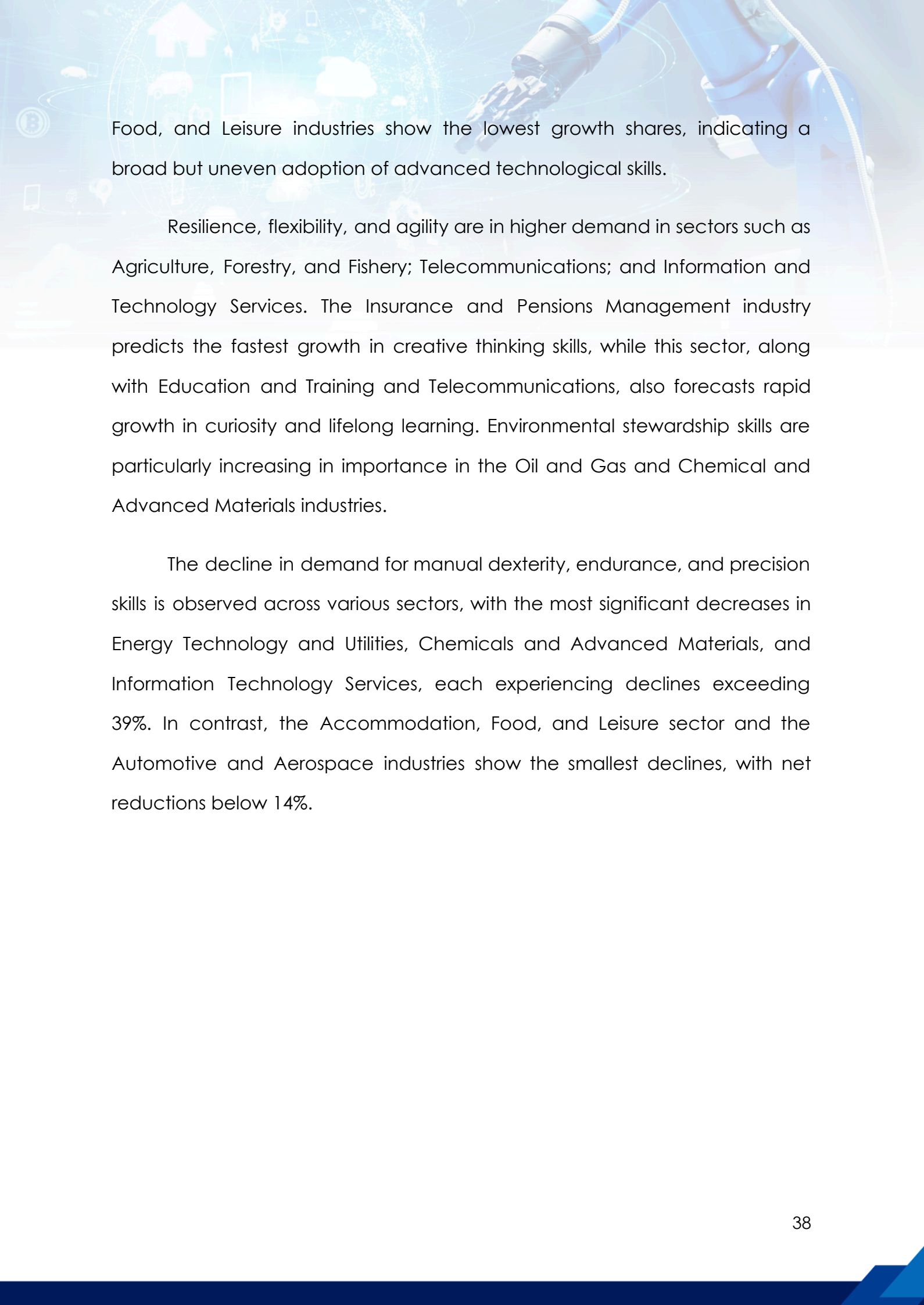
Leadership and social influence, talent management, analytical thinking, and environmental stewardship are also among the top 10 skills projected to rise in importance. These skills underscore the need for workers who can effectively lead teams, manage talent, and adapt to sustainability and green transitions in an increasingly complex global environment.

On the other hand, skills such as sensory-processing abilities, reading, writing, mathematics, dependability, attention to detail, quality control, and global citizenship are expected to remain relatively stable. However, a slight decline is anticipated in the importance of reading, writing, and mathematics. Notably, manual dexterity, endurance, and precision are expected to see a significant net decline, with 24% of respondents predicting a decrease in their relevance. This marks the first time physical abilities have shown a negative decline in the Future of Jobs Reports.

Comparisons with previous surveys of the World Economic Forum reveal a notable shift in skill demands. Technology-related skills, including AI and big data, networks and cybersecurity, and environmental stewardship, have seen the largest net increase in importance. Conversely, traditional skills such as reading, writing, mathematics, manual dexterity, endurance, precision, dependability, and attention to detail have experienced the most significant declines in projected demand.

Figure 4 highlights industry-specific variations in the evolving importance of skills. AI and big data are expected to grow significantly across nearly all sectors, with over 90% of respondents in the top 10 industries anticipating increased use. The Agriculture, Forestry, and Fishing and Accommodation,

Food, and Leisure industries show the lowest growth shares, indicating a broad but uneven adoption of advanced technological skills.

Resilience, flexibility, and agility are in higher demand in sectors such as Agriculture, Forestry, and Fishery; Telecommunications; and Information and Technology Services. The Insurance and Pensions Management industry predicts the fastest growth in creative thinking skills, while this sector, along with Education and Training and Telecommunications, also forecasts rapid growth in curiosity and lifelong learning. Environmental stewardship skills are particularly increasing in importance in the Oil and Gas and Chemical and Advanced Materials industries.

The decline in demand for manual dexterity, endurance, and precision skills is observed across various sectors, with the most significant decreases in Energy Technology and Utilities, Chemicals and Advanced Materials, and Information Technology Services, each experiencing declines exceeding 39%. In contrast, the Accommodation, Food, and Leisure sector and the Automotive and Aerospace industries show the smallest declines, with net reductions below 14%.

Figure 5 - Job growth and decline (%) , 2025-2030
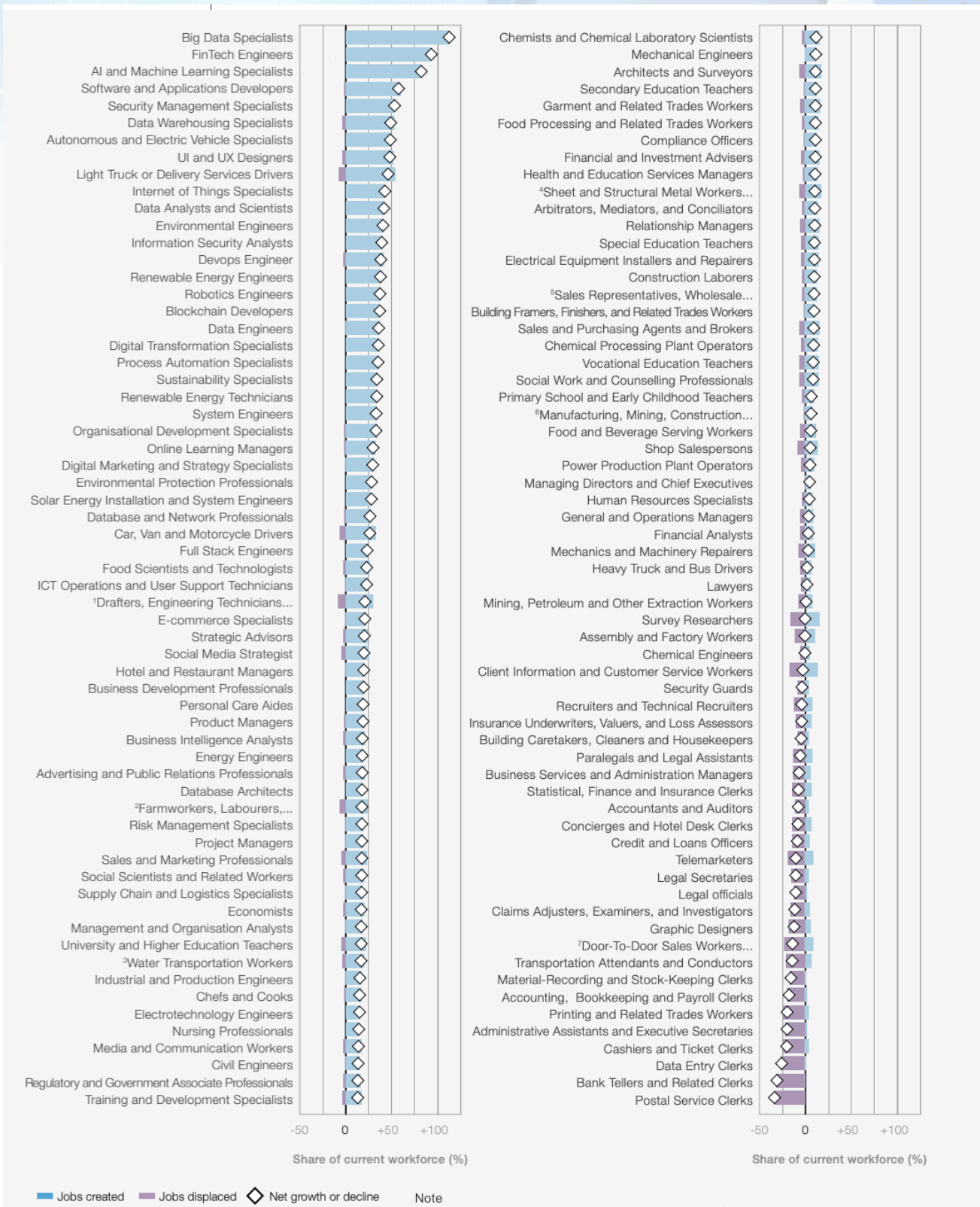
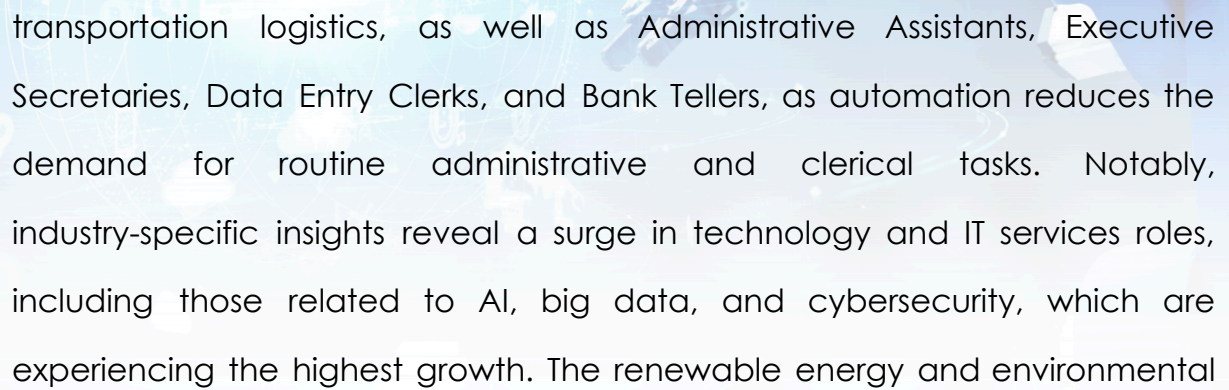*Source: The Future of Jobs Report 2025, World Economic Forum*

Figure 5 from The World Economic Forum's Future of Jobs Report 2025 offers a comprehensive analysis of projected job growth and decline from 2025 to 2030, highlighting key trends shaping the labor market. This analysis, based on employer surveys, emphasizes the growing demand for roles in technology, sustainability, and digital transformation. **High-growth occupations include Big Data Specialists**, driven by the increasing need for data-driven decision-making, and roles in FinTech, AI, and machine learning, spurred by rapid advancements in financial technologies and AI. Similarly, Software and Applications Developers are expected to experience continued demand due to the ongoing digital transformation across industries, while the rising threat of cyberattacks calls for more professionals in cybersecurity fields, such as Security Management Specialists and Information Security Analysts. The renewable energy sector also presents significant opportunities, with Renewable Energy Engineers and Technicians at the forefront of the global push for sustainable energy. Moderate-growth occupations are driven by the focus on environmental sustainability, with Environmental Engineers and Sustainability Specialists in demand due to stricter regulations and societal expectations. Digital Transformation Specialists and Process Automation Specialists are also seeing steady growth as organizations increasingly invest in technology to remain competitive. In addition, Online Learning Managers and Digital Marketing Specialists are benefiting from the growing prominence of e-learning and digital marketing strategies. Certain occupations, such as Nursing Professionals, Social Work and Counselling Professionals, and Primary School and Early Childhood Teachers, remain stable due to the consistent need for healthcare and education. However, several traditional roles are projected to decline, including Car, Van, and Motorcycle Drivers, as autonomous vehicles reshape

transportation logistics, as well as Administrative Assistants, Executive Secretaries, Data Entry Clerks, and Bank Tellers, as automation reduces the demand for routine administrative and clerical tasks. Notably, industry-specific insights reveal a surge in technology and IT services roles, including those related to AI, big data, and cybersecurity, which are experiencing the highest growth. The renewable energy and environmental protection sectors are also seeing a rise in demand for professionals to support the global transition to more sustainable energy sources. The healthcare and education industries are characterized by steady demand, while the transportation and logistics sector is adapting to technological changes, such as autonomous vehicles. The report underscores the profound transformation in the labor market, with a shift toward roles supporting innovation, sustainability, and digital progress. As traditional occupations decline, new opportunities are emerging, particularly in the technology and green economy sectors. Policymakers, educators, and industry leaders must collaborate to ensure the workforce is equipped with the necessary skills to navigate these changes and thrive in the evolving labor landscape.

The TVET system in the Philippines must adapt to address these skills needs. Current challenges include inadequate funding, a shortage of qualified trainers, and outdated curricula. Enhancing TVET programs to include emerging skills like AI ethics and sustainable design will be essential for workforce readiness (*TESDA, 2023*).

Some of TVET qualifications that may be considered part of 5IR are Digital Agriculture Level II, Battery Electric Vehicle Servicing (PUV) Level II, PV System Design NC III, Programming (.Net Technology) NC III, and etc.

VIII. Conclusion

The dawn of the 5IR presents the Philippines with a unique opportunity, a chance to leap forward in its journey of economic and social development. This is not simply about keeping pace with technological advancements. It is about harnessing the power of these innovations to build a more inclusive, sustainable, and prosperous future for all Filipinos. The 5IR, with its intricate tapestry of interconnected technologies, offers the potential to reshape industries, redefine work, and ultimately, improve lives. But realizing this potential requires more than just embracing the latest gadgets and software. It demands a holistic and human-centered approach, one that prioritizes sustainability, invests in our people, and tackles the systemic challenges that might hinder our progress.
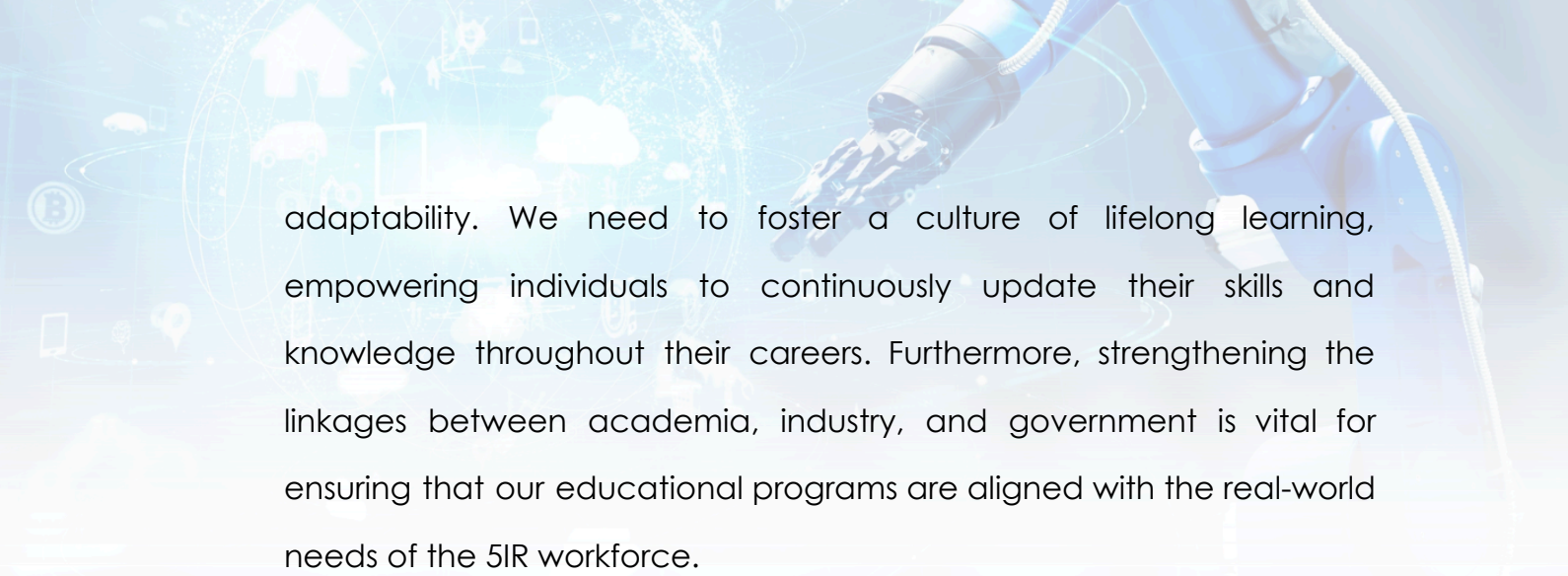
The very nature of the 5IR is its extensiveness and interconnectedness. It is not confined to a single sector or a handful of technologies. It is a cross-cutting force that permeates every facet of our economy and society. This means that our response must be equally comprehensive and collaborative. While agencies like the DTI, DICT, DOST, NEDA, DOLE, DepEd, and CHED play pivotal roles in shaping our 5IR strategy, their efforts cannot exist in silos. The 5IR's cross-sectoral nature necessitates a dynamic and adaptable approach, one that allows for the involvement of other relevant agencies depending on the specific industry or area of focus. Whether we're discussing the future of agriculture, the transformation of healthcare, or the evolution of manufacturing, each sector will have its unique 5IR-related needs and require tailored solutions. This calls for

open communication, shared expertise, and a willingness to break down traditional bureaucratic boundaries to work together towards common goals.

Beyond government, the private sector, the industries themselves, are indispensable partners in this endeavor. From manufacturing and ICT to transportation, healthcare, energy, construction, and agriculture, businesses are on the front lines of 5IR implementation. They are the ones who will ultimately integrate these new technologies into their operations, create new job roles, and drive innovation. Their active participation in shaping 5IR strategies, investing in workforce training, and fostering a culture of innovation is absolutely essential. We must encourage businesses to not only adopt new technologies but also to prioritize the well-being of their employees, ensuring a just transition for workers whose jobs may be affected by automation. This involves investing in upskilling and reskilling programs, creating new pathways for career advancement, and fostering a collaborative environment where humans and machines work together seamlessly.

But perhaps the most crucial element in unlocking the transformative power of the 5IR lies in our institutions. Our educational institutions, training centers, and research organizations are the bedrock upon which our future workforce will be built. They must adapt their curricula, teaching methods, and research agendas to reflect the rapidly evolving demands of the 5IR economy. This means not only equipping students with technical skills but also nurturing uniquely human capabilities like critical thinking, creativity, problem-solving, and

adaptability. We need to foster a culture of lifelong learning, empowering individuals to continuously update their skills and knowledge throughout their careers. Furthermore, strengthening the linkages between academia, industry, and government is vital for ensuring that our educational programs are aligned with the real-world needs of the 5IR workforce.

The 5IR is not just a technological revolution; it is a human revolution. It is a chance to build a future where technology empowers us to reach our full potential, where innovation drives inclusive growth, and where sustainability is at the heart of everything we do. By working together – government, industry, and individuals – we can shape a 5IR future that benefits all Filipinos, a future where we not only adapt to change but also actively create it. This is our opportunity to build a brighter, more prosperous, and more equitable Philippines, a nation ready to lead in the 5IR era.

With regard to skills mapping, given the components of the 5th IR such as the use of robotics and advanced technologies, existing TVET programs should be evaluated on their alignment with the competencies, skills, and industry demands of the Fifth Industrial Revolution. This ensures that any adjustments or enhancements are based on clear evidence of gaps or misalignments.

IX. Recommendations

As the Philippines continues its transition to 5IR, TESDA has the opportunity to equip the workforce with the necessary skills and competencies that will be in demand across various industries. In line with this, the following are the recommendations:

- **Review of TESDA Training Regulations for Alignment with the Fifth Industrial Revolution**
    - It is recommended that TESDA conduct a thorough review of its training regulations, taking into account the key components identified in this study. This will help determine whether the existing programs are truly aligned with the demands and advancements of the Fifth Industrial Revolution. By ensuring that training programs remain responsive to emerging technologies, evolving industry needs, and future workforce requirements, TESDA can enhance its role in preparing learners for the challenges and opportunities of the 5th IR.

- **TESDA should initiate focused consultations with 5IR industry stakeholders to understand skills gaps and workforce needs.**
    - The office must engage with key players in sectors directly impacted by 5IR Technologies, such as manufacturing, agriculture, logistics, health, ICT, and renewable energy. Using the Skills Insights as a guide, consultations should focus on identifying the specific skills, occupations, and competencies required to support the growth of these industries.

- TESDA must engage with specific sectors most impacted by 5IR, such as advanced manufacturing, AI and robotics, renewable energy, and digital services. It is critical to consult with the Department of Science and Technology (DOST), Department of Trade and Industry (DTI), and key industry players like Globe Telecom, PLDT, and Meralco, to accurately map out the skills required in these sectors.
- These consultations should specifically focus on:
  - Identifying new and emerging occupations related to 5IR technologies such as AI engineers, robotics technicians, data scientists, and renewable energy systems specialists.
  - Reviewing the competencies required for these occupations, especially technical skills in machine learning, data analytics, IoT systems management, and cloud computing.
  - Gathering input on green skills that intersect with digital technologies, such as sustainable energy systems, energy-efficient automation, and carbon footprint management.
- Regular follow-up consultations with these stakeholders should be scheduled to ensure the relevance of the competencies identified.
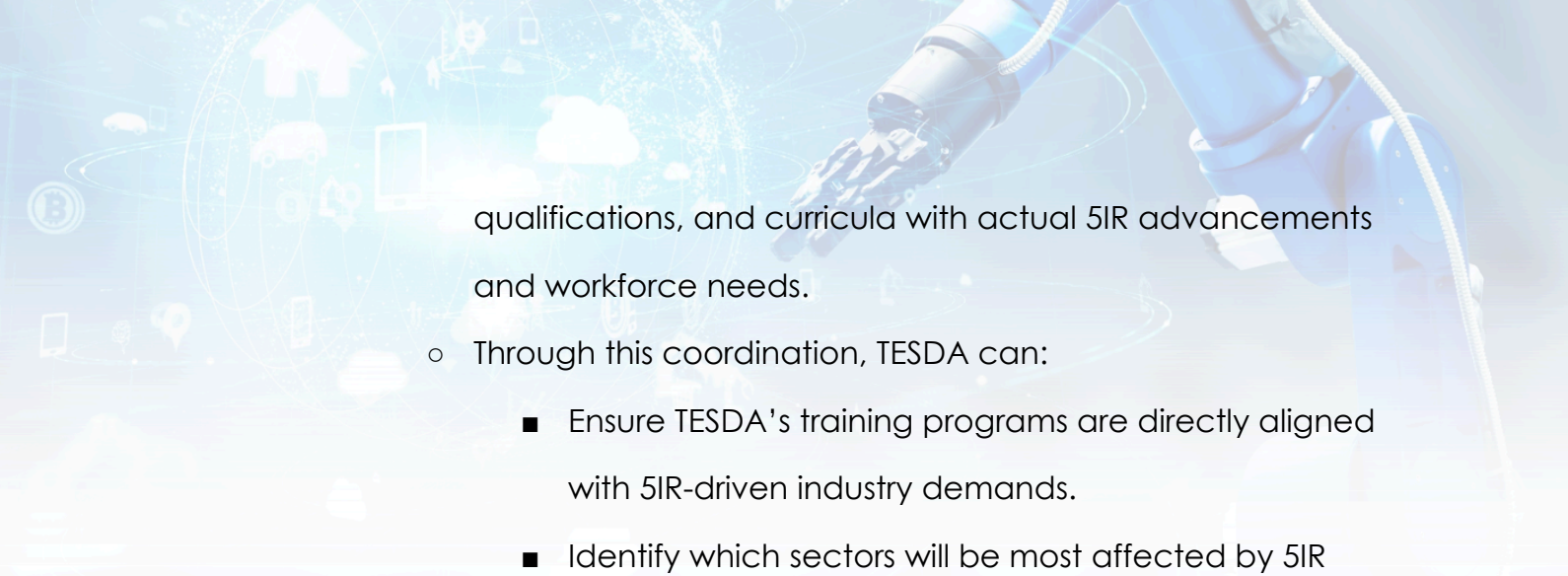
- **TESDA should utilize the Industry TVET Boards (ITB's) initiatives to recommend programs or needs responsive to 5IR.**
  - ITBs play a crucial role in identifying the sector-specific training demands and ensuring that TESDA's programs are aligned with evolving industry needs.
  - ITBs should be leveraged to assess workforce trends, skill gaps, and technological advancements in key 5IR sectors such as AI, advanced manufacturing, green energy, and digital services.
  - ITBs should actively contribute to curriculum development by recommending new qualifications, micro-credentials, and certification programs tailored to 5IR industries.
  - TESDA should collaborate with ITBs to establish industry-led standards that ensure graduates meet both local and global competency requirements.
  - ITBs should assist in expanding linkages between TESDA, private sector companies, and international training institutions to facilitate knowledge exchange and industry immersion opportunities for TVET learners.
- **Coordinate with the Department of Trade and Industry (DTI) to Define and Align 5IR Programs**
  - TESDA should coordinate closely with the Department of Trade and Industry (DTI) to obtain a clear definition of what 5IR means in the context of the Philippine economy.
  - DTI's expertise in industry development and emerging technologies will help TESDA align its training programs,

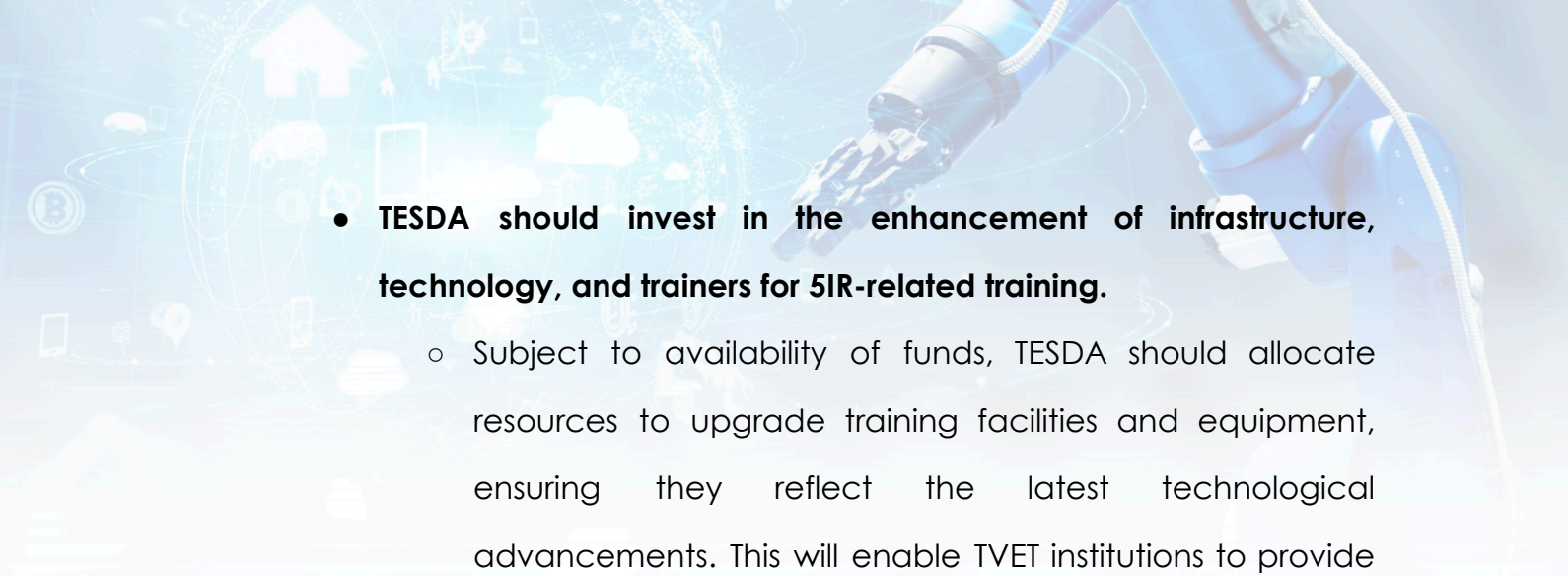qualifications, and curricula with actual 5IR advancements and workforce needs.

- ○ Through this coordination, TESDA can:
  - ■ Ensure TESDA's training programs are directly aligned with 5IR-driven industry demands.
  - ■ Identify which sectors will be most affected by 5IR technologies and develop customized training interventions.
  - ■ Collaborate with DTI's industry clusters to design training initiatives tailored for local businesses, MSMEs, and large-scale enterprises adopting 5IR innovations.
  - ■ This strategic alignment will ensure that TESDA's workforce development initiatives remain relevant, responsive, and forward-thinking in the face of rapid technological changes.
- **TESDA should collaborate with educational institutions, industry leaders, and government agencies such as the Department of Information and Communications Technology (DICT), the Department of Science and Technology (DOST), and the National Economic and Development Authority (NEDA) to ensure the workforce is prepared for 5IR technologies.**
  - ○ TESDA must collaborate with top universities in the country as well as tech companies like Accenture, Google Philippines, and Amazon Web Services (AWS), to design and implement training programs aligned with industry needs.

- Specific programs should include:
  - AI and machine learning certifications that align with international standards, tailored for TVET learners.
  - Digital transformation leadership training, aimed at preparing managers and executives to lead organizations through technological change.
  - Robotics programming and maintenance courses that provide hands-on learning in working with cutting-edge robotic systems used in manufacturing and healthcare.
  - TESDA should facilitate the development of short-term boot camps in partnership with private tech companies and foreign tech experts, offering intensive, hands-on learning for in-demand 5IR skills.

- **TESDA Regional Offices should facilitate local consultations with 5IR-related industries.**
  - Regional offices must conduct consultations with local businesses, local government units (LGUs), and industry associations such as the Philippine Chamber of Commerce and Industry (PCCI) to identify industry-specific 5IR needs.
  - Regional offices should focus on:
    - Promoting local smart manufacturing hubs, particularly in regions with significant industrial bases such as Cebu and Batangas, by offering training on AI-driven production and advanced robotics.

■ Targeting regions with significant agricultural sectors like Region II for programs on agri-tech, including drone-based farming, precision agriculture, and IoT-based monitoring systems.

○ The regional offices should also collaborate with local energy companies such as First Gen Corporation and Solar Philippines to develop skills programs for workers in renewable energy technologies and energy storage solutions.

● **TESDA should prioritize the development of upskilling programs for workers transitioning to 5IR roles.**

○ The need for continuous education will be key in the 5IR landscape. TESDA is urged to offer priority training programs that cater to employees whose current roles may be at risk due to automation or digital transformation. These upskilling programs should focus on areas like machine learning, data analytics, and digital transformation leadership.

○ TESDA should provide TVET scholarship funding for priority sectors, ensuring that individuals in high-risk job categories have access to retraining opportunities. This initiative would help workers transition smoothly into new roles created by the evolving job market.

○ In addition, TESDA should support the development of online platforms and digital tools that offer flexible training options, making these resources more accessible to workers across all regions.

- **TESDA should invest in the enhancement of infrastructure, technology, and trainers for 5IR-related training.**
  - Subject to availability of funds, TESDA should allocate resources to upgrade training facilities and equipment, ensuring they reflect the latest technological advancements. This will enable TVET institutions to provide hands-on experience in emerging tools such as AI programming environments, robotics kits, and virtual simulation systems.
  - Trainer training and capacity-building initiatives should also be emphasized to ensure that instructors are equipped to teach 5IR-related skills effectively. This would involve upskilling trainers to keep up with rapid advancements in technology.
- **Policymakers must establish clear guidelines and funding mechanisms to support the 5IR transition.**
  - The government should prioritize investments in digital and transportation infrastructure to bridge the digital divide and ensure equitable access to the benefits of 5IR technologies, particularly in rural and underserved areas.
  - Regulations that foster innovation, while addressing ethical concerns, must be developed to ensure that AI, automation, and other disruptive technologies are used responsibly. Policies should encourage transparency, data privacy, and equitable access to new technologies, ensuring that no demographic is left behind.

- Public-private collaborations should be strengthened to facilitate the creation of an inclusive, sustainable, and forward-thinking workforce ecosystem capable of responding to the challenges and opportunities of 5IR.

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Contributors:
Daniel David O. Tan
Gabriel Philip A. Mendoza
Michael William H. Del Rosario
Katherine Amor A. Zarsadias

Labor Market Information Division
Planning Office
Office of the Deputy Director General for Policies and Planning
Technical Education and Skills Development Authority
TESDA Complex, East Service Road, South Luzon Expressway (SLEX)
Fort Bonifacio, Taguig City 1630, Metro Manila