

Bayudan-Dacuycuy, Connie; Epetia, Ma. Christina F.; Vargas, Anna Rita P.; Ocbina, John Joseph S.

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Inputs to the Philippine labor market information system and TESDA's skills anticipation and prioritization of skills requirements framework

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Inputs to the Philippine Labor Market Information System and TESDA's Skills Anticipation and Prioritization of Skills Requirements Framework

*Connie Bayudan-Dacuycuy, Ma. Christina F. Epetia,
Anna Rita P. Vargas, and John Joseph S. Ocbina*



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CONTACT US:

RESEARCH INFORMATION DEPARTMENT
Philippine Institute for Development Studies

18th Floor, Three Cyberpod Centris - North Tower
EDSA corner Quezon Avenue, Quezon City, Philippines

publications@pids.gov.ph
(+632) 8877-4000

<https://www.pids.gov.ph>

Inputs to the Philippine Labor Market Information System
and TESDA's Skills Anticipation and Prioritization of Skills
Requirements Framework

Connie Bayudan-Dacuycuy
Ma. Christina F. Epetia
Anna Rita P. Vargas
John Joseph S. Ocbina

PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES

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Abstract

In the Philippines, skills mismatch has persisted since the 1970s, when the higher education system produced more college graduates than the economy could absorb. Prolonged skills mismatch can result in adverse outcomes such as lower wages, decreased job satisfaction, diminished productivity, and increased turnover rates for individuals and businesses. Addressing skills mismatch requires a well-operating Labor Market Information System (LMIS).

This study is an input to the Technical Education and Skills Development Authority (TESDA) Skills Anticipation and Prioritization of Skills Requirements (SAPSR) Framework. The SAPSR is intended primarily as a reference in identifying skills requirements. Viewing SAPSR as an integral part of the broader LMIS, this study reviews the available data, the requisite analytical capabilities/tools, and institutional arrangements to make SAPSR relevant to stakeholders. This study finds that while the country has valuable data sources relevant to the skills needs assessment initiative and has several LMIs in operation, there are several areas for improvements in data and its collection, capability building, and institutional arrangements.

Drawing from the idea that the SAPSR is part of a system that involves the engagement of various players, the recommendations forwarded by this paper do not focus on what TESDA alone can do but on areas for collaboration to make the LMIS and SAPSR sustainably successful. The recommendations focus on the following areas: partnerships and institutional arrangements, skills taxonomy and skills-occupation mapping, use of PSOC (highly disaggregated if possible) in data collection and other skills and labor market initiatives (e.g., PhilJobNet, PESO-Information System, Philippine Skills Framework Initiative), training to harness emerging data sources and conduct qualitative and quantitative methods, dissemination initiatives, and support.

Keywords: TESDA, labor market information system, skills anticipation and prioritization of skills requirements framework, skills need anticipation

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Inputs to the Philippine Labor Market Information System and TESDA's Skills Anticipation and Prioritization of Skills Requirements Framework

***Connie Bayudan-Dacuycuy, Ma. Christina F. Epetia, Anna Rita P. Vargas,
and John Joseph S. Ocbina¹***

1. Introduction

Skills mismatch is broadly understood as a discrepancy between the available skills and the skills sought by employers or firms, and it comes in different forms, including skills gaps, skills obsolescence, skills shortages, vertical mismatch, and horizontal mismatch (ILO, 2020). Mismatch occurs due to incomplete and imperfect information (Řihova, 2016). Earlier evidence indicates that information deficits result in mismatches between the choice of vocational specialization and labor market outcomes amid unanticipated changes in the labor market (Borghans et al., 1996). They concluded that additional public labor forecasts are important in guiding student choices.

Skills mismatch, when happening over prolonged periods, negatively affects individuals, firms, and the whole economy. At the individual level, overqualification is associated with wage penalties and lower job satisfaction (e.g., Sánchez-Sánchez and McGuinness, 2015). At the firm level, skills mismatch may result in lower firm productivity, underinvestment in innovation, and higher employee turnover rates (ILO, 2020). Aggregating these effects for individuals and firms means lower economy-wide productivity, lower national competitiveness, and higher unemployment and underemployment rates (Řihova, 2016).

While skills mismatch always exists due to incomplete and imperfect information (Řihova, 2016), mismatch and its negative consequences can be mitigated by a well-functioning labor market information (LMI) system. An LMI has various definitions. However, a comprehensive definition is that of Schmillen (2019, par.1), articulating that it “includes any quantitative or qualitative information and intelligence on the labor market that can assist labor market agents in making informed plans, choices, and decisions related to business requirements, career planning and preparation, education and training offerings, job search, hiring, and governmental policies and workforce investment strategies”. Meanwhile, European Training Foundation (2017a, par.6) articulates that “a labor market information system (LMIS) is the institutional arrangements and procedures that coordinate collection, processing, storage, retrieval, and dissemination of LMI”. Thus, a well-functioning LMIS is useful in addressing career, skills, education, training, and labor market issues.

Skills anticipation, a component of a broader LMIS, refers to activities that systematically assess current and future skills needs in the labor market (ILO, 2015). It is essential in guiding various stakeholders in the labor market and skills and training ecosystem. Skills needs anticipation (SNA) is designed to address labor market failures and, thus, largely falls within the sphere of government's function. However, the key to a successful SNA is a strong culture of collaboration among stakeholders.

¹ Fellow II, Former Fellow I, Research Specialist, and Research Analyst II, respectively. The authors would like to acknowledge the research assistance of Ms. Kimberly Librero.

In the Philippines, skills mismatch has been a persistent issue for decades. As early as the 1970s, the Philippine higher education system was producing a supply of college graduates higher than the economy's capacity to absorb highly educated workers (Perlman, 1978, as cited by Epetia (2018)). Recent evidence shows a persistent mismatch, with 65% of graduates not getting jobs from the sector of their choice due to a lack of skills (Aspiring Minds, 2017), around one-third of college graduates considered overeducated (Epetia, 2018), and around 20% of workers with college degrees employed in jobs using basic skills only (Bayudan-Dacuycuy and Dacuycuy, 2021). Related to technical and vocational education and training (TVET), around two-thirds of TVET graduates are mismatched with their occupations (ADB, 2021).

The Technical Education and Skills Development Authority (TESDA) is cognizant that various developments on several fronts can exacerbate mismatch and unemployment. The agency recognizes that education and training systems should keep pace with changes in demography (e.g., aging populations), average educational profiles, work organizations (e.g., flatter organizational structures), technology and innovation (e.g., Fourth Industrial Revolution), globalization and trade liberalization, and climate change (ILO, 2015). The agency also recognizes the crucial role of industry stakeholders (companies, associations, MSMEs, etc.) in determining industry needs. Thus, it pursued an area-based and demand-driven policy reform, which serves as a strategic and purposive response of agility and flexibility in seeking global competitiveness while achieving social inclusion. TESDA has been pursuing this reform since 2021 through the TESDA Circular 042 series of 2021.

In 2021, the agency conducted a pre-review and evaluation of its Training Regulations (TR)². In particular, TESDA (2022, p. 21) highlighted the need to include critical competencies such as “digital literacy, soft skills, and socio-emotional skills”, which are relevant for TRs developed before 2019. The report also highlighted that approximately 38 percent of the assessed TRs lack a registered training program or remain unused. To ensure that its programs and policies are responsive to changing labor market demands, TESDA developed a Skills Anticipation and Prioritization of Skills Requirements (SAPSR) Framework that will be used as a reference in identifying skills requirements (Figure 1). The Framework consists of inputs, processes, and outputs³.

- Inputs and information in the Framework are used to determine industry requirements. Inputs include (1) National Skills Map, which is based on the Philippine Development Plan, Industry Roadmaps, JobsFit reports, Philippine Skills Framework, research/result of studies including LMI Report, overseas requirements, results of the Provincial/Regional Skills Mapping, Workplace Skills and Satisfaction Survey, industry consultations, and World/ASEAN Skills Competition; (2) national policies and law; and (3) emerging skills requirements which are not included in the National Skills Map and are yet to be developed.
- The processes involve the validation of industries through sectoral consultations that determine the specific skills requirements that can be addressed by TVET programs. Furthermore, the prioritization of a set of criteria to determine the actions to be taken by TESDA in line with the identified gaps between industry needs and TESDA's capacity. In particular, the following criteria are used by the agency as the basis for the development of a program: 1) Priority needs of the industry sector; 2) Nationwide

² The updating mainly covers those TRs that have developed new technologies and practices and those that were created three years or more.

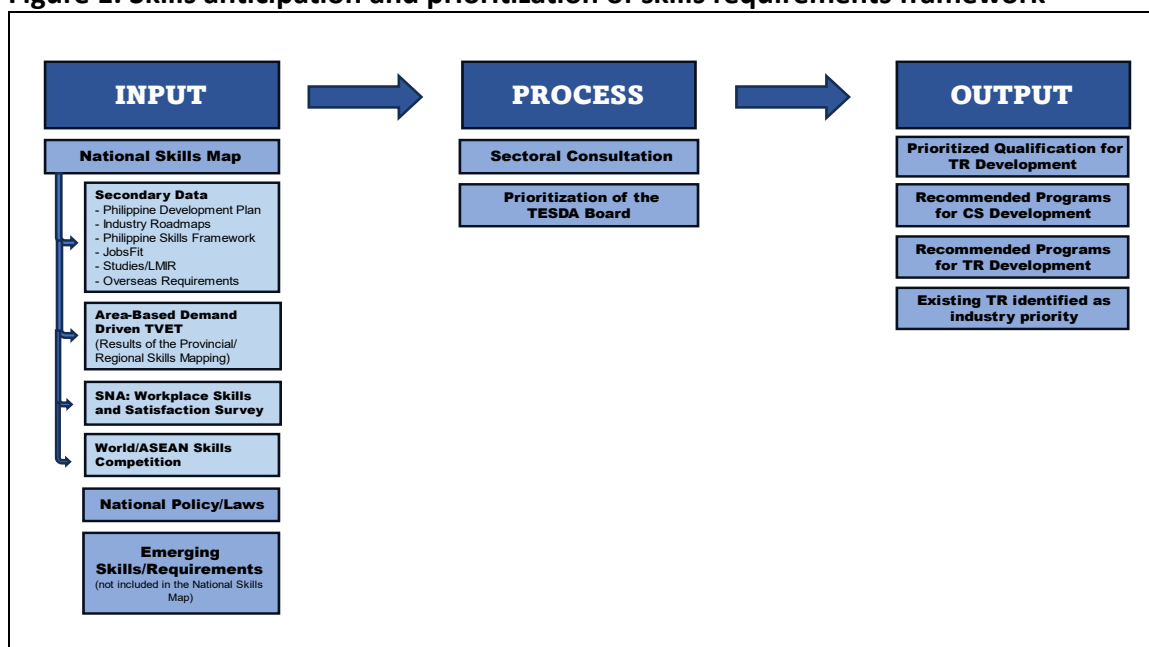
³ Based on TESDA Planning Office - Labor Market Information Division (2023).

application in terms of public welfare or interest; 3) Employment generation and investment opportunities; and 4) Need for standardization and certification (TESDA 2021, p. 3).

- Outputs include the determination of prioritized qualification for training regulation development, recommended programs for competency standards development, recommended programs for training regulation (TR) review and the identified existing TR as industry priority, which may serve as a basis for prioritizing scholarship allocation.

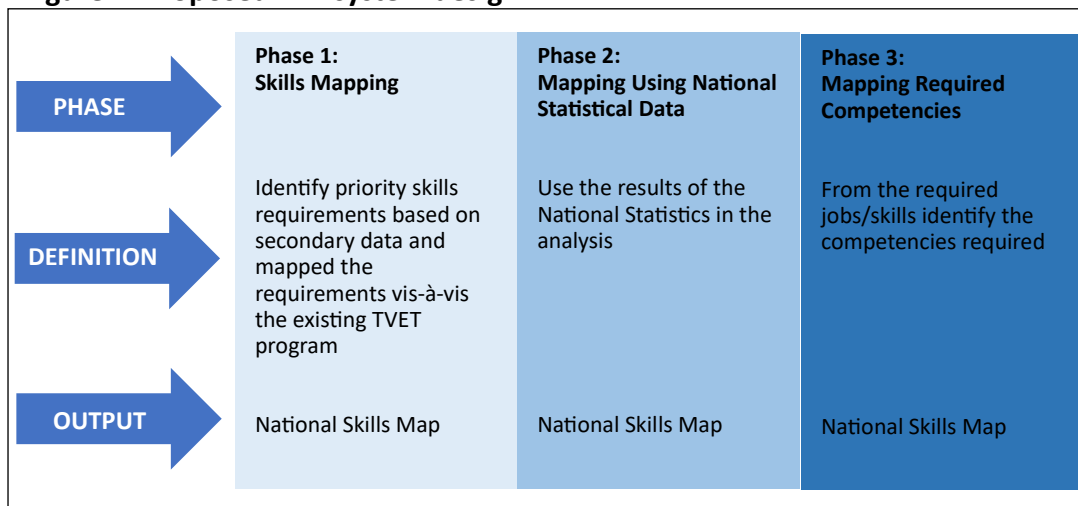
Relatedly, the study focuses on how the LMI Framework can be used to formulate policies that address jobs-skills mismatch. TESDA's proposed LMIS (Figure 2) comprises three phases: Skills Mapping, Mapping Using National Statistical Data, and Mapping Required Competencies. In the first phase, skills mapping aligns priority skills with existing TVET programs at both national and provincial levels. This process involves consulting with concerned stakeholders (e.g., employers, Jobstreet, Public Employment Service Office (PESO), and conducting surveys like the Workplace Skills and Satisfaction Survey. Transitioning to the second phase, national statistics, including the Labor Force Survey, will be used to evaluate the status, causes, and consequences of qualifications and skills mismatch. Lastly, the essential competencies for each job or occupation identified in the previous phases are organized to create a comprehensive skills occupation mapping (TESDA n.d.). The validity of this Framework will be evaluated in terms of the available LMI data and the institutions and agencies that should be involved in the system.

Figure 1. Skills anticipation and prioritization of skills requirements framework



Source: Email communication by TESDA to PIDS, August 19, 2022.

Figure 2. Proposed LMI system design



Source: Email communication by TESDA to PIDS, August 19, 2022.

Research objectives

The TESDA's SAPSR Framework is a step to identify skills priorities and target policies and programs that will address skills demand systematically. The SAPSR is a component of the broader LMIS, which requires institutional capabilities and coordination mechanisms to translate data and tools into useful policies and programs and address skills, labor, and employment-related issues. To address the job-skills mismatch, the 2022 General Appropriations Act stipulates a provision on the allocation of funding for the development of the Forecasting Model or Strategy with technical assistance from the National Economic and Development Authority (NEDA) and the Philippine Institute for Development Studies (PIDS).

On the side of PIDS, in collaboration with TESDA, this study focuses on recommending inputs to the SAPSR Framework and is guided by the following research questions:

- How can the TESDA LMI Framework be validated to be consistent with the Philippine context and its relation to other government initiatives?
- What LMI indicators can be included in the LMI Framework?
- What inputs can be recommended in the development of the LMIS?

2. Skills needs anticipation (SNA) and the labor market information system (LMIS)

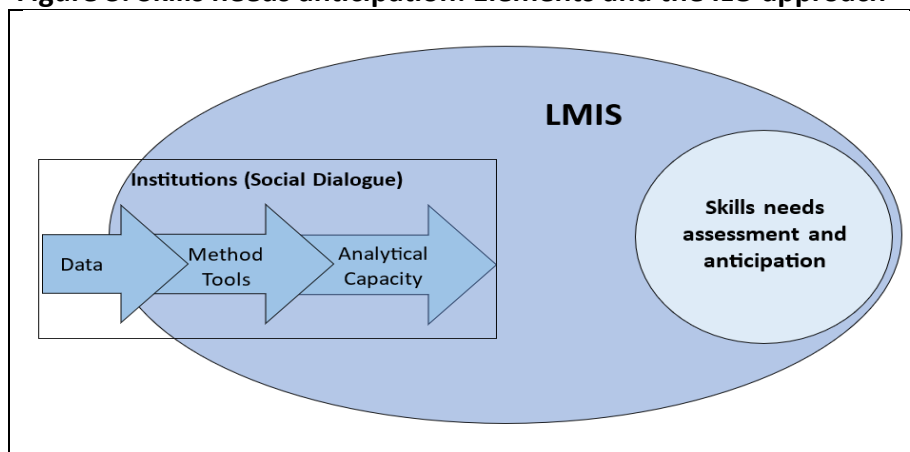
SNA strategically and systematically assesses the future skills needs of the labor market and informs stakeholders about skills gaps, outlook, and trends (ILO, 2015). It is a tool to reduce skills mismatch by informing skills and training development initiatives and guiding players in the labor market, including firms, training providers, policymakers, workers, and jobseekers.

SNA is viewed as one of the components of the LMIS (ILO, 2015). The key to SNA and the LMIS is sustainable and effective collaboration, which can be fostered by social dialogue and consultation among the players in the ecosystem. The LMIS has three functions: (1) a tool for labor market analysis, (2) a tool to aid monitoring and reporting on employment and labor

policies, and (3) a mechanism that facilitates information exchange and coordination among stakeholders/institutions (Sparreboom 2013, pp. 258-259).

Regardless of its functions, the LMIS has three key elements: data collection, analytical capacity and tools, and institutional arrangement. How these elements are related in forming a cohesive information system is demonstrated in ILO (2015). In the context of SNA, Figure 3 underscores the key elements, emphasizing the importance of institutional capabilities and social dialogue and highlighting the interpretation of results and program/policy designs informed by the thoughtful use of data and methods.

Figure 3. Skills needs anticipation: Elements and the ILO approach



Source: Merged version of Figures 3 and 4 in ILO (2015)

2.1 Good practices in SNA and the LMIS

Analyzing other countries' LMIS and other labor-related practices is useful in assessing what the Philippines can do to achieve a successful LMIS-SNA. While the methods employed by different countries were specifically implemented to fit their needs and concerns (see Table A1 in the appendix for a summary of selected countries), there are overarching themes where best practices and strategic directions can be identified. These themes include data, big data analytics and non-traditional data collection strategies, skills taxonomy and skills-occupation mapping, collaboration and engagements, dissemination practices, and financial resources and sustainability.

2.1.1 Data

Graduate tracer study for higher education and vocational courses

The most common data sources countries use are household and labor market surveys, administrative data, and national indicators. However, countries like Germany, Singapore, Malaysia, and South Africa employ graduate tracer surveys. Tracer surveys aim to benchmark institutional performance, check the employment outcomes of students, and improve curriculum responsiveness to labor market demand (Usher and Marcucci, n.d.). Tracer surveys are conducted from a few months to a year after graduation. Germany, however, has taken a step further by creating a longitudinal dataset. Specifically, the DZHW graduate survey series gathers information from fresh graduates. It collects information after five years as students start their careers and ten years after as experienced professionals (Research Data Centre for Higher Education Research and Science Studies [FDZ-DZHW], n.d.). Part of the country's

institutional accreditation requirement is having a system that can trace graduates (World Bank, 2019).

In line with South Africa's policy priority to increase the number of Doctoral graduates, its government recently conducted a tracer study of Doctoral graduates from South African universities. This study examines the general pool of Doctoral graduates (between 2000 and 2018) and gathers data on demographic characteristics, work experience, career direction, and movement (Department of Science and Innovation, 2023). Meanwhile, Malaysia's Manpower Department has been collecting a yearly survey for TVET and higher education graduates since 2012. This intends to assess the employability of graduates, labor market trends, and labor movements (Khirotin et al., 2019).

Public and private employment services

Public and private employment services platforms provide job matching assistance to jobseekers and employers (e.g., JobsMalaysia and Returning Expert Programme databases in Malaysia and MyCareersFuture.sg in Singapore). Some countries are looking into how employment services can be strengthened given their value in anticipating skills needs (see, for example, Rasool (2021) in South Africa). While private organizations also deliver similar services (e.g., LinkedIn, Glassdoor), they rarely share the data (even the anonymous versions). One such exception is the LinkedIn Economic Graph, with its partnership with the Singapore government. This collaboration is useful for understanding where AI talents work and analyzing the skills exhibited across the region to understand emerging trends in the field (APEC Policy Support Unit, 2021).

2.1.2 Big data analytics and non-traditional data collection strategies

While traditional data sources can be representative of the population, these may not be as immediately updated and as granular as stakeholders want them to be. The data collected in most standard statistics, at best, provide proxies that may not adequately capture the skills dynamics and requirements in the labor market. Thus, there is an increasing move to supplement traditional data sources with big data, specifically from online job vacancies (OJV) and jobseekers' credentials. These sources provide rich granular data (see Table 1 for information that can be extracted), which aid in analyzing detailed skills gaps, outlook, and trends at a faster pace and in helping stakeholders formulate more timely and relevant choices/decisions.

Table 1. Information that can be extracted from online job-matching platforms

Information extracted from job posts	Information extracted from resumes or Curriculum Vitae
➤ Employer name and industry/sector	➤ Worker name (generally anonymized during processing and aggregation)
➤ Job title/occupation	➤ Residential location
➤ Skill requirements	➤ Current and former job titles/occupations
➤ Education, certification, and experience requirements	➤ Time spent in each role
➤ Compensation	➤ Current and former employers and
➤ Job location	➤ industries
➤ Job type: Full-time, part-time, permanent, temporary, internship, remote, etc.	➤ Job locations
➤ Duration of job posting	➤ Competencies/skills
	➤ Education and alma mater

Source: APEC Policy Supporting Unit (2021)

To enhance traditional data sources, economies with more developed LMIS leverage big data techniques. For example, Textkernel's natural language programming to mine text, parse data, and develop labor market taxonomies in Austria (Plaimauer, 2020). The number of labor market entrants is also predicted in the country by leveraging available data from reports and dashboards, inputs from stakeholders, and an internet spider to collect data from OJV (van Gelooven, 2020). Big data is also used to anticipate and match skills in the Netherlands. Meanwhile, the European Centre for the Development of Vocational Training (Cedefop) has been investigating the complementarity of OJV data with other skills intelligence tools such as skills forecasts and surveys (Van Loo and Pouliakas, 2020). In line with this, Cedefop set up the Skills Online Vacancy Analysis Tool for Europe (OVATE), a system designed to extract the skills content from OJVs.

In Asia, Singapore's MyCareersFuture.sg⁴ uses machine learning techniques to obtain data from jobseekers and job posting data. These help estimate the effect of skill mismatch on long-term unemployment and determine the probability of unemployed jobseekers securing work (Ministry of Trade and Industry Singapore, 2018). Malaysia also uses job posting data from Burning Glass Technologies⁵ and JobsMalaysia⁶ databases to identify skill requirements of in-demand occupations and to develop a list of critical occupations (APEC Policy Support Unit, 2021).

Notwithstanding benefits, big data have issues related to sample representativeness and coverage since job posters are from the formal sector and are likely to advertise high-level skills (Van Loo and Pouliakas, 2020). This issue is magnified in developing economies where the informal economy is big. Job vacancies can also be posted on various websites, resulting in the overestimation of jobs and skills required by the labor market. Meanwhile, big data from jobseekers' credentials can be skewed toward some population segments, with people from urban areas or income segments with better capacity to purchase better connectivity more likely to utilize and monitor online job-matching platforms. Harnessing big data also requires analytical and technical experts to clean, code, and translate data into knowledge and value.

2.1.3 Skills taxonomy and skills-occupation mapping

A system to classify skills is necessary for any skills matching, anticipating, or forecasting exercises. Such a system provides structures to data collection/analysis and perspectives in discussions and forum. With a standard language for skills in place, mapping skills with occupations and jobs follow. Skills-occupation mapping allows the analysis of skill distributions across various levels of disaggregation (i.e., geographical indicators, jobs' and workers' characteristics). It allows the analysis of labor market dynamics, including job transitions and the transferability of skills between occupations and jobs. It also enhances the value of the LFS and other surveys that do not have skills content.

The need for a standard language is more acute in light of big data use in the LMIS, with stakeholders raising the usefulness of data extracted from unsupervised learning techniques.

⁴ MyCareersFuture.sg is an online portal that provides a convenient job search service and match jobseekers with relevant jobs, in accordance with their current skills and competencies. Singaporeans or permanent resident of Singapore can also find career-related content, such as career insights and career guidance, to help facilitate their career planning (MyCareersFuture n.d.)

⁵ Burning Glass Technologies is one of Malaysia's biggest online job placement platforms. It has information on job opening, education, skills, and work experience (MOHR and ILMIA 2020).

⁶ JobsMalaysia is an online portal used for nationwide job matching. This provides a platform for employers to post their vacancies, and a means for jobseekers to check labor opportunities.

OJV data are not necessarily useful without additional information on how skills are related to tasks, jobs, and occupations. Thus, the skills taxonomy is considered an input to the OJV data production. Two popular skills taxonomies, Occupational Information Network (O*NET) and European Skills, Competences, Qualifications and Occupations (ESCO), serve as inputs to the skills taxonomy development of other countries. O*NET is probably the oldest taxonomy when its first iteration, the Dictionary of Occupational Titles (DOT), was published in 1939 by the US Department of Labor. The DOT contained ratings of the cognitive, interpersonal, and physical demands of jobs. Launched in 1990, O*NET used job incumbents (instead of job analysts) as raters. It is based on the Content Model to organize occupational information (Hillage and Cross 2015).

The O*NET website contains comprehensive information (see Figure 4) useful in charting career pathways, such as occupational outlook (whether occupations are expected to grow rapidly, will have large numbers of job openings, or are new and emerging), career cluster (which occupations require similar skills,), and hot technologies (in-demand technologies in job postings). It also contains descriptors and data on the importance and level⁷ of abilities, interests, knowledge, skills (basic and cross-cutting), work activities, content, styles, and values in each occupation. Skills, for example, has 35 descriptors. O*NET uses standard occupational classification, and the importance and level data can be downloaded in excel files, which facilitates the crosswalking of the O*NET data with survey datasets produced by other countries.

Figure 4: The O*NET dashboard

Find Occupations ▾	Advanced Searches ▾ O*N	O*NET Data ▾ Crosswalk	Crosswalks ▾
Bright Outlook	Job Duties	Abilities	Military
Career Cluster	Professional Associations	Interests	Education
Hot Technology	Related Activities	Knowledge	Occupation Handbook
Industry	Soft Skills	Skills (Basic)	SOC
Job Family	Technology Skills	Skills (Cross-Functional)	DOT
Job Zone		Work Activities	RAPIDS
STEM		Work Context	ESCO
All Occupations		Work Styles	
		Work Values	

Source: <https://www.onetonline.org/>, accessed January 6, 2024

ESCO is the classification of skills, competences, and occupations used in European countries. It describes the skills and competencies relevant to occupations, facilitates matching, promotes mobility across European countries, informs training, and helps jobseekers draft their CVs (<https://esco.ec.europa.eu/en/about-esco/what-esco/how-can-esco-be-used>). It currently contains 3008 occupations (based on ISCO-08) and 13 890 skills linked to these occupations and has been translated into 28 languages (<https://esco.ec.europa.eu/en/about-esco/what-esco>). ESCO leverages data science and machine learning techniques to perform multilingual mapping of OJV texts to the ESCO taxonomy. ESCO provides information on knowledge, skills, and transversal skills and competencies for each occupation. The ESCO website is not as comprehensive as the O*NET website in providing an occupational outlook. However, ESCO uses the International Standard Classification of Occupations (ISCO), and the

⁷ Determined by job incumbents (Handel, 2016)

skills-occupation mapping data are downloadable, making it a useful resource for countries aiming to develop a mapping system.

Following O*NET and using other international competency-based frameworks⁸ and Canada's skills-related initiatives⁹, Employment and Social Development Canada (ESDC) developed its skills and competencies taxonomy (Labor Market Information Council, 2020). The Taxonomy has eight main categories, namely, skills, personal abilities and attributes, knowledge, interests, work context, work activities, tools, and technology, each with groups and occupational descriptors (<https://noc.esdc.gc.ca/SkillsTaxonomy/TheTaxonomy>). For example, under the skills category, there are five groups (foundational, analytical, technical, resource management, and interpersonal), each containing descriptors and definitions (see Figure 5 for illustrations).

Canada is working on linking its National Occupational Classification (NOC) to the ESDC's skills and competencies. A visit to the website¹⁰ indicates that the NOC-skills taxonomy mapping is yet to be operationalized. However, the Labor Market Information Council (2020) indicated that consultation with stakeholders is ongoing to gather feedback and improve the descriptors. The Canadian government will also leverage partnerships with various players to identify and evaluate mapping approaches.

Figure 5: Descriptors and definitions for foundational and analytical skills in Canada's skills and competencies taxonomy

▼ Foundational Skills	
Developed capabilities that facilitate the more rapid acquisition of other skills and knowledge.	
Showing 1 to 7 of 7 entries Show 30 ▼ entries	
Descriptor	Definition
Oral Communication: Active Listening [Endnotes]	The capability to give full attention to what other people are saying, take time to understand the points being made, ask questions as appropriate, and not interrupt at inappropriate times.
Oral Communication: Oral Comprehension [Endnotes]	The capability to listen to and understand information and ideas presented through spoken words and sentences.
Oral Communication: Oral Expression [Endnotes]	The capability to talk to others to convey information effectively.
Reading Comprehension [Endnotes]	The capability to understand written information presented through words, sentences, paragraphs, symbols, and images in work-related documents.
Writing [Endnotes]	The capability to communicate in writing by using written words, sentences, paragraphs, symbols, and images and adapted for the needs of the audience.
Numeracy [Endnotes]	The capability to understand, use and report numbers and other mathematical information presented through words, numbers, symbols, and graphics.
Digital Literacy [Endnotes]	The capability to understand and use digital devices and tools to obtain, exchange, create or process digital information in a secure manner.

▼ Analytical Skills	
Developed capability that people need to process information and data logically to produce useable results.	
Showing 1 to 8 of 8 entries Show 30 ▼ entries	
Descriptor	Definition
Critical Thinking [Endnotes]	The capability to use logic and reasoning to question, discern, interpret and analyze various types of information to form an evidence-based conclusion or judgment.
Learning and Teaching Strategies	The capability to select and use training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
Decision Making [Endnotes]	The capability to analyze information among a set of alternatives, to evaluate potential outcome and choose the most appropriate solutions to achieve a predetermined objective.
Evaluation	The capability to systematically assess products, services or processes using measurable indicators with the goal of ensuring or improving performance.
Requirements Analysis	The capability to analyze needs and product requirements to create a design.
Problem Solving [Endnotes]	The capability to identify problems and review related information to develop solutions or feasible options to achieve the desired end state.
Researching and Investigating	The capability to conduct studies and to examine information and data to increase knowledge, understand facts, find causes, test hypotheses and draw conclusions or make recommendations.
Systems Analysis	The capability to determine how a system should work and how changes in conditions, operations, and the environment will affect outcomes.

Source: <https://noc.esdc.gc.ca/SkillsTaxonomy/ViewTaxonomyCategory?objectId=MYgCNtv4nrBUP6U79Nyu6w%3D%3D>, accessed on December 28, 2023

The Skills Framework¹¹, a SkillsFuture initiative to support the Industry Transformation Maps in Singapore, aims to promote lifelong learning among Singapore's workforce. It helps employers develop incentives related to human resource development, guides students in making informed career choices, and assists training practitioners in developing training

⁸ For example, the Program for the International Assessment of Adult Competencies (PIAAC) and Program for International Student Assessment (PISA)

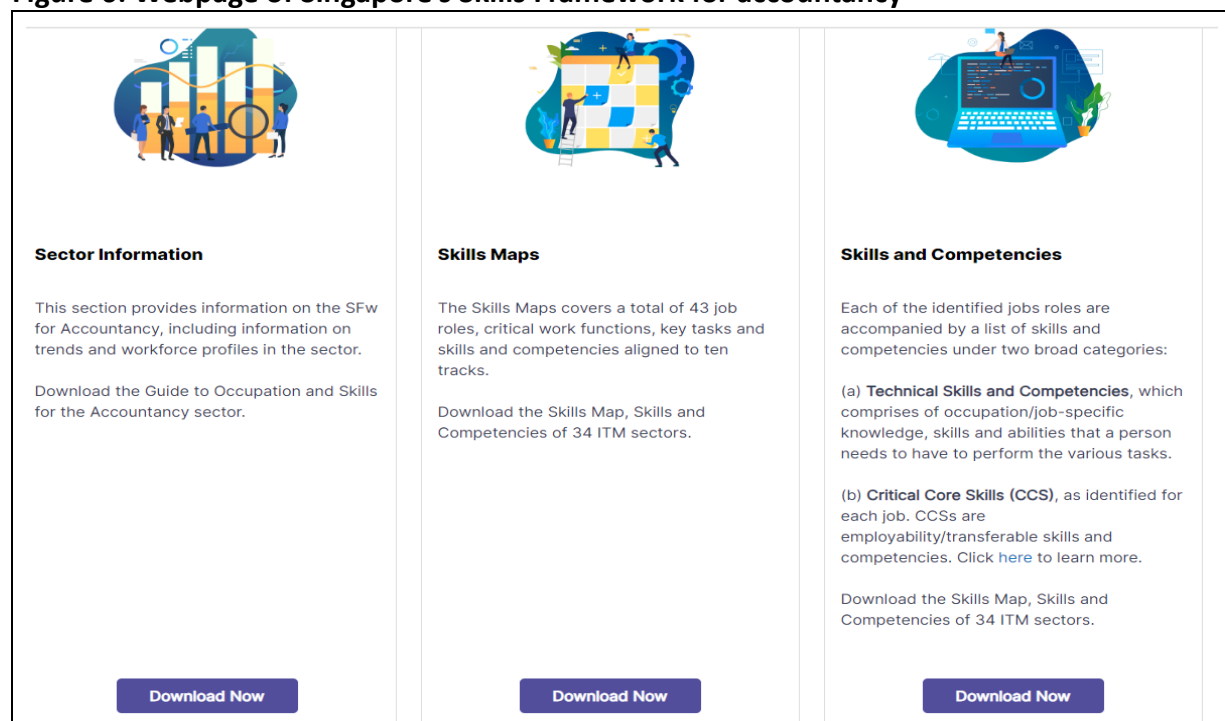
⁹ For example, Canada's career handbook, skills and knowledge checklist, employability skills list, and hazards database

¹⁰ <https://noc.esdc.gc.ca/?GoCTemplateCulture=en-CA>, accessed on December 28, 2023

¹¹ <https://www.skillsfuture.gov.sg/skills-framework>, accessed January 2, 2024

programs. The Framework contains skills maps covering job roles in 35 sectors. Unlike other skills and competencies taxonomies that can be viewed in a dashboard, sectoral Skills Framework can be directly downloaded in excel files (see Figure 6).

Figure 6: Webpage of Singapore’s Skills Framework for accountancy



Source: <https://www.skillsfuture.gov.sg/skills-framework/accountancy>, accessed on January 2, 2024

Meanwhile, there is an increasing use of OJV to improve the skills taxonomy. One example is the ESCO. Another example is the National Skills Commission of Australia, which leveraged OJV in the Australian Skills Classification (ASC)¹² and mapped skills with the Australian and New Zealand Standard Classification of Occupations (APEC Policy Support Unit, 2021). The ASC identifies the following (see Figure 7 for an illustrative example of competencies and skills): a) 10 core competencies (including digital engagement, initiative and innovation, learning, numeracy, oral communication, planning and organizing, problem-solving, reading, teamwork, and writing) common to all jobs and are rated between 1-10, b) specialist tasks that are grouped based on skills clusters, and c) technology tools (identified as trending or emerging).

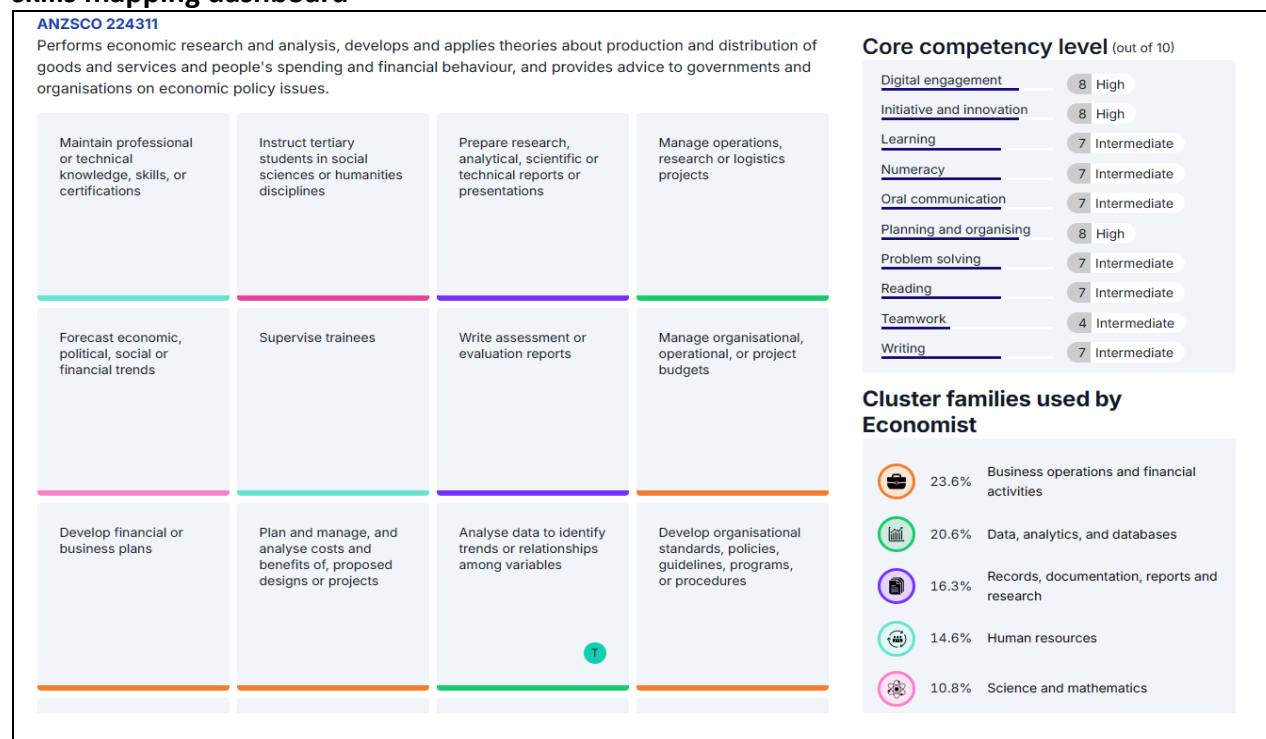
Given its growing importance, it is worthwhile to note how OJV data are translated into knowledge (Figure 8). Selection involves assessing the reliability of data sources such as websites using the four Vs (volume, variety, velocity, and value) characterizing big data. Ingestion involves identifying and downloading vacancy content, which can be done by combining application program interface (API)¹³ or other data mining strategies. For example,

¹² Australian Skills Classification | Jobs and Skills Australia, accessed January 2, 2024

¹³ Directly downloads content from sources but needs permission or agreement from owners to do so.

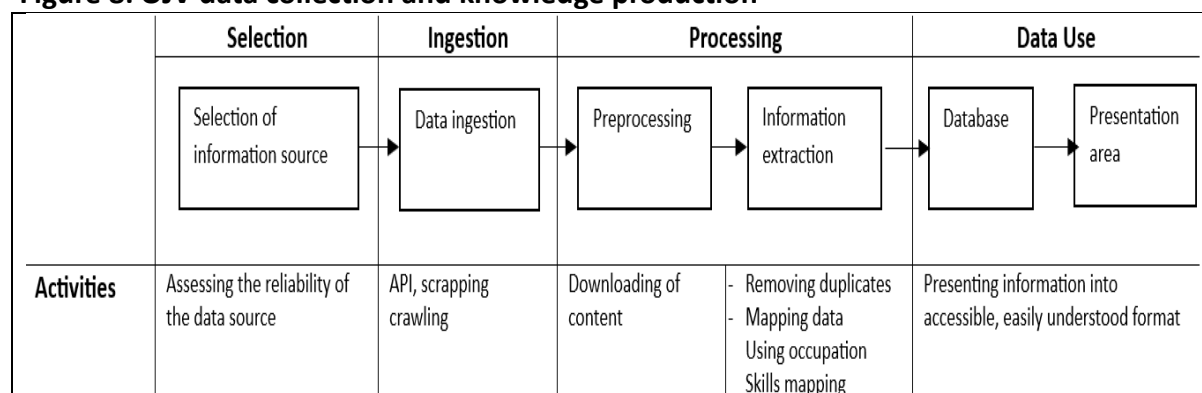
Skills OVATE uses API when owners agree to the data collection or scraping¹⁴ and crawling¹⁵ in case owners decline access requests (Van Loo and Pouliakas, 2020). Processing involves data cleaning and removing duplicates (i.e., job vacancies can be posted on several sites) and mapping information based on standard classifications (i.e., ISCO for occupations, ISIC for industry, and ISCED for education) (Van Loo and Pouliakas, 2020). Data use involves translating the extracted data into user-friendly information, typically aided by dashboards and visualization tools.

Figure 7: Core competencies and skills clusters for Economist in the Australian occupation-skills mapping dashboard



Source: Australian Skills Classification | Jobs and Skills Australia, accessed on January 2, 2024

Figure 8: OJV data collection and knowledge production



Source: Cedefop (2019). Online job vacancies and skills analysis: A Cedefop pan-European approach., accessed on January 10, 2024. The lower panel of the figure is based on the authors' summary of information in Van Loo and Pouliakas (2020).

¹⁴ Downloads content from the target web page, aims to convert specific website content into a structured format, such as tables, JSON, databases, and XML representations (<https://www.scrapehero.com/web-scraping-vs-web-crawling/>).

¹⁵ Programs robots to browse web portals and download pages and index search engines (<https://www.scrapehero.com/web-scraping-vs-web-crawling/>).

Linking occupation and skills is nuanced and requires resources. First, occupation-skills mapping in O*NET is determined by the level and importance of a skill in a job, while that of ESCO is determined by whether the skill is essential for the job. Both require substantial input from job incumbents, occupational analysts, and training practitioners. Second, occupation-skills mapping can leverage big data, although there are challenges. For example, The World Bank-LinkedIn skills report¹⁶ used OJV data, while Coursera leveraged enrollment data to offer skills insights¹⁷. Using data from these websites requires agreement with owners and technical and analytical experts to translate the data into knowledge. Third, a hybrid approach uses existing mapping systems (e.g., O*NET, ESCO) as baselines, contextualizing these systems through consultations with key players (e.g., employers/private sectors, practitioners, workers, organizations, and other government agencies) and leveraging big data to update and enrich the mapping. To evaluate the mapping, the Labor Market Information Council (2020) advocates using the following criteria: flexibility, sustainability/cost-effectiveness, representativeness, responsiveness, measurability, and statistical soundness.

2.1.4 Collaboration and engagements

Consultations with stakeholders and field experts complement quantitative data. In most cases, stakeholder and expert interviews are used to help benchmark and develop LMIS. The involvement of multiple sectors in different phases of LMIS development is key, ensuring that approaches are multidisciplinary and strategies are complementary. It is ideal for data to be interoperable across different sectors and agencies, which can help provide a holistic picture of the status of the labor market.

With respect to the technical aspect of using big data in LMIS, collaboration with groups of labor analytics experts has been documented. For example, Australia's Department of Education, Skills and Employment has partnered with Emsi Burning Glass (EBG) and Boston Consulting Group to improve and update its skills taxonomy, while Cedefop has an existing partnership with EBG in developing its OJV system (APEC Policy Support Unit, 2021). Singapore partners with LinkedIn Economic Graph to analyze trends in AI skills.

Given the restrictions on the use of big data, compiling available information and building partnerships for data sharing with relevant government agencies is a good move in the short-run. In this regard, Malaysia has consolidated fragmented labor-related data across ministries and agencies (ILO, 2021a). South Africa, with the help of ILO, is shifting from their previous "silo" approach to creating a centralized LMIS (ILO, n.d.). Notwithstanding the critical role of collaboration, setting clear boundaries is important to prevent overlapping tasks and ensure that resources are maximized. In the case of South Africa, there are instances where mandates of the Department of Employment and Labour (DEL) and Department of Higher Education and Training (DHET) are similar, since both have broad responsibilities regarding workers and research coverage. DEL and DHET can build closer collaboration, especially in areas with similar objectives and programs (Rasool, 2021). Moreover, stakeholders' commitment and participation should be actively maintained to ensure that objectives are still aligned.

2.1.5 Dissemination practices

A highly developed LMIS leverages dashboards and visualization tools. Dashboards facilitate wider reach in data dissemination, and visualization tools aid better understanding since these

¹⁶ See, for example, [Jobs, Skills and Migration Trends and Emerging Jobs 2020 Report](#), , accessed January 2, 2024

¹⁷ See, for example, [Job Skills Report 2024](#), , accessed January 2, 2024

summarize data effectively. Other than O*NET, ESCO, and Australian occupation-skills mapping dashboards, other dashboards include the following:

- The QuBE portal in Germany provides an interactive dashboard that displays qualifications and occupation projections. The QuBE visually presents possible labor sector development pathways (BIBB, n.d.). Germany is currently working on creating a one-stop shop website for specific target groups.
- Multiple portals through the Department of Statistics Malaysia, like the Institute of Labor Market Information and Analysis (ILMIA) and Malaysia Labor Market Interactive Data (MyLMID), have been developed. Both platforms have interactive dashboards and are using data from traditional and non-traditional sources. Malaysia is also looking into creating a labor market information analytics platform to integrate LMI and enhance skills systems in the country (ILO, 2021a).

Websites can also be supplemented with interactive activities such as online games or self-assessment activities, creating meaningful interaction with data that seems more personal (Alexander et al., 2019).

2.1.6 Financial resources and sustainability

In establishing and maintaining an extensive LMIS, adequate funding is crucial. Countries with longer-term funding are more likely to have a more comprehensive work plan and an established data collection system (Barnes et al., 2023). However, this is exceedingly challenging for developing countries given that priority is often low for such projects and risks of budget cuts are always present. Long-term planning may not be feasible in these cases. The preceding discussion underscores the need for strategic financial planning, international collaborations, and innovative funding models to ensure system continuity.

While most of the budget directly comes from the government, countries have initiated international partnerships to help develop their LMIS. For instance, South Africa and Malaysia are collaborating with the International Labour Organization (ILO). Through the European Union, Germany benefits from the region's LMIS and EU Skills Panorama¹⁸. In the case of Singapore, the focus is on the joint responsibility of social partners (Mangozho, 2001) and collaboration with the academic community and private organizations.

2.2 Application of LMIS in informing policy

LMIS is a tool for crafting evidence-based policies and programs. Most policies generated from its use focus on the labor and education sectors. However, some countries have recently been using LMIS to develop better policies in other fields, such as population and migration, demonstrating the need for stronger stakeholder collaboration.

2.2.1 Education, training, skilling policy

How instructions on education and training are delivered are no longer constrained by the traditional classroom setup. This should, however, be supported by qualifications and quality assurance systems so that such skills can be certified and recognized. Thus, having an LMIS

¹⁸ EU Skills Panorama, managed by the European Centre for the Development of Vocational Training (Cedefop), is an online tool that provides centralized information on skills needed in occupations, trends of skills supply and demand, and potential skill mismatches (European Training Foundation 2017b).

can inform policies on incentives for skills development programs. The following uses are noted:

- In Germany, sectoral bodies help ensure that training and skills development meet the specific requirements of their respective sector (ILO, 2015).
- In Australia, the Department of Education, Skills, and Employment is developing a report on reskilling by supplementing local taxonomies (such as the ANZCO and the country's educational requirements through the Australian degree systems) with data analytics and blockchain (APEC Policy Support Unit, 2021).
- Recommendations from Malaysia's Critical Occupations List 2019/2020 highlight the need to improve the responsiveness of training, upskilling, and reskilling programs (MOHR and ILMIA, 2020). In addition, the education sector can benefit from using the above list to help develop relevant and updated coursework.
- Through SkillsFuture Initiative, Singapore provides a credit of SGD 500 for its citizens to invest in learning, including those offered by massive open online courses (MOOCS) (Panth and Maclean, 2020).

2.2.2 Labor and employment policy

In Malaysia, to develop their annual Critical Occupations List report, they have employed both a top-down, which uses traditional data, and a bottom-up approach, which collects evidence and information from stakeholders (Ministry of Human Resources [MOHR] and Institute of Labour Market Information and Analysis [ILMIA], 2020). This aims to help coordinate workforce policies with the needs of the demand side. Meanwhile, Germany puts up QuBE, a data portal that can assist students and employees in making informed decisions based on long-term market demand projections. Moreover, these projections are used as one of the bases of the federal government's skilled labor strategy (Barnes et al., 2023). The information in QuBE is also used to forecast different scenarios for disruptive events like digitalization and climate change.

2.2.3 Population and migration policy

Matching migration policy with current needs is also important, especially today when people have become mobile. While training and education policies contribute to resolving medium to long-term shortages in domestic demand, there are instances when specific skills are urgently required. In such cases, regional and international migration can play a pivotal role in addressing immediate gaps. Consequently, many countries primarily concentrate on enhancing their domestic labor markets in their LMIS practices (Razzaque et al., 2019). It is important, however, to strike a balance given the increasing trend of globalization and existing skill mismatch. Information on immigration, such as visa and work permits, can likewise be used to complement existing labor market data.

In Africa, the Joint Labour Migration Programme (JLMP)¹⁹ uses labor market information to aid intra-African labor mobility. In particular, the LMIS provides labor information and skill forecasting to help improve skills pooling and implement targeted skills development programs in the continent (ILO, 2021b). This is useful given the growing youth labor force and unemployment concerns in some African countries.

¹⁹ The Joint Labour Migration Programme (JLMP) is a joint undertaking among four organizations, namely the African Union Commission, International Labour Organization, International Organization for Migration, and Economic Commission for Africa, to support the African Unions' Agenda 2063 and UN Sustainable Development Goals (United Nations Network on Migration, n.d.)

On the other hand, Malaysia immediately fills gaps in labor market demand by matching migration policy with current needs. From 2019 to 2020, the country created policies to encourage highly skilled migrants (MOHR and ILMIA 2020). Meanwhile, Australia's National Security Committee developed a medium-term employment projection on emerging labor demand (covering five years), which informs their Priority Migration Skilled Occupations List (Barnes et al., 2023).

Many countries have also provided open-access to their respective labor market information, such as job vacancies, trends, and labor projections. However, crucial information like wages and salaries are present only in a few highly developed countries such as Canada and the United Kingdom. It is important to note, however, that information on training programs and skills development opportunities has become increasingly available for developed (i.e., Australia, Canada, United Kingdom) and developing (i.e., Sri Lanka, Philippines, Malaysia) countries (Razzaque et al., 2019).

Aside from helping the government formulate policy interventions, an effective LMIS can also help address information asymmetry between domestic and international actors. The LMIS can be used as an instrument to reduce labor market issues, such as underpayment of employers, exploitative practices, and issues concerning intermediary interventions (Razzaque et al., 2019).

3. Inputs to the TESDA's Skills anticipation and prioritization of skills requirements (SAPSR) framework

Recognizing that SNA is a component of the LMIS, inputs to the SAPSR Framework include data and data sources, analytical capacity and tools, and institutional arrangements (see Figure 9). A system that organizes and classifies skills is the key to any skills-related initiative. Given a common language for skills and mapping this into widely used occupation classifications, the content of an otherwise standard data source is enhanced, aiding better forecasting techniques. A common language eliminates ambiguities, facilitating expert panel discussions and stakeholder consultations. Thus, the skills taxonomy is a data foundation that serves as an input to other data sources, including standard, skills-specific, and big data. The latter is increasingly used to complement traditional data sources in providing real-time LMI and enhancing the informational content of the skills taxonomy. It should be noted that skills-occupation mapping is part of the LMIS (not just SAPSR). Thus, the skills taxonomy should be fully developed for the highly disaggregated PSOC (i.e., 4- or 5-digit).

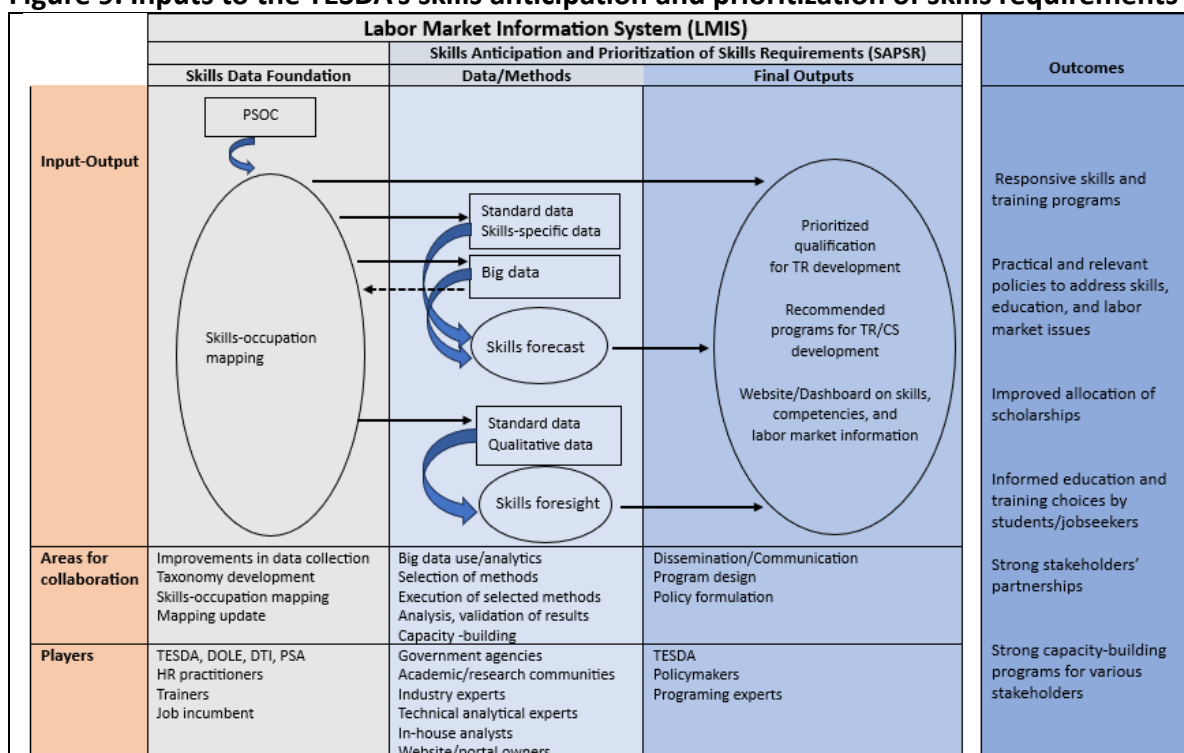
Taking stock of the available data helps determine the appropriate methods, which can be a combination of qualitative and quantitative techniques. While the SAPSR initiative is primarily envisioned to inform the TESDA's training regulation and competency standards development, its content and all inputs used to generate the SAPSR can serve other government agencies, students, jobseekers, policymakers, and the academic and research community. Thus, to maximize the use of the SAPSR, its inputs and outputs should be widely disseminated. Maintaining and updating websites and dashboards with visualization tools and links to other knowledge-generating tools are common strategies that TESDA can explore to keep the SAPSR relevant and accessible to a wider audience. Collaboration with various stakeholders at all stages of the SAPSR is crucial. This results in better data foundation, capacity building, and technical and analytical tools and resources.

3.1 Data and data sources

The key to an effective SNA tool is the availability of quality data, the frequency of collection, and the level of data disaggregation. In the Philippines, a good LMI can be culled from the datasets collected and published by various government agencies, such as the Philippine Statistics Authority, Commission on Higher Education, Department of Labor and Employment (DOLE), Department of Trade and Industry, and TESDA.

LMI-related datasets can be distinguished based on their skills content: 1) standard statistics, which are useful in providing a general overview and contexts where demand for and supply of skills operate, and 2) skill-specific data sources, which contain skills proxies and can directly inform skills deficit and outlook (Řihova, 2016). Other data sources can also be considered. For example, national development plans, sectoral blueprints, and laws and policies undergo rigorous vetting among stakeholders and are, thus, excellent data sources of skills needs. Meanwhile, primary data, or data collected specific to the current research objectives, are essential in validating results, contextualizing information, and collecting insights for future developments.

Figure 9. Inputs to the TESDA's skills anticipation and prioritization of skills requirements



Source: Authors' representation of their inputs to the SAPSR Framework

Note: Input within the column . Input to another column . Output

3.1.1 Standard statistics and data sources²⁰

The Labor Force Survey (LFS) is the country's most reliable source of labor market structure. It was collected quarterly but has been collected monthly since 2021. Thus, official labor market statistics based on the LFS are now available monthly, regional estimates are available quarterly, and provincial estimates are made recently available, albeit annually. These

²⁰ See Table A2 in the Annex.

indicators inform employment and underemployment trends at different aggregation levels and varying time intervals.

The LFS also collects data on age, gender, and highest grade completed. Educational attainment and qualifications are used as proxies for skills. Thus, the LFS provides core information to understand mismatch at the macro level. The age profile of the labor force is also an important indicator for skills anticipation. Experience in the labor market differs across the age distribution of the working and non-working populations and, thus, has different implications for training needs. A young workforce indicates the country's need to bolster its qualifications and training programs for school dropouts, recent graduates, and labor market reentrants. Meanwhile, an aging workforce indicates the need for skills updating and upgrading through lifelong learning programs. The LFS and the National Accounts are used by the Philippine Statistics Authority (PSA) to monitor sectoral labor productivity²¹. More importantly, researchers can request the LFS public use files with the 4-digit Philippine Standard Occupational Classification (PSOC) from PSA. The finer PSOC aggregation allows the skills content analysis in Philippine occupations following a task approach (see Generalao, 2019) or through crosswalking with other countries' skills taxonomies such as O*NET (see Bayudan-Dacuycuy and Dacuycuy, 2021). Since TESDA's LMI skills planning occurs at various geographic levels, having a Labor Force Survey with a 4-digit PSOC representative at the provincial level would be beneficial.

Administrative data from CHED supplement education-related variables generated in the LFS. Enrolled senior high schools per K-12 track, enrolled tertiary students per discipline group, and graduates per program level can inform trends in the education sector, including oversubscribed HEI programs. Meanwhile, the number of takers and passers of licensure examinations has been collected by the Philippine Regulation Commission (PRC) since 2011. This informs the programmatic structures of graduates and potential practitioners.

Various standard statistics can be generated from other sources compiled by several agencies.

- The PSA conducts the Occupational Wages Survey to compile information on wages; the Integrated Survey on Labor and Employment to collect data on the employment of specific groups of workers, occupational shortages and surpluses, training of workers, and industrial relations practices); and the Labor Turnover Statistics to collect data on sectoral labor turnover rates.
- The PSA conducts the Census of Philippine Business and Industry and the Annual Survey of Philippine Business and Industry every five years and annually, respectively. Both sources, collected at the 3-digit PSIC, contain data on the number of establishments, employees, workers under manpower agencies, and labor productivity.
- Specific to TVET programs, TESDA has conducted a Study on the Employment of TVET Graduates annually since 2014. The study reports on TVET graduates' employment rate, monthly income, skills utilization rate, and satisfaction with the program attended. The agency annually publishes TVET Statistics culled from the TESDA Training Management Information System, including sectoral and regional data on enrolled and graduates.
- The Compendium of OFW Statistics, compiled by the Philippine Overseas Employment Administration, reports data on the deployment of new hires by occupation and destination.

²¹ See for example, <https://psa.gov.ph/system/files/iesd/Table%201%20-%20Labor%20Productivity%20by%20Sector%2C%20Philippines%2C%201991-%202018.pdf>, accessed on November 15, 2023.

On the other hand, the International Labour Organization (ILO) has introduced the Key Indicators of the Labour Market (KILM) to monitor emerging labor market trends and promote global comparability (See Table 2). KILM is a versatile tool for evaluating various aspects of the labor market, with some indicators overlapping with the Decent Work Agenda and Sustainable Development Goals (SDGs) (ILO 2023). Standard statistics, such as those collected by the Labor Force Survey, already monitor the majority of the indicators listed in the core KILM. However, a few indicators would need nuanced questions that can be added to existing PSA surveys. For example, under wages and compensation costs, detailed information on the structure of compensation is still needed.

Table 2. Core KILM indicators

Indicator	Definition/Measurement	Potential Data source
<i>Employment quantity</i>		
KILM 1. Labor force participation rate	Proportion of working-age population that engages actively in the labor market, either by working or by looking for work	LFS
KILM 2. Employment-to-population ratio	Proportion of a country's working-age population that is employed	LFS
<i>Employment characteristics</i>		
KILM 3. Status in employment	Proportion of the total number of employed persons (for employees and self-employed – disaggregated into employer, own-account workers, members of producers' cooperatives and contributing family workers)	LFS
KILM 4. Employment by sector	Employment disaggregated into three broad sectors, agriculture, industry and services, and expressed as a percentage of total employment	LFS
KILM 5. Employment by occupation	Employment disaggregated by occupation, expressed as percentage of total employment	LFS
KILM 6. Part-time workers	Proportion of individuals whose working hours total less than full time ¹ , as a proportion of total employment (1) total part-time employment as a proportion of total employment (2) percentage of the part-time workforce composed of women	LFS
KILM 7. Hours of work	(1) numbers of employed classified according to their weekly hours of work (2) average annual actual hours worked per person	LFS
KILM 8. Employment in the informal economy	Combines two measures of the informal economy: (1) employment in the informal sector (2) informal employment - Informal employment and its subcategories are presented as a share of total non-agricultural employment	LFS
<i>Persons not in employment</i>		
KILM 9. Unemployment	Proportion of the labor force that does not have a job, is available to work and is actively looking for work	LFS
KILM 10. Youth unemployment	The indicator presents youth unemployment in the following ways: (1) the youth unemployment rate (2) the ratio of the youth unemployment rate to the adult unemployment rate	LFS

Indicator	Definition/Measurement	Potential Data source
	(3) the youth share in total unemployment (4) youth unemployment as a proportion of the youth population	
KILM 11. Long-term unemployment	(1) those unemployed for one year or more as a percentage of the labor force; and (2) those unemployed for one year or more as a percentage of the total unemployed (the incidence of long-term unemployment).	LFS
KILM 12. Time-related underemployment	Time-related underemployment as a percentage of total employment <i>This includes all persons in employment who “wanted to work additional hours, whose working time in all jobs was less than a specified hours threshold, and who were available to work additional hours given an opportunity for more work”</i>	LFS
KILM 13. Persons outside the labor force	Percentage of the population that is neither working nor seeking work (that is, not in the labor force)	LFS
Contextual indicators		
KILM 14. Educational attainment and illiteracy	(1) educational attainment of the labor force, (2) distribution of the unemployed population by level of educational attainment (3) unemployment rates of persons who attained education at, respectively, primary level or less, secondary level or tertiary level	LFS, Integrated Survey on Labor and Employment
KILM 15. Wages and compensation costs	(1) average monthly wages, in both nominal and real terms (2) levels, trends and structures of employers’ hourly compensation costs for the employment of workers in the manufacturing sector. <i>Total compensation is broken down into “hourly direct pay” with subcategories “pay for time worked”, “directly paid benefits” and “social insurance expenditure and labor-related taxes”</i>	LFS, Occupational Wages Survey
KILM 16. Labor productivity	Defined as output per unit of labor input. (1) GDP per person engaged, and (2) GDP per hour worked	LFS, GDP compiled by PSA
KILM 17. Poverty, income distribution and the working poor	In addition to national poverty measurements and the Gini index this indicator presents data on employment by economic class	Merged FIES-LFS

Note: 1/ Can be based on national threshold

Source: The first two columns are lifted from ILO (2023)

3.1.2 Skills-specific data sources²²

Several sources of skills-specific data include the survey collected by TESDA and tracer studies conducted by other government agencies. The TESDA’s Workplace Skills and Satisfaction (WSS) Survey contains data on emerging and future skills and requirements. This offers crucial information to guide key stakeholders (i.e., policymakers, TVET providers) in crafting policies. However, the sectors covered are limited to the following: logistics, construction, IT-BPM,

²² See Table A3 in the Annex for some details.

Agriculture, Health, and Tourism (see Figure 10). Based on the recent WSS survey, the majority of newly emerging skills are a result of the Fourth Industrial Revolution (FIRe), which requires a technologically-literate workforce. In addition, new practices and innovations for Agriculture are also being introduced. There are also tracer studies, such as the graduate tracer studies by the PIDS²³ and the tracer of OWWA Skills for Employment Scholarship Program beneficiaries. However, these studies were conducted only once and are quite dated.

Figure 10. Results from TESDA's Workplace Skills and Satisfaction Survey

	IT-BPM	Construction	Logistics	Agriculture	Health	Tourism
In Demand Hard-to-Fill Skills;	Game Development/Artist 2D Cutout Animation 3D Animation (3D Modeling, Texture Lighting, and UV Mapping & 3D Rigging)	Heavy Equipment Operator Heavy Equipment Mechanic BIM Manager Foreman Quantity Surveying	Truck Driver Welder Mechanic Forklift Operator/Driver Heavy Equipment Operator	Agricultural extension Worker Farm Manager and Overseer Farmer Agriculture Technician Tractor Operator Machine and equipment Operators Post-Harvest Workers	Graphic Artist Respiratory-Therapy Services Nursing Attendant/Assistant Practical Nursing Medical X-ray Equipment Operation	Boat Operator Guest Relations Manager Executive Housekeeper Executive Chef Hotel Manager Art Gallery/Museum Curator
Critical Occupations	Medical Claims & Medical Coding and Billing Software Development					
Emerging Skills	<ul style="list-style-type: none"> Artificial Intelligence Cybersecurity Business and Data Storytelling/Data Visualization Data Analytics/Data Science and Analytics Digital Savviness and Readiness 	<ul style="list-style-type: none"> Robotic Installation Digital Skills Digital Cost Management (5D BIM) People and Project Management Green Construction 	<ul style="list-style-type: none"> Data Analytics/Data Science Information security (e.g. information security analysis) Internet of Things Cloud Computing Software and Application developers and analysts Sales and marketing professionals 	<ul style="list-style-type: none"> Soil Scanning Device Operation and Analysis Value Added Agriculture Techniques Bean Quality Control/Bean Grade Financial Literacy Chocolate Process/Making Marketing and Sales Nursery production of quality seedlings (grafted) Plant Propagation Managing the cooperative Fermentation procedure (Cacao) Climate Change Initiatives Machine operation Grafting and Pruning Activity Rubber Wood Processing 	<ul style="list-style-type: none"> Health information system navigation and management Electronic medical records management Telemedicine/Telehealth Information security Technology use of disease prevention and control Complex information processing and interpretation Environmental and occupational health and hygiene Remote patient monitoring Health surveillance and monitoring 	<ul style="list-style-type: none"> Emergency preparedness and resiliency Emergency response system Inclusive tourism (cultural sensitivity) Barrier Free Tourism - Accessibility (PWD Facilitation) Basic Foreign Language (i.e. Chinese, Japanese, Korean) Product and services design Data collection

Source: Email communication by TESDA to PIDS, February 23, 2024.

3.1.3 Development Plans/Sectoral Roadmaps and Policies/Laws²⁴

Development plans and sectoral roadmaps undergo critical vetting from various stakeholders and are good sources of information on future skills in emerging sectors. Sectoral roadmaps, including those of construction, IT-BPM, agriculture, and artificial intelligence, comprehensively present sectoral outlook, goals, and needs. The Philippine Development Plan, the country's development blueprint, also presents thematic issues alongside enabling mechanisms to achieve the Plan's medium-term goals.

Relevant to the dual transition to digitalization and a green economy, there are laws addressing the competitiveness of the digital workforce (Republic Act No. 11927) and the promotion of green jobs (Republic Act No. 10771). Bills are also filed in the lower and upper chambers of Congress, aiming to promote skills related to the digital economy and emerging technologies and to mandate the collaboration of various agencies in the education and training ecosystems to integrate digital technology courses in curricula and training programs.

²³ <https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps1926.pdf>, accessed on November 15, 2023

²⁴ See Tables A4 and A5 in the Annex for some details.

3.1.4 Qualitative data sources²⁵

Qualitative data sources are complementary to quantitative data. These sources are useful in providing contexts and filling in information gaps. The most common and least cost qualitative data sources are literature reviews. These entail desk research only but are very useful in scanning developments in the local and international labor markets, understanding advances in analytical framework and methods, and identifying areas for collaboration among the players in the ecosystem.

Stakeholders' consultation, expert panels, and iterative surveys are good qualitative data sources (see the discussion on skills foresight below for further information). There are other qualitative data sources, although literature reviews, expert panels, and iterative surveys strongly complement each other and are identified to be well-suited for SNA (see Bakule et al., 2016). Many developed economies that conduct skills foresight, including Brazil, Canada, Finland, Germany, Japan, and South Korea, use a combination of the three data sources.

3.1.5 Big data²⁶

Big data obtained from OJV and jobseekers' credentials online can complement the data collected through traditional sources. This complementarity is increasingly observed in economies with highly developed LMIS (e.g., Austria, Singapore, Malaysia), although its usefulness has been demonstrated in economies with emerging LMIS. For example, in Myanmar, data from JobNet.com.mm were mined and matched with JobKred's taxonomy to analyze labor demand (Katayama, 2020).

In the Philippines, the use of big data to complement its existing LMIS is yet to emerge, although some big data sources are available. Privately-owned websites such as LinkedIn and Jobstreet are good sources of OJV and jobseekers' credentials. However, extracting data from these sources requires partnerships, as demonstrated by Singapore's collaboration with LinkedIn Economic Graph and the World Bank's partnership with LinkedIn. The more readily available big data source is PhilJobNet, a job-matching platform maintained by the DOLE-Bureau of Labor and Employment (BLE). While the raw data may be easier to access by another government agency, data cleaning and coding require analytical tools and technical and analytical experts.

3.1.6 Summary

Table 3 summarizes the information on data sources relevant to the SAPSR. The LFS and other surveys, such as the Occupational Wages Survey, provide labor market contexts and mismatches only at the aggregate level. However, these datasets use the PSOC (the finer disaggregation of which can be requested from the PSA), highlighting the importance of developing the skills taxonomy for occupations in the PSOC. This will substantially improve the relevance of PSA-conducted surveys to the LMIS and SNA exercises.

Skills-specific data sources are not readily available. Skills surveys are not regularly conducted and if conducted, are done only for specific sectors. Meanwhile, graduate tracer surveys that are useful for identifying mismatches are currently dated. Development plans and sectoral

²⁵ See Table A6 in the Annex for some details.

²⁶ See Table A7 in the Annex for some details.

roadmaps are heavily vetted documents that inform sectoral skills outlook, making these good sources of baseline information for qualitative data collection. Related to big data, OJV and jobseekers' credentials posted on PhilJobNet and other websites like LinkedIn and JobStreet can be good sources of skills data. However, harnessing the knowledge from these sources requires tools such as a well-developed skills taxonomy and resources, including technical and analytical experts.

3.2 Existing LMI/LMIS initiatives in the Philippines²⁷

These data sources have been used to generate reports on labor market profiles and trends. DOLE's Labor Market Profile (LMP) provides the macro view of the country's labor and demand situations. Meanwhile, DOLE's Labor Markets Trends (LMT) features thematic labor market information in a given year. The 2019 LMT reported the top 10 highest-paying occupations with the educational requirements using the 2016 Occupational Wage Survey and the courses offered in HEIs. The 2019 and 2020 reports discussed the recession and unemployment in the context of COVID-19 and the DOLE's recovery programs, respectively. The 2022 LMT reported sectoral labor and employment trends and leveraged the Public Employment Service Office (PESO) Employment Information System (PEIS) and PhilJobNet to provide labor demand situations, including top job vacancy postings by industry and occupation, and labor supply situations, including the number of senior high school graduates by track, school type, and region, the number of college graduates by discipline group, and the number of examinees and passers in licensure examinations.

Meanwhile, the Jobs and Labor Market Forecast 2022-2025 (previously JobsFit LMI) is the leading LMI report of the DOLE-BLE on emerging industries, key employment generating sectors, and in-demand and hard-to-fill occupations. TESDA also publishes its LMI report, which provides trends and issues in key sectors' labor supply and demand. It is used as input into the agency's development of training regulations and alignment of TVET programs with the labor market needs.

The PESO is also an important LMI data source. It facilitates local employment and caters to certain segments of the working population, including students, out-of-school youth, returning OFWs, and displaced workers. Thus, the PEIS data are locality-specific. However, in the context of inclusive growth and Sustainable Development Goals, the PEIS provides an opportunity to understand local skills and guide upskilling initiatives. However, its capacity to provide comprehensive LMI and strategic insights about future labor market conditions is limited given the low coverage and quality of services provided by the PESO (ADB, 2019) and duplication in programs, poor targeting of beneficiaries, and absence of impact monitoring systems (Bachita and Bayoneta, 2021, pg.142). ADB (2019, p. 3) noted the following reforms to improve the effectiveness of PESO: 1) institutionalization of job facilitation services in key LGUs; 2) provide adequate financial resources to support core operations; and 3) ensure technical proficiency of managers and staff. Indeed, evidence indicates a significant decrease in unemployment rates given the heightened presence of an institutionalized PESO (Villanueva 2020).

PhilJobNet²⁸, an initiative of the DOLE, matches jobseekers and employers online. It is a facility envisioned by the DOLE to become the country's leading LMIS, facilitating matching between jobseekers and employers and providing useful guides to various stakeholders in the

²⁷ See Table A8 in the Annex for some details.

²⁸ <https://philjobnet.gov.ph/>, accessed on January 3, 2024

labor market and training ecosystems. PhilJobNet is also the online platform for the PEIS, the PESO database of active jobseekers and employers registered under the DOLE's National Skills Registry Program. The DOLE-BLE maintains the PhilJobNet, so obtaining permission to access the raw data is potentially easier (relative to privately-owned websites). There are challenges, however. While job postings on the website are free, only firms from the formal sector can post (i.e., those with TIN, registered in the DTI or Securities and Exchange Commission) to protect jobseekers from fraud. Thus, the representativeness of the demand for skills is an issue since the country has a large informal sector. The same issue can be raised on the supply side since the jobseekers' propensity to participate on PhilJobNet may be determined by their location and socioeconomic attributes (i.e., jobseekers on PhilJobNet may heavily come from urban areas or households with better connectivity).

Patterned after the Skills Framework in Singapore, the Philippine Skills Framework (PSF) Initiative²⁹ aims to develop skills frameworks for priority sectors in the Philippines, including construction, creatives, food, health and wellness, Information Technology and Business Process Management, logistics and supply chain, manufacturing, and tourism (<https://www.dti.gov.ph/archives/news-archives/national-skills-upgrading-launching/>). The PSF contains skills maps and technical skills and competencies. The skills maps can be used by the human resource department in job posting and hiring through information on job descriptions, critical work functions, and key tasks. Meanwhile, the technical skills and competencies include functional and enabling categories. Looking into the PSF for supply chain³⁰, the functional skills and competencies use six levels, although this does not correspond with the Philippine Qualification Framework descriptors. In addition, the PSF does not use the PSOC found in standard labor data such as the LFS. Alignment with the PSOC will facilitate the analysis of skills distributions and trends. The PSF document is available online, although users may find it challenging to navigate the copy. Thus, its dissemination can be improved through a dashboard similar to popular career and LMI systems such as O*NET, ESCO, and ASC.

TESDA also drafted a skills map³¹ leveraging TESDA's development plans, various DOLE reports, the Department of Trade and Industry's (DTI) industry roadmaps, and the Philippine Development Plan. It maps training regulations and identifies sectoral emerging and soft skills. However, some identified skills in the skills map are not skills but are jobs (e.g., processor, genomicist, data analyst), broad occupation categories (e.g., health care management, engineering services), knowledge (e.g., basic sanitation, ethical standards, preventive or curative medical knowledge standard of care), or work activities (e.g., crowd farming, promotion of products, visualization, and immersion). Others are potential descriptors of a broader skills category. For example, teamwork, cooperative, proactive, and flexible (identified for the Automotive and Land Transportation sector) are not skills but potential descriptors of a skills category. Following the O*NET skills classification, these can be used to describe Coordination under the broader Social Skills category. Under the soft skills identified in the TESDA's skills map for information and communication technology (ICT), multitasking skills and time management skills can be used as descriptors of Resource Management Skills, advance coding can be used as a descriptor of Programming under Technical Skills, and customer service can be used as a descriptor of Social Perceptiveness under Social Skills. The preceding observations highlight the need to develop a skills taxonomy for occupations listed in the PSOC.

²⁹ An interagency initiative spearheaded by the DTI.

³⁰ https://observatory.dti.gov.ph/?page_id=95, accessed January 3, 2024

³¹ https://tesda.gov.ph/Uploads/File/LMIR%202020/20.08.16_Updated-Skills-Map.pdf, accessed on January 3, 2024

Table 3. Potential data sources for SNA in the Philippines

	Standard statistics								Skills-specific data sources					
	LFS	Education statistics	Occupational Wages Survey	Integrated Survey on Labor and Employment	Labor Turnover Statistics	Study on the Employment of TVET Graduates	TVET Statistics	Enterprise survey	Workplace skills and satisfaction survey (selected sectors)	Tracer survey*	Development plans, roadmaps, policies, laws	Qualitative data sources	PhilJobNet and PEIS**	Online job vacancies, jobseekers credentials**
Demand														
Structure of employment by sector	✓		✓	✓	✓			✓	✓				✓	✓
Structure of employment by occupation	✓		✓					✓	✓				✓	✓
Structure of sectors/occupations by age	✓								✓				✓	✓
Vacancies									✓ by subsector			✓ by occupation	✓	✓
Labor turnover by subsector					✓				✓					
Supply														
Age structure of population or labour force	✓													
Structure of population/labour force by education	✓			✓										
Structure of graduates		✓				✓	✓			✓				
Participation of adults in education and training		✓				✓	✓							
Mismatch														
Unemployment rate by education level	✓									✓				
Proportions of unemployed versus employed at each education level	✓													
Wage dynamics by occupation	✓		✓											
Hard-to-fill/skills-shortage vacancies									✓			✓	✓	✓
Skill gaps reported by employers												✓	✓	✓
Subjective mismatch reported by workers/graduates										✓				
Emerging skills									✓		✓	✓	✓	✓

Source: Categories are from Řihova (2016), augmented by the authors

Note: *Dated, **Have issues with the representativeness of samples

3.3 Tools and analytical capacity

3.3.1 Skills foresight

Foresight is a systematic, intelligence-gathering, and medium to long-term vision-building process to identify future opportunities and challenges (Bakule et al., 2016). It is used to inform policy, build networks among players, and develop a “foresight culture” (Bakule et al., 2016). Its forward-looking nature makes foresight a suitable strategy for skills needs anticipation.

While literature review is not a foresight method, it is usually considered the first step as it provides contexts and a deeper understanding of socioeconomic, technical, and analytical issues. It also helps identify critical resources and areas for future collaboration. Materials for background information include local (i.e., agency reports, development plans, laws) and international sources (i.e., reports of reputable organizations, skills dashboards, journal articles). The information from the literature review can be compiled in a full-blown report with a digested version. The report can serve as a baseline for future reviews. The brief can guide the development of initial questions in Delphi surveys and can be disseminated before consultations and interviews.

The background information gathered from literature reviews is useful in setting the tone for other qualitative data collection initiatives, including expert panels and iterative surveys. Expert panels consist of stakeholders with substantial knowledge in specific sectors. Panels are useful in providing targeted information on issues/challenges/trends and generating ideas for sectoral programs and initiatives. Panel discussions can be structured to assess the drivers of change, perform a SWOT analysis, and identify future skills and skills gaps. Expert panels encourage the diversity of ideas, although these require an effective moderator to follow up on relevant insights and prevent one voice from dominating the conversation. Video/audio recording of the panel discussion and note-taking while the discussion is ongoing are ideal practices for capturing important insights on future actions and interventions.

Delphi survey is another qualitative method that engages experts but is highly structured and iterative in format, with the initial round involving the presentation of different views, the previous rounds used as inputs to succeeding rounds, and the final round synthesizing stakeholders’ consensus. Unlike the expert panel, which requires face-to-face interaction, the Delphi survey offers anonymity and freedom from norms or biases (i.e., conceding to the opinions of senior participants). However, due to its iterative format, the survey is time-consuming and requires trained personnel to synthesize the results after each round.

After the information from foresight activities is interpreted and synthesized, key activities include disseminating the results and utilizing these as inputs to strategic policies and programs of key government agencies.

3.3.2 Skills forecast

Forecasting systematically analyzes past, current, and future trends and provides scenarios for debate and further research (Kriechele et al., 2016). Forecasting methods include several modeling techniques, such as CGE, DSGE, and input-output models (see Kriechele et al., 2016). Similar to skills foresight, key activities after the forecast are validation and dissemination of results and ensuring that these become inputs to policies and programs. The key to forecasting is the availability of data and the level of data disaggregation across relevant levels (sectoral,

industrial, regional) and workers' attributes (age, gender). Meanwhile, modeling techniques have different data needs, with some requiring long time series while others do not. Thus, it is important to conduct a data inventory before deciding on the forecasting approach.

Forecasting requires data from standard sources, although there are challenges to assembling these. First, changes in definition, updating of standard classifications to reflect new and emerging categories, and policy-induced changes such as shifts to a different geopolitical classification or educational system result in discontinuities in the data. There are methods to convert the data into consistent series, although these require assumptions and should be properly documented. Second, critical data, such as population, are only collected in a census typically conducted every five years. Extrapolations are typically used to fill in the gaps.

Assembling skills data is more challenging since these are not regularly collected. Some surveys collect task data, while others collect data only for selected sectors. For example, the Department of ICT's National ICT and Household Survey³² has collected data on computer-related tasks, which need to be translated into skills through a factor analysis (see, for example, Bayudan-Dacuycuy and Dacuycuy, 2022). Meanwhile, the TESDA's Workplace Skills and Satisfaction Survey is conducted only for logistics, construction, and IT-BPM.

A readily available source of skills data in the Philippines is the OJV and jobseekers' resumes on PhilJobNet³³. There are issues in the representativeness of the firm and jobseekers' samples, however. In addition, the data need to be cleaned and coded, requiring technical and analytical experts. Tools such as a standard skills language are also needed, emphasizing the need for a skills taxonomy of occupations at a finely disaggregated PSOC (4- or 5-digit level). This also underpins an important improvement on PhilJobNet: the inclusion of the 4- or 5-digit PSOC in OJV posted by firms/employers.

3.4 Institutional arrangements and collaboration

Institutional arrangements and strong collaboration are critical elements in SNA (see Figure 3). These should be in place at all stages of the LMIS-SNA development to maximize the use of resources and sustain SNA updating/improvement initiatives.

Related to data collection, TESDA must coordinate with agencies that collect LMI data (e.g., PSA, DOLE, DTI, CHED, and TESDA) to ensure that future data collection efforts align with the needs of SNA. Some surveys and skills-related data collection initiatives, for example, do not collect the PSOC, an information that can improve the skills content of standard data sources (assuming a skills taxonomy will be developed). Determining the suitable approaches to skills-occupation mapping and ensuring that the mapping is relevant and appropriate to the Philippine context also requires collaboration with sectoral experts, human resource practitioners, job incumbents, and firms/employers.

Capacity building, essential at various stages of SNA, also requires collaboration with academic and research communities, industry experts, and practitioners. Capacity is needed to moderate expert panels effectively and comprehensively synthesize ideas in iterative surveys. It is also necessary to choose and implement the appropriate combination of qualitative and quantitative methods, analyze and validate results, and effectively communicate them to various stakeholders.

³² was conducted in 2019 and has another round currently being conducted.

³³ <https://philjobnet.gov.ph/>

Due to data access and ownership, moving towards real-time data requires institutional arrangements, such as drawing memorandum of agreements. Partnerships to access data are easier between government agencies (e.g., TESDA and DOLE-BLE for PhilJobNet) than between a government agency and a private website owner (e.g., TESDA and LinkedIn), although the latter has been known to happen in Singapore. Technical experts who will harness knowledge from big data are also needed. Developed economies have collaborated with international groups specializing in labor analytics to enrich their skills taxonomy (e.g., Australia's Department of Education, Skills, and Employment has partnered with Emsi Burning Glass (EBG) and Boston Consulting Group). Developing economies considering big data to enrich their SNA can leverage partnerships with these groups while capacity building initiatives are ongoing (i.e., sponsoring scholars to study data science abroad, seeking support to bring international experts to train local talents).

Communicating results to stakeholders is an integral part of SNA. While the SAPSR is developed for a specific goal (i.e., to develop/update training regulations and competency standards), it can also serve other purposes. For example, the SAPSR can help policymakers formulate practical skills and labor policies, students chart their education and training, and jobseekers chart their career pathways. More importantly, proving its usefulness to various players will open more funding support for a SAPSR initiative. Thus, it is important to communicate results effectively. Successful LMIS do this by making information accessible through websites and using dashboards and visualization tools to present and summarize information. These websites often function as a one-stop shop for information on careers, skills, training, employment, and labor markets.

4. Some insights

The TESDA's SAPSR Framework is a step to identify skills priorities and craft policies and programs to address skills, labor, and employment-related issues. Leveraging ILO (2015), this paper viewed the SAPSR as a component of the broader LMIS, which has three elements: data/data collection, analytical capacity and tools, and institutional arrangement. Critical to this framework is the role of social dialogue and institutional capabilities to ensure the synergy of data, tools, methods, and technical/analytical capacity in crafting informed policies and programs.

While the country has good data sources relevant to an SNA initiative and several LMIs are in place, the study finds that improvements are needed to ensure a relevant and sustainable SAPSR. The study finds that:

- Key to any skills-related initiatives is a system that organizes and classifies skills (i.e., skills taxonomy). Having a common language for skills and mapping this into widely used occupation classifications like the PSOC will improve the skills content of standard data sources, aid better forecasting techniques, and facilitate consultations and qualitative data collection. Thus, the skills taxonomy is a data foundation critical for the SAPSR and the broader LMIS.
- Collecting PSOC at higher disaggregation (4- or 5-digit) in government-initiated surveys/data collection initiatives can improve the skills content of standard data sources.
- Graduate tracer datasets are useful in determining the effectiveness of training programs. The collection of such datasets is costly, however.

- Using big data can enhance the timeliness and granularity of information the SAPSR needs. It can also enrich the skills-occupation mapping.
- PESO/Philjobnet Related to big data, OJV and jobseekers' credentials posted on PhilJobNet and other websites like LinkedIn and JobStreet can be good sources of skills data. However, harnessing the knowledge from these sources requires tools such as a well-developed skills taxonomy and resources, including technical and analytical experts.

Related to tools and analytical capacity, the study finds that qualitative and quantitative methods are complementary. Qualitative strategies require trained facilitators/moderators, while quantitative methods have different data needs. These highlight the importance of stock-taking regarding available data and human resources. Finally, the study finds the importance of capacity-building and multi-stakeholder collaboration at all stages of the SAPSR. Drawing from the idea that the SAPSR is part of a system that involves the engagement of various players, the insights below do not focus on what TESDA alone can do but on areas for collaboration to make the LMIS and SAPSR sustainably successful.

Institutional arrangements and collaboration

DOLE: Oversee the LMIS, including the development data foundation, like the skills taxonomy and skills-occupation mapping. The success of the SAPSR depends on a good LMIS. Currently, there is no common skills language that can systematically guide data collection, updating, and analysis. Thus, the skills taxonomy and skills-occupation mapping are important LMIS data foundations that should be developed for all occupations. DOLE can be the lead agency in forging institutional arrangements with key agencies, including TESDA, CHED, DepEd, PSA, DTI, NEDA, and the private sector, such as industry groups, to establish a strong data foundation. Involving these stakeholders ensures that sectoral inputs and concerns are accounted for, increasing commitments to participating and sustaining data collection initiatives. A strong data foundation will benefit the TESDA's SAPSR and all initiatives working on skills, training, and employment-related issues.

In addition, funding may not always be available for an LMIS, and international partnerships can help the LMIS development (i.e., through technical assistance and funding support, establishing linkages to experts, and/or sharing of tools and other knowledge resources). While DOLE, as the lead agency, will be responsible for forging international partnerships, other key agencies can tap their network and share these resources with each other to achieve the common goal of a well-functioning LMIS.

Government: Strengthen the PESO. The SAPSR initiative can benefit from the PESO database. However, the database's capacity to inform LMI-SAPSR efforts is limited, given the low coverage and low quality of employment facilitation services. PESO partnerships with HEIs in the locality can increase students' awareness of the PESO services and the PhilJobNet-PEIS platform to increase coverage. Meanwhile, LGUs can promote the PESO to businesses in their localities. Human resources training and development and enhanced connectivity can improve service delivery, potentially attracting firms and jobseekers and facilitating network effects on the PhilJobNet-PEIS (i.e., more firms will register due to the number of jobseekers and vice versa, more firms will register due to the number of firms on the platform).

DOLE, TESDA, NEDA, PSA, and other key agencies: Cultivate a culture of multistakeholders' collaboration. Collaboration is needed to maximize the use of resources and sustain LMIS-SAPSR updating/improvement initiatives. It is needed to establish a good data foundation (i.e., skills-occupation mapping and its updating), improve data collection and methods (i.e., inclusion of standard classifications in data collection, data sharing, providing inputs/insights, participation in expert panels/interviews), enhance capacity building (i.e., sharing of technical and analytical knowhow), and improve communication and dissemination of information. Moving towards big data requires institutional arrangements and drawing memorandum of agreements with partners such as local government units/PESO, the private sector, groups of labor analytics experts, and owners of websites where OJV data can be harnessed.

Data

DOLE, TESDA, NEDA, and other key agencies: Develop a skills taxonomy as a tool to assign and classify skills across occupations and tasks. The skills taxonomy is a data foundation, providing a common language necessary for skills matching and forecasting. The taxonomy should be anchored to the 4- or 5-digit PSOC (skills-occupation mapping) to improve the value of standard data sources, such as the LFS, in forecasting. A common language also eliminates ambiguities, facilitating expert panel discussions and stakeholder consultations. Skills-occupation mapping is a crucial tool for harnessing knowledge from big data sources as well. Given that jobs become obsolete and new jobs emerge, the skills-occupation mapping requires continuous updating that benefits from stakeholders' inputs.

Agencies collecting LMI data: Use standard classifications (i.e., 4- or 5-digit PSOC) in data collection. Including standard classifications in data collection initiatives is complementary to developing skills-occupation mapping. This will improve the skills-specific content of survey data, allowing the analysis of skills distributions and trends and facilitating better anticipating and forecasting techniques. There are existing skills-related initiatives spearheaded by the DTI and TESDA, such as the Philippine Skills Framework and the Skills Map, respectively, although these do not use the PSOC.

Government: Institutionalize the collection of the Philippine Identification System (PhilSys)³⁴ in the education and labor market systems. Graduate tracer surveys inform mismatch and are valuable to the SAPSR and the development of curriculum and training programs. Currently, there are few tracer surveys and are dated, likely due to the lack/absence of funding and difficulties in tracking graduates/high attrition rates. Collecting the PhilSys number at salient entry and exit points (i.e., enrollment, graduation, hiring, transfer, participation in training) is a powerful tool to match education and employment outcomes. In addition, including the PhilSys number in the administrative data collected by key agencies (i.e., DepEd, CHED, TESDA) and firms reduces the need for tracer surveys. However, using this as a tool requires that stakeholders are willing to collect and share data. This can only happen in an environment with strong institutional arrangements and partnerships.

³⁴ a comprehensive national identification system for all Filipinos and resident aliens in the country. In line with its goals of simplifying private and public transactions, PhilSys can help streamline the data-gathering process and develop interoperable databases from different sectors (PSA n.d.)

Dissemination

DOLE and TESDA: Improve information dissemination of the LMIS and SAPSR. The SAPSR is primarily envisioned to inform the TESDA's training regulation and competency standards development. However, its content and all inputs used to generate the SAPSR can serve other government agencies, students, jobseekers, policymakers, and the academic and research community. For example, it helps policymakers formulate practical skills and labor policies, students chart their education and training, and jobseekers chart their career pathways.

Proving the usefulness of the LMIS and SAPSR to various players can lead to more support for sustaining these initiatives. Thus, it is important to effectively communicate information to stakeholders whose information needs vary (i.e., policymakers need more granular information than students and jobseekers). Maintaining and updating a website and dashboards with visualization tools and links to other knowledge-generating sources can make the LMIS and SAPSR more relevant and accessible to a wider audience. Dissemination efforts can tap the best practices of well-established LMIS, including O*NET, ESCO, and ASC.

Support

Policymakers: Provide continuous support to sustain the LMIS and SAPSR initiatives. The SAPSR is a continuous initiative, and its success hinges on the success of the LMIS. As the experience of other countries shows, the availability of long-term funding for LMIS provides for a well-thought-out data foundation and a coordinated data collection system.

Policymakers: Provide support for capacity building. Capacity building is essential at all stages of the SAPSR. Capacity is needed to moderate expert panels effectively and comprehensively synthesize ideas in iterative surveys. Capacity is also necessary to harness knowledge from big data sources and to correctly choose and implement the appropriate combination of qualitative and quantitative methods, analyze and validate results, and effectively communicate these results to various stakeholders. While capacity-building strategies can include leveraging partners' networks and knowledge resources, policymakers' support for sponsoring scholars and bringing international experts to train local talents in using big data is important.

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Annex

Table A1. Summary of some labor-related practices, selected countries

Aspect	Germany	Singapore	South Africa	Malaysia
1. Data Foundation				
Additional Data Sources (i.e., tracer study)	Longitudinal Graduate Tracer Study	Graduate tracer study	Doctoral graduate tracer study	Graduate Tracer Study for TVET and Higher Education
Big Data Analytics	Natural language programming (NLP), web scraping	Machine learning techniques using MyCareersFuture.sg data		Job posting data from Burning Glass Technologies and public job-matching platforms
2. Collaborating and Engaging Social Partners				
Role of Employment Services		LinkedIn Economic Graph partnership, private organizations	Assessment and strengthening of public and private services	
Partnership in Data Collection	Benefits from the European Union's LMIS (EU Skills Panorama)	Collaboration with schools, private organizations	Shifting from a "silo" approach to a centralized LMIS	Consolidating fragmented data across ministries
3. Dissemination Practices				
Interactive Dashboards	QuBE portal with interactive dashboard (BIBB)	Active survey/feedback	Data repository	ILMIA and MyLMID portals with interactive dashboards
4. Financial Resources and Long-term Sustainability				
Funding Sources	Government budget and European Union collaboration	Joint responsibility of social partners	ILO collaboration, international partnerships	ILO collaboration, international partnerships
5. Application of LMIS in Informing Policy				
Education and Training Policy	Sector-specific training in Germany	MOOCS for upskilling in Singapore,		Coordination of workforce policies with demand side (Critical Occupations List)
Labor and Employment Policy	QuBE portal for informed decisions, skilled labor strategy in Germany		Top-down and bottom-up approach in Critical Occupations List	
Population and Migration Policy			Matching migration policy with current needs	Covering vulnerable groups in policies (youth, women, people with disabilities)

Source: Authors' compilation

Table A2: Standard Statistics useful for skills analysis

Name of Data	Source of Data/Agency Responsible	Availability	Level of Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
<u>Labor Force Survey</u>	Philippine Statistics Authority	Available online	By Sector, By Occupation, By Class of worker, By Subsector, by Age Group, by sex, by Highest grade completed, by Major Industry Group	* Employed Persons by Sector, Occupation, and Class of Worker, with Measures of Precision, Philippines * Employed Persons by Sector, Subsector, and Hours Worked, with Measures of Precision, Philippines * Underemployed Persons by Hours Worked and Sector and Unemployed Persons by Age Group, Sex, and Highest Grade Completed * Key Employment Indicators with Measures of Precision, Philippines * Employment by Major Industry Group and Total Hours Worked, Philippines * Reasons for Working Less Than 40 Hours, Working More Than 48 Hours, and with Job but not at Work, Philippines * Key Employment Indicators by Sex with Measures of Precision, Philippines	Quarterly (until 2020), monthly (from 2021)	October 2023	PSOC (up to 4-digit disaggregation from PSA)	Updated monthly since 2021. Publicly available and can request for PUF.	
<u>Education Statistics</u>									
<u>Expanded Tertiary Education Equivalency and Accreditation (ETEEAP) and Ladderized Education Program</u>	Commission on Higher Education	Available online	By number of enrollees and graduates	* Number of enrollees and graduates under ETEEAP * Number of enrollees and graduates under the Ladderized Education Program (LEP)	Annual (AY 2016=2017 to AY 2020-2021)	September 2021			* Aggregated data only. Limited information.
<u>Higher Education Indicators</u>	Commission on Higher Education	Available online	By HEIS, By Discipline	* Number of Higher Education Institutions* Enrollment numbers* Graduates' numbers* Performance in licensure examination* Faculty Qualification* Accreditation	Annual (AY 2009-2010 to AY 2019-2020)	2019		* Can see which discipline has a higher number of enrollees and graduates and can target training programs for them* Can also develop training programs that are stackable across discipline	* No disaggregation by region.
<u>Regional Distribution of Higher Education Institutions</u>	Commission on Higher Education	Available online	By Region	* Number of SUCs per region * Number of other government HEIs per	Once (AY 2019-2020)	2019		* TVIs can provide support to regions	

Name of Data	Source of Data/Agency Responsible	Availability	Level of Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
				region * Number of private HEIs per region				with low number of SUCs in a region	
<u>Higher Education Enrollment by Discipline Group</u>	Commission on Higher Education	Available online	By Discipline	* Number of enrolled students per discipline group	Annual (AY 2010-2011 to AY 2019-2020)	2019		* Can see which discipline has a higher number of enrollees and can target training programs for them	* No disaggregation by region. Might be useful to see what disciplines have a higher/lower number of enrollees
<u>Higher Education Enrollment AY 2019-2020 and Graduates AY 2018-2019</u>	Commission on Higher Education	Available online	By Program Level	* Number of enrolled and number of graduates per program level	Two academic years (AY 2018-2019 for graduates and AY 2019-2020 for enrollees)	2019		* Can develop training programs for enrollees/ graduates that are stackable	* No disaggregation by region. Might be useful to see what disciplines have a higher/lower number of enrollees
<u>State Universities and Colleges (SUCs) Enrollment and Graduates</u>	Commission on Higher Education	Available online	By Region, By SUC	* Number of enrolled and number of graduates per SUC per region	Annual (Enrolled - AY 2017-2018 to AY 2019-2020; Graduates - AY 2016-2017 to AY 2018-2019)	2019		* Can see which region has a higher number of enrollees and can target training programs for them	* Cannot provide insights about skills
<u>State Universities and Colleges (SUCs) Highest Degree Attained</u>	Commission on Higher Education	Available online	By Region, By SUC	* Number of faculty per highest degree and SUCs	Once (AY 2019-2020)	2019		* Can provide insights on the capacity of the faculty in a SUC	* Cannot provide insights about skills
<u>Number of enrollment in Senior High School</u>	Department of Education	Available online	By Region, By Track, By Sex, Per Sector	* Number of enrollees in K12 track per region and sex	Annual (AY 2016-2017 to AY 2020-2021)	2020		* Might be a good source of possible training/jobs to be provided/to be catered for K12 graduates depending on the number of enrollees in a specific track	* Cannot provide insights about skills
<u>Number of Schools, Examinees, and Distribution of Passers by Sex in Various Licensure Examination</u>	Philippine Statistics Authority through Professional	Available online	By licensure examination, by number of schools, no. of examinees, by	* Number of schools, examinees, and distribution of sex in various licensure examination	Annual (2011-2021)	2021		* Provides information on number of passers. Can target training programs for them.	

Name of Data	Source of Data/Agency Responsible	Availability	Level of Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
	Regulation Commission		no. of passers, and by sex						
Other employment-related data									
<u>Occupational Wages Survey</u>	Philippine Statistics Authority	Available online	By Industry/Occupation	* Average monthly wage rates of time-rated workers on a full-time basis in selected industries and occupations * Average monthly wage rates of benchmark occupations by Industry * Average monthly wage rates of benchmark occupations by region * Median monthly basic pay and monthly allowances of time-rated workers on a full-time basis by industry and sex * Median monthly basic pay and monthly allowances of time-rated workers on a full-time basis by region and sex * Percent distribution of time-rated workers on a full-time basis by industry and monthly basic pay * Percent distribution of time-rated workers on a full-time basis by industry and monthly allowances * Percent distribution of time-rated workers on full-time basic by region, sex, and monthly basic pay	Every two years (2002-2022)	2022	PSIC PSOC (up to 4-digit disaggregation from PSA)	* Good source of productivity and price policies, wage, and income. Moreover, it can be used to measure wage differentials, wage inequality, basic pay, and allowance, among others. * Comprehensive source of data.	
<u>Integrated Survey on Labor and Employment (ISLE)</u>	Philippine Statistics Authority	Not available online	Disaggregated by major industry group	* Number and percentage of Establishments employing 20 or more workers with productivity improvement programs (PIPs) by major industry group * Percentage of establishments with PIPs by program implemented * Percentage of establishments with PIPs by program developer * Percentage of establishments with PIPs by program objective * Percentage of workers covered by PIP	Annual (2015-2019)	2019	PSIC (up to Section Code disaggregation)	* Provides good input on industry trends and practices (including employment of specific groups of workers, occupational shortages and surpluses, and training of workers, among others).	* Dataset not released on the website. Only infographics.
<u>Labor Turnover Survey</u>	Philippine Statistics Authority	Not available online	By Industry	* Labor turnover rates by sector * Labor turnover rates in establishments with 20 or more workers by major industry	Quarterly (2016 3rd Quarter to	2021	PSIC (up to 2-digit disaggregation)	* Shows insights into which industries are	* Dataset not released on the website. Only infographics from 2020 onwards.

Name of Data	Source of Data/Agency Responsible	Availability	Level of Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
					2021 4th Quarter)			high/low accession or separation.	* Focused only on NCR from 2020 onwards.
<u>Study on the Employment of TVET Graduates</u>	Technical Education and Skills Development Authority	Available online	Per Sex, Per Sector, among others	* Weighted Distribution of TVET graduates by Region, Sex, Age Group, Highest Educational Attainment, Training Venue, Scholarship Program, and Sector, their Reason for taking up TVET programs, as whether they took a career profiling examination/career assessment test, by program registration, among others. * Labor Force Participation Rate of TVET graduates by sex, age group, highest educational attainment, type of provider, training venue, and client type, among others.	Annual (2014 to 2021)	2021		* Comprehensive source of data related to TVET	* Does not track individual overtime to see career improvement
<u>TVET Statistics</u>	Technical Education and Skills Development Authority	Available online	By Region, By Province, By Sex	* Data on training output, scholarship programs output, assessment and certification, program registration, trainer development program, partnerships and linkages, sectoral data and promulgated TRs	Annual (2020-2022); Quarterly (2020 1st Quarter to 2023 1st Quarter)	2023 1st Quarter		* Provides comprehensive information about TVET in the country	
<u>Compendium of OFW Statistics</u>	Philippine Overseas Employment Administration	Available online	By country/destination By major occupational group and sub-major occupational group	* Deployed OFW by country/destination * OFW deployment per skill - new hires	Annual (1992 to 2020)	2020		* Presents which occupations are in demand	* Data are dated
Enterprise Statistics									
Census of Philippine Business and Industry (CPBI) <u>Mining and Quarrying</u> <u>Manufacturing</u> <u>Construction Establishments</u> <u>Electricity, Gas, Steam, and Air Conditioning Supply</u>	Philippine Statistics Authority	Available online	By Industry Group	* Number of establishments * Number of employees * Workers on Sub-contract agreements or under manpower agencies * Total revenue * Expense * Employment per Establishment * Revenue per Expense * Value Added per Employee (Labor Productivity)	Every six years (2018, 2012, 2006)	2018	PSIC (up to 3-digit disaggregation from PSA) PSGC	Much more comprehensive, in scope, than the survey.	* Same with the annual survey, it cannot provide specific skills needed for the industry but can gather insights based on what's presented in the results. * Collected every five years

Name of Data	Source of Data/Agency Responsible	Availability	Level of Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
Annual Survey of Philippine Business and Industry (ASPBI) - <u>Mining and Quarrying Sector</u> <u>Manufacturing Sector</u> <u>Construction Sector</u> <u>Electricity, Gas, Steam and Air Conditioning Supply Sector</u> <u>Water Supply; Sewerage, Waste Management and Remediation Activities</u>	Philippine Statistics Authority	Available online	By Region, By Industry	* Number of establishments * Number of employees per industry * Total revenue * Expense * E-Commerce Sales * Employment per Establishment * Average Annual Compensation per Paid Employee * Revenue per Expense Ratio	Annual	2021	PSIC (<i>up to 3-digit disaggregation from PSA</i>) PSGC	* Can provide insight into which industries are more in demand. Thus, it could develop training programs that will cater to those industries. On the other hand, they can also target lucrative industries.	* Cannot provide specific skills needed for the industry but can gather insights based on what's presented in the results. * Inconsistent release of results that might affect data analysis. * Available only in selected data enclaves at PSA

Source: Authors' compilation

Table A3: Skill-specific data sources

Name of Data	Source of Data/Agency Responsible	Availability	Aggregation	Coverage	Frequency/Interval	Latest Version/Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
Skills Needs Anticipation: <u>Workplace Skills and Satisfaction Survey</u>	Technical Education and Skills Development Authority	Available online	Qualitative (Paper)*	* Skills in the business * Emerging skills associated with industry developments among others	2020 and 2021	2021		* Used in anticipating future/emerging skills requirements	* Limited sector (Logistics, Construction, and IT-BPM)
Tracer Studies									
<u>The 4th Philippine Graduate Tracer Study: Examining Higher Education as Pathway To Employment, Citizenship,</u>	Philippine Institute for Development Studies	Available online	Qualitative (Paper)*	* Summary of sample size, tracing, and enumeration status * Discipline group graduated in by HEI type * Did the curriculum enable you to compete in the labor market?	Once	The report was released in 2019, but the data		* Good source in terms of employment outcomes to improve higher education provision	* The data used was dated. However, a lot of information/insights can be gathered from the report.

Name of Data	Source of Data/ Agency Responsible	Availability	Aggregation	Coverage	Frequency/ Interval	Latest Version/ Last Update	Usage of PSOC/PSIC/ISCO	Strength	Weakness
<u>and Life Satisfaction from the Learner's Perspective</u>				* Courses/training programs that should be added to the curriculum * Employment status by HEI type * Employment status by discipline group		used was from AY 2009-2011.			* Should be gathered yearly to track the career improvement of an individual.
<u>Tracer Study of OWWA Skills for Employment Scholarship Program (SESP)</u>	Institute for Labor Studies	Available online	Qualitative (Paper)*	* Number of former SESP scholars from 2012 to 2014 * SESP Graduates by sex, program eligibility, age, group, and highest educational attainment	Once	2015			* Does not provide any insights on the skills needed * Dated information/data

Source: Authors' compilation

Table A4: Development Plans/Sectoral Roadmaps

Name of Data	Source of Data/Agency Responsible	Availability	Priority Skills	Strengths	Weaknesses
<i>Sectoral Roadmaps</i>					
<u>Philippine Construction Industry Roadmap 2020-2030</u>	Construction Industry Authority of the Philippines	Available Online	Technological and digitization skills	*Lays out the important goals for the construction sector to work and the actionable steps that can be taken	*Needs monitoring mechanism if the steps/plans are being met/achieved
<u>The Philippine IT-BPM Sector 2022</u>	IT & Business Process Association - Philippines	Available Online	Big Data and Analytics (BDA), Internet-of-Things, Automation and Artificial Intelligence, Cloud Computing	*Comprehensively presents the current IT-BPM environment and the possible steps to further improve the IT-BPM industry * Plans to establish a Program Management Office to provide support in the monitoring and evaluation	
<u>National Artificial Intelligence (AI) Strategy Roadmap</u>	Department of Trade and Industry	Available Online	Learning and development (L&D) programs related to data extraction, data cleaning, data analysis, and machine learning, among others.	*Serves as a guide in employing AI technologies and developing AI economies	
<u>National Agriculture and Fisheries Modernization and Industrialization Plan 2021-2030</u>	Department of Agriculture	Available Online	<i>Technical skill for the following jobs:</i> trainers in urban farming and farm tourism, transport/delivery logistics - refrigerated trucks and cold chain operators, integrated farm designers, additive manufacturing technicians, customized equipment designers, software designers,	*Comprehensive presentation of the modernization plans for the agriculture and fisheries sector	

Name of Data	Source of Data/Agency Responsible	Availability	Priority Skills	Strengths	Weaknesses
			<p>maintenance technicians for farm equipment, farm machinery operators, gadget repair, apps designer/programmer, farm tourism guide, organic farm certifiers, carbon footprint auditors, controlled environment technicians - construction and maintenance, genomic lab technicians, growers of bamboo and other raw materials for packaging, manufacture of biodegradable and reusable packaging, food safety inspectors, waste recycling technicians, single cell protein factory workers, edible insect factories, seed producers, pens and cages for mariculture, feed industry for fish, pigs, and chicken, greenhouse manufacturing, installation, maintenance, drip irrigation equipment, social media employees, teachers at all levels to teach food systems concepts, operation, and management</p> <p>Identified skills: technical, fiscal, and managerial competencies, entrepreneurship, facilitation, conflict resolution, communication, contractual arrangements, and intellectual property rights.</p>		
<i>Philippine Development Plan</i>					
Chapter 2: Promote Human and Social Development	National Economic and Development Authority	Available Online	Future-ready skills and skills related to enhanced science, technology, engineering, agriculture-fisheries, and mathematics (STEAM) strand, agri-entrepreneurship, tropical agriculture farming management, and modern agri-fisheries technologies and manufacturing (in relation to EBT)	*There are identified legislative agenda to support the medium-term goal of the administration.	*Needs a monitoring scheme to check if there are programs offering the identified priority skills
Chapter 4: Increase Income-earning Ability			<p>Managerial, technical, and digital skills;</p> <p>Social (collaboration and teamwork); cognitive (strategic problem solving, agility, and adaptability) and specialized skills (data analysis, content creation) and storytelling;</p> <p>Advanced manufacturing, robotics, artificial intelligence, the Internet of Things, and blockchain; green competencies</p>		

Source: Authors' compilation

Table A5: Policies/Laws

Policies/Laws	Title	Summary	Issuance Date/Filing Date/Enactment Date
<i>Republic Act</i>			
<u>Republic Act No. 11927</u>	An act to enhance the Philippine Digital Workforce Competitiveness, establishing for the purpose an inter-agency council for the development and competitiveness of the Philippine Digital Workforce and for other purposes	One of the goals of the legislation is to guarantee that Filipinos possess digital skills and skills relevant to the 21st century. Additionally, the law aims to provide ample protection and support for the digital workforce, ensuring their continuous enhancement of skills to proficiently meet global standards.	July 30, 2022
<u>Republic Act No. 10771</u>	An act promoting the creation of Green Jobs, granting incentives, and appropriating funds therefor	The legislation aims to encourage sustainable development, foster the creation of quality jobs, and enhance resilience to climate change by offering incentives to businesses generating environmentally friendly employment opportunities. In the act (Section 4c), green jobs are defined as “employment contributing to preserving or restoring environmental quality,” emphasizing that they must also be “decent jobs,” characterized by productivity, worker rights, fair income, workplace security, social protection for families, and promotion of social dialogue. The act outlines specific incentives for promoting green job creation, encompassing tax deductions for skills training, research and development related to green jobs, and duty-free imports of capital equipment exclusively dedicated to advancing green employment.	April 29, 2016
<i>TESDA Circular</i>			
<u>TESDA Circular No. 048 s. 2020</u>	Revised Technical Education and Skills Development Committee (TESDC) Implementing Rules and Regulations	The objective of the circular is to enhance the connection and align policies between the national and local levels through the TESDA Board and the Technical Education and Skills Development Committees (TESDCs). This will be achieved through the updated implementing rules and regulations outlined in the circular.	March 3, 2020, Superseded TESDA Circular No. 25 s. 2011
<u>TESDA Circular No. 001 s. 2021</u>	Implementing Guidelines on the Skills Mapping and Prioritization of Skills Requirements	The circular seeks to enhance the skills mapping and prioritize skill requirements both nationally and locally by employing the Policy-oriented, Sector-focused, Area-based, and Market-driven (PSALM) approach.	January 6, 2021
<u>TESDA Circular No. 001 s. 2023</u>	Implementing Guidelines on the Prioritization in the Development and Review of Training Regulations/Competency Standards	The circular will offer information about the selection of key training regulations and competency standards for both development and review, drawn from the identified industry priorities.	January 3, 2023
<u>TESDA Circular No. 039 s. 2023</u>	Revised Implementing Guidelines on the Area-Based and Demand-Driven TVET	The goal of the circular is to aid the implementation of an area-based and demand-driven policy direction at all operational levels.	September 20, 2023, Superseded TESDA Circular No. 042 s. 2021
<i>Senate Bill</i>			
<u>SB 2317</u>	Digital Skills and Technology Education Act of 2023	The proposed legislation seeks to direct relevant agencies to update current curricula by integrating technology courses, such as coding and programming, digital marketing, data analytics, web and mobile app development, artificial intelligence and robotics, cybersecurity, digital multimedia, and design, entrepreneurship in the digital age, and more. Its goal is to guarantee inclusive digital education and establish a robust foundation in digital skills.	July 17, 2023, Pending in the Committee (8/2/2023)
<u>SB 2314</u>	Enhancing Workers Protection and Skills Development in Digital Economy Job Disruption	The bill suggests establishing a national task force dedicated to addressing job disruption in the digital economy. This task force would be responsible for devising and executing	July 17, 2023, Pending in the Committee (8/2/2023)

Policies/Laws	Title	Summary	Issuance Date/Filing Date/Enactment Date
		a comprehensive program for upskilling and reskilling, with a specific focus on digital skills and emerging technologies, among other functions proposed by the task force.	
<i>House Bill</i>			
<u>HB 9580</u>	Digital Skills and Technology Education Act of 2023	This proposed legislation aims to require the Department of Education (DepEd), the Commission on Higher Education (CHED), and the Technical Education and Skills Development Authority (TESDA) to update the current educational curricula in elementary, higher education, and technical-vocational education and training (TVET) by integrating relevant digital technology courses.	November 20, 2023, Pending with the Committee on Basic Education and Culture since 2023-11-21

Source: Authors' compilation

Table A6: Qualitative sources

Possible sources of data	Possible participants	Strengths	Weaknesses
<i>Literature review</i>			
<i>Expert consultation</i>	<ul style="list-style-type: none"> * Government agencies such as TESDA, DOLE, DTI, CHED, DepEd, among others. * Representatives from the private sector and the key employment generators 	<ul style="list-style-type: none"> *Can gather insights and information from various sources *Good avenue to build a network with the various stakeholders present 	<ul style="list-style-type: none"> *Time-consuming process *Tendency for other participants to dominate the discussion
<i>Delphi Survey</i>	<ul style="list-style-type: none"> * Policymakers * Representatives from the unions/employees/jobseekers 	<ul style="list-style-type: none"> *Can avoid large group gatherings *Can gather different opinions from a large number of experts 	<ul style="list-style-type: none"> *Time-consuming process *Labor intensive because it might take a few rounds to have a consensus

Source: Authors' compilation

Table A7: Big data

	Potential sources	Strength	Weakness	Remarks
<i>Big data using Application Program Interface, scraping, web crawling</i>	<u>LinkedIn</u>	Can filter jobs by employment type, job title, experience level, and location	Users may be prone to spam or fake recruiters	Also acts as a networking platform for professionals.
	<u>Indeed</u>	Can browse jobs by job title, company, industry, and location. Can filter job opportunities based on desired salary		
	<u>Glassdoor</u>	Workers can leave reviews and rate current and former employers and jobs.		

	Potential sources	Strength	Weakness	Remarks
	Kalibrr	Can see recommended jobs based on your profile	Some companies do not disclose the salary.	
	Jobstreet	Can filter the job opportunities when you input your desired salary		

Source: Authors' compilation

Table A8: Existing LMI initiatives

Name of Data	Source of Data/Agency Responsible	Availability	Coverage	Frequency/ Interval	Usage of PSOC/PSIC/ ISCO	Strength	Weakness
<u>Reports</u>							
Labor Market Trends	Bureau of Labor and Employment - Department of Labor and Employment	Available online	* Various themes	Annual (2019-2022)		* Provides information about the current labor market.	* Does not have quantitative data and might be limited in scope.
Labor Market Profile	Bureau of Labor and Employment - Department of Labor and Employment	Available online	* Employed persons by major industry group, Philippines * Key employment indicators, Philippines * Job vacancy postings: Distribution by occupation and industry * Number of Senior High School graduates in public, private, SUCs/LUCs & PSO by region * Number of senior high school graduates in public schools/private schools by region * Number of graduates by discipline group and by region * Annual number of examinees, passers, and passing percentage by profession * TVET assessed and certified by region	Annual (2018, 2019, 2020, 2021, 2022)	PSIC (up to 2-digit disaggregation; data from PSA)	* Contains information on labor demand and supply from various LMI sources	
Labor Market Intelligence Report	Technical Education and Skills Development Authority	Available online	Includes labor market intelligence report on the cold chain industry, green skills, solid waste management sector, coconut industry, circular economy, construction sector, health care, AI, IT-BPM industry, logistics industry, cybersecurity, automotive, aquaculture, among others.	Annual (2011-2023 except 2014)		* Good source of anticipated and emerging skills in identified industries	* Does not have a longitudinal perspective/report on industries. Good to see what the changes are over the years.

Name of Data	Source of Data/Agency Responsible	Availability	Coverage	Frequency/ Interval	Usage of PSOC/PSIC/ ISCO	Strength	Weakness
<u>Labor Market Forecast (previously JobsFit)</u>	Bureau of Labor and Employment - Department of Labor and Employment	Available online	*Has chapters on industry outlook, emerging industries and jobs, priority skills requirements, digital economy, and green jobs, among others.	Publications for 2010, 2013-2020, 2022, and 2022-2025		* Provides forecast on the state of the labor market by giving information on key employment generation sectors, emerging industries, in-demand, hard-to-fill occupations, and other relevant information.	
<u>Philippine Skills Framework</u>	Department of Trade and Industry	Available online	By Sector, By Job/Occupation	Once (as of 2021)		Provides information about the skills needed per job for logistics & supply chain operations, warehouse operations, freight forwarding operations, and IT Logistics/ Operations. Information includes job role description, critical work functions, key tasks, and skills and competencies.	Currently, the sectors with the skills framework are limited.
<u>TESDA's skills map</u>	Technical Education and Skills Development Authority	Available online	By Sector, By Job/Occupation	Once (as of 2020)		*Presents job/occupation without training regulations, which can help identify priorities *Shows emerging skills	*Does not show the demand per region
<u>Online matching platforms</u>							
<u>PhiljobNet</u>		Available online, By Agency, By Area, By Educational Attainment, By type of employment	* Company and Location * Salary * Educational level * Type of engagement (Permanent, Contractual, Project-based)	Daily		* Updated daily with the location, educational level of attainment, type of engagement	* Companies are not required to update the information being reported on the site
<u>Public Employment Service Office (PESO) Employment Information System (PEIS)</u>	Public Employment Service Office	Available online, By PESO Address (connected with PhiljobNet - by agency, by area)	* Company and Location * Salary * Educational level * Type of engagement (Permanent, Contractual, Project-based)	Daily		* Updated daily with the location, educational level of attainment, type of engagement	* Some companies do not post the salary * Companies are not required to update the information being reported on the site

Source: Authors' compilation