



Technical Education and Skills Development Authority
and
Institute for Labor Studies

SKILLS NEEDS ANTICIPATION WORKPLACE SKILLS AND SATISFACTION SURVEY (CONSTRUCTION SECTOR)

Abstract

This study uses a workplace skills and satisfaction survey among construction companies to generate baseline data on needed and critical skills requirements of the construction industry. This baseline data will be used to inform future training programs, support, and other programs by government for capacity building and innovation of the industry, in support of the human resource strategy of the Philippine Construction Industry Roadmap 2020-2030. Further, the results of the workplace skills and satisfaction survey can form part of wider skills needs anticipation initiatives and analyses. This is so that the construction sector will have the necessary human capital to support and strengthen the industry as a whole in attaining the goals of the Roadmap.

Executive Summary

The objective for the survey is to generate baseline data on needed and critical skills requirements of the construction industry. This baseline data will be used to inform future training programs, support, & other programs by government for capacity building and innovation of the industry, in support of the human resource strategy of the Philippine Construction Industry Roadmap 2020-2030. Further, the results of the workplace skills and satisfaction survey can form part of wider skills needs anticipation initiatives and analyses. This is so that the construction sector will have the necessary human capital to support and strengthen the industry as a whole in attaining the goals of the Roadmap.

Specifically, the study seeks to:

- Provide quantitative data on skills, e.g. skills gaps, skills shortages, skills utilization in the workplace;
- Provide analysis on the current skills situation of the construction industry;
- Identify emerging future skills;
- Assess factors that are likely to impact on skills use; and
- Determine the satisfaction of employers on the competencies and performance of TVET graduates in the workplace.

1. Methodology

- The Technical Education and Skills Development Authority (TESDA) commissioned the Institute for Labor Studies-Department of Labor and Employment (ILS-DOLE) to conduct the study, in partnership with the Philippine Constructors Industry, Inc. (PCA).
- The questionnaire used is based on an instrument for establishment skills survey developed by the ILO, modified to country and sectoral context based on stakeholder feedback. The survey asks questions about Employment, Compensation of Employees, Critical Occupations, Improving Business Productivity, Adoption of Modern, Efficient, and Green Technologies and Workforce Matters. It is programmed in and administered through SurveyCTO, a Computerized Assisted Personal Interviewing (CAPI) software and platform.
- The survey uses probability sampling to ensure representativeness and to provide robust data. The respondents are PCA members, one of the major industry associations in the sector. The population covered by the survey is comprised of the regular and chapter members of PCA, with the unit of analysis at the company or organization level. Using proportional allocation to sample size according to membership, 44 regular members and three (3) chapter members were sampled.
- The survey was initially conducted from October to December 2019, and was extended from late January to February 2020. The survey collected data on 34 participating construction companies across the different PCAB Ratings (except for E).

2. Highlights of the Result of the Study

1) Employment

a) Project and Non-project, Occupational Groups

- i) Majority of employed is on project-based employment, comprising of jobs particular to construction projects or sites. Their occupations are mostly Craft and Related Trades Workers, Elementary Occupations, and Service and Sales Workers.
 - ii) Non-project-based employment is mostly for regular workers based in the headquarters or offices of contractors / construction companies. These include managers and supervisors, and professionals, and general office staff.
 - iii) Female employment is minimal for project-based, while having a considerable share for regular workers particularly for managers and supervisors (e.g., HR managers/supervisors) and clerical support workers (e.g., general office and administrative staff, HR, accounting, procurement, etc.). Informally during survey interviews, some respondents have expressed that construction jobs on-site are not suitable for women.
- b) Age Group.** Bulk of employment in the sector is in the core age group of productive age, 25 to 54 years old, with employment share significantly decreasing for those older. Since construction jobs especially on-site are manual and physically demanding, there may be early retirement in the sector, or a preference for younger workers as well.
- c)** Industry stakeholders observe that some larger industry players take the initiative of training project-based workers so that they can hire them afterwards. However, they recognize that this is only a good practice, and that for the industry as a whole, strategies or schemes for the skills development for project-based workers remains to be determined. One proposal raised by some industry players is to have a centralized training fund for the industry, to be funded through a levy or fee among licensed contractors proportional to their financial capacity and technical experience

2) Existing Occupations

a) Top occupations

- i) For monthly-paid workers, the top occupations are managerial/supervisory and professionals. These may also reflect the non-project based and regular employment in the sector.
 - ii) For daily-paid workers, the top occupations are craft and related trades worker, elementary occupations, and Unskilled Workers Except Janitors, Messengers and Freight Handlers. There are also daily-paid professionals. This may reflect the project-based employment in the sector.
- b) Qualifications.** Majority of the monthly-paid occupations required higher education (diploma, baccalaureate and post-baccalaureate). Meanwhile, daily-paid occupations mostly had required qualifications of High School or lower, and/or NCs (almost all at NC II).

3) Critical Occupations

- a) Four out of five companies have critical occupations, or vacancies that were in-demand and/or hard-to-fill in the past 12 months
- b) Of these companies, almost 90% cited that the reasons are related to issues on skills (e.g., 1) No/few applicants applied for the job; 2) Applicants lack years of experience; 3) Applicants

lack needed competency/skill; and 4) Applicants lack professional license/TESDA skills certification)

- c) **Top occupations.** Heavy Equipment Operator (35.3%); Foreman (26.5%); Heavy Equipment Mechanic (26.5%); Pipefitters (23.5%); Carpenter (23.5%); Civil Engineer (23.5%) ; Mobile Crane Operator (23.5%); Scaffolder (23.5%); Supervisor (20.6%); Steel Man (17.6%); Rigger (17.6%); Surveyor (17.6%); Survey Aide (14.7%); Vibro Machine Operator (11.8%)
- d) **Search period.** The overall average time taken to fill the vacancies for the critical occupations are two months. The critical occupations that have longer search periods than this are Heavy Equipment Mechanic (3.4 months), Safety Nurse (3.0), Electrician (3.0), Heavy Equipment Operator (2.8), Vibro Machine Operator (2.8), Mobile Crane Operator (2.7), Hydraulic Excavator Operator (2.7), and Hydraulic Operator (2.7).
- e) **Status of work.** Almost all of the identified critical occupations were more likely to be non-regular positions, reflecting that the majority of employment in the sector are project-based.
- f) **In-demand occupations.** Top in-demand occupations are Spotter, Rebar, and Traffic Man (purely in-demand. Other top in-demand occupations are Leadman (66.7%), Hydraulic Operators (66.7%), Survey Aide (60.0%), and Supervisor (57.1%).
- g) **Hard-to-fill occupations.** Top hard-to-fill occupations are Heavy Equipment Mechanic (77.8%), Heavy Equipment Operator (75.0%), Mobile Crane Operator (75.0%) and Hydraulic Excavator Operator (66.7%). Top occupations identified to be more hard-to-fill compared to the previous year are Mobile Crane Operator (75.0%) and Tile Setters (66.7%).
- h) **Qualifications**
 - i) Majority of the critical occupations require qualifications that are either high-school level or lower, and/or NC II. Of the critical occupations identified, those that require NC II are:
 - (1) Rigger
 - (2) Tile Setters
 - (3) Mobile Crane Operator
 - (4) Scaffolder
 - (5) Pipefitters
 - (6) Vibro Machine Operator
 - (7) Carpenter
 - (8) Heavy Equipment Operator
 - (9) Hydraulic Excavator Operator
 - (10) Heavy Equipment Mechanic
 - (11) Rebar
 - (12) Hydraulic Operators
 - (13) Electrician
 - (14) Plumber
 - (15) Installer
 - (16) Excavators
 - (17) Steel Man
 - (18) Leadman
 - (19) Foreman
 - (20) Supervisor
 - ii) Critical occupations that require some higher education (diploma, baccalaureate, and post-baccalaureate) are:
 - (1) Surveyor
 - (2) Supervisor

- (3) Density Testing Aide
- (4) Draftsman
- (5) Safety Nurse
- (6) Civil Engineer
- (7) Heavy Equipment Mechanic
- (8) Foreman

- i) **Skills or Competencies Required.** Respondents had difficulty in distinguishing between basic, core and common competencies, as similar items were identified across the three categories. In general, the skills or competencies that were identified refer to qualifications (e.g., having the required qualifications, with specific levels identified from high School-level or graduate, college graduate, general NC level or specific NCs; passing trade tests; having certain years of experience), hard skills (e.g., having the relevant technical skills and knowledge, with specific skills identified in some instances), and soft skills (e.g., problem solving; teamwork and effective communication skills; leadership and management skills; willingness to Learn; and adaptability and flexibility).
- j) **Reasons for hard-to-fill vacancies.** Top reasons are having no or few applicants applied for the job (67.9%), applicants lacking needed competency/skill (50.0%), and location or work schedule problem (50.0%)
- k) **Strategies employed to meet labor needs.** Top strategies are to raise wages (64.3%), increase worker's training (57.1%), and to expand local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) (46.4%).

4) Improving Business Productivity

- a) **Work performance.** Companies reported that 56.8% of their workforce are able to perform the job adequately but not beyond, while 8.6% were unable to cope with their existing duties. Further, 34.6% have the potential to cope with more demanding duties than they currently have.
- b) **Reasons for poor performance.** Top reasons are on lacking expected behavioral skills (e.g., reliability, responsiveness, work discipline, motivation, integrity, adaptability, etc.) (83.3%), lacking technical skills (58.3%), and lacking socio-emotional skills (extraversion, emotional stability, agreeableness, grit, consciousness, decision-making, openness, etc.) (41.7%).
- c) **Strategies to remedy poor performance**
 - i) Top strategies that are always used are to have more workers' appraisals/performance reviews (50.0%), to increase supervision of workers (37.5%), and disciplinary procedures (33.3%). This is in line with the top reasons cited for poor performance being on behavioral skills and socio-emotional skills. Top strategies that are always used that relate to hard or technical skills is on implementing mentoring/buddying schemes (29.2%) and to increase training activity (25.0%). Almost all of the top strategies cited to be always used would not entail additional costs for companies, except maybe for increasing training activity (if done with an external service provider).
 - ii) Those entailing additional cost are indicated as not used, like re-training (37.5%), promotion of alternative learning system (33.3%), development of career pathing for workers (33.3%), and increasing recruitment (33.3%). Factors why these strategies are not used may be on the additional costs it can entail (e.g., when having to formally retrain), and the often project-based and short-term employment engagement of workers (which may deter career pathing). Increasing recruitment may also entail

additional cost when having to hire more workers than intended, so companies may opt to just manage their current workforce.

d) **Developing HR potential.** Majority (62.5%) of companies responded that they have already taken steps to develop their high potential staff.

e) **Developments likely to impact employment**

i) Top developments cited are government policy direction (e.g., legislation of 30-Year Infrastructure Master Plan) (73.5%), climate change and sustainability (67.6%), and changes in policy and regulatory environment affecting market access (e.g., PPP Law, Procurement Law and its IRR, Right-of-Way Acquisition Law) (61.8%).

ii) Overall, such developments were perceived to have had a positive employment on the employment of all types of workers (professional, skilled, low-skilled) over the past five years, with even more optimistic views on its increase in the next five years. There is also the same positive perception for employment by age group, especially for younger cohorts (18-44 years old).

5) **Adoption of Modern, Efficient, and Sustainable Technologies towards the 4IR**

a) **Extent of adoption.** Technologies that have the highest level of adoption, where companies have already started provision/funding and it is one of the main business foci, are Engineering, Procurement, and Construction (EPC) and Design-Build capabilities (32.3%), and digital technologies (e.g., building information modeling [BIM], drones, robotics, remote monitoring, smart centers, computational design, and modern technologies for large public infrastructure projects) (25.8%). Technologies with the lowest level of adoption, (e.g., no provision/funding and no immediate plan of doing so), are on Institutionalizing uniform or standard carbon dioxide (CO₂) measurement, benchmarking, and reduction approaches (38.7%).

b) **Readiness.** While almost a fourth of the companies responded they have already started provision/funding on digital technologies, about the same proportion also indicated that they have no provision/funding for it. It can also be noted that the bigger companies (with higher PCAB rating) were more likely to indicate they have already started or are planning for the provision or funding of the listed technologies.

c) **Impact of the adoption of digitization and green technology in the workplace**

i) **On tasks**

(1) Top tasks to have more consistent positive demand (e.g., more skills demanded or to stay the same) are Observing Procedures, Specifications and Manual of Instructions; Interpreting Technical Drawing and Plans; Performing Masonry (Pipefitting, Excavation, Concreting); Performing Electrical Work; and Using the Test Instrument.

(2) Some tasks have more inconsistent signals, where there the proportion of responses on the skill being more or less demanded both have considerable magnitudes. These are on the Use of Basic Hand Tools, Performing Mensuration and Calculation, and Preparing Construction Materials, Tools, and Equipment. These are skills that may be affected by the adoption of newer technologies and automation especially by the more capable companies (e.g., bigger firms), while firms with less capability to adopt these technologies will still mostly retain the use of these skills.

ii) **On functional areas.** Top functional areas to have more skills demanded are Civil Engineering (71.0%), Quality Assurance Inspection (61.3%), Quality Control Inspection (61.3%), Materials Engineering (54.8%), and Electrical (54.8%). Meanwhile, top skills cited to have fewer skills demanded are Quantity Survey (25.8%), Quantity Estimation (22.6%), and CAD Design (19.4%).

- iii) **On emerging skills.** Top emerging skills to have more demand are On Green Construction (58.1%), On Building Information Modeling (BIM) (48.4%), and On Process Automation (45.2%).
 - d) **Extent of actions undertaken.** Around 70% indicated that they have started some initiatives/programs in terms of training and development of the human resource, while 66.7% also responded that they have established plans to address the requirements. Meanwhile, 62.5% have started some initiatives/programs for the acquisition of equipment and materials relevant for the requirements. While this category still garnered a major share of the respondents (more than half), it also had the least share compared to others since it can entail the highest cost. In addition, companies may also prioritize the establishment of plans and preparation of human resource before they can start to acquire equipment and materials.
 - e) **Preparation of human resource.** All of the respondents indicated that they do retooling and upskilling of existing employees to acquire the required competencies, while 52.9% indicated that they hire new employees. As cited previously, companies may be limited to making the best out of their current workforce since hiring new workers may entail additional labor cost, especially when workers cannot be directly substituted (e.g., before end of tenure) or there is already difficulty in hiring for certain occupations.
 - f) **Top sustainable industry developments that are relevant to the current and near future business needs of companies, in terms of knowledge, skills and competencies.** Energy Labelling, and Reuse and Recycling of CDW is among the top responses, and relevant across the three aspects. Other top industries relevant in one or more categories are New Technologies Applied to Building Maintenance and Refurbishment; Low Environmental Impact Materials; Sustainable Construction Standardization; Virtual Design Construction (VDC), Sustainable Building Certification; Systems; and Environmental Labelling.
- 6) **Workforce Matters: workers with TVET training & performance**
- a) More than three-fourths (76.5%) of the respondents have preference in hiring NC holders.
 - b) The proportion of all (in-house and via agencies) jobs (not employees) that require at least an NC qualification to do the job is at 22.2%.
 - c) The percentage of the existing workforce that are TVET graduates, with or without achieving a qualification, is at 20.2%.
 - d) Majority (85.7%) of the companies were either satisfied or very satisfied with TVET graduates.
 - e) An even higher proportion (90.5%) were also either satisfied or very satisfied with TVET-certified employees.

3. Conclusion and Recommendation

1. On skills supply

- On promoting equity in and access to training opportunities, measures can be focused on adult learners, low skill workers, and mid-career or older workers that need to reskill and upskill. These should consider responsiveness to the diverse profiles of workers in terms of age and experience and as they possibly shift careers. Industry-wide training initiatives can be oriented towards developing a talent pipeline or pool

given the inefficiency of letting individual firms address training and development issues, and the mostly project-based nature of construction employment.

- Towards ensuring industry/job relevance of training content for technical skills, explore and assess alternative training interventions in partnership with firms, such as work-based learning programs and integrated education and training models. This may also involve encouraging employers to provide more on-the-job training and to partner with technical training providers. Also strengthen the Recognition of Prior Learning.
- To address gaps in core skills, improve the delivery and assessment of core skills so that these skills are adequately developed by the TVET and skills system
- Address perennial issues with regards to the preparedness, capacity and quality of Philippine TVET system in terms of infrastructure and operational mechanism (e.g., increase availability of training providers and assessors especially in certain regions to adequately meet demand)
- Examine further employment and skills development among subcontractors, since these firms are responsible for the supply of specialist skills (Myers, 2008).

2. On skills demand

- On creating jobs and promoting demand for high skill workers in the sector, further analyze the drivers of and obstacles to innovation and adoption of technology faced by companies. This is to promote efficient and cost-effective training interventions to support the adoption of modern, efficient and sustainable technologies, since the challenges to this may come from outside of the skills system (Hentschel, 2017).
- Examine further the recognition and valuation of skills by employers.
- Strengthen human resource management and capacity of construction firms so they can assess skills needs and acquire staff through hiring and recruitment and/or training and development more effectively
- Explore both top-down and bottom-up approaches in the formulation of the skills agenda for the sector, at the industry, firm and individual/worker levels. Top-down industry level approach is needed since the labor market structure in the construction sector present barriers to skills development (Watson & Sharp, 2007). Meanwhile, there is also a need for bottom-up approaches so that views from the ground will feed into national and industry-level strategies and interventions. For this, both employers and workers must be capacitated in analyzing, identifying, and voicing out their skills needs and issues (Chan & Dainty, 2007).

- 3. On improving skills assessments.** Establish and coordinate a national framework and system for skills needs anticipation. This is to promote the sustainability, efficiency and usefulness of skills anticipation activities like this survey. This can also be an opportunity to streamline and improve coherence of the wider LMIS, given the various sources from official statistics and surveys, administrative data, and potentially big data.

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List of Abbreviations

| | |
|-----------------|--|
| BIM | Building Information Modelling |
| CO2 | carbon dioxide |
| CAD | Computer-aided design |
| CAPI | Computer-Assisted Personal Interviewing |
| CDW | construction and demolition wastes |
| DomRAC | Domestic Refrigeration and Air-Conditioning Servicing |
| RDO | Engineering Services Outsourcing |
| EPC | Engineering, Procurement, and Construction |
| FCAW | Flux Cored Arc Welding |
| 4IR | Fourth Industrial Revolution |
| GMAW | Gas Metal Arc Welding |
| GTAW | Gas Tungsten Arc Welding |
| HMO | Health Maintenance Organization |
| HVAC | Heating, Ventilation, And Air Conditioning |
| HEO | Heavy Equipment Operation |
| HR | Human Resources |
| IRR | Implementing Rules and Regulations |
| ILS | Institute for Labor Studies |
| ILO | International Labour Organization |
| LMIS | Labor Market Information System |
| MMC | modern methods of construction |
| NC | National Certificate |
| OHNAP | Occupational Health Nurses Association of the Philippines |
| OJT | On-the-Job Trainee |
| ODA | Overseas Direct Assistance |
| PACU/CRE | Packaged-Type Air-Conditioning Unit / Commercial Refrigeration Equipment |
| PCA | Philippine Constructors Association, Inc. |
| PCAB | Philippine Contractors Accreditation Board |
| PTQCS | Philippine TVET Qualification and Certification System |
| PPP | Public Private Partnership |
| RAC | Refrigeration and Air-Conditioning Servicing |
| RPL | Recognition of Prior Learning |
| RVA | Recognition, validation, and accreditation of non-formal and informal learning |
| SMAW | Shielded Metal Arc Welding |
| SNA | Skills Needs Anticipation |
| SAW | Submerged Arc Welding |
| TESDA | Technical Education and Skills Development Authority |
| TVET | Technical and Vocational Education and Training |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| VDC | Virtual Design Construction |
| WSS | Workplace Skills and Satisfaction Survey |

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4. Introduction

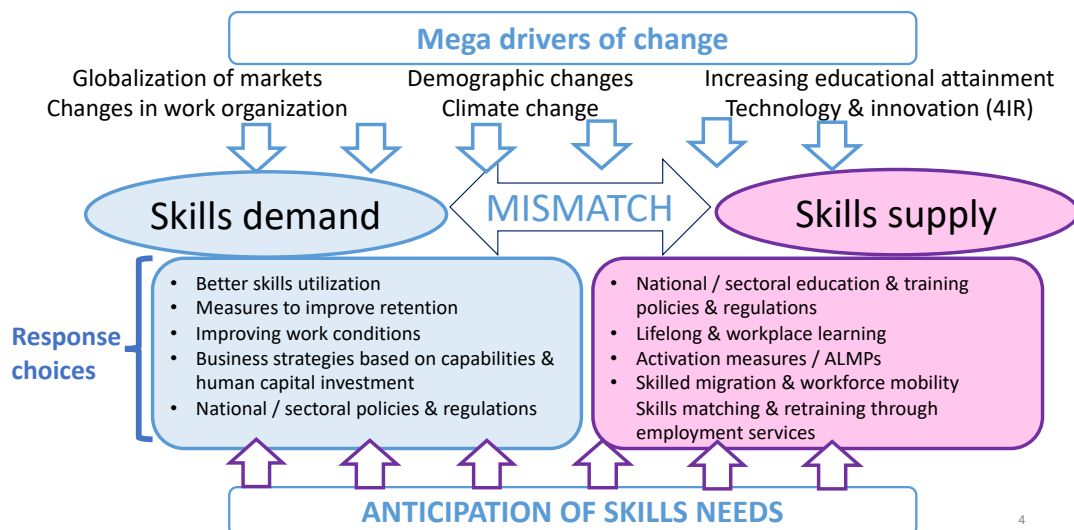
4.1. Rationale for and overview of sectoral skills needs anticipation through establishment skills survey

4.1.1. Need for skills needs anticipation

The rationale for this research is skills needs anticipation as an input to measures addressing skills imbalances or mismatches. Skills needs anticipation refers to activities to assess future skills needs in the labor market in a strategic way, using consistent and systematic methods. Information on future skills needs can provide key stakeholders with better means to respond to imbalances, and guide firms and workers to make informed decisions and contribute to more efficient labor market outcomes. Overall, it contributes to strengthening education and skills development policies and system, and in ensuring that supply is better matched to demand, towards improved employability, productivity and competitiveness (ILO 2017). For firms, human capital is an important factor to consider that may contribute in their better performance (Blair 2011).

Figure 1 shows an illustration of the factors influencing skills demand and supply, and responses to avoid skills mismatch. We have the mega trends that are driving skills demand and supply, and which may result to an imbalance or mismatch. There are several possible responses to address skills mismatch, which can be divided into skills demand- and supply- sides. The anticipation of skills needs provides input information to both demand-side and supply-side responses to skills mismatches (ILO 2015).

Figure 1. Factors influencing skills demand & supply, & responses to avoid skills mismatch



Source: Adapted from (ILO 2015), p. 2

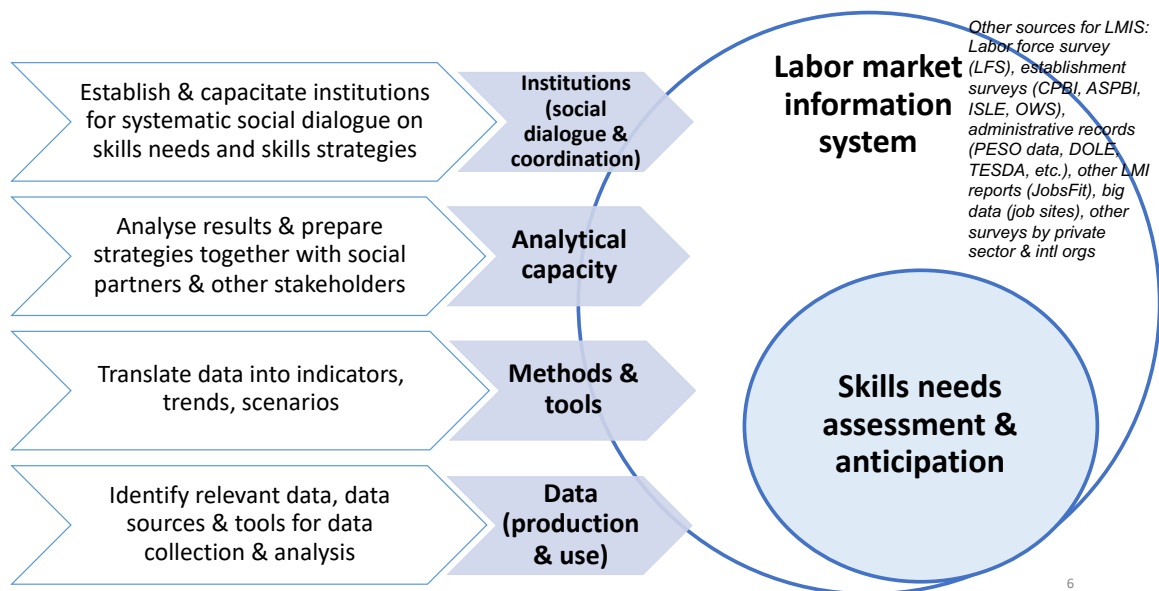
4.1.2. Need for sectoral approach in skills needs anticipation

This research hopes to contribute towards a sectoral approach to skills anticipation and development for improved relevance of training to labor market demands especially of key sectors like construction. In skills needs anticipation and development, it is important and useful to have a sectoral perspective because sectors have different skills needs following the type of economic activities they pursue and the technologies associated with them. National education and training policies affecting all sectors can be overly general and insufficient to tackle the skills needs that are specific to particular sectors (ILO 2016).

A sectoral approach can then improve the relevance of training to labor market demands, especially for key economic sectors. In taking a sectoral focus, there can be a clear and specific set of stakeholders that can focus on analyzing their shared and particular needs, towards working together to address the sector's skills requirements for the development of the specific sector. Another advantage of a sectoral approach is the opportunity to pilot improvements that can be difficult to introduce system-wide. The conduct of establishment skills survey is one important method that can be used in sectoral skills development (Wilson, Tarjáni, and Rihova 2016).

Figure 2 provides an illustration of the approaches to & essential components of skills needs anticipation, to better contextualize the sectoral approach to skills anticipation and development, with focus on construction for this research, and using the method of an establishment skills survey.

Figure 2. Approaches to and essential components of skills needs anticipation



Source: Adapted from (ILO 2015), p. 2

Skills needs assessment and anticipation is just one component of a broader labor market information system (LMIS)¹. The key elements of skills needs assessment and anticipation include institutions, analytical capacity, methods and tools, and data (including its production and use). To have the necessary institutions, the approach is to establish & capacitate institutions for systematic social dialogue on skills needs and skills strategies. To have the necessary analytical capacity, the approach is to analyse results & prepare strategies together with social partners & other stakeholders. To have the necessary methods and tools, the approach is to translate data into indicators, trends, scenarios. To have the necessary data, the approach is to identify relevant data, data sources & tools for data collection & analysis.

A sectoral approach, particularly construction-focused skills anticipation, informs approaches for developing institutions and analytical capacity, while the conduct of the establishment skills survey is one of the methods or tools for data production for skills anticipation (ILO 2015).

4.2. Objective of the study

The specific objective for the survey is to generate baseline data on needed and critical skills requirements of the construction industry. This baseline data will be used to inform future training programs, support, & other programs by government for capacity building and innovation of the industry, in support of the human resource strategy of the Philippine Construction Industry Roadmap 2020-2030. A repeated exercise in the future will also provide an assessment on the 'interim progress' made under the Roadmap. In view of the COVID-19 pandemic which has had significant economic and employment impact, future workplace skills and satisfaction survey may be undertaken two to three years from now to allow for a more normalized measure of skills needs alongside the recovery after the pandemic. Further, the results of the workplace skills and satisfaction survey can form part of wider skills needs anticipation initiatives and analyses.

This is so that the construction sector will have the necessary human capital to support and strengthen the industry as a whole in attaining the goals of the Roadmap. As indicated in the Roadmap Recommendation Cluster on Productivity: on reengineering the skills and promoting the dignity of the construction labor force, "...the attainment of higher technical skills and a more productive workforce will result to optimized efficiency in construction projects, leading to less wastages and less damages to the environment" (Philippine Constructors Association Inc. (PCA), 2019, p. 47).

Specifically, the study seeks to:

- Provide quantitative data on skills, e.g., skills gaps, skills shortages, skills utilization in the workplace;
- Provide analysis on the current skills situation of the construction industry;
- Identify emerging future skills;

¹ Aside from skills needs anticipation, other sources for the wider labor market information system include: Labor force survey (LFS) and other multi-purpose household surveys, establishment surveys (CPBI, ASPBI, ISLE, OWS), administrative records (PESO data, program data from DOLE, TESDA, etc.), other LMI reports (e.g., JobsFit report, TESDA LMI reports), big data (e.g., web scraping from job sites), other surveys by private sector & international orgs, evaluation reports of related policies/programs (e.g., TESDA tracer studies and employability reports) (ILO 2015).

- Assess factors that are likely to impact on skills use; and
- Determine the satisfaction of employers on the competencies and performance of TVET graduates in the workplace.

5. Literature Review

5.1. Brief context on construction sector

It is useful to provide a brief context of the Philippine construction industry to better appreciate the survey results.

Construction is a key economic sector, being a major direct contribution to the Philippine economy. In terms of GDP, the construction sector's gross value accounted for 7.1% of GDP, equivalent to PHP2.35 trillion or USD43.7 billion in 2018, and an average of 6.0% of GDP for 2010-17. In terms of employment, it had 9.4% share or 3.8 million persons employed in the sector in 2018. It also has indirect contribution as input to infrastructural investment across other sectors. Steady economic growth in recent years, and government-led infrastructure investment under the Build, Build, Build Program helped expenditure in the construction industry expand, by 15.9% in 2018. Demand drivers are the Build, Build, Build Program, strong demand for condos, duplexes, and quadruplexes notably by Chinese investors (Oxford Business Group 2019).

In this sector, contractors basically refer to the companies or firms that undertake construction. The basic definition of contractor is *"A contractor is responsible for providing all of the material, labor, equipment (such as engineering vehicles and tools) and services necessary for the construction of the project."* (PCAB).

The main regulation governing contractors is the Contractors License Law or R.A. 4566 as amended by P.D. No. 1746. This is to ensure only qualified and reliable contractors are allowed to undertake construction in the country, to ensure safety of the public and growth of the industry. Contractors are required to get license under the Philippine Contractors Accreditation Board (PCAB) -- Construction Industry Authority of the Philippines, Department of Trade and Industry (DTI). This is the key government agency with regards to the construction industry.

The eight (8) PCAB License Categories (e.g., AAAA, AAA, AA, A, B, C, D, E) are according to the evaluated capability of contractor to undertake contracts of different costs, based on financial capacity & experience, among others. Hence, this may also be an indicator for company size in terms of net worth and number of employees. As of the financial year 2019-2020, there are 15,533 licensed contractors according to PCAB data. The details with regard to the financial capacity and other requirements for the PCAB Categorization are in Annex B, Table 31, on the PCAB Categorization Classification Table based on PCAB Board Resolution No. 201, Series of 2017.

It may also be noted that there is high informality among construction firms. Based on the Construction Industry Roadmap, it is estimated that there are around 30,000 to 45,000 unlicensed contractors, compared to 11,147 licensed contractors in 2018. This is by comparing the number of licensed contractors to the number of local business permits related to construction activities processed each year based on administrative data, and around 180,000 construction projects that are estimated to be undertaken every year, based on a World Bank study cited in the Roadmap.

The cyclical nature of employment in construction is a feature of the sector that has several implications for skills. A cyclical industry is a type of industry that is sensitive to the business cycle, such that revenues generally are higher in periods of economic prosperity and expansion and are lower in periods of economic downturn and contraction.

In case of economic downturn and then recovery, there can be skills shortages in the recovery period as workers who have secured employment in other sectors are reluctant to re-join the construction workforce. The cyclical nature of employment is also a deterrent for younger entrants into the sector as well as for highly skilled workers, such as managers (including civil engineers) who seek more stable employment in other sectors where their skills are sought after (UK Commission for Employment and Skills, 2012). For the Philippine construction industry, industry stakeholders have a positive outlook for the sector in the medium-term as indicated in the Philippine Construction Industry Roadmap 2020-2030, including at the time of the conduct of the survey.

In light of the Philippines being a major sending country for migrant labor, a considerable portion of which are construction workers overseas, the domestic construction sector is also competing for labor in the overseas market. In view of perceived labor supply challenges due to competition with the overseas labor market, there has been concerns raised on the emerging employment of foreign, particularly Chinese, workers in the Philippine construction sector. However, rather than a response of Philippine firms to the labor shortage of Filipino workers, this can be attributed to the hiring preference and practice of Chinese contractors undertaking infrastructure projects in the country that are funded by Chinese loans.

In view of the COVID-19 pandemic, the Philippine government implemented lockdown measures by March 2020 and which had negative economic and employment impacts. Infrastructure projects were halted for a couple of months due to the restrictions on economic activity especially in the first months of the lockdown which had stricter measures in place. While public and private construction projects were allowed to be resumed in May 2020, the overall economic downturn due to the pandemic is expected to also slow down the otherwise robust growth forecasts for the sector. Hence, the skills outlook of the respondents at the time of the survey and as presented in the survey results may not hold.

6. Methodology

The research uses a descriptive cross-sectional establishment skills survey (i.e., a survey among companies about their skills needs covering one period of time). The questionnaire used is based on an instrument for establishment skills survey developed by the ILO, modified to country and sectoral context based on stakeholder feedback. It is programmed in and administered through SurveyCTO, a Computerized Assisted Personal Interviewing (CAPI) software and platform. The survey uses probability sampling to ensure representativeness and to provide robust data.

The survey respondents are Philippine Constructors Industry, Inc. (PCI) members, one of the major industry associations in the sector. The PCI has 152 member companies as of date, excluding chapter members, and associates, with different categories and classification of Philippine Constructors Accreditation Board (PCAB) license. There are two type of members: Regular (NCR-based) and Chapter (regional or city associations of contractors). Meanwhile, there are 12 chapter

members as of December 2020. The sampled chapters include those in Luzon (Pangasinan, Bataan, MariValley), Visayas (Cebu, Negros, Dumaguete, Leyte, Ormoc), and Mindanao (Davao).² The survey was initially conducted from October to December 2019, and was extended from late January to February 2020.

6.1. Questionnaire

The research instrument is based on a questionnaire on workplace skills and satisfaction from TESDA and which was developed by experts on workplace skills and satisfaction surveys and skills needs anticipation through technical assistance by the ILO. The questionnaire was consulted with PCA and modified accordingly to ensure that it is appropriate and applicable to the sector's context, and is acceptable to the target respondents. For instance, to address concerns on privacy and trade secrecy, only proportions instead of absolute numbers are asked, when possible. For questions on compensation, the range of values were asked instead of specific amounts.

The questionnaire has the following sections:

- A. General Information
- B. Employment
- C. Compensation of Employees
- D. Critical Occupations
- E. Improving Business Productivity
- F. Adoption of Modern, Efficient, and Green Technologies
- G. Workforce Matters

The questionnaire was programmed in the CAPI software SurveyCTO, which was used as the data collection platform. The survey is administered through a personal interview by enumerators with representatives of the respondent companies that are knowledgeable about skills needs, usually the human resource officers or personnel, during a visit on company premises.

6.2. Sample and Sampling Technique

The population covered by the survey is comprised of the regular and chapter members of PCA, with the unit of analysis at the company or organization level (i.e., one survey response across one company covering all their sites, if they have multiple).

The sample size is calculated using the Slovin's Formula. Given the confidence level at 95 percent, margin of error at \pm twelve (12) percent, and a population of 152, the computed sample size is 47 (Table 1). Using proportional allocation to sample size according to membership, 44 regular members and three (3) chapter members were sampled.

² Previously, PCA had 11 chapter members during the time of the research design formulation in the second to third quarter of 2019, which was used as basis for sampling for chapter members as shown in Table 1.

Table 1. Sample Size Computation

| Type of Membership | Number | Weights | Sample Size |
|--------------------|------------|-------------|-------------|
| Regular | 141 | 0.93 | 44 |
| Chapter | 11 | 0.07 | 3 |
| Total | 152 | 1.00 | 47 |

Note: Weights are computed based on the proportion to total population. Total number of chapter members applied for the sampling is 11, which was as of the time of the research design formulation in the second to third quarter of 2019. As of Dec. 2020, PCA has 12 chapter members.

Source: Author's own calculation

Consequently, sampling of regular members was allocated according to PCAB license (Table 2). The weights for the PCAB license categories were computed based on the proportion to total population of each PCAB license category among the list of PCA Regular Members. Identification of site-respondents was based on simplified random sampling (SRS) using the PCA business directory.

Table 2. Regular Members with PCAB License

| Regular | Weights | Sample Size | Region |
|--------------|-------------|-------------|--------|
| AAAA | 0.09 | 4 | NCR |
| AAA | 0.40 | 18 | |
| AA | 0.09 | 4 | |
| A | 0.27 | 12 | |
| B | 0.09 | 4 | |
| C | 0.01 | 0 | |
| D | 0.04 | 2 | |
| Trade | 0.01 | 0 | |
| Total | 1.00 | 44 | |

Note: Weights are computed based on the proportion to total population.

Source: Author's own calculation

Meanwhile, the list of chapter members planned to be surveyed based on SRS are the following (Table 3). The survey aimed to sample around five companies for each chapter.

Table 3. Sampled Chapter Members

| Name | Location | Region |
|--|-----------|-------------|
| 1. PCA Marivalley Construction Association, Inc. | Marikina | NCR |
| 2. PCA Pangasinan Inc. | Calasiao | Region I |
| 3. PCA Bataan Chapter | Balanga | Region III |
| 4. Constructors Association of NegOr, Inc. | Dumaguete | Region VII |
| 5. Cebu Contractors Association, Inc. | Cebu | |
| 6. PCA Leyte Chapter | Tacloban | Region VIII |
| 7. PCA Ormoc Chapter | Ormoc | |

Source: Author's own calculation

6.3. Data collection strategies

The following strategies were utilized to ensure smooth implementation of the survey and attain a good response rate:

- Close coordination with PCA and PCA Chapter Secretariats

ILS closely coordinated with PCA to get the participation of regular members. PCA sent out official communication to each of their regular members with a letter signed by PCA, TESDA and ILS inviting them to participate in the survey and to endorse ILS as the survey implementer. The word copy of the survey form along with a briefer about the survey was also provided with the letter to promote understanding of the purpose and utility of the survey, and so that the companies can also prepare ahead since some portions of the survey require prior data gathering on their part. After this initial communication by PCA, ILS followed-up through phone calls with each of the members to get confirmation of their participation in the survey and schedule the face-to-face interview using CAPI.

For the PCA Chapters in the selected regions I, III, VII, VIII and XI, ILS contacted the Chapter Secretariats based on the directory of the PCA Secretariat. ILS provided them a template letter similar to what was sent to the regular members, also with the briefer and word copy of the survey form, and then the Chapter Secretariats sent out the communication and coordinated with their members to get confirmation of their participation.

- Development of communication materials and Conduct of orientations on the research project among target respondent to improve understanding and appreciation of the survey's purpose and usefulness, and promote participation among companies.

Since the survey is the first of its kind in the industry, being an establishment-based survey on skills, the stakeholders underscored the importance of being able to let the target participants appreciate and understand the aims and usefulness of the research project so they will be more inclined to participate in the survey. For this, communication materials were developed—on a template letter to companies signed by PCA, TESDA and ILS, and a project briefer which contains the salient points about the research undertaking for easy dissemination.

ILS and PCA with TESDA's participation also sought to organize a series of orientations among the target respondents. The orientation involves presentations on the Construction Industry Roadmap 2020-2030, government's initiatives on training for the construction industry, and the research project given by PCA, TESDA, and ILS, respectively.

Orientations among the chapter members about the research project were also planned, to be organized by the Chapter Secretariat. The orientation can also be a venue to administer the survey to the company representatives in attendance, since finding available schedules of the companies for the interview visit within the limited fieldwork schedule in each region was challenging.

- Telephone correspondence and online submission of questionnaires

Due to the difficulty for many companies to schedule an interview visit, ILS continued to follow-up with regular members through phone calls to get their participation in the survey extension. The companies were given the option of accomplishing the word format of the survey form and submitting it via email, then ILS will encode in the CAPI form. ILS will then follow-up with companies for any additional information or clarification needed until the form is completed.

6.4. Scope & Limitations

6.4.1. Scope of skills needs anticipation activities and use for policymaking

Skills needs anticipation aims to provide information to all labor market actors about potential future skills needs and imbalances, so that they can make decisions, develop measures and take actions with a view to meeting the needs and avoiding the imbalances (ILO 2015).

However, the aim of skills needs anticipation activities is not to provide and cannot answer questions on the exact numbers of workers, classified by types and their levels of qualifications, which will be required in the future at a given time and location; their outcomes should not be interpreted this way. What skills needs anticipation can provide is “...guidance, preparedness and flexibility, and supporting more effective operation of labor markets” (ILO, 2015, p. 3).

6.4.2. As a baseline survey

The universe and sample are limited to PCA members, as this is only baseline survey. Given the push from the industry group for human resource development for the sector as indicated in the Construction Industry Roadmap 2020-2030, this baseline survey gives a starting point for subsequent sectoral level skills anticipation activities for the construction industry. There are several strategic advantages with PCA as partner for the study that lends to the feasibility of conducting the baseline survey. They have existing initiatives with TESDA on skills development (e.g., consultation with formulation of training regulations, and partnership in the provision and implementation of training programs). The group is also composed of key industry players – includes major contractors in the country. The group also lead the formulation of the industry roadmap.

6.4.3. Survey limitations and challenges

There is also the data collection challenges inherent in establishment surveys. Its success (i.e., having valid and credible results) depends on the participation of firms, but there is often a low response rate. There are concerns on privacy and confidentiality of data in light of the respondents’ need to protect trade secrets, or information that confer competitive advantage. There is also the respondent burden/effort required to answer questionnaire. Establishment surveys often require more time to answer due to need to compile required information. It is also done during working hours so may be discouraged because this takes away time from doing work tasks (Lavrakas 2008).

There are also several challenges in the implementation of establishment skills surveys. One is on institutional capacities. The conduct of sectoral and establishment skills survey is not yet a practice

in the Philippines, so there is limited capacity since it is one of the first times that it is being done in the country. The records of some firms may be absent or of poor quality. This may be related to the quality of the firm’s human resource management (e.g., HR systems and processes in place). There is also the potentially large informality in the construction sector as discussed previously. Data from informal firms cannot be captured by this method. This type of survey can also be expensive, and hence limits the number of firms that can be surveyed (Mane and Corbella 2017). The response rate was also limited compared to the target due to the timing of the survey at the latter part of the year, when many of the targeted respondents were busy with wrapping-up operations for the fiscal year, and also because of to the limited understanding and appreciation of establishment surveys.

Due to the short-term and dynamic nature of contracting and subcontracting in this sector, the survey is not able to adequately capture the magnitude of contracting and subcontracting employment among the surveyed companies.

7. Results

7.1. General Information

A total of 34 companies participated in the survey. Majority of the surveyed companies belong to the higher PCAB categories, with those with AAAA to AAA rating comprising of 50%% of the surveyed companies. Adding those with AA to A rating, these companies comprised of 76.5% of the respondents. There were no companies in the smallest (E or Trade) category that were surveyed (Table 4).

According to type of PCA membership, there are 53% regular members and 47% chapter members that were surveyed. Meanwhile, companies had around half of their current project engagements at the time of the survey to be public sector projects, on average, while 44.7% are private projects. There is a small share of PPP-ODA projects at 3.6% (Table 4).

Table 4. Distribution of Participating Companies, by PCAB rating, PCA Membership and Type of Current Project Engagements

| Item | % |
|--------------------|------|
| PCAB Rating | |
| AAAA | 8.8 |
| AAA | 41.2 |
| AA | 5.9 |
| A | 20.6 |
| B | 14.7 |
| C | 2.9 |
| D | 5.9 |
| E (Trade) | 0 |

| | |
|--|------|
| Type of Membership | |
| Regular | 52.9 |
| Chapter | 47.1 |
| Type of current project engagements | |
| Public projects | 51.7 |
| Private projects | 44.7 |
| PPP-ODA projects | 3.6 |

7.2. Employment

In terms of employment status, a major proportion of workers is project-based (66.4%) compared to non-project based (25%), and contractor/subcontractor-hired (8.6%) (Table 5).

In the context of the construction sector, project-based employees are those employed in connection with a particular construction project or phase thereof and whose employment is co-terminus with each project or phase of the project to which they are assigned.

On the other hand, non-project based employees are those employed without reference to any particular construction project or phase of a project.

Meanwhile, contracted-hired employees are workers employed by the contractors to perform certain phases of a construction project pursuant to a service agreement within the premises of the establishment. They are excluded from the total employment of the company.

As noted in the scope and limitations section previously, it is difficult to capture the extent of contractor/subcontractor-hired employment in the survey due to the short-term nature of these type of employment engagements, as expressed by the respondents. Industry stakeholders note that there is also a practice by larger industry players of engaging manpower cooperatives. For female workers, the average proportion for non-project employees is much higher at 44.7%, and female project employees is at 6.2% only (Table 5).

Meanwhile, for employment in terms of age group, 80.0% are comprised of the 25 to 54 years old cohort. The largest group is comprised of those aged 25 to 34 years old, at 38.4%. The employment share tapers off sharply for those aged 55 and up (7.2% for 55 to 64 years old and 1.9% for 65 years old and over). On the other hand, females have higher employment shares for the youngest (18 to 24 years old) and older (55 to 64 years old) age groups compared to the overall figures, at 20.6% and 17.8%, compared to 15.7% and 7.2%, respectively (Table 5).

In terms of occupation, groups that have the highest share are Service and Sales Workers (28.6%), Craft and Related Trades Workers (26.5%), and Elementary Occupations (23.8%), collectively comprising of 78.9% of total employment. For female workers, there are notably higher employment shares for Managers and Clerical Support Workers compared to the overall results, at 18.9% and 37.1% compared to 5.1% and 9.8%, respectively (Table 5).

Table 5. Distribution of Workers and Female Workers by Employment Status, Type of Non-Project Employee, Age Group, and Occupational Group

| Item | % of workers | % female workers |
|--|--------------|------------------|
| Employment Status | | |
| Project Employees | 66.4 | 6.2 |
| Non-Project Employees | 25.0 | 44.7 |
| Contractor/Subcontractor-Hired Employees | 8.6 | 2.1 |
| Non-Project Employees | | |
| Regular Employees | 83 | 34 |
| Probationary Employees | 12.5 | 18.8 |
| Casual Employees | 4.6 | 1.2 |
| Age Group | | |
| 18-24 years old | 15.7 | 20.6 |
| 25-34 years old | 38.4 | 15.5 |
| 35-44 years old | 26 | 12.6 |
| 45-54 years old | 15.8 | 8.6 |
| 55-64 years old | 7.2 | 17.8 |
| 65 years old and over | 1.9 | 0.6 |
| Occupational Group | | |
| Managers | 5.1 | 18.9 |
| Professionals | 10.6 | 19 |
| Technicians and associate professionals | 14.2 | 11.1 |
| Clerical support workers | 9.8 | 37.1 |
| Service and sales workers | 28.6 | 6.7 |
| Craft and related trades workers | 26.5 | 1.2 |
| Plant and machine operators and assemblers | 17.7 | 1.3 |
| Elementary occupations | 23.8 | 0.7 |

7.3. Existing Occupations

Table 6 shows the top existing occupations in companies, for monthly-paid and daily-paid workers. For monthly-paid workers, it may be noted that most of the top existing occupations are managerial/supervisory (e.g., Construction Supervisors [21.7%], and Construction Managers [13.4%]) and professionals (e.g., Civil Engineers [19.2%]; Project Engineers [17.0%]; Electrical Engineers [10.8%]; Safety Officers [12.0%]; Building Architects [9.9%]).

Meanwhile, most of the top occupations for daily-paid workers are craft and related trades workers (Carpenters and Joiners [14.5%]; Stonemasons, Stone Cutters, Splitters and Carvers [12.9%]; Building and Related Electricians [12.3%]; Structural Metal Preparers, Erectors and Related Workers [8.6%]; Concrete Placers, Concrete Finishers and Related Workers [8.3%]; Bricklayers and Related Workers [8.0%]), and elementary occupations (Building Construction Laborers [31.9%], Civil Engineering Laborers [23.9%], and Unskilled Workers Except Janitors, Messengers and Freight Handlers [8.0%]). A considerable portion are also professionals (Material Engineers [21.7]; Project Engineers [12.5%]; Landscape Architects [12.0%]; Civil Engineers [8.1%]; Safety Officers [7.9%]).

Table 6. Top 15 Existing Occupations, Monthly-Paid and Daily-Paid

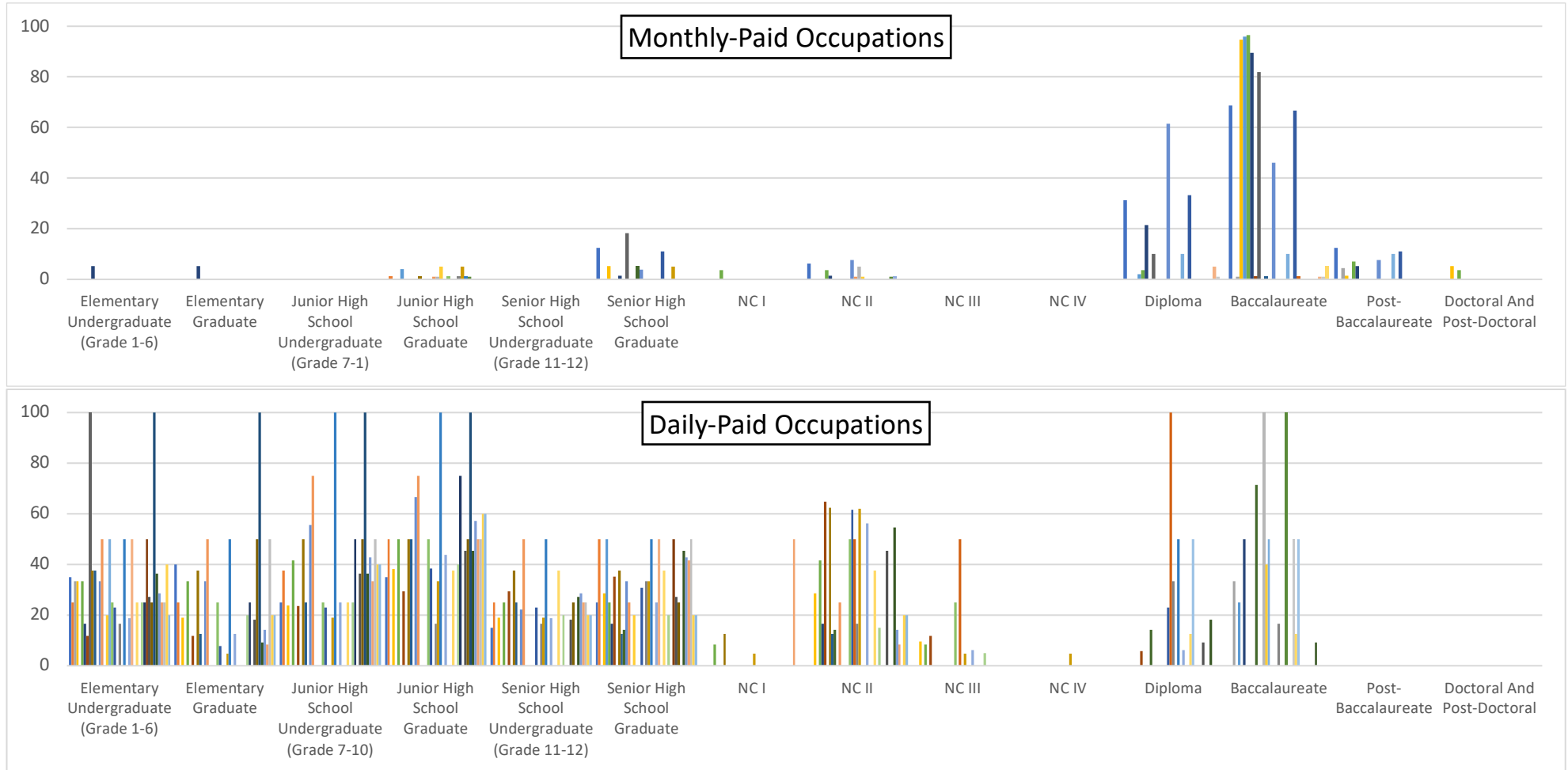
| Monthly-Paid Occupations | Percentage of Existing (In-House) Employees | Daily-Paid Occupations | Percentage of Existing (In-House) Employees |
|-----------------------------------|--|--|--|
| Construction Supervisors | 21.7 | Building Construction Laborers | 31.9 |
| Carpenters and Joiners | 20.0 | Civil Engineering Laborers | 23.9 |
| Civil Engineers | 19.2 | Material Engineers | 21.7 |
| Project Engineers | 17.0 | Carpenters and Joiners | 14.5 |
| Accounting and Bookkeeping Clerks | 15.0 | Construction Managers | 14.3 |
| Construction Managers | 13.4 | Stonemasons, Stone Cutters, Splitters and Carvers | 12.9 |
| Safety Officers | 12.0 | Project Engineers | 12.5 |
| Electrical Engineers | 10.8 | Building and Related Electricians | 12.3 |
| Quality Control Technicians | 10.3 | Landscape Architects | 12.0 |
| Civil Engineering Laborers | 10.0 | Structural Metal Preparers, Erectors and Related Workers | 8.6 |
| Building Architects | 9.9 | Concrete Placers, Concrete Finishers and Related Workers | 8.3 |
| Driver | 8.5 | Civil Engineers | 8.1 |
| Draftsmen | 8.2 | Unskilled Workers Except Janitors, Messengers and Freight Handlers | 8.0 |
| Plumbers and Pipe Fitters | 8.0 | Bricklayers and Related Workers | 8.0 |
| Painters and Related Workers | 7.5 | Safety Officers | 7.9 |

Note: Multiple responses were allowed.

The required minimum qualifications for monthly-paid and daily-paid existing occupations are plotted in Figure 3. It may be observed that for monthly-paid occupations, most require Diploma and Baccalaureate qualifications. Meanwhile, the qualifications required for daily-paid occupations are more spread out through the qualification levels, but more skewed towards the lower end, from Elementary to Senior High School, and NC II. A number of daily-paid occupations also require Diploma and Baccalaureate levels.

The applicable Training Regulations for occupations that require NCs as minimum qualifications for both monthly-paid and daily-paid occupations are listed in Tables 32 and 33 in Annex B.

Figure 3. Distribution of Required Qualifications for Existing Occupations, Monthly-Paid and Daily-Paid



7.4. Critical Occupations

For critical occupations, 82.4% of the companies responded that they had hard-to-fill³ or in-demand vacancies in the past 12 months. Occupations that are either a hard-to-fill or in-demand vacancy are also referred to as critical occupations. Among companies that had hard-to-fill or in-demand vacancies in past 12 months, 89.1% of companies had skill-shortage vacancies (SSVs), or those whose reasons for having hard-to-fill or in-demand vacancies are related to issues on skills. These include: 1) No/few applicants applied for the job; 2) Applicants lack years of experience; 3) Applicants lack needed competency/skill; and 4) Applicants lack professional license/TESDA skills certification (Table 7).

Table 7. Percentage of Companies with Hard-to-Fill or In-Demand Vacancies, & Companies with Such Vacancies Due to Skills-Related Issues, by PCAB Rating

| Item | PCAB Rating | | | | |
|--|-------------|-------|------|-------|------|
| | All | AAAA | AAA | AA | A-D |
| % of companies with hard-to-fill or in-demand vacancies | 82.4 | 100.0 | 85.7 | 100.0 | 73.3 |
| % of Companies W/ Hard-To-Fill Positions Due to Skills Shortage (Skills Shortage Vacancies) | 89.1 | 100.0 | 83.3 | 100.0 | 90.9 |

Note: Skills shortage vacancies (SSVs) were computed by getting the proportion companies that responded to have had hard-to-fill or in-demand vacancies, and also responded that the reasons for having such vacancies were related to skills issues, e.g.: No/few applicants applied for the job; Applicants lack years of experience; Applicants lack needed competency/skill; Applicants lack professional license/TESDA skills certification.

Table 8 shows the critical occupations and the proportion of respondents that identified such occupations were critical. The top critical occupations are Heavy Equipment Operator (35.3%); Foreman (26.5%); Heavy Equipment Mechanic (26.5%); Pipefitters (23.5%); Carpenter (23.5%); Civil Engineer (23.5%) ; Mobile Crane Operator (23.5%); Scaffolder (23.5%); Supervisor (20.6%); Steel Man (17.6%); Rigger (17.6%); Surveyor (17.6%); Survey Aide (14.7%); Vibro Machine Operator (11.8%)

In terms of the average number of vacancies identified, the top critical occupations are Tile Setter, Carpenter, Traffic Man, Spotter, and Rebar.

³ The Philippine Statistics Authority (PSA), in its Integrated Survey on Labor and Employment (ISLE) which collects establishment data on occupational shortages and surpluses, among others, defines hard to fill vacancies as job vacancies for which an establishment has encountered difficulties in recruiting for some reasons, such as no/few applicants applied for the job, applicants lack years of experience, applicants lack needed competency/skill, applicants lack professional license/TESDA Skills Certification, applicants expect high salary, location or work schedule problem or competition with overseas jobs. The definition of hard-to-fill vacancies in the Philippines does not include a specified time period for a vacancy to have been open for it to be considered as hard-to-fill.

Meanwhile, critical occupations which have the highest percentage of women needed are Safety Nurse (50.0%), Density Testing Aide (15.0%), Mobile Crane Operator (12.5%), Civil Engineer (12.5%), and Supervisor (9.3%). In fact, these are also the only critical occupations for which the companies indicated a certain percentage of women is needed.

The overall average time taken to fill the vacancies for the critical occupations is two months. The critical occupations that have longer search periods than this are Heavy Equipment Mechanic (3.4 months), Safety Nurse (3.0), Electrician (3.0), Heavy Equipment Operator (2.8), Vibro Machine Operator (2.8), Mobile Crane Operator (2.7), Hydraulic Excavator Operator (2.7), and Hydraulic Operator (2.7). Meanwhile, those critical occupations that have relatively the shortest search periods were Civil Engineer (0.5 months), Installer (0.5), Rebar (1.0), Plumber (1.0), Tile Setters (1.3) and Spotter (1.3).

Regarding status of work, almost all of the identified critical occupations were more likely to be non-regular positions. Overall, the ratio of non-regular and regular status for critical occupations are 59.8% and 12.1%, respectively. Regular positions refer to jobs that last for an indefinite duration with the company, while non-regular positions are temporary jobs or those on fixed terms.

In-demand occupations refer to active occupations/job vacancies posted or advertised recurrently by and across establishments/industries, as defined by TESDA. Among the critical occupations, those that are purely in-demand are Spotter, Rebar, and Traffic Man. Other top in-demand occupations are Leadman (66.7%), Hydraulic Operators (66.7%), Survey Aide (60.0%), and Supervisor (57.1%).

On the other hand, hard-to-fill occupations are defined as job vacancies to which the employer/company is having difficulty or taking longer time to be filled because job applicants are not qualified and/or there is no supply of job applicants for the particular job vacancy (TESDA). The top hard-to-fill occupations are Heavy Equipment Mechanic (77.8%), Heavy Equipment Operator (75.0%), Mobile Crane Operator (75.0%) and Hydraulic Excavator Operator (66.7%).

Meanwhile, top occupations identified to be more hard-to-fill compared to the previous year are Mobile Crane Operator (75.0%) and Tile Setters (66.7%).

Table 8. Critical Occupations and Corresponding Percentage of Companies That Had Such Vacancies, No. of Vacancies, Percentage of Women Need, and Average Time Take to Fill

| Critical Occupation | % of companies that responded occupation is critical | No. of Job Vacancies from The Past 12 Months | Percentage of Women Needed | Average Time Taken to Fill Vacancies (in months) | Status of Work | | Category | | | If More or Less Hard-To-Fill Than It Was A Year Ago | | | |
|------------------------------|--|--|----------------------------|--|------------------|----------------------|-----------|--------------|-------------------------------|---|------------------------------------|-------------------|--------|
| | | | | | Regular Position | Non-Regular Position | In-Demand | Hard-To-Fill | Both In-Demand & Hard-To-Fill | More Hard-To-Fill | Neither More nor Less Hard-To-Fill | Less Hard-To-Fill | Unsure |
| Heavy Equipment Operator | 35.3 | 14 | - | 2.8 | 33.3 | 66.7 | 8.3 | 75.0 | 16.7 | 50.0 | 33.3 | 16.7 | - |
| Foreman | 26.5 | 3 | - | 2.0 | 11.1 | 88.9 | 44.4 | 44.4 | 11.1 | 22.2 | 44.4 | 33.3 | - |
| Heavy Equipment Mechanic | 26.5 | 4 | - | 3.4 | 44.4 | 55.6 | 11.1 | 77.8 | 11.1 | 44.4 | 33.3 | 11.1 | 11.1 |
| Mobile Crane Operator | 23.5 | 2 | 12.5 | 2.7 | 25.0 | 75.0 | - | 75.0 | 25.0 | 75.0 | 12.5 | 12.5 | - |
| Carpenter | 23.5 | 173 | 0.1 | 1.8 | - | 100.0 | 50.0 | 37.5 | 12.5 | 25.0 | 37.5 | 37.5 | - |
| Scaffolder | 23.5 | 17 | - | 2.1 | 12.5 | 87.5 | 12.5 | 50.0 | 37.5 | 50.0 | 50.0 | - | - |
| Pipefitters | 23.5 | 17 | - | 2.4 | - | 100.0 | 12.5 | 50.0 | 37.5 | 25.0 | 25.0 | 50.0 | - |
| Civil Engineer | 23.5 | 1 | 12.5 | 0.5 | 37.5 | - | 37.5 | - | - | - | 12.5 | 25.0 | - |
| Supervisor | 20.6 | 7 | 9.3 | 2.1 | 28.6 | 71.4 | 57.1 | 28.6 | 14.3 | 28.6 | 28.6 | 28.6 | 14.3 |
| Rigger | 17.6 | 11 | - | 2.0 | - | 100.0 | 50.0 | 50.0 | - | 16.7 | 66.7 | 16.7 | - |
| Steel Man | 17.6 | 22 | - | 1.7 | - | 100.0 | 50.0 | 50.0 | - | 16.7 | 66.7 | 16.7 | - |
| Surveyor | 17.6 | 3 | - | 2.3 | 33.3 | 66.7 | 33.3 | 50.0 | 16.7 | 33.3 | 66.7 | - | - |
| Survey Aide | 14.7 | 5 | - | 1.8 | - | 100.0 | 60.0 | 40.0 | - | 20.0 | 40.0 | 40.0 | - |
| Vibro Machine Operator | 11.8 | 2 | - | 2.8 | 25.0 | 75.0 | 25.0 | 50.0 | 25.0 | 50.0 | 50.0 | - | - |
| Leadman | 8.8 | 9 | - | 1.7 | - | 100.0 | 66.7 | - | 33.3 | - | 66.7 | 33.3 | - |
| Hydraulic Excavator Operator | 8.8 | 5 | - | 2.7 | 33.3 | 66.7 | - | 66.7 | 33.3 | 33.3 | 66.7 | - | - |
| Hydraulic Operators | 8.8 | 3 | - | 2.7 | 33.3 | 66.7 | 66.7 | - | 33.3 | - | 66.7 | 33.3 | - |

| Critical Occupation | % of companies that responded occupation is critical | No. of Job Vacancies from The Past 12 Months | Percentage of Women Needed | Average Time Taken to Fill Vacancies (in months) | Status of Work | | Category | | | If More or Less Hard-To-Fill Than It Was A Year Ago | | | |
|----------------------|--|--|----------------------------|--|------------------|----------------------|-----------|--------------|-------------------------------|---|------------------------------------|-------------------|--------|
| | | | | | Regular Position | Non-Regular Position | In-Demand | Hard-To-Fill | Both In-Demand & Hard-To-Fill | More Hard-To-Fill | Neither More nor Less Hard-To-Fill | Less Hard-To-Fill | Unsure |
| Tile Setters | 8.8 | 271 | - | 1.3 | - | 100.0 | 33.3 | 33.3 | 33.3 | 66.7 | - | 33.3 | - |
| Spotter | 8.8 | 36 | - | 1.3 | - | 100.0 | 100.0 | - | - | - | 33.3 | 66.7 | - |
| Excavators | 8.8 | 10 | - | 1.5 | - | 100.0 | - | 50.0 | 50.0 | 50.0 | 50.0 | - | - |
| General Office Staff | 8.8 | - | - | - | - | - | - | - | - | - | - | - | - |
| Density Testing Aide | 5.9 | 3 | 15.0 | 1.5 | - | 100.0 | 50.0 | 50.0 | - | 50.0 | 50.0 | - | - |
| Rebar | 5.9 | 23 | - | 1.0 | - | 100.0 | 100.0 | - | - | - | 100.0 | - | - |
| Traffic Man | 5.9 | 61 | - | 1.5 | - | 100.0 | 100.0 | - | - | - | - | 50.0 | 50.0 |
| Draftsman | 5.9 | 1 | - | 1.5 | 50.0 | - | - | 50.0 | - | 50.0 | - | - | - |
| Electrician | 5.9 | 1 | - | 3.0 | - | 50.0 | - | 50.0 | - | - | - | 50.0 | - |
| Laborer | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - |
| Safety Nurse | 5.9 | 1 | 50.0 | 3.0 | - | 50.0 | - | 50.0 | - | - | 50.0 | - | - |
| Plumber | 5.9 | 6 | - | 1.0 | - | 50.0 | - | 50.0 | - | 50.0 | - | - | - |
| Installer | 5.9 | 1 | - | 0.5 | 50.0 | - | - | - | 50.0 | 50.0 | - | - | - |
| Geodetic Engineer | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - |
| HR Staff | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - |
| Mason/Finisher | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - |
| Tin Smith | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - |
| Safety Officer | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - |

Table 9 shows the distribution of critical occupations according to the level of minimum qualification required. As also plotted in Figure 4, majority of the critical occupations require qualifications that are either high-school level or lower, and/or an NC. Almost all of the required NC is on NC II. Of the critical occupations identified, those that require NCs are:

- Rigger
- Tile Setters
- Mobile Crane Operator
- Scaffolder
- Pipefitters
- Vibro Machine Operator
- Carpenter
- Heavy Equipment Operator
- Hydraulic Excavator Operator
- Heavy Equipment Mechanic
- Rebar
- Hydraulic Operators
- Electrician
- Plumber
- Installer
- Excavators
- Steel Man
- Leadman
- Foreman
- Supervisor

Meanwhile, critical occupations that require some higher education (diploma, baccalaureate, and post-baccalaureate) are:

- Surveyor
- Supervisor
- Density Testing Aide
- Draftsman
- Safety Nurse
- Civil Engineer
- Heavy Equipment Mechanic
- Foreman

Figure 4. Distribution of Required Qualification/s for Critical Occupations

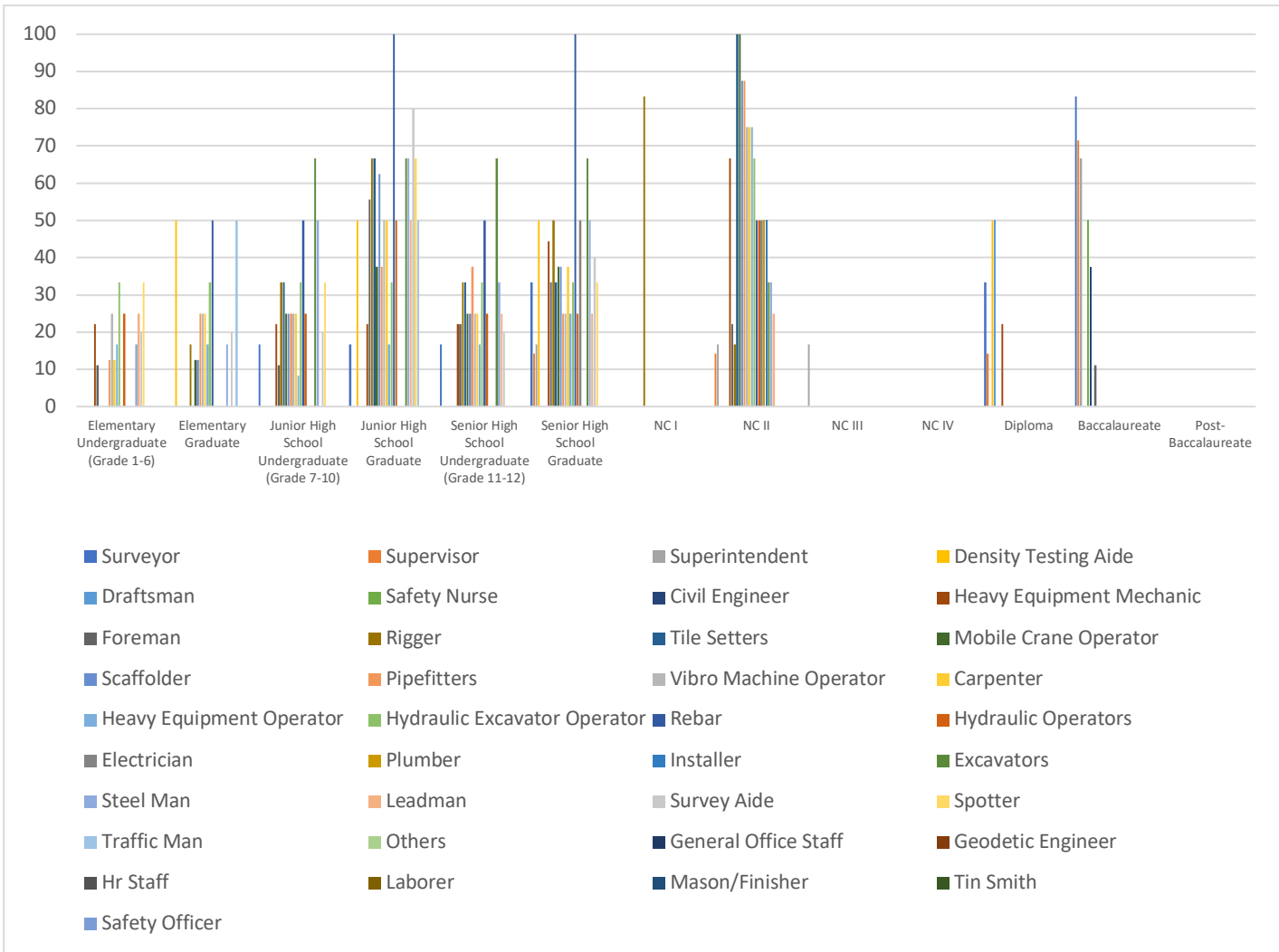


Table 9. Distribution of Critical Occupations by Required Qualification/s

| Critical Occupations | Level of Qualification | | | | | | | | | | | | | Total |
|------------------------------|--------------------------------------|---------------------|---|-----------------------------|--|-----------------------------|------|-------|--------|-------|---------|---------------|--------------------|-------|
| | Elementary Undergraduate (Grade 1-6) | Elementary Graduate | Junior High School Undergraduate (Grade 7-10) | Junior High School Graduate | Senior High School Undergraduate (Grade 11-12) | Senior High School Graduate | NC I | NC II | NC III | NC IV | Diploma | Baccalaureate | Post-Baccalaureate | |
| Supervisor | - | - | - | - | - | 14.3 | - | 14.3 | - | - | 14.3 | 71.4 | - | 100.0 |
| Foreman | 11.1 | - | 11.1 | 55.6 | 22.2 | 33.3 | - | 22.2 | - | - | - | 11.1 | - | 100.0 |
| Leadman | 25.0 | - | - | 50.0 | 25.0 | 25.0 | - | 25.0 | - | - | - | - | - | 100.0 |
| Heavy Equipment Operator | 16.7 | 16.7 | 8.3 | 16.7 | 16.7 | 25.0 | - | 75.0 | - | - | - | - | - | 100.0 |
| Heavy Equipment Mechanic | 22.2 | - | 22.2 | 22.2 | 22.2 | 44.4 | - | 66.7 | - | - | 22.2 | - | - | 100.0 |
| Mobile Crane Operator | - | 12.5 | 25.0 | 37.5 | 25.0 | 37.5 | - | 100.0 | - | - | - | - | - | 100.0 |
| Hydraulic Excavator Operator | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | - | 66.7 | - | - | - | - | - | 100.0 |
| Vibro Machine Operator | 25.0 | 25.0 | 25.0 | 50.0 | 25.0 | 25.0 | - | 75.0 | - | - | - | - | - | 100.0 |
| Survey Aide | 20.0 | 20.0 | 20.0 | 80.0 | 20.0 | 40.0 | - | - | - | - | - | - | - | 100.0 |
| Density Testing Aide | - | 50.0 | - | 50.0 | - | 50.0 | - | - | - | - | 50.0 | - | - | 100.0 |
| Rigger | - | 16.7 | 33.3 | 66.7 | 33.3 | 50.0 | 83.3 | 16.7 | - | - | - | - | - | 100.0 |
| Hydraulic Operators | 25.0 | - | 25.0 | 50.0 | 25.0 | 25.0 | - | 50.0 | - | - | - | - | - | 100.0 |

| | | | | | | | | | | | | | | |
|----------------------|------|------|------|-------|------|-------|---|-------|---|---|------|------|---|-------|
| Steel Man | 16.7 | 16.7 | 50.0 | 66.7 | 33.3 | 50.0 | - | 33.3 | - | - | - | - | - | 100.0 |
| Carpenter | 12.5 | 25.0 | 25.0 | 50.0 | 25.0 | 37.5 | - | 75.0 | - | - | - | - | - | 100.0 |
| Tile Setters | - | - | 33.3 | 66.7 | 33.3 | 33.3 | - | 100.0 | - | - | - | - | - | 100.0 |
| Rebar | - | 50.0 | 50.0 | 100.0 | 50.0 | 100.0 | - | 50.0 | - | - | - | - | - | 100.0 |
| Scaffolder | - | 12.5 | 25.0 | 62.5 | 25.0 | 37.5 | - | 87.5 | - | - | - | - | - | 100.0 |
| Traffic Man | - | 50.0 | - | 50.0 | - | - | - | - | - | - | - | - | - | 100.0 |
| Surveyor | - | - | 16.7 | 16.7 | 16.7 | 33.3 | - | - | - | - | 33.3 | 83.3 | - | 100.0 |
| Spotter | 33.3 | - | 33.3 | 66.7 | - | 33.3 | - | - | - | - | - | - | - | 100.0 |
| Pipefitters | 12.5 | 25.0 | 25.0 | 37.5 | 37.5 | 25.0 | - | 87.5 | - | - | - | - | - | 100.0 |
| Excavators | - | - | 66.7 | 66.7 | 66.7 | 66.7 | - | 33.3 | - | - | - | - | - | 100.0 |
| Others | | | | | | | | | | | | | | |
| General Office Staff | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| Civil Engineer | - | - | - | - | - | - | - | - | - | - | - | 37.5 | - | 100.0 |
| Draftsman | - | - | - | - | - | - | - | - | - | - | 50.0 | - | - | 100.0 |
| Electrician | - | - | - | - | - | 50.0 | - | 50.0 | - | - | - | - | - | 100.0 |
| Geodetic Engineer | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| HR Staff | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| Laborer | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| Mason/Finisher | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| Safety Nurse | - | - | - | - | - | - | - | - | - | - | - | 50.0 | - | 100.0 |
| Tin Smith | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |
| Plumber | - | - | - | - | - | - | - | 50.0 | - | - | - | - | - | 100.0 |
| Installer | - | - | - | - | - | - | - | 50.0 | - | - | - | - | - | 100.0 |
| Safety Officer | - | - | - | - | - | - | - | - | - | - | - | - | - | 100.0 |

Note: Multiple responses were allowed.

The Training Regulations identified for critical occupations that have NC as required qualifications are listed in Annex B, Table 34.

The questionnaire contains questions on the basic, common, and core skills or competencies required of critical occupations. These are defined by TESDA as the following:

- Basic competencies refer to non-technical skills (knowledge, skills and attitudes) that everyone will need in order to perform satisfactorily at work and in society and are considered portable and transferable irrespective of jobs and industrial settings.
- Core competencies refer to skills, knowledge and attitude needed by all people working in a particular industry.
- Common competencies refer to specialized units of competency required of workers that are unique in a particular area of work. They are sector specific and may pertain to a stream of technology or specialty job with a particular industry or sector.

The respondents had difficulty in distinguishing between these concepts, as similar items were identified across the three categories. In general, the skills or competencies that were identified refer to qualifications (e.g., having the required qualifications, with specific levels identified from high School-level or graduate, college graduate, general NC level or specific NCs; passing trade tests; having certain years of experience), hard skills (e.g., having the relevant technical skills and knowledge, with specific skills identified in some instances), and soft skills (e.g., problem solving; teamwork and effective communication skills; leadership and management skills; willingness to Learn; and adaptability and flexibility).

Table 10 shows the distribution of companies by their reasons cited for having hard-to-fill vacancies. Top reasons for hard-fill-vacancies are having no or few applicants applied for the job (67.9%), applicants lacking needed competency/skill (50.0%), and location or work schedule problem (50.0%) (Table 10).

Table 10. Distribution of Companies by Reasons for Hard-to-Fill Vacancies, by PCAB Rating

| Reasons for hard-to-fill vacancies | PCAB Rating | | | | |
|---|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| No/Few Applicants Applied for The Job | 67.8 | 66.7 | 58.3 | 100.0 | 72.7 |
| Applicants Lack Needed Competency/Skill | 50.0 | 100.0 | 41.7 | - | 54.5 |
| Location or Work Schedule Problem | 50.0 | 33.3 | 66.7 | 50.0 | 36.4 |
| Applicants Expect High Salary | 46.4 | 66.7 | 66.7 | 50.0 | 18.2 |
| Competition with Overseas Jobs | 46.4 | 66.7 | 41.7 | 50.0 | 45.5 |
| Applicants Lack Years of Experience | 35.7 | 66.7 | 50.0 | 0.0 | 18.2 |
| Applicants Lack Professional License/TESDA Skills Certification | 35.7 | 66.7 | 33.3 | 0.0 | 36.4 |
| Others | 10.7 | - | 8.3 | 50.0 | 9.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Other Reasons for Hard-To-Fill Vacancies | | | | | |
| Competition with Other Local Construction Companies | | - | 100.0 | - | - |
| Internal or Overseas Migration | | - | - | 100.0 | - |
| Total | | - | 100.0 | 100.0 | - |

Note: Multiple responses were allowed.

Table 11 shows the distribution of the companies by methods of recruitment used. Top methods of recruitment are posting in online job portals (e.g., Jobstreet, PhilJobNet) (85.7%), word-of-mouth (82.1%), and posting in Public Employment Service Offices (PESOs) (60.7%) (Table 12). In addition, recruitment through social media (56.3%) is also a major method. It may be noted that internal promotion may be more of a practice in companies with higher PCAB rating, since these companies are also more likely to be bigger organizations and hence have more room to promote staff.

Table 11. Distribution of Companies by Method of Recruitment, by PCAB Rating

| Method of Recruitment | PCAB Rating | | | | |
|---|-------------|-------|-------|-------|------|
| | All | AAAA | AAA | AA | A-D |
| Posting in Online Job Portals (e.g., Jobstreet, Philjobnet) | 85.7 | 66.7 | 100.0 | 100.0 | 72.7 |
| Word-of-Mouth | 82.1 | 100.0 | 66.7 | 100.0 | 90.9 |

| Method of Recruitment | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Posting in Public Employment Service Offices (PESOs) | 60.7 | 66.7 | 66.7 | 50.0 | 54.5 |
| Others | 57.1 | 66.7 | 58.3 | 50.0 | 54.5 |
| Internal Promotion/Within the Organization | 46.4 | 66.7 | 58.3 | 50.0 | 27.3 |
| Posting in Company's Website | 39.3 | 100.0 | 50.0 | 50.0 | 9.1 |
| Posting of Vacancies in Schools/Universities | 39.3 | 66.7 | 33.3 | 100.0 | 27.3 |
| Advertisement Through Newspaper | 21.4 | 33.3 | 33.3 | - | 9.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Other Methods of Recruitment | | | | | |
| Social Media (e.g., Facebook) | 56.3 | 100.0 | 57.1 | 100.0 | 16.7 |
| Job Fairs | 31.3 | 50.0 | 42.9 | 100.0 | - |
| Posting in office area/on-site | 12.5 | - | - | - | - |
| Providing Scholarships, Training, Paid Internship Opportunities, recruitment/absorption of former OJTs | 12.5 | - | 14.3 | - | - |
| Employee Referral Program | 6.3 | - | 14.3 | - | - |
| Inhouse recruitment | 6.3 | 50.0 | - | - | 16.7 |
| Recruitment Agents | 6.3 | - | - | - | 16.7 |
| Through industry association/network | 6.3 | - | 14.3 | - | 16.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: Multiple responses were allowed.

Table 12 shows the distribution of companies by strategies used to meet labor needs. The top strategies employed to meet labor needs are to raise wages (64.3%), increase worker's training (57.1%), and to expand local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) (46.4%). There seems to be little variation in the strategies used across PCAB ratings.

Table 12. Distribution of Companies by Strategies Used to Meet Labor Needs, by PCAB Rating

| Strategies | PCAB Rating | | | | |
|----------------------------|-------------|------|------|-------|------|
| | All | AAAA | AAA | AA | A-D |
| Raise Wages | 64.3 | 66.7 | 66.7 | 50.0 | 63.6 |
| Increase Worker's Training | 57.1 | 66.7 | 66.7 | 100.0 | 36.4 |

| | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| Expand local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) | 46.4 | 66.7 | 66.7 | - | 27.3 |
| Hire Temporary or Contract Workers | 32.1 | - | 50.0 | 50.0 | 18.2 |
| Promote safety nets (e.g. social security, housing, HMO, pension, insurance) to workers | 28.6 | 66.7 | 33.3 | 50.0 | 9.1 |
| Establish or expand partnerships with education or training providers focused on the recruitment of graduate | 25.0 | 33.3 | 25.0 | 50.0 | 18.2 |
| Hire Less Well-Qualified Applicant | 21.4 | - | 33.3 | - | 18.2 |
| Outsource This Job Function | 21.4 | - | 16.7 | - | 36.4 |
| Invest Additional Equipment That Can Be Used for Actual Work | 21.4 | - | 33.3 | 50.0 | 9.1 |
| Increase Working Hours or Overtime | 14.3 | - | 16.7 | - | 18.2 |
| Others | 14.3 | 33.3 | 8.3 | - | 18.2 |
| Convert Part-Time Workers to Full-Time Status | 10.7 | - | 16.7 | - | 9.1 |
| Automate Tasks Performed in This Occupation | 7.1 | - | 8.3 | - | 9.1 |
| Expand International Recruitment Efforts | 3.6 | - | 8.3 | - | - |
| Convince Workers to Delay Retirement | 3.6 | - | - | - | 9.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Other Strategies Employed to Meet Labor Market Needs | | | | | |
| Tapping networks | 50.0 | 100.0 | | | 50.00 |
| Assign Ad Hoc Additional Job Functions as Needed | 25.0 | - | - | - | 50.0 |
| Employee Referral Scheme | 25.0 | - | 100.0 | - | - |
| Total | 100.0 | 100.0 | 100.0 | - | 100.0 |

Note: Multiple responses were allowed.

7.5. Improving Business Productivity

Table 13 shows the percentage of existing (in-house) workers according to level of performance. Companies reported that 56.8% of their workforce are able to perform the job adequately but not beyond, while 8.6% were unable to cope with their existing duties. Further, 34.6% have the potential to cope with more demanding duties than they currently have. These measures aim to capture skills mismatch. Workers able to perform the job adequately but not beyond are those whose skills are matched with the job requirements. Workers unable to cope with existing duties are those that are underskilled or who have skills gaps, or whose level and/or type of skills are assessed to be lower than the job requirements. Meanwhile, workers who have the potential to cope with more demanding duties than they currently have are those that are overskilled or whose skills are underutilized, as their level and/or type of skills are assessed to exceed the job requirements.

These skills mismatches mean the poor utilization of human resources by the firm, and may cause employment issues for the worker. Underskilled workers, who lack knowledge and skills, may be less adaptable to technological changes and hence may slow down growth. They are also more likely to be out of a job and be displaced due to poor performance. Hence, these underskilled workers would need more training so they can improve their performance. Meanwhile, overskilled (or underutilized) workers can result in productivity loss due to high employee turnover, skill depreciation, and lower job satisfaction (Stoevska 2018). These underutilized workers can be a source of greater productivity for the firm, if they are developed further. However, since these figures only capture the in-house or non-project based workers, then the figure on underutilized workers may not also entirely represent the size of the potential talent pool that can be a source of higher productivity. Comparing across PCAB categories, AA contractors seem to have a higher proportion of under-utilized workers (“Have the Potential to Cope with More Demanding Duties Than They Currently Have”), and hence may have more opportunities to seek talent among their existing workers.

Table 13. Percentage of Existing (In-House) Workers According to Level of Performance

| Workers who are... | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Able to Perform the Job Adequately but Not Beyond | 56.8 | 63.3 | 66.5 | 47.5 | 55.1 |
| Unable to Cope with Their Existing Duties | 8.6 | 10.7 | 11.4 | - | 9.6 |
| Have the Potential to Cope with More Demanding Duties Than They Currently Have | 34.6 | 26.0 | 22.1 | 52.5 | 35.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 14 shows the distribution of companies by the reasons cited for the poor performance of workers unable to cope with existing duties. The top reasons cited are on lacking expected behavioral skills (e.g., reliability, responsiveness, work discipline, motivation, integrity, adaptability, etc.) (83.3%), lacking technical skills (58.3%), and lacking socio-emotional skills (extraversion, emotional stability, agreeableness, grit, consciousness, decision-making, openness, etc.) (41.7%).

Table 14. Distribution of Companies by Reasons Cited for Poor Performance, by PCAB Rating

| Reasons for poor performance | PCAB Rating | | | | |
|---|-------------|-------|------|----|------|
| | All | AAAA | AAA | AA | A-D |
| Lacking expected behavioral skills (e.g. reliability, responsiveness, work discipline, motivation, integrity, adaptability, etc.) | 83.3 | 100.0 | 90.9 | - | 70.0 |
| Lacking Technical Skills | 58.3 | 66.7 | 54.5 | - | 60.0 |
| Lacking socio-emotional skills (extraversion, emotional stability, agreeableness, grit, consciousness, decision-making, openness, etc.) | 41.7 | 66.7 | 45.5 | - | 30.0 |
| Lacking soft skills (e.g. complex problem solving, critical thinking, creativity, people | 37.5 | 33.3 | 54.5 | - | 20.0 |

| | | | | | |
|--|--------------|--------------|--------------|----------|--------------|
| management, coordinating with others, etc.) | | | | | |
| Lacking Leadership and Management Skills | 37.5 | 66.7 | 45.5 | - | 20.0 |
| Lacking basic industry knowledge (e.g. industry environment, customer needs, work procedures, use of core equipment, etc.) | 33.3 | 33.3 | 45.5 | - | 20.0 |
| Lacking Knowledge of Occupational Safety and Health Standards | 25.0 | - | 27.3 | - | 30.0 |
| Lacking Office and Administration Skills | 20.8 | 33.3 | 27.3 | - | 10.0 |
| Others | 8.3 | - | 9.1 | - | 10.0 |
| Lacking Knowledge of Labor Education | 4.2 | - | 9.1 | - | - |
| Total | 100.0 | 100.0 | 100.0 | - | 100.0 |
| Other Skills Gaps | | | | | |
| Environmental Factor | 50.0 | - | - | - | 100.0 |
| Health Condition | 50.0 | - | 100.0 | - | - |
| Total | 100.0 | - | 100.0 | - | 100.0 |
| Specific Lacking Technical Skills | | | | | |
| Technical Skills and Knowledge Relevant to Occupation / Field | 16.7 | - | - | - | 100.0 |
| Required Certifications | 8.3 | 50.0 | - | - | - |
| Project Management Skills | 8.3 | - | - | - | - |
| Practical Skills | 8.3 | - | 20.0 | - | - |
| Equipment Operations | 8.3 | 50.0 | - | - | - |
| Ducting, Welding, Pipefitting | 8.3 | - | 20.0 | - | - |
| Computer literacy | 16.7 | - | 20.0 | - | - |
| Carpentry | 16.7 | - | 20.0 | - | 100.0 |
| Total | 100.0 | 100.0 | 100.0 | - | 100.0 |

Note: Multiple responses were allowed.

Table 15 shows the summary of companies' qualitative assessment on the frequency of strategies used to remedy poor performance of workers unable to cope with existing duties. The top strategies that are always used are to have more workers' appraisals/performance reviews (50.0%), to increase supervision of workers (37.5%), and disciplinary procedures (33.3%). This is in line with the top reasons cited for poor performance being on behavioural skills and socio-emotional skills. It is worth noting that contractors with preference for punishment-based remedies have room to strengthen the development aspect of their strategies (e.g., more on training or staff development) so they may better reduce staff turn-over and address skills shortage issues. Meanwhile, top strategies that are always used that relate to hard or technical skills is on implementing mentoring/buddying schemes (29.2%) and to increase training activity (25.0%). Almost all of the top strategies cited to be always used would not entail additional costs for companies, except maybe for increasing training activity (if done with an external service provider).

Meanwhile, top strategies cited to be often used are on increasing training activity (45.8%), implementing mentoring/buddying Schemes (33.3%), and training supervisors and managerial levels (33.3%).

On the other hand, top unused strategies are on formal re-training (37.5%), promotion of alternative learning system (33.3%), development of career pathing for workers (33.3%), and increasing recruitment (33.3%). Factors why these strategies are not used may be on the additional costs it can entail (e.g., for training or tuition fees in formal retraining), and the often project-based and short-term employment engagement of workers (which may deter career pathing). Increasing recruitment may also entail additional cost when having to hire more workers than intended, so companies may opt to just manage their current workforce.

Table 15. Summary of Companies' Qualitative Assessment on the Frequency of Strategies Used to Remedy Poor Performance, by PCAB Rating

| Strategies | PCAB Rating | | | | |
|---|-------------|------|------|----|------|
| | All | AAAA | AAA | AA | A-D |
| Increase Training Activity | | | | | |
| Not Used | 12.5 | - | 9.1 | - | 20.0 |
| Sometimes | 16.7 | - | 18.2 | - | 20.0 |
| Often Used | 45.8 | 66.7 | 45.5 | - | 40.0 |
| Always | 25.0 | 33.3 | 27.3 | - | 20.0 |
| Formal Re-Training | | | | | |
| Not Used | 37.5 | 33.3 | 18.2 | - | 60.0 |
| Sometimes | 29.2 | 33.3 | 45.5 | - | 10.0 |
| Often Used | 20.8 | - | 27.3 | - | 20.0 |
| Always | 12.5 | 33.3 | 9.1 | - | 10.0 |
| Changing Work Practices (e.g., Work Schedule, Improve OSH Practices) | | | | | |
| Not Used | 29.2 | 66.7 | 18.2 | - | 30.0 |
| Sometimes | 41.7 | - | 54.5 | - | 40.0 |
| Often Used | 4.2 | - | - | - | 10.0 |
| Always | 25.0 | 33.3 | 27.3 | - | 20.0 |
| Promote Alternative Learning System | | | | | |
| Not Used | 33.3 | 33.3 | 27.3 | - | 40.0 |
| Sometimes | 41.7 | 33.3 | 45.5 | - | 40.0 |
| Often Used | 16.7 | - | 27.3 | - | 10.0 |
| Always | 8.3 | 33.3 | - | - | 10.0 |
| Develop Career Pathing for Workers | | | | | |
| Not Used | 33.3 | 66.7 | 9.1 | - | 50.0 |
| Sometimes | 41.7 | 33.3 | 54.5 | - | 30.0 |
| Often Used | 16.7 | - | 27.3 | - | 10.0 |
| Always | 8.3 | - | 9.1 | - | 10.0 |
| More Workers' Appraisals/Performance Reviews | | | | | |
| Not Used | 16.7 | 66.7 | 9.1 | - | 10.0 |

| Strategies | PCAB Rating | | | | |
|--|--------------|--------------|--------------|----------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Sometimes | 20.8 | - | 27.3 | - | 20.0 |
| Often Used | 12.5 | - | 18.2 | - | 10.0 |
| Always | 50.0 | 33.3 | 45.5 | - | 60.0 |
| Implement Mentoring/Buddying Schemes | | | | | |
| Not Used | 8.3 | 33.3 | - | - | 10.0 |
| Sometimes | 29.2 | - | 45.5 | - | 20.0 |
| Often Used | 33.3 | 66.7 | 27.3 | - | 30.0 |
| Always | 29.2 | - | 27.3 | - | 40.0 |
| Increase Supervision of Workers | | | | | |
| Not Used | 16.7 | 33.3 | - | - | 30.0 |
| Sometimes | 16.7 | - | 18.2 | - | 20.0 |
| Often Used | 29.2 | 66.7 | 27.3 | - | 20.0 |
| Always | 37.5 | - | 54.5 | - | 30.0 |
| Train Supervisors and Managerial Levels | | | | | |
| Not Used | 25.0 | 33.3 | 9.1 | - | 40.0 |
| Sometimes | 20.8 | - | 27.3 | - | 20.0 |
| Often Used | 33.3 | 66.7 | 54.5 | - | |
| Always | 20.8 | - | 9.1 | - | 40.0 |
| Disciplinary Procedures | | | | | |
| Not Used | 16.7 | 33.3 | - | - | 30.0 |
| Sometimes | 25.0 | - | 36.4 | - | 20.0 |
| Often Used | 25.0 | - | 36.4 | - | 20.0 |
| Always | 33.3 | 66.7 | 27.3 | - | 30.0 |
| Increase Recruitment | | | | | |
| Not Used | 33.3 | 33.3 | 36.4 | - | 30.0 |
| Sometimes | 29.2 | 33.3 | 36.4 | - | 20.0 |
| Often Used | 25.0 | - | 27.3 | - | 30.0 |
| Always | 12.5 | 33.3 | - | - | 20.0 |
| Total | 100.0 | 100.0 | 100.0 | - | 100.0 |

For simpler analysis and comparison of the frequency of strategies used to remedy poor performance by PCAB Category, Table 16 presents the strategies according to two general categories. The responses from Table 15 were recategorized into “Always to Often Used”, and “Sometimes to Not Used”. The figures for these two new general categories were derived by getting the sum of the proportion of responses for “Always” and “Often Used” in Table 15 for the former, and the sum for “Sometimes” and “Not Used” for the latter. The responses were then ranked in descending order. The strategies then presented in Table 16 are those that had majority share of responses (more than 50%).

For strategies always to often used, the top ones that are common across all PCAB license categories are to Increase Training Activity and Implement Mentoring/Buddying Schemes. Meanwhile, in addition to these, the common top strategies always to often used for bigger firms (AAAA and AAA) are to Increase Supervision of Workers, Disciplinary Procedures, and to Train Supervisors and Managerial Levels. It may also be noted that the bigger firms had a wider set of strategies that are always to often used compared to smaller firms (A-D). The top strategies always to often used unique to bigger firms may be a function of the size of the firm. Bigger firms are more likely to handle projects that are wider in scope and value, and in turn has higher manpower requirements. With larger teams for projects, these firms would also need a corresponding level of supervisory/managerial staff and control. For the smaller firms, a unique top strategy that is always to often used is on More Workers' Appraisals/Performance Reviews. This may refer to enhancing the quality of supervisory/managerial staff or control, rather than the quantity as for the bigger firms previously discussed.

Meanwhile, the common strategies that are sometimes to not used across all PCAB license categories are Develop Career Pathing for Workers, Changing Work Practices (e.g., Work Schedule, Improve OSH Practices), Promote Alternative Learning System, and Formal Re-training. In addition to these, a common strategy that are sometimes to not used among bigger firms (AAAA to AAA) is to Increase Recruitment. Meanwhile, a unique strategy in this category for smaller firms (A-D) is to Train Supervisors and Managerial Levels. This may be due to the smaller projects of these firms in terms of size and value, and hence having lower manpower requirements and needed level of supervisory/managerial staff and control.

Table 16. Comparison of Responses to Frequency of Strategies Used to Remedy Poor Performance Whether "Always to Often Used" and "Sometimes to Not Used", by PCAB Rating

| PCAB Category | Always to Often Used | Sometimes to Not Used |
|----------------------|---|--|
| All | <ol style="list-style-type: none"> 1. Increase Training Activity (70.8) 2. Increase Supervision of Workers (66.7) 3. More Workers' Appraisals/Performance Reviews (62.5) 4. Implement Mentoring/Buddying Schemes (62.5) 5. Disciplinary Procedures (58.3) 6. Train Supervisors and Managerial Levels (54.1) | <ol style="list-style-type: none"> 1. Promote Alternative Learning System (75) 2. Develop Career Pathing for Workers (75) 3. Changing Work Practices (e.g., Work Schedule, Improve OSH Practices) (70.9) 4. Formal Re-Training (66.7) 5. Increase Recruitment (62.5) |
| AAAA | <ol style="list-style-type: none"> 1. Increase Training Activity (100) 2. Increase Supervision of Workers (66.7) 3. Implement Mentoring/Buddying Schemes (66.7) 4. Disciplinary Procedures (66.7) 5. Train Supervisors and Managerial Levels (66.7) | <ol style="list-style-type: none"> 1. Develop Career Pathing for Workers (100) 2. Changing Work Practices (e.g., Work Schedule, Improve OSH Practices) (66.7) 3. More Workers' Appraisals/Performance Reviews (66.7) 4. Promote Alternative Learning System (66.6) 5. Formal Re-Training (66.6) 6. Increase Recruitment (66.6) |
| AAA | <ol style="list-style-type: none"> 1. Increase Supervision of Workers (81.8) 2. Increase Training Activity (72.8) 3. Disciplinary Procedures (63.7) 4. More Workers' Appraisals/Performance Reviews (63.7) | <ol style="list-style-type: none"> 1. Promote Alternative Learning System (72.8) 2. Increase Recruitment (72.8) 3. Changing Work Practices (e.g., Work Schedule, Improve OSH Practices) (72.7) 4. Formal Re-Training (63.7) |

| | | |
|------------|--|--|
| | 5. Train Supervisors and Managerial Levels (63.6) 6. Implement Mentoring/Buddying Schemes (54.6) | 5. Develop Career Pathing for Workers (63.6) |
| A-D | 1. More Workers' Appraisals/Performance Reviews (70) 2. Implement Mentoring/Buddying Schemes (70) 3. Increase Training Activity (60) | 1. Promote Alternative Learning System (80) 2. Develop Career Pathing for Workers (80) 3. Changing Work Practices (e.g., Work Schedule, Improve OSH Practices) (70) 4. Formal Re-Training (70) 5. Train Supervisors and Managerial Levels (60) |

Table 17 shows the distribution of companies by extent of action taken to utilize workers' potential to cope with more demanding duties. Majority (62.5%) of companies responded that they have already taken steps to develop their high potential staff. It may be noted that while the presence of these workers is indicative of a skills mismatch issue, it also presents opportunities for employers when they have a group of staff that would always have the capacity to perform more. With the presence of these high-potential workers, it is important for employers to ensure that they are able to identify these staff and develop them further so these high-potential workers are able to continuously increase organizational performance. In the skills literature, employers' policies and practices for attracting, retaining and motivating high-performance employees pertain to high performance working (HPW), or high performance work practices (HPWP) or systems (HPWS). With this, it is desirable for employers to have more high-potential workers since they will always have the ability to develop and perform better, which can be a source of competitive advantage. Therefore, there will always be a skills mismatch issue but the skills under-utilization in this manner is advantageous for employers to have.

Table 17. Distribution of Companies by Extent of Action Taken to Utilize Workers' Potential to Cope with More Demanding Duties, by PCAB Rating

| Action Taken | PCAB Rating | | | | |
|---|-------------|------|------|------|------|
| | All | AAAA | AAA | AA | A-D |
| No action – management is not fully aware of the potential capability | 3.1 | - | 7.7 | - | - |
| No action – management is aware of the potential but it is not sure what can be done | 3.1 | - | - | - | 7.1 |
| No action – the current organisational structure and work practices do not allow changes to take advantage of this potential | - | - | - | - | - |
| The organization is aware of the potential performance capability and it will review and re-deploy if necessary | 31.3 | 33.3 | 15.4 | 50.0 | 42.9 |
| The organization has already taken steps to develop this potential performance capability amongst employees (e.g. having formal | 62.5 | 66.7 | 76.9 | 50.0 | 50.0 |

| | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| program for managing high potential staff) | | | | | |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

While Table 17 identifies high-potential workers in terms of the extent to which their skills are identified and utilized by employers, Table 18 identifies the presence of high potential workers from another perspective—how talent is viewed by the management and within the organization. In this table, employees that are “Holding senior positions who are promoted internally” is a measure of the extent the employer is able to nurture its own people and to provide upward career opportunities. If the employer is not able to do this, this deficiency will be reflected in low proportion for this type of workers. The employer may often resort to poaching or recruitment to source senior staff. Meanwhile, workers under “Adding significant value to your business. This refers to employees whose work can significantly affect the bottom line of the business” refer to the percentage of staff who are regarded by management as significantly contributing to the business. If there are higher figures for this, then it indicates that the employer has a good pool of internal talent available who really matter to the performance of the company. Next, those “Having difficulty replacing within three months if they resigned” refer to people seen as key or critical for the operations of the establishment or firm. A higher number for this type of workers may indicate that the type of business of the employer is complex, hence it needs more of these types of workers. It may also indicate that there are highly devolved responsibilities among staff, which is desirable since it encourages staff participation. Lastly, the figures for those “Supported by career planning policy or practices for current and future development (e.g., career pathways)” are reflective of the employers’ approach towards its talent, similar to the first item (“Holding senior positions who are promoted internally”) where higher figures indicate better capabilities of the employer to develop its internal talent.

Table 18. Percentage of High-Potential Employees, by Type of High-Potential Employee and PCAB Rating

| Item | PCAB Rating | | | | |
|---|-------------|------|------|-------|------|
| | All | AAAA | AAA | AA | A-D |
| Holding senior positions who are promoted internally | 9.0 | 10.7 | 18.3 | 4.5 | 10.3 |
| Adding significant value to your business. This refers to employees whose work can significantly affect the bottom line of the business | 34.4 | 24.3 | 51.1 | 100.0 | 24.8 |
| Having difficulty replacing within three months if they resigned | 12.9 | 24.3 | 15.8 | 3.5 | 17.4 |
| Supported by career planning policy or practices for current and future development (e.g. career pathways) | 37.4 | 18.3 | 27.5 | 50.0 | 31.9 |

Table 19 shows the summary of the companies’ qualitative assessment on the likelihood of various developments to influence the organization’s employment levels between now and the next five years. Top developments cited as very likely to have impact are government policy direction (e.g.,

legislation of 30-Year Infrastructure Master Plan) (73.5%), climate change and sustainability (67.6%), and changes in policy and regulatory environment affecting market access (e.g., PPP Law, Procurement Law and its IRR, Right-of-Way Acquisition Law) (61.8%).

Table 19. Summary of Companies' Qualitative Assessment on the Likelihood of Various Developments to Influence on the Organization's Employment Levels Between Now and the Next Five Years, by PCAB Rating

| Development | PCAB Rating | | | | |
|---|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Government policy direction (e.g. Legislation of 30-Year Infrastructure Master Plan) | | | | | |
| Not Likely | 14.7 | - | 7.1 | - | 26.7 |
| Somewhat Likely | 11.8 | - | 14.3 | - | 13.3 |
| Very Likely | 73.5 | 100.0 | 78.6 | 100.0 | 60.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Changes in policy and regulatory environment affecting market access (e.g. PPP Law, Procurement Law and its IRR, Right-of-Way Acquisition Law) | | | | | |
| Not Likely | 8.8 | - | - | - | 20.0 |
| Somewhat Likely | 29.4 | 33.3 | 50.0 | - | 13.3 |
| Very Likely | 61.8 | 66.7 | 50.0 | 100.0 | 66.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Global competitiveness and international markets in public policy or business strategy | | | | | |
| Not Likely | 17.6 | - | 7.1 | - | 33.3 |
| Somewhat Likely | 26.5 | 66.7 | 28.6 | 50.0 | 13.3 |
| Very Likely | 55.9 | 33.3 | 64.3 | 50.0 | 53.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Application of efficient and modern technologies towards the Fourth Industrial Revolution (4IR) | | | | | |
| Not Likely | 8.8 | - | 7.1 | - | 13.3 |
| Somewhat Likely | 35.3 | 66.7 | 42.9 | 50.0 | 20.0 |
| Very Likely | 55.9 | 33.3 | 50.0 | 50.0 | 66.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Climate Change and Sustainability | | | | | |
| Not Likely | 8.8 | - | 14.3 | - | 6.7 |
| Somewhat Likely | 23.5 | 33.3 | 35.7 | - | 13.3 |
| Very Likely | 67.6 | 66.7 | 50.0 | 100.0 | 80.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 20 shows the summary of the companies' qualitative assessment of the impact of the developments cited previously on the employment levels of the company, by skill level⁴ (professional, skilled, and low-skilled). Overall, such developments were perceived to have had a

⁴ The three skill levels used in this part of the survey (professionals, skilled and low-skilled workers) correspond to the three broad skill levels under the International Standard Classification of Occupations ([ISCO-08], the current version published in 2008), respectively: 1) High skilled (skill levels 3-4, including managers; professionals; and technicians and associate professionals); 2) Medium skilled (skill level 2, including clerical support workers; service and sales workers; skilled agricultural, forestry, and fishery workers; craft and related trades workers; and plant and machine operators, and assemblers); and 3) low skilled (skill level 1, including elementary occupations).

positive impact on the demand for all types of workers by skill level over the past five years with high positive values for net increases in the level of employment across skill levels over the past five years, and even higher figures for the next five years. One primary factor for the positive outlook is the government’s policy thrust on infrastructure, with projects to be expected to commence and continue for a number of years. However, the projections of the respondents regarding the sectoral outlook and skills demand at the time of the survey may not hold after the advent of the COVID-19 pandemic which has had widespread negative impacts on the Philippine economy and most of its sectors, including construction.

Table 20. Summary of Companies’ Qualitative Assessment of the Changes in the Occupational Structure of Their Organization's Employment, by Skill Level

| Have There Been Changes in the Level of Employment by Skill Level | Skill Level | | |
|---|---------------|-----------------|---------------------|
| | Professionals | Skilled Workers | Low-Skilled Workers |
| Over the Past Five Years | | | |
| Decreased | 8.8 | 8.8 | 17.6 |
| Same | 23.5 | 17.6 | 20.6 |
| Increased | 67.6 | 73.5 | 61.8 |
| Don't Know | - | - | - |
| Total | 100.0 | 100.0 | 100.0 |
| Net Increased* | 58.8 | 64.7 | 44.2 |
| In the Next Five Years | | | |
| Decreased | - | - | 5.9 |
| Same | 11.8 | 14.7 | 14.7 |
| Increased | 85.3 | 85.3 | 76.5 |
| Don't Know | 2.9 | - | 2.9 |
| Total | 100.0 | 100.0 | 100.0 |
| Net Increased* | 85.3 | 85.3 | 70.6 |

*Note: Net Increased = Increased - Decreased

Table 21 shows the summary of the companies’ qualitative assessment of impact of the developments cited previously on the employment levels of the company, by age group. In line with the positive views for the employment levels by type of worker, there is also a perceived increase in the demand for workers in the past five years especially for the younger age groups, with a high net proportion of companies that responded with positive outlooks. Even more companies responded that employment will continue to increase in the next five years for the younger age groups. However, there is a negative outlook for the demand for older age workers from 45 years old and beyond in the next five years, as seen in the negative net increased figures.

Table 21. Summary of Companies’ Qualitative Assessment of the Changes in the Occupational Structure of Their Organization's Employment, by Age Group

| | Age Group |
|--|-----------|
|--|-----------|

| Have There Been Changes in the Level of Employment by Age Group | 18-24 Years Old | 25-34 Years Old | 35-44 Years Old | 45-54 Years Old | 55-64 Years Old | 65 Years Old and Over |
|--|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------------|
| Over the Past Five Years | | | | | | |
| Decreased | 6.7 | 2.9 | 14.7 | 16.7 | 28.0 | 41.7 |
| Same | 33.3 | 44.1 | 50.0 | 66.7 | 56.0 | 50.0 |
| Increased | 60.0 | 52.9 | 35.3 | 16.7 | 8.0 | - |
| Don't Know | - | - | - | - | 8.0 | 8.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net Increased* | 53.3 | 50.0 | 20.6 | - | -20.0 | -41.7 |
| in the Next Five Years | | | | | | |
| Decreased | 10.0 | 2.9 | 8.8 | 30.0 | 40.0 | 41.7 |
| Same | 26.7 | 20.6 | 41.2 | 56.7 | 40.0 | 41.7 |
| Increased | 60.0 | 73.5 | 50.0 | 13.3 | 8.0 | - |
| Don't Know | 3.3 | 2.9 | - | - | 12.0 | 16.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net Increased* | 50.0 | 70.6 | 41.2 | -16.7 | -32.0 | -41.7 |

*Note: Net Increased = Increased - Decreased

7.6. Adoption of Modern, Efficient, and Sustainable Technologies towards the 4IR

Table 22 shows the distribution of companies by the extent of their implementation regarding the adoption of modern, efficient and sustainable technologies towards the 4IR. Technologies that have the highest level of adoption, where companies have already started provision/funding and it is one of the main business foci, are Engineering, Procurement, and Construction (EPC) and Design-Build capabilities (32.3%), and digital technologies (e.g., building information modeling [BIM], drones, robotics, remote monitoring, smart centers, computational design, and modern technologies for large public infrastructure projects) (25.8%).

On the other hand, technologies with the lowest level of adoption, (e.g., no provision/funding and no immediate plan of doing so), are on Institutionalizing uniform or standard carbon dioxide (CO₂) measurement, benchmarking, and reduction approaches (38.7%). While almost a fourth of the companies responded they have already started provision/funding on digital technologies, about the same proportion also indicated that they have no provision/funding for it. It can also be noted that the bigger companies (with higher PCAB rating) were more likely to indicate they have already started or are planning for the provision or funding of the listed technologies. Since the industry would like to move towards the adoption of these technologies, smaller or lower PCAB rated firms would need additional support from the industry association or government since they are less likely to have provisions.

Table 22. Distribution of Companies by Extent of Implementation Regarding the Adoption of Digitization and Modernization Policies and Technologies Towards the 4IR, by PCAB Rating

| Item | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Adopt digital technologies (e.g. building information modeling (BIM), drones, robotics, remote monitoring, smart centers, computational design, and modern technologies for large public infrastructure projects) | | | | | |
| No Provision/Funding and No Immediate Plan of Doing So | 25.8 | - | 15.4 | - | 46.2 |
| No Provision/Funding but Planning to Do So | 22.6 | - | 15.4 | 50.0 | 30.8 |
| Have Already Started Provision/Funding | 25.8 | 66.7 | 38.5 | - | 7.7 |
| Have Already Started Provision/Funding and It Is One of The Main Business Foci | 25.8 | 33.3 | 30.8 | 50.0 | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Promote Engineering, Procurement, and Construction (EPC) and Design-Build capabilities in areas where local expertise and resources are available | | | | | |
| No Provision/Funding and No Immediate Plan of Doing So | 9.7 | - | 15.4 | - | 7.7 |
| No Provision/Funding but Planning to Do So | 22.6 | - | 23.1 | 50.0 | 23.1 |
| Already Started Provision/Funding | 35.5 | 33.3 | 38.5 | - | 38.5 |
| Have Already Started Provision/Funding and It Is One of The Main Business Foci | 32.3 | 66.7 | 23.1 | 50.0 | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Institutionalize a research and development program for courses on green buildings, etc. | | | | | |
| No Provision/Funding and No Immediate Plan of Doing So | 19.4 | - | 15.4 | 50.0 | 23.1 |
| No Provision/Funding but Planning to Do So | 48.4 | 66.7 | 53.8 | - | 46.2 |
| Have Already Started Provision/Funding | 16.1 | 33.3 | 15.4 | 50.0 | 7.7 |
| Have Already Started Provision/Funding and It Is One of The Main Business Foci | 16.1 | - | 15.4 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Institutionalize uniform or standard carbon dioxide (CO2) measurement, benchmarking, and reduction approaches | | | | | |
| No Provision/Funding and No Immediate Plan of Doing So | 38.7 | - | 23.1 | 50.0 | 61.5 |
| No Provision/Funding but Planning to Do So | 32.3 | 66.7 | 38.5 | 50.0 | 15.4 |
| Have Already Started Provision/Funding | 25.8 | 33.3 | 30.8 | - | 23.1 |
| Have Already Started Provision/Funding and It Is One of The Main Business Foci | 3.2 | - | 7.7 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 23 shows the summary of companies' qualitative assessment of the impact of the adoption of digitization and green technology on skills demand, by type of task. All of the tasks have positive net more skills demanded. Top tasks in terms of net more skills demanded are Using the Test Instrument (35.4%); Observing Procedures, Specifications and Manual of Instructions (32.3%); Interpreting Technical Drawing and Plans (32.2%); and Performing Electrical Work (32.2%).

Meanwhile, looking at the results by PCAB Rating, some tasks have negative net more skills demanded: Performing Mensuration and Calculation (-66.7), Interpreting Technical Drawing and Plans (-33.3), both for AAAA companies. For the biggest firms, these tasks will have significantly fewer skills demanded due to the impact of adoption of digitization and green technology.

Table 23. Summary of Companies' Qualitative Assessment of the Impact of the Adoption of Digitization and Green Technology on Skills Demand by Type of Task, by PCAB Rating

| Tasks | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Use of Basic Hand Tools | | | | | |
| More Skills Demanded | 38.7 | - | 38.5 | - | 53.8 |
| Staying the Same | 25.8 | 100.0 | 7.7 | 50.0 | 23.1 |
| Fewer Skills Demanded | 25.8 | - | 38.5 | 50.0 | 15.4 |
| Not Applicable | 9.7 | - | 15.4 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 12.9 | - | - | -50.0 | 38.5 |
| Performing Mensuration and Calculation | | | | | |
| More Skills Demanded | 35.5 | - | 38.5 | - | 46.2 |
| Staying the Same | 25.8 | - | 30.8 | 100.0 | 15.4 |
| Fewer Skills Demanded | 22.6 | 66.7 | 23.1 | - | 15.4 |
| Not Applicable | 16.1 | 33.3 | 7.7 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 12.9 | -66.7 | 15.4 | - | 30.8 |
| Interpreting Technical Drawing and Plans | | | | | |
| More Skills Demanded | 41.9 | - | 46.2 | 50.0 | 46.2 |
| Staying the Same | 38.7 | 66.7 | 30.8 | 50.0 | 38.5 |
| Fewer Skills Demanded | 9.7 | 33.3 | 15.4 | - | - |
| Not Applicable | 9.7 | - | 7.7 | - | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 32.2 | -33.3 | 30.8 | 50.0 | 46.2 |
| Preparing Construction Materials, Tools, and Equipment | | | | | |
| More Skills Demanded | 48.4 | 33.3 | 38.5 | 50.0 | 61.5 |
| Staying the Same | 19.4 | 33.3 | 23.1 | - | 15.4 |
| Fewer Skills Demanded | 25.8 | 33.3 | 30.8 | 50.0 | 15.4 |
| Not Applicable | 6.5 | - | 7.7 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 22.6 | - | 7.7 | - | 46.2 |
| Observing Procedures, Specifications and Manual of Instructions | | | | | |
| More Skills Demanded | 45.2 | 33.3 | 53.8 | 50.0 | 38.5 |
| Staying the Same | 35.5 | 66.7 | 15.4 | 50.0 | 46.2 |
| Fewer Skills Demanded | 12.9 | - | 23.1 | - | 7.7 |

| | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|
| Not Applicable | 6.5 | - | 7.7 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 32.3 | 33.3 | 30.7 | 50.0 | 30.8 |
| Performing Masonry (Pipefitting, Excavation, Concreting) | | | | | |
| More Skills Demanded | 38.7 | 33.3 | 23.1 | 50.0 | 53.8 |
| Staying the Same | 29.0 | 66.7 | 38.5 | - | 15.4 |
| Fewer Skills Demanded | 12.9 | - | 15.4 | 50.0 | 7.7 |
| Not Applicable | 19.4 | - | 23.1 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 25.8 | 33.3 | 7.7 | - | 46.2 |
| Performing Electrical Work | | | | | |
| More Skills Demanded | 41.9 | - | 23.1 | 100.0 | 61.5 |
| Staying the Same | 32.3 | 66.7 | 46.2 | - | 15.4 |
| Fewer Skills Demanded | 9.7 | - | 7.7 | - | 15.4 |
| Not Applicable | 16.1 | 33.3 | 23.1 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 32.2 | - | 15.4 | 100.0 | 46.2 |
| Using the Test Instrument | | | | | |
| More Skills Demanded | 41.9 | - | 61.5 | 50.0 | 30.8 |
| Staying the Same | 35.5 | 100.0 | 23.1 | 50.0 | 30.8 |
| Fewer Skills Demanded | 6.5 | - | - | - | 15.4 |
| Not Applicable | 16.1 | - | 15.4 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Net More Skills Demanded* | 35.4 | - | 61.5 | 50.0 | 15.4 |

*Note: Net More Skills Demanded = More Skills Demanded - Fewer Skills Demanded

Table 24 shows the summary of companies' qualitative assessment of the impact of the adoption of digitization and green technology on skills demand, by functional area. All functional areas have overall positive net more skills demanded. The top functional areas in terms of net more skills demanded are Civil Engineering (71.0%); Quality Assurance Inspection (58.1%); Materials Engineering (54.8%); Quality Control Inspection (54.8%); and Electrical (48.3%).

Meanwhile, looking at the results by PCAB Rating, some functional areas have negative net more skills demanded: CAD Design (-33.4%) for AAAA companies, and Plumbing and Pipefitting; Quantity Estimation; and Quantity Survey each with -15.4% for AAA companies. Meanwhile, for smaller (A-D) companies, these functional areas remain to have considerable net more skills demanded, ranging around 60.0%.

Table 24. Summary of Companies' Qualitative Assessment of the Impact of the Adoption of Digitization and Green Technology on Skills Demand by Functional Area, by PCAB Rating

| Functional Area | PCAB Rating | | | | |
|--------------------------|-------------|------|------|-------|------|
| | All | AAAA | AAA | AA | A-D |
| Civil Engineering | | | | | |
| More Skills Demanded | 71.0 | 33.3 | 61.5 | 100.0 | 84.6 |
| Staying The Same | 19.4 | 66.7 | 15.4 | - | 15.4 |

| | | | | | |
|-------------------------------------|--------------|--------------|--------------|--------------|--------------|
| Fewer Skills Demanded | - | - | - | - | - |
| Not Applicable | 9.7 | - | 23.1 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 71.0 | 33.3 | 61.5 | 100.0 | 84.6 |
| Materials Engineering | | | | | |
| More Skills Demanded | 54.8 | 66.7 | 53.8 | - | 61.5 |
| Staying The Same | 32.3 | 33.3 | 23.1 | 100.0 | 30.8 |
| Fewer Skills Demanded | - | - | - | - | - |
| Not Applicable | 12.9 | - | 23.1 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 54.8 | 66.7 | 53.8 | - | 61.5 |
| Quality Assurance Inspection | | | | | |
| More Skills Demanded | 61.3 | 66.7 | 69.2 | 50.0 | 53.8 |
| Staying The Same | 25.8 | 33.3 | 15.4 | 50.0 | 30.8 |
| Fewer Skills Demanded | 3.2 | - | - | - | 7.7 |
| Not Applicable | 9.7 | - | 15.4 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 58.1 | 66.7 | 69.2 | 50.0 | 46.2 |
| Quality Control Inspection | | | | | |
| More Skills Demanded | 61.3 | 66.7 | 69.2 | 50.0 | 53.8 |
| Staying The Same | 29.0 | 33.3 | 23.1 | 50.0 | 30.8 |
| Fewer Skills Demanded | 6.5 | - | 7.7 | - | 7.7 |
| Not Applicable | 3.2 | - | - | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 54.8 | 66.7 | 61.5 | 50.0 | 46.2 |
| Laboratory Technician | | | | | |
| More Skills Demanded | 35.5 | 33.3 | 46.2 | 50.0 | 23.1 |
| Staying the Same | 12.9 | 66.7 | 7.7 | - | 7.7 |
| Fewer Skills Demanded | 12.9 | - | 15.4 | 50.0 | 7.7 |
| Not Applicable | 38.7 | - | 30.8 | - | 61.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 22.6 | 33.3 | 30.8 | - | 15.4 |
| CAD Design | | | | | |
| More Skills Demanded | 48.4 | 33.3 | 30.8 | 50.0 | 69.2 |
| Staying the Same | 22.6 | - | 30.8 | - | 23.1 |
| Fewer Skills Demanded | 19.4 | 66.7 | 15.4 | 50.0 | 7.7 |
| Not Applicable | 9.7 | - | 23.1 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 29.0 | -33.4 | 15.4 | - | 61.5 |
| Quantity Survey | | | | | |

| | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|
| More Skills Demanded | 38.7 | 33.3 | 23.1 | 50.0 | 53.8 |
| Staying the Same | 19.4 | 33.3 | 15.4 | 50.0 | 15.4 |
| Fewer Skills Demanded | 25.8 | 33.3 | 38.5 | - | 15.4 |
| Not Applicable | 16.1 | - | 23.1 | - | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>*Net More Skills Demanded</i> | 12.9 | - | -15.4 | 50.0 | 38.5 |
| Quantity Estimation | | | | | |
| More Skills Demanded | 41.9 | 33.3 | 23.1 | 50.0 | 61.5 |
| Staying the Same | 29.0 | 33.3 | 23.1 | - | 38.5 |
| Fewer Skills Demanded | 22.6 | 33.3 | 38.5 | 50.0 | - |
| Not Applicable | 6.5 | - | 15.4 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>*Net More Skills Demanded</i> | 19.3 | - | -15.4 | - | 61.5 |
| Architecture | | | | | |
| More Skills Demanded | 29.0 | - | 30.8 | 50.0 | 30.8 |
| Staying The Same | 45.2 | 66.7 | 30.8 | 50.0 | 53.8 |
| Fewer Skills Demanded | 3.2 | - | 7.7 | - | - |
| Not Applicable | 22.6 | 33.3 | 30.8 | - | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>*Net More Skills Demanded</i> | 25.8 | - | 23.1 | 50.0 | 30.8 |
| Plumbing and Pipefitting | | | | | |
| More Skills Demanded | 35.5 | - | 15.4 | 50.0 | 61.5 |
| Staying the Same | 35.5 | 66.7 | 30.8 | 50.0 | 30.8 |
| Fewer Skills Demanded | 12.9 | - | 30.8 | - | - |
| Not Applicable | 16.1 | 33.3 | 23.1 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>*Net More Skills Demanded</i> | 22.6 | - | -15.4 | 50.0 | 61.5 |
| Welding | | | | | |
| More Skills Demanded | 48.4 | 33.3 | 38.5 | 50.0 | 61.5 |
| Staying the Same | 32.3 | 33.3 | 30.8 | 50.0 | 30.8 |
| Fewer Skills Demanded | 12.9 | - | 23.1 | - | 7.7 |
| Not Applicable | 6.5 | 33.3 | 7.7 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>*Net More Skills Demanded</i> | 35.5 | 33.3 | 15.4 | 50.0 | 53.8 |
| Mechanical Electrical Plumbing (MEP) | | | | | |
| More Skills Demanded | 32.3 | - | 30.8 | 50.0 | 38.5 |
| Staying the Same | 32.3 | 66.7 | 23.1 | - | 38.5 |
| Fewer Skills Demanded | 12.9 | - | 15.4 | 50.0 | 7.7 |
| Not Applicable | 22.6 | 33.3 | 30.8 | - | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

| | | | | | |
|----------------------------------|--------------|--------------|--------------|--------------|--------------|
| *Net More Skills Demanded | 19.4 | - | 15.4 | - | 30.8 |
| Heavy Equipment Operation | | | | | |
| More Skills Demanded | 48.4 | 66.7 | 46.2 | - | 53.8 |
| Staying the Same | 25.8 | 33.3 | 15.4 | 100.0 | 23.1 |
| Fewer Skills Demanded | 9.7 | - | 7.7 | - | 15.4 |
| Not Applicable | 16.1 | - | 30.8 | - | 7.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 38.7 | 66.7 | 38.5 | - | 38.5 |
| Heavy Equipment Servicing | | | | | |
| More Skills Demanded | 45.2 | 66.7 | 53.8 | - | 38.5 |
| Staying the Same | 25.8 | 33.3 | 7.7 | 100.0 | 30.8 |
| Fewer Skills Demanded | 6.5 | - | 7.7 | - | 7.7 |
| Not Applicable | 22.6 | - | 30.8 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 38.7 | 66.7 | 46.1 | - | 30.8 |
| Electro-Mechanical | | | | | |
| More Skills Demanded | 38.7 | - | 53.8 | - | 38.5 |
| Staying the Same | 22.6 | 33.3 | 15.4 | 100.0 | 15.4 |
| Fewer Skills Demanded | 12.9 | - | 15.4 | - | 15.4 |
| Not Applicable | 25.8 | 66.7 | 15.4 | - | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 25.8 | - | 38.4 | - | 23.1 |
| Electrical | | | | | |
| More Skills Demanded | 54.8 | 33.3 | 46.2 | 50.0 | 69.2 |
| Staying the Same | 35.5 | 66.7 | 30.8 | 50.0 | 30.8 |
| Fewer Skills Demanded | 6.5 | - | 15.4 | - | - |
| Not Applicable | 3.2 | - | 7.7 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 48.3 | 33.3 | 30.8 | 50.0 | 69.2 |

**Note: Net More Skills Demanded = More Skills Demanded - Fewer Skills Demanded*

Table 25 shows the summary of companies' qualitative assessment of the impact of the adoption of digitization and green technology on skills demand, by emerging skill. All emerging skills have positive net more skills demanded. Top emerging skills in terms of net more skills demanded are on Green Construction (48.4%); on Building Information Modelling (BIM) (35.5%); on Process Automation (35.5%); on Rubberized Asphaltting (35.5%); and on Sea-Based Construction (35.5%). Meanwhile, emerging skills that had the least net more skills demanded are on Engineering Services Outsourcing (RDO) (19.4%); on Glass Fiber Reinforce Concrete (19.4%); and on Subway Tunnelling (22.6%).

Table 25. Summary of Companies' Qualitative Assessment of the Impact of the Adoption of Digitization and Green Technology on Skills Demand by Emerging Skills, by PCAB Rating

| Emerging Skills | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| On Building Information Modelling (BIM) | | | | | |
| More Skills Demanded | 48.4 | 66.7 | 53.8 | 50.0 | 38.5 |
| Staying the Same | 12.9 | - | - | 50.0 | 23.1 |
| Fewer Skills Demanded | 12.9 | - | 23.1 | - | 7.7 |
| Not Applicable | 25.8 | 33.3 | 23.1 | - | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 35.5 | 66.7 | 30.8 | 50.0 | 30.8 |
| On Green Construction | | | | | |
| More Skills Demanded | 58.1 | 100.0 | 53.8 | 100.0 | 46.2 |
| Staying the Same | 12.9 | - | 7.7 | - | 23.1 |
| Fewer Skills Demanded | 9.7 | - | 15.4 | - | 7.7 |
| Not Applicable | 19.4 | - | 23.1 | - | 23.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 48.4 | 100.0 | 38.5 | 100.0 | 38.5 |
| On Glass Fibre Reinforce Concrete | | | | | |
| More Skills Demanded | 29.0 | 33.3 | 30.8 | - | 30.8 |
| Staying the Same | 22.6 | 33.3 | 7.7 | 50.0 | 30.8 |
| Fewer Skills Demanded | 9.7 | - | 15.4 | - | 7.7 |
| Not Applicable | 38.7 | 33.3 | 46.2 | 50.0 | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 19.4 | 33.3 | 15.4 | - | 23.1 |
| On Engineering Services Outsourcing (RDO) | | | | | |
| More Skills Demanded | 32.3 | 33.3 | 30.8 | 100.0 | 23.1 |
| Staying the Same | 25.8 | 33.3 | 15.4 | - | 38.5 |
| Fewer Skills Demanded | 12.9 | - | 23.1 | - | 7.7 |
| Not Applicable | 29.0 | 33.3 | 30.8 | - | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 19.4 | 33.3 | 7.7 | 100.0 | 15.4 |
| On Process Automation | | | | | |
| More Skills Demanded | 45.2 | 66.7 | 38.5 | 100.0 | 38.5 |
| Staying the Same | 12.9 | - | - | - | 30.8 |
| Fewer Skills Demanded | 9.7 | - | 23.1 | - | - |
| Not Applicable | 32.3 | 33.3 | 38.5 | - | 30.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 35.5 | 66.7 | 15.4 | 100.0 | 38.5 |
| On Robotics Specialization | | | | | |

| | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| More Skills Demanded | 32.3 | 33.3 | 23.1 | 100.0 | 30.8 |
| Staying the Same | 9.7 | - | 7.7 | - | 15.4 |
| Fewer Skills Demanded | 6.5 | - | 15.4 | - | - |
| Not Applicable | 51.6 | 66.7 | 53.8 | - | 53.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 25.8 | 33.3 | 7.7 | 100.0 | 30.8 |
| On Rubberized Asphaltting | | | | | |
| More Skills Demanded | 38.7 | 100.0 | 30.8 | 50.0 | 30.8 |
| Staying the Same | 16.1 | - | 7.7 | - | 30.8 |
| Fewer Skills Demanded | 3.2 | - | 7.7 | - | - |
| Not Applicable | 41.9 | - | 53.8 | 50.0 | 38.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 35.5 | 100.0 | 23.1 | 50.0 | 30.8 |
| On Sea-Based Construction | | | | | |
| More Skills Demanded | 35.5 | 33.3 | 30.8 | 100.0 | 30.8 |
| Staying the Same | 6.5 | - | - | - | 15.4 |
| Fewer Skills Demanded | | | | | |
| Not Applicable | 58.1 | 66.7 | 69.2 | - | 53.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 35.5 | 33.3 | 30.8 | 100.0 | 30.8 |
| On Underwater Telecommunication | | | | | |
| More Skills Demanded | 32.3 | 33.3 | 30.8 | 50.0 | 30.8 |
| Staying the Same | 3.2 | - | - | - | 7.7 |
| Fewer Skills Demanded | 3.2 | - | - | - | 7.7 |
| Not Applicable | 61.3 | 66.7 | 69.2 | 50.0 | 53.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 29.0 | 33.3 | 30.8 | 50.0 | 23.1 |
| On Subway Tunnelling | | | | | |
| More Skills Demanded | 25.8 | 33.3 | 23.1 | 50.0 | 23.1 |
| Staying the Same | 6.5 | - | 7.7 | - | 7.7 |
| Fewer Skills Demanded | 3.2 | - | - | - | 7.7 |
| Not Applicable | 64.5 | 66.7 | 69.2 | 50.0 | 61.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *Net More Skills Demanded | 22.6 | 33.3 | 23.1 | 50.0 | 15.4 |

**Note: Net More Skills Demanded = More Skills Demanded - Fewer Skills Demanded*

Majority (77.4%) of the companies indicated that they are ready given the identified emerging skills in the sector (Table 26).

Table 26. Percentage of Companies that are Ready Given the Identified Emerging Skills in the Sector, by PCAB Rating

| Item | PCAB Rating | | | | |
|--------------|--------------|------------|-------------|------------|-------------|
| | All | AAAA | AAA | AA | A-D |
| Yes | 77.4 | 100.0 | 76.9 | 100.0 | 69.2 |
| No | 22.6 | - | 23.1 | - | 30.8 |
| Total | 100.0 | 9.7 | 41.9 | 6.5 | 41.9 |

Table 27 shows the distribution of companies by extent of action taken to prepare their human resources given the identified emerging skills in the sector. Around 70.0% indicated that they have started some initiatives/programs in terms of training and development of the human resource, while 66.7% also responded that they have established plans to address the requirements. Meanwhile 62.5% have started some initiatives/programs for the acquisition of equipment and materials relevant for the requirements. While this category still garnered a major share of the respondents (more than half), it also had the least share compared to others since it can entail the highest cost. In addition, companies may also prioritize the establishment of plans and preparation of human resource before they can start to acquire equipment and materials. However, these results also need to be examined further. It may be possible that given the positive bias of the respondents due to the overall optimistic outlook for the sector's growth in the next short to medium-term at the time of the survey, they may have also overestimated the firm's expansion activities. There is also a need to determine or qualify what particular type of plans or initiatives were started.

Table 27. Distribution of Companies by Extent of Action Taken to Prepare Human Resources Given the Identified Emerging Skills in the Sector, by PCAB Rating

| Actions Taken | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Established Plans to Address the Requirements | 66.7 | 100.0 | 70.0 | 100.0 | 44.4 |
| Started some initiatives/programs in terms of training and development of the human resource | 70.8 | 66.7 | 70.0 | 100.0 | 66.7 |
| Started some initiatives/programs for the acquisition of equipment and materials relevant for the requirements | 62.5 | 66.7 | 60.0 | 100.0 | 55.6 |
| Others | 12.5 | - | - | 50.0 | 22.2 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Other Actions Taken for The Identified Emerging Actions Taken | | | | | |
| Attended Related Seminars | 33.3 | - | - | - | 50.0 |

| Actions Taken | PCAB Rating | | | | |
|---------------------------------------|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Diversify Business (i.e., Properties) | 33.3 | - | - | 100.0 | - |
| Will Start Preparing for Improvements | 33.3 | - | - | - | 50.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: Multiple responses were allowed.

Table 28 shows the distribution of companies by type of action taken to prepare their human resources. All of the respondents indicated that they do retooling and upskilling of existing employees to acquire the required competencies, while 52.9% indicated that they hire new employees. As cited previously, companies may be limited to making the best out of their current workforce since hiring new workers may entail additional labor cost, especially when workers cannot be directly substituted (e.g., before end of tenure) or there is already difficulty in hiring for certain occupations.

Table 28. Distribution of Companies by Type of Action to Prepare Their Human Resources, by PCAB Rating

| Item | PCAB Rating | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Hire New Employee/s Who Have the Required Skills | 52.9 | 50.0 | 57.1 | 50.0 | 50.0 |
| Re-Tool/Upskill Existing Employee/s To Acquire the Required Competencies | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Others | 11.8 | 50.0 | 14.3 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Other Actions Taken to Prepare the Human Resource | | | | | |
| Potential Partnership with TESDA | 50.0 | 100.0 | - | - | - |
| Update of in-House Technology on It and Systems | 50.0 | - | 100.0 | - | - |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 29 shows the top sustainable industry developments that are relevant to the current and near future business needs of companies, in terms of knowledge, skills and competencies. Knowledge is defined as critical understanding, theories, and principles. Skills pertain to skills mastery and innovation for solving complex problem. Competencies refer to managing activities and tasks (TESDA).

Energy Labelling, and Reuse and Recycling of CDW is among the top responses, and relevant across the three aspects. Other top industries relevant in one or more categories are New Technologies Applied to Building Maintenance and Refurbishment; Low Environmental Impact Materials;

Sustainable Construction Standardization; Virtual Design Construction (VDC), Sustainable Building Certification; Systems; and Environmental Labelling. Table 35 in Annex B shows the distribution of responses for all sustainable industry developments.

Table 29. Top Sustainable Industry Developments Relevant to Companies

| Sustainable Technology | Knowledge (%) | Skills (%) | Competencies (%) |
|--|----------------------|-------------------|-------------------------|
| Energy Labelling | 62.5 | 62.5 | 62.5 |
| Reuse and Recycling of CDW | 60.0 | 70.0 | 70.0 |
| New Technologies Applied to Building Maintenance and Refurbishment | 64.7 | 58.8 | - |
| Low Environmental Impact Materials | 60.0 | - | 53.3 |
| Sustainable Construction Standardization | - | 70.4 | 74.1 |
| Virtual Design Construction (VDC) | - | 62.5 | 62.5 |
| Sustainable Building Certification Systems | 54.5 | - | - |
| Environmental Labelling | 53.8 | - | - |

7.7. Workforce Matters: workers with TVET training & performance

Table 30 shows the summary of responses on workforce matters. More than three-fourths (76.5%) of the respondents have preference in hiring NC holders. The proportion of all (in-house and via agencies) jobs (not employees) that require at least an NC qualification to do the job is at 22.2%. On the other hand, the percentage of the existing workforce that are TVET graduates, with or without achieving a qualification, is at 20.2%.

Regarding the satisfaction with the work and performance of TVET workers, majority (85.7%) of the companies were either satisfied or very satisfied with TVET graduates. An even higher proportion (90.5%) were also either satisfied or very satisfied with TVET-certified employees.

Table 30. Summary of Responses on Workforce Matters

| Item | PCAB Rating | | | | |
|---|--------------------|--------------|--------------|--------------|--------------|
| | All | AAAA | AAA | AA | A-D |
| Percentage of companies with preference in hiring NC Holders | 76.5 | 100.0 | 85.7 | 50.0 | 66.7 |
| For companies with no preference, if Have Plans of Giving Preference in Hiring NC Holders | | | | | |
| Yes | 50.0 | - | - | 100.0 | 60.0 |
| No | 50.0 | - | 100.0 | - | 40.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Percentage of all (in-house and via agencies) jobs (not employees) requires at least an NC qualification to do the job | 22.2 | 13.3 | 28.6 | 10.0 | 19.7 |
| Percentage of your existing workforce (in-house and via agencies) are TVET | 20.2 | 6.7 | 30.4 | 5.0 | 15.3 |

| graduates, with or without achieving a qualification | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|
| Satisfaction with work and performance | | | | | |
| TVET Graduates | | | | | |
| Very Dissatisfied | 4.8 | - | 10.0 | - | - |
| Neither | 9.5 | - | - | - | 22.2 |
| Satisfied | 52.4 | 100.0 | 50.0 | 100.0 | 44.4 |
| Very Satisfied | 33.3 | - | 40.0 | - | 33.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| TVET-Certified Employees | | | | | |
| Very Dissatisfied | 4.8 | - | 10.0 | - | - |
| Neither | 4.8 | - | 10.0 | - | - |
| Satisfied | 52.4 | 100.0 | 50.0 | 100.0 | 44.4 |
| Very Satisfied | 38.1 | - | 30.0 | - | 55.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

8. Conclusion and Recommendation

8.1. Issues and policy implications of survey findings

Given the survey results discussed previously, these are the issues and policy implications:

2. General Information

- There is a need for better participation and representation of respondents across different administrative regions and lower PCAB categories, to get a fuller picture of different skills needs and situations of the industry

3. Employment

- Majority of employment in the sector is project-based. The more casual and temporary nature of many jobs in the sector presents challenges for skills development. This also raises the question of who will be responsible for the skills development of this type of workers.
- Industry stakeholders observe that some larger industry players take the initiative of training project-based workers so that they can hire them afterwards. However, they recognize that this is only a good practice, and that for the industry as a whole, strategies or schemes for the skills development for project-based workers remains to be determined. One proposal raised by some industry players is to have a centralized training fund for the industry, to be funded through a levy or fee among licensed contractors proportional to their financial capacity and technical experience (Philippine Constructors Association Inc. (PCA) 2020), similar to the PCAB Categorization (Table 31).
- There is also the markedly project-based nature of employment for a major portion, reflecting the nature of the sector. However, project-based employment is characterized as being casual, temporary and insecure (Ive and Gruneberg 2000). Work is seasonal and tied to demand in the sector, which is cyclical. The lack of security in the sector (not necessarily entirely due to tenure but due to the mostly

project-based nature of operations and employment) which also contribute to poor career prospects may make construction work less attractive.

- The practice of labor provision through subcontracting may have implications for sectoral skills development. Main contractors cannot direct subcontractors providing labor to adopt new machinery, skills, and methods in ways that they could with direct employees (Ive and Gruneberg 2000). Further research is needed on skills situation and practices with regards to contracting and subcontracting since employment under these arrangements were not really captured in the survey (due to the short-term nature of these engagements). In addition, industry stakeholders note that there are also manpower cooperatives in the sector and they are increasingly being engaged by the bigger players.
- In other countries, there is also the practice of sole trading in the construction industry. This can refer to individuals or small businesses that work in the construction industry or do construction-related work for projects as a contractor or subcontractor. There is a need to further examine practices by sole traders in the Philippine construction sector.
- In relation to the practice of engaging manpower cooperatives by some players and sole traders in other countries, the Construction Industry Roadmap identifies as an initiative the amendment of the Cooperative Development Authority Law to allow cooperatives to provide construction services in order to be qualified for PCAB license, and to adopt a cooperative model for networking of pooled workers, professionals, and small specialty contractors (p. 48).
- There is opportunity to promote and expand female participation in on-site construction employment since female employment in the industry at present is mostly limited to office-based work. This is to maximize the human resource pool in light of possible difficulties in hiring (e.g., one most cited reason for difficulty in hiring is lack or unavailability of applicants). However, there is also a need to assess if there are conditions in the sector that would enable female employment (e.g., low level of discriminatory practices, gender-friendly workplaces especially on-site). This is also considering that a major portion of employment in this sector is skilled manual labor (or skilled trade and craft workers), and which has long had occupational gender segregation as it is traditionally viewed as an occupation more suitable for men.
- There is a need to look further into issues in the employment of older aged workers in the construction sector given the notable tapering off of the employment share for the age group 55 to 64 years old. This may mean several things: that there is early retirement in the sector, perhaps due to chronic conditions caused by the intense physical manual labor involved in many construction occupations, and/or that firms may have a preference for younger workers due to older workers being stereotyped as less capable of keeping up with work loads. Whether it is due to the worker's side or the firm's decision, this points to the need to ensure that the ability to work and employability are maintained across age groups and throughout the workers' life cycle. Especially in sectors like construction, it is noted that cumulative exposure to physically demanding work may have impacts on workers' health and functional ability in the long term. If working conditions and occupational safety and health is not managed well, this may cause health deterioration and early exit from the workforce. Specific measures for older workers may be looked into, based on risk

assessment (European Agency for Safety and Health at Work 2016a). In ensuring ability to work and employability, including equal treatment in employment, across age groups, there are benefits and opportunities such as easing the skills/talent shortage when older workers with skills and experience are retained for longer periods, reduced turnover and recruitment costs, and tapping into the expertise, and experiences of older workers (European Agency for Safety and Health at Work 2016b). For example, in the survey results, mentoring and buddying was among the top strategies employed by the respondents to remedy poor performance (Table 15 and 16). Older workers can be often in the position of being mentors to younger workers given their accumulated expertise and experience throughout the years.

- A considerable proportion of employment in the sector is on low-skill workers. The Construction Industry Roadmap notes that the prevalence of unskilled labor contributes to low productivity in the sector, being among the lowest compared to other developing countries. The construction sector is key source of employment for the low-skilled in developing countries (Ofori 2007), since it is one of the most labor-intensive industries. Low-skilled work is assumed to be less productive, with poorer output quality and higher wastage, and would often correspond to the use of less modern production technologies. More productive firms are more likely to use more skill-intensive technology (Burstein and Vogel (2012) and hence have higher demand for skilled workers compared to low skill workers. The composition of employment, whether for skilled or lower skilled workers, may also reflect the type of projects being undertaken (e.g., high rise offices, medium-rise apartments, five-star hotels) (Valence 2011).
- Following the vision for the industry to move towards more modern and sustainable technologies, and the possibility of automation, low-skill workers in the sector whom constitute a notable proportion of employment will be at higher risk of being redundant and to be displaced. This would then mean that they need to be retrained so they can avail of new or other employment opportunities within the sector or in other sectors. However, low-skill workers usually have less capacity for retraining or upskilling. This entails time and financial costs while low skill workers have lower savings, or ability to take time off work in order to train. Companies are also less likely to be invested in the retraining or reskilling of or to upgrade low skill workers, since they are often homogenous or easily substitutable. To address this, one possibility is to have targeted training scholarships for low skill workers. Meanwhile, the issue on this is on how can low skill workers know about training options or opportunities.

4. Existing Occupations

- There is differentiation in occupations that are monthly-paid and daily-paid, with managerial/supervisory and professional occupations for the former and craft and related trades workers for the latter. It can be inferred that monthly-paid workers are more likely to be regular or non-project employees, while daily-paid workers are those that are project-based. Managerial/supervisory and professional occupations are more often employed on a regular or non-project basis since they have skills that are needed throughout the firms' operations, and not limited to certain projects. Meanwhile, craft and related trades workers offer job-specific skills particular to the type of project being implemented. This type of workers also fall under the TVET

system and would be clients of technical and vocational training. However, based on the survey, those with NCs are mostly limited to NC II level, on top of a high school or lower level education. There is opportunity to promote take-up of training and certification for higher-level NCs.

5. Critical Occupations

- Majority of respondents have hard-to-fill or in-demand vacancies, and often the reason is due to skills issues or shortage (e.g., 1) No/few applicants applied for the job; 2) Applicants lack years of experience; 3) Applicants lack needed competency/skill; and 4) Applicants lack professional license/TESDA skills certification). Almost all of the identified critical occupations were also more likely to be non-regular (or project-based) positions. This points to the need for coordination on skills development beyond the firm-level since individual firms or contractors also have less incentive for the training and development of non-regular or project-based occupations. Firms will be less inclined to invest in training when there is no guarantee that the benefits will accrue to the firm or that they will recoup the cost of training since workers will be free to move to other firms after the project, or that these workers may be poached. Since the need for the skills of these workers are often particular to the type of project, firms are also less inclined to employ them as regular workers to prevent or minimize turnover.
- Training interventions and support for the immediate term may be focused on the top hard-to-fill occupations, such as Heavy Equipment Mechanic Heavy Equipment Operator, Mobile Crane Operator and Hydraulic Excavator Operator.
- The respondents had limited understanding of and ability to identify basic, common, and core skills or competencies. In general, the skills or competencies that were identified refer to qualifications (e.g., having the required qualifications, with specific levels identified from high School-level or graduate, college graduate, general NC level or specific NCs; passing trade tests; having certain years of experience), hard skills (e.g., having the relevant technical skills and knowledge, with specific skills identified in some instances), and soft skills (e.g., problem solving; teamwork and effective communication skills; leadership and management skills; willingness to Learn; and adaptability and flexibility). In order for firms to identify their skills needs, there is a need to improve their capacity to analyze and determine the basic, common, and core skills or competencies of their workforce.
- Companies with higher PCAB rating are able to recruit by internal promotion, since these companies are also more likely to be bigger organizations and hence have more room to promote staff. This raises the question of career development or progression for project-based workers.

6. Improving Business Productivity

- On the top reasons cited for poor performance, there is the lack of expected behavioral skills (e.g., reliability, responsiveness, work discipline, motivation, integrity, adaptability, etc.) (83.3%) and lack of socio-emotional skills (extraversion, emotional stability, agreeableness, grit, consciousness, decision-making, openness, etc.) (41.7%). Meanwhile, lack of technical skills is at 58.3%. While lack of technical

skills is a major concern, there is a good opportunity to improve job performance by addressing soft skills.

- In line with the top reasons cited for poor performance being on behavioural skills and socio-emotional skills, the top strategies that are always used by companies to remedy poor performance are measures like more workers' appraisals/performance reviews, increased supervision of workers and disciplinary procedures. However, there is a need to examine further if such measures are appropriate or effective in addressing lack of expected behavioural skills and socio-emotional skills. Meanwhile, top strategies that are always used that relate to hard or technical skills is on implementing mentoring/buddying schemes and to increase (in-house) training activity. These measures would not entail additional costs for companies, except maybe for increasing training activity if done with an external service provider.
- There is a need to examine further why companies would prefer non-formal/informal means to address lack of technical skills, such as if it is just an issue of cost, or if there are other barriers to accessing formal training, and on their perception of the relevance or adequacy of formal training. The Construction Industry Roadmap also identifies the issue of low enrolment and market penetration of skills training at the national level.
- While majority of companies responded that they have already taken steps to develop their high potential staff, their initiatives would be limited to their in-house workers only. There is the question of how high-potential project-based employees can be identified and developed further.
- It is worth noting that skills development strategies like career pathing are more applicable to the context of direct employment under construction firms. Skills development for non-project or regular workers directly employed by construction firms is largely determined by the management for their employees. In comparison, ways for skills development of project-based workers are less clear as discussed previously. In other countries, there is the practice of sole trading in the construction industry. This can refer to individuals or small businesses that work in the construction industry or do construction-related work for projects as a contractor or subcontractor. To be more responsive to their client's needs and become more competitive, some sole traders expand the scope of their services, so that they are able to provide a package of services or solutions to the client rather than just one type. Sole traders that are able to expand like this have the potential of scaling up as independent SMEs that can provide their services to larger construction firms or other contractors. Regarding skills development in the context of sole traders in construction, individuals or a group of individuals will need to upgrade their skills so they can provide a wider range of services and have the entrepreneurial ability to scale up their operations as an SME.
- Overall, the respondents have a positive outlook for employment in the sector, with majority of the companies expecting their employment levels to increase in the next five years. This is also consistent across skill levels (professionals, skilled and low-skilled workers), and age groups. However, in light of the present difficulties in hiring faced by the sector as seen in the incidence of critical occupations, there is the question of how to promote the attractiveness of employment in the sector.

7. Adoption of Modern, Efficient, and Sustainable Technologies towards the 4IR

- Overall, there is positive net more skills demanded across tasks, functional areas, and emerging skills based on the companies' qualitative assessment of the impact of the adoption of digitization and green technology on skills demanded.
- There is a need to gather more information on the extent of action taken by construction companies to prepare their human resources given the identified emerging skills in the sector, given the high proportion of respondents that indicated that they have established plans or started initiatives/programs on training and acquisition of equipment/materials.
- Bigger firms are more likely to indicate that they have plans and/or provisions for the adoption of these technologies.
- In the Construction Industry Roadmap 2020-2030, the primary strategy for promoting productivity in the sector is through the adoption of efficient, modern, and digital technologies. This is also part of raising the capacity of the industry as a whole so that it can better respond to growing construction demand. Given the strategic direction of the industry to move towards these type of technologies, smaller construction firms will need additional support, whether in terms of information and awareness, funding, technical capacity/know-how and staff training, so they may also adopt and benefit these newer technologies and adapt in the 4IR.
- The Roadmap also recommends the provision and promotion of incentives to promote the adoption of technologies particularly for research and development, and acquisition of new equipment and technologies (p.48). However, support for addressing skills development needs for new technology adoption is not mentioned.

8. Workforce Matters: workers with TVET training & performance

- There is some inconsistency in the stated preference of firms for hiring NC holders and their actual practice. Majority (76.5%) of the companies responded they have preference in hiring NC holders. Majority (85% to 90%) of companies were also satisfied with the work and performance of TVET graduates and TVET-certified employees. However, only around one-fifth of all jobs requires at least an NC qualification to do the job. Further, only one-fifth of the existing workforce are TVET graduates (with or without achieving a qualification). There is a need to examine further why there is a gap between stated preference for hiring NC holders and the actual practices of companies.
- **On public awareness and reach of the Philippine TVET system.** While the TVET structure and policy frameworks are in place across direction setting, standards setting and systems development and support to TVET provision, there are remaining challenges with regards to the public's awareness and reach of the TVET system. This is reflected in the seemingly low awareness among the respondents regarding relevant policies, such as on the Philippines Qualification Framework, and the relevant Training Regulations for certain NCs and occupations. Companies seem to mostly determine their own qualifications and skills requirements (not based on a wider qualifications framework), and NCs are not seen as strict qualification requirements. If NCs are required, the NC level (I, II, III, IV) is mostly specified rather than the particular NCs for occupations.

- A related issue to this may be on the reach and take-up of the TVET System. All over the world, the image of TVET has long been a challenge or on how to promote the demand for TVET among students, young people and potential trainees. It is only recently under the K-12 Basic Education Program that Technical-Vocational-Livelihood became an established track. Until then, the overall take-up of TVET relative to its potential target population is even less certain. There are also remaining challenges with service provision, such as on the adequacy of training and assessment services in view of demand (TESDA 2018). For the construction sector, some respondents cited the challenge of complying with government-determined mandatory qualifications for certain occupations especially with regards to occupational safety and health. While they are willing to comply and have the resources for training, there is a lack of assessors and assessment centres in some areas.
- If there is only a small proportion of TVET graduates and certified persons relative to the human resource pool, then employers may not opt to utilize the TVET qualifications as strict requirement or means for quality assurance, since they will be constrained in hiring. For the construction sector, possible additional challenges in hiring are the urgency and time-boundedness of projects, the short-term duration of some jobs, and competition with other construction companies especially in seasons of high-demand for the sector. In addition to this, stakeholders and some respondents also expressed that the sector is also competing for construction jobs overseas, especially among NC holders.
- With regards to this situation, there may also be a negative feedback loop where workers or potential trainees have less incentive to take-up TVET if it does not have much premium for employers, hence lessening the perceived return on investment in training.
- If the sector will eventually shift to production technologies that have higher skills requirements, the views and HR practices relative to TVET may also change, especially for areas or skills where firms themselves don't have much experience in and hence cannot rely on their own training provision or existing experience of workers. For this, firms may look to external quality assurance through the assessment and certification system of TESDA.
- There is a need to look further into the promotion of the formal recognition of non-formal and informal learning in the sector, through TESDA's Recognition of Prior Learning (RPL) under the Philippine TVET Qualification and Certification System. This is also called the recognition, validation, and accreditation (RVA) of non-formal and informal learning by the UNESCO (Singh 2015). This is in light of the possibility that there is considerable non-formal and informal learning that is taking place in the sector, such as when workplace learning is more of the practice. This is also in view of the limitations to the provision of formal learning by firms due to the high proportion of temporary or project-based workers. In addition, employers also seem to put more weight on experience compared to NCs in their hiring, and do not put premiums on NCs.
- One cited benefit for workers of RPL or RVA is that with workers' skills being made visible and recognized, this will help them compete, and hence promote their participation in the labor market. In addition, this may also help address inequalities

in education and training opportunities, since workers with less access to formal learning but have acquired learning and knowledge can still have the opportunity to attain national qualifications. This may also be especially important for low-skill workers, who often lack formal certification, awareness and ability to articulate their competencies (Singh 2015).

- For employers, a benefit of RVA/RPL is making visible the knowledge, skills, and competencies of applicants or workers, which will then help employers to better match them with jobs or tasks (Werquin 2010), and also help firms or organizations to determine their overall stock of competencies and qualifications (Singh 2015). For example, given the considerable proportion of overskilled/underutilized workers from the survey results (34.6% in Table 13), these workers may have been better harnessed if their competencies were made visible. Conversely, the underskilled workers (8.6%) may have been also better matched to jobs if their competencies were clearer to the employer.
- However, there should also be caution in just making certification mandatory, since there is also need to consider what might really be the underlying reasons for the employers and workers on why they do not opt for this, such as the costs involved (e.g., administrative requirements and other transaction costs, opportunity costs). There is also a need to consider the level of readiness of the TVET infrastructure such as having the adequate number of assessment centers and assessors by locality. A separate but related issue that is also impacting on all of these is the level of awareness of employers on the Philippine Qualifications Framework and the extent to which it is used in recruitment and employment practices in the first place.
- Some employers also have the perception that due to the issue of brain drain or the recruitment of Filipino construction workers in foreign labor markets as also identified in the Construction Industry Roadmap, TVET trained and certified employees are more likely to be hired or seek employment abroad.

9. Others: on the conduct of workplace skills survey for skills needs anticipation

- This study aimed to contribute to address the need to enhance sectoral approaches to skills development especially for key sectors, such as construction. However, this needs to be coordinated with a wider national skills anticipation and development system, and in view of the wider LMIS.
- The considerable extent of informality among contractors and the practice of subcontracting may limit the coverage of skills anticipation and impact of sectoral skills development strategies, and which may require other approaches. For instance, in the Construction Industry Roadmap, there is an estimated 30,000 to 45,000 unlicensed contractors. These unlicensed contractors can be assumed to be the smaller players which financial capability and technical experience cannot be ascertained compared to PCAB licensed contractors. Since these unlicensed contractors are outside the scope of regulation, their level of compliance to building and safety standards cannot be assured. This can also have some implications on skills when their workers may not have the necessary training, such as on construction occupational safety and health.
- There is also a need for more qualitative methods to probe more into sector-specific employment concerns and practices. This can also aid in the design of future surveys.

8.2. Recommendations

Given the identified issues and policy implication of the survey results, the recommendations are the following:

4. On skills supply

- On promoting equity in and access to training opportunities
 - Measures can be focused on adult learners, low skill workers, and mid-career or older workers that need to reskill and upskill. These should consider responsiveness to the diverse profiles of workers in terms of age and experience and as they possibly shift careers (World Bank 2018).
 - Industry-wide training initiatives can be oriented towards developing a talent pipeline or pool given the inefficiency of letting individual firms address training and development issues, and the mostly project-based nature of construction employment. If construction firms will have initiatives on skills development, the scope and benefits may only be limited to non-project based workers or those under direct employment of the firms. This may result to suboptimal results for the industry as a whole since a major share of industry employment is actually project-based, and project-based workers may be left behind in terms of skills development.
- On ensuring industry/job relevance of training content for technical skills
 - In light of the possible limitations of formal training, explore and assess alternative training interventions in partnership with firms, such as work-based learning programs and integrated education and training models. This may also involve encouraging employers to provide more on-the-job training and to partner with technical training providers (World Bank 2018).
 - Strengthen the Recognition of Prior Learning (RPL) in the sector.
- On addressing gaps in core skills
 - Improve the delivery and assessment of core skills so that these skills are adequately developed by the TVET and skills system. The survey results points to the importance of soft skills to address poor performance. This includes behavioral skills and socio-emotional skills. In the basic, common and core skills or competencies required of critical occupations, the companies also identified soft skills such as problem solving; teamwork and effective communication skills; leadership and management skills; willingness to Learn; and adaptability and flexibility. These fall under core work or core employability skills⁵ (Brewer

⁵ Core work or core employability skills are defined as “... the skills, knowledge and competencies that enhance a worker’s ability to secure and retain a job, progress at work and cope with change, secure another job if he/she so wishes or has been laid off and enter more easily into the labour market at different periods of the life cycle. Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem solving, information and

and Comyn 2015). While core skills along with foundational skills are often aimed to be developed through the basic or general education, the TVET and skills system also play an equally important role in the development of core skills. Through the TVET and skills system, adult learners can also be provided opportunities to improve their core skills for employability (Brewer and Comyn 2015). However, the development of core skills is not yet sufficiently supported by many TVET systems (Marope, Chakroun, and Holmes 2015).

- In the Philippines, there are basic competencies that are required components of all TVET programs under TESDA Training Regulations. There are nine core skill areas, with 45 individual units of competency positioned at the different PQF levels (NC I to V) (TESDA 2019). However, in an assessment of country systems and practices (Brewer and Comyn 2015), the Philippines is considered to have partial integration of the basic competencies in the TVET system because many privately provided training programs are noncompliant with TESDA training regulations. With regards to the mapping, revision and/or development of delivery, assessment and reporting practices, while the Philippines has delivery and assessment tools, institutional assessment, and institutional reporting, there is no standardized national-level system for the assessment and reporting of core skills achievement (e.g., how core skills are present in delivery and assessment practices; to what extent core skills have been internalized by TVET students and graduates), to determine to what extent and which core skills are meaningfully addressed in the delivery of training. On professional development of teachers, trainers, and institution managers, while there are programs in place, it is not a mandatory requirement for trainers and teachers to have professional development on core skills delivery. There is also weak monitoring and evaluation or impact assessment of the implementation of programs for core skills for employability.
- Address perennial issues with regards to the preparedness, capacity and quality of Philippine TVET system in terms of infrastructure and operational mechanism (TESDA 2018). For instance, there is the lack of training providers and assessors for certain construction NCs. Even when companies are ready to undertake formal training for staff, especially when certain qualifications like on construction safety is required for authorities to grant operation permits, there is a lack of training providers and assessors in some regions.
- Examine further the employment and skills development among subcontractors, since these firms are responsible for the supply of specialist skills (Myers 2008).

5. On skills demand

- On creating jobs and promoting demand for high skill workers in the sector
 - Further analyze the drivers of and obstacles to innovation and adoption of technology faced by companies. This is to promote efficient and cost-effective

communications technology (ICT) and communication and language skills. This combination of skills enables them to adapt to changes in the world of work.” (ILO Recommendation 195 or Human Resources Development Recommendation, 2004, as cited in (Brewer 2013))

training interventions to support the adoption of modern, efficient and sustainable technologies, since the challenges to this may come from outside of the skills system (Hentschel 2017).

- On the recognition and valuation of skills by employers
 - Examine further the recognition and valuation of skills by employers. While the policy direction is to utilize reliable and efficient assessment methods primarily through Philippine TVET Competency Assessment and Certification System (PTCACS), there is the low uptake of NC holders in the sector as reflected in the low proportion of jobs requiring at least an NC qualification to do the job, and the existing workforce that are TVET graduates, with or without achieving a qualification.
- Strengthen human resource management and capacity of construction firms
 - Firms need to have adequate human resources systems and staff (human resource specialists or practitioners) in place to be able to assess skills needs and more effectively acquire staff through hiring and recruitment and/or training and development. However, many smaller contractors do not have dedicated HR units or staff, or do not have mature HR systems and processes.
- Explore both top-down and bottom-up approaches in the formulation of the skills agenda for the sector, at the industry, firm and individual/worker levels.
 - Top-down industry level approach are needed since the labor market structure in the construction sector present barriers to skills development (Watson and Sharp 2007). The structure of the labor market is due to the nature of the sector, being cyclical (or easily affected by economic cycles), potential to be highly affected by government directives (e.g., priorities on public infrastructure, regulations), and operations being mostly project-based. This gives rise to more short-term and project-based employment. With this type of employment, there is less incentive for employers to provide training since there is no guarantee of training benefits to accrue to their firm when the employment relationship ends with the project.
 - Meanwhile, there is also a need for bottom-up approaches so that views from the ground will feed into national and industry-level strategies and interventions. For this, both employers and workers must be capacitated in analyzing, identifying, and voicing out their skills needs and issues (Chan and Dainty 2007).
 - Some possible venues or mechanisms for these are industry associations and industry tripartite councils. There are Construction Industry Tripartite Councils at the national and regional levels. While the formulation of the industry roadmap is an important step, there are opportunities in increasing the cohesion of the construction industry, such as higher membership in industry associations. This is for improved ability of the sector to aggregate its concerns, such as on human resource and training, and to coordinate sector-wide solutions.
 - On the other hand, workers' organizations should also be strengthened and utilized as channels to coordinate skills and human resource interventions, which may be difficult to do when workers have less cohesion due to the mostly project-based and short-term nature of employment in the construction sector. In view of this, guilds or associations by trade or occupation can be promoted.

6. On improving skills assessments

- Establish and coordinate a national framework and system for skills needs anticipation. This is to promote the sustainability, efficiency and usefulness of skills anticipation activities like this survey. This can also be an opportunity to streamline and improve coherence of the wider LMIS, given the various sources from official statistics and surveys, administrative data, and potentially big data.
- As previously mentioned, the results capture the perspectives and outlook of the respondents at the time of the survey, which was before the advent of the COVID-19 pandemic. At the time, the outlook for the sector is generally positive, primarily driven by the government's priority and direction for the sector in the short to medium term following its massive infrastructure program. However, the perspectives and outlook of the sector's stakeholders may no longer be the same after the advent of the pandemic, due to its pervasive impacts on the country's economic and economic activity including in construction. Hence, the survey results such as on the signals and directions on skills demand may no longer hold at the time of publication.
- As a way forward, authorities may seek feedback from the stakeholders on the specific ways that the COVID-19 pandemic is affecting and skills demand and development in the sector.

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10. Annex A: Description of Data Annex

This describes the contents of the data annex, according to each **folder**:

- 1) **Data**
 - a) **Datasets**
 - i) Raw dataset (.csv and .dta Stata data file, output from SurveyCTO)
 - ii) Clean dataset (.dta Stata data file, in long and wide format)
 - b) **Questionnaire (paper form & SurveyCTO print-out)**
 - c) **Questionnaire files (SurveyCTO survey form design files)**
- 2) **Codes**
 - a) *00 to execute all do-files.do* - This do-file can be executed to automate production of clean dataset and data tables of results, and easily update these when there are additional responses
 - b) *01 Stata code to export data from SurveyCTO.do* – Template code from SurveyCTO to convert exported results dataset in the default .csv format into a Stata data file (.dta)
 - c) *02 data preparation.do* – Do-file to produce clean dataset from the raw dataset, in wide and long formats
 - d) *03 data analysis.do* – Do-file to produce data tables of survey results per section and item
- 3) **Figures** – contains data tables that are raw Stata output, and the formatted and cleaned data tables

11. Annex B: Additional Tables

Table 31. PCAB Categorization Classification Table, based on PCAB Board Resolution No. 201, Series of 2017

| Classification | Category | Minimum Qualification Requirements | | | | | |
|---|---------------|------------------------------------|---------------|--|-----------------------|-----------------------|---------------------------------|
| | | (1) *Financial Capacity | | (2) **Sustaining Technical Employee (STE) Construction Experience | | | (3) ***Overall Credit Points |
| | | Minimum Networth / Equity (₱) | Credit Points | Individual (years) | Aggregate (man-years) | Minimum Credit Points | |
| A. GENERAL ENGINEERING GE-1 (Road, Highways, Pavement, Railways, Airport Horizontal Structure, and Bridges) GE-2 (Irrigation or Flood Control) GE-3 (Dam, Reservoir or Tunneling) GE-4 (Water Supply) GE-5 (Port, Harbor or Offshore Engineering) | AAAA | 1,000,000,000.00 | 10,000.00 | 10 | 60 | 300 | 10,300.00 |
| | AAA | 180,000,000.00 | 1,800.00 | 10 | 60 | 300 | 2,850.00 |
| | AA | 90,000,000.00 | 900.00 | 10 | 50 | 250 | 1,365.15 |
| | A | 30,000,000.00 | 300.00 | 7 | 21 | 105 | 475.00 |
| | B | 10,000,000.00 | 100.00 | 5 | 10 | 50 | 177.50 |
| | C | 6,000,000.00 | 60.00 | 3 | 3 | 15 | 105.50 |
| | D | 2,000,000.00 | 20.00 | 3 | 3 | 15 | 35.00 |
| | AAAA | 1,000,000,000.00 | 10,000.00 | 10 | 60 | 300 | 10,300.00 |
| | AAA | 180,000,000.00 | 1,800.00 | 10 | 60 | 300 | 2,810.00 |
| | AA | 90,000,000.00 | 900.00 | 10 | 50 | 250 | 1,345.00 |
| A | 30,000,000.00 | 300.00 | 7 | 21 | 105 | 471.00 | |
| B | 10,000,000.00 | 100.00 | 5 | 10 | 50 | 175.50 | |
| C | 6,000,000.00 | 60.00 | 3 | 3 | 15 | 96.50 | |
| D | 2,000,000.00 | 20.00 | 3 | 3 | 15 | 35.00 | |
| C. SPECIALTY SP-FW (Foundation Work) SP-SS (Structural Steel Work) SP-CC (Concrete Pre-casting, Pre-Stressing or Post-tensioning) SP-PS (Plumbing & Sanitary Work) SP-EE (Electrical Work) SP-ME (Mechanical Work) SP-AC (Air-conditioning or Refrigeration) SP-ES (Elevator or Escalator) SP-FP (Fire Protection Work) SP-WP (Waterproofing Work) | AAAA | 1,000,000,000.00 | 10,000.00 | 10 | 60 | 300 | 10,300.00 |
| | AAA | 180,000,000.00 | 1,800.00 | 10 | 60 | 300 | 2,410.00 |
| | AA | 90,000,000.00 | 900.00 | 10 | 50 | 250 | 1,145.00 |
| | A | 30,000,000.00 | 300.00 | 7 | 21 | 105 | 421.00 |
| | B | 10,000,000.00 | 100.00 | 5 | 10 | 50 | 165.50 |
| | C | 6,000,000.00 | 60.00 | 3 | 3 | 15 | 90.50 |
| | D | 2,000,000.00 | 20.00 | 3 | 3 | 15 | 35.00 |

| | | | | | | | |
|--|---------|------------|------|------|------|------|------|
| SP-PN (Painting Work) | | | | | | | |
| SP-WD (Well-Drilling Work) | | | | | | | |
| SP-CF (Communication Facilities) | | | | | | | |
| SP-MS (Metal Roofing & Siding Installation) | | | | | | | |
| SP-SD (Structural Demolition) | | | | | | | |
| SP-LS (Landscaping) | | | | | | | |
| SP-EM (Electro Mechanical Work) | | | | | | | |
| SP-NF (Navigational Facilities) | | | | | | | |
| D. SP-TRADE | Trade/E | 100,000.00 | 1.00 | none | none | none | 1.00 |
| <p>* Minimum Qualification Requirements for Principal Classification ** For Other Classification/s, Minimum of 3 Years Actual Construction Experience *** Overall credit points inclusive of Equipment Capacity (1 point/P100Th); Experience of Firm (10 points/year of active existence); and 1 point/P100Th of 3 year Average Annual Volume of Work Accomplished; and COMTCP points if STEs are COMTCP certified</p> | | | | | | | |

Table 32. Distribution of Training Regulations for Existing Occupations, Monthly-Paid, with NCs as Required Qualification - List per Occupation

| | |
|---|-------|
| Construction Managers | % |
| Masonry NC I | 3.6 |
| Plumbing NC I | 3.6 |
| Shielded Metal Arc Welding (SMAW) NC I | 3.6 |
| Carpentry NC II | 3.6 |
| Heavy Equipment Operation (Bulldozer) NC II | 3.6 |
| Heavy Equipment Servicing (Mechanical) NC II | 3.6 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 3.6 |
| Masonry NC II | 3.6 |
| Pipefitting NC II | 3.6 |
| Plumbing NC II | 3.6 |
| Shielded Metal Arc Welding (SMAW) NC II | 3.6 |
| Construction Supervisors | % |
| Carpentry NC II | 6.3 |
| Masonry NC II | 6.3 |
| Shielded Metal Arc Welding (SMAW) NC II | 6.3 |
| Carpenters and Joiners | % |
| Carpentry NC II | 100.0 |
| Plumbers and Pipe Fitters | % |
| Pipefitting NC II | 100.0 |
| Air Conditioning and Refrigeration Mechanics | % |
| RAC Servicing (DomRAC) NC II | 100.0 |
| Painters and Related Workers | % |
| Construction Painting NC II | 50.0 |
| Welders and Flame Cutters | % |
| Gas Metal Arc Welding (GMAW) NC II | 50.0 |
| Gas Tungsten Arc Welding (GTAW) NC II | 50.0 |
| Shielded Metal Arc Welding (SMAW) NC II | 100.0 |
| Heavy Equipment Mechanics | % |
| Heavy Equipment Servicing (Mechanical) NC II | 100.0 |
| Safety Officers | % |

| | |
|---|-----|
| Carpentry NC II | 5.3 |
| Construction Painting NC II | 5.3 |
| Masonry NC II | 5.3 |
| Pipefitting NC II | 5.3 |
| Plumbing NC II | 5.3 |
| Scaffolding Works NC II (Supported Type Scaffold) | 5.3 |
| Shielded Metal Arc Welding (SMAW) NC II | 5.3 |
| Structural Erection NC II | 5.3 |
| Submerged Arc Welding (SAW) NC II | 5.3 |

Table 33. Distribution of Training Regulations for Existing Occupations, Daily-Paid, with NCs as Required Qualification - List per Occupation

| | |
|---|----------|
| Civil Engineers | % |
| Shielded Metal Arc Welding (SMAW) NC II | 14.3 |
| Project Engineers | % |
| HEO (Crawler Crane) NC II | 16.7 |
| HEO (Gantry Crane) NC II | 16.7 |
| Construction Supervisors | % |
| Scaffolding Works NC II (Supported Type Scaffold) | 16.7 |
| Quality Control Technicians | % |
| Air Duct Servicing NC II | 50.0 |
| Construction Painting NC II | 50.0 |
| Electrical Installation and Maintenance NC II | 50.0 |
| Carpentry NC III | 50.0 |
| Construction Painting NC III | 50.0 |
| Electrical Installation and Maintenance NC III | 50.0 |
| Bricklayers and Related Workers | % |
| Masonry NC II | 25.0 |
| Stonemasons, Stone Cutters, Splitters and Carvers | % |
| Masonry NC I | 8.3 |
| Carpentry NC II | 8.3 |
| Masonry NC II | 41.7 |
| Shielded Metal Arc Welding (SMAW) NC II | 8.3 |
| Masonry NC III | 8.3 |
| Concrete Placers, Concrete Finishers and Related Workers | % |
| Masonry NC II | 12.5 |
| Carpenters and Joiners | % |
| Carpentry NC II | 28.6 |
| HEO (Motor Grader) NC II | 4.8 |
| Masonry NC II | 9.5 |

| | |
|---|----------|
| Carpentry NC III | 9.5 |
| Building Frame and Related Trades Workers Not Elsewhere Classified | % |
| Reinforcing Steel Works NC II | 14.3 |
| Scaffolding Works NC II (Supported Type Scaffold) | 14.3 |
| Floor Layers and Tile Setters | % |
| Tile Setting NC II | 20.0 |
| Tile Setting NC III | 20.0 |
| Plasterers | % |
| Masonry NC II | 20.0 |
| Plumbers and Pipe Fitters | % |
| Pipefitting NC II | 31.3 |
| Plumbing NC II | 43.8 |
| Pv Systems Installation NC II | 6.3 |
| Plumbing NC III | 6.3 |
| Air Conditioning and Refrigeration Mechanics | % |
| Air Duct Servicing NC II | 25.0 |
| Electrical Installation and Maintenance NC II | 25.0 |
| RAC Servicing (DomRAC) NC II | 25.0 |
| RAC Servicing (PACU/CRE) NC III | 25.0 |
| Painters and Related Workers | % |
| Construction Painting NC II | 15.0 |
| Construction Painting NC III | 5.0 |
| Welders and Flame Cutters | % |
| Shielded Metal Arc Welding (SMAW) NC I | 4.8 |
| Submerged Arc Welding (SAW) NC I | 4.8 |
| Flux Cored Arc Welding (FCAW) NC II | 14.3 |
| Gas Metal Arc Welding (GMAW) NC II | 19.0 |
| Gas Tungsten Arc Welding (GTAW) NC II | 23.8 |
| Gas Welding NC II | 9.5 |
| Shielded Metal Arc Welding (SMAW) NC II | 47.6 |
| Submerged Arc Welding (Saw) NC II | 9.5 |

| | |
|---|----------|
| Shielded Metal Arc Welding (SMAW) NC III | 4.8 |
| Shielded Metal Arc Welding (SMAW) NC IV | 4.8 |
| Structural Metal Preparers, Erectors and Related Workers | % |
| Rigging NC I | 12.5 |
| Reinforcing Steel Works NC II | 12.5 |
| Scaffolding Works NC II (Supported Type Scaffold) | 37.5 |
| Shielded Metal Arc Welding (SMAW) NC II | 12.5 |
| Structural Erection NC II | 25.0 |
| Riggers and Cable Splicers | % |
| Rigging NC I | 50.0 |
| Heavy Equipment Mechanics | % |
| Electrical Installation and Maintenance NC II | 7.7 |
| Heavy Equipment Operation (Bulldozer) NC II | 46.2 |
| Heavy Equipment Servicing (Mechanical) NC II | 46.2 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 23.1 |
| HEO (Backhoe Loader) NC II | 30.8 |
| HEO (Crawler Crane) NC II | 15.4 |
| HEO (Forklift) NC II | 23.1 |
| HEO (Gantry Crane) NC II | 15.4 |
| HEO (Hydraulic Excavator) NC II | 30.8 |
| HEO (Motor Grader) NC II | 7.7 |
| HEO (Paver) NC II | 7.7 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 15.4 |
| HEO (Rigid On-Highway Dump Truck) NC II | 15.4 |
| HEO (Road Roller) NC II | 15.4 |
| HEO (Rough Terrain Crane) NC II | 15.4 |
| HEO (Tower Crane) NC II | 15.4 |
| HEO (Truck Mounted Crane) NC II | 15.4 |
| HEO (Wheel Loader) NC II | 15.4 |
| Building and Related Electricians | % |
| Electrical Installation and Maintenance NC II | 64.7 |
| Electrical Installation and Maintenance NC III | 11.8 |
| Earthmoving and Related Plant Operators | % |

| | |
|---|------|
| Heavy Equipment Operation (Bulldozer) NC II | 12.5 |
| HEO (Backhoe Loader) NC II | 25.0 |
| HEO (Crawler Crane) NC II | 12.5 |
| HEO (Forklift) NC II | 12.5 |
| HEO (Hydraulic Excavator) NC II | 12.5 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 12.5 |
| HEO (Rigid On-Highway Dump Truck) NC II | 25.0 |
| HEO (Rough Terrain Crane) NC II | 12.5 |
| HEO (Tower Crane) NC II | 12.5 |
| HEO (Truck Mounted Crane) NC II | 12.5 |
| HEO (Wheel Loader) NC II | 12.5 |

| | |
|---|----------|
| Crane, Hoist and Related Plant Operators | % |
|---|----------|

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 9.1 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 9.1 |
| HEO (Backhoe Loader) NC II | 9.1 |
| HEO (Crawler Crane) NC II | 36.4 |
| HEO (Forklift) NC II | 9.1 |
| HEO (Gantry Crane) NC II | 27.3 |
| HEO (Hydraulic Excavator) NC II | 9.1 |
| HEO (Motor Grader) NC II | 9.1 |
| HEO (Paver) NC II | 9.1 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 9.1 |
| HEO (Rigid On-Highway Dump Truck) NC II | 9.1 |
| HEO (Road Roller) NC II | 9.1 |
| HEO (Rough Terrain Crane) NC II | 27.3 |
| HEO (Tower Crane) NC II | 36.4 |
| HEO (Truck Mounted Crane) NC II | 45.5 |
| HEO (Wheel Loader) NC II | 9.1 |

| | |
|--------------------------------|----------|
| Lifting Truck Operators | % |
|--------------------------------|----------|

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 9.1 |
| Heavy Equipment Servicing (Mechanical) NC II | 9.1 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 9.1 |
| HEO (Backhoe Loader) NC II | 9.1 |
| HEO (Crawler Crane) NC II | 9.1 |
| HEO (Forklift) NC II | 9.1 |
| HEO (Hydraulic Excavator) NC II | 9.1 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 9.1 |
| HEO (Rigid On-Highway Dump Truck) NC II | 18.2 |

| | |
|---------------------------------|------|
| HEO (Road Roller) NC II | 9.1 |
| HEO (Rough Terrain Crane) NC II | 9.1 |
| HEO (Tower Crane) NC II | 9.1 |
| HEO (Truck Mounted Crane) NC II | 18.2 |
| HEO (Wheel Loader) NC II | 9.1 |

Table 34. Distribution of Training Regulations for Critical Occupations with NCs as Required Qualification - List per Occupation

| Supervisor | % |
|--|----------|
| Electrical Installation and Maintenance NC II | 14.3 |
| Gas Metal Arc Welding (GMAW) NC II | 14.3 |
| Pipefitting NC II | 14.3 |
| Shielded Metal Arc Welding (SMAW) NC II | 14.3 |
| Foreman | % |
| Carpentry NC II | 11.1 |
| Electrical Installation and Maintenance NC II | 11.1 |
| Gas Metal Arc Welding (GMAW) NC II | 11.1 |
| Pipefitting NC II | 11.1 |
| Shielded Metal Arc Welding (SMAW) NC II | 11.1 |
| Leadman | % |
| Electrical Installation and Maintenance NC II | 25.0 |
| Pipefitting NC II | 25.0 |
| Heavy Equipment Operator | % |
| Heavy Equipment Operation (Bulldozer) NC II | 41.7 |
| Heavy Equipment Servicing (Mechanical) NC II | 8.3 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 8.3 |
| HEO (Backhoe Loader) NC II | 50.0 |
| HEO (Crawler Crane) NC II | 25.0 |
| HEO (Forklift) NC II | 25.0 |
| HEO (Gantry Crane) NC II | 8.3 |
| HEO (Hydraulic Excavator) NC II | 33.3 |
| HEO (Motor Grader) NC II | 25.0 |
| HEO (Paver) NC II | 25.0 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 25.0 |
| HEO (Rigid On-Highway Dump Truck) NC II | 33.3 |
| HEO (Road Roller) NC II | 25.0 |
| HEO (Rough Terrain Crane) NC II | 25.0 |
| HEO (Tower Crane) NC II | 25.0 |
| HEO (Truck Mounted Crane) NC II | 25.0 |
| HEO (Wheel Loader) NC II | 25.0 |
| Heavy Equipment Mechanic | % |
| Electrical Installation and Maintenance NC II | 11.1 |

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 11.1 |
| Heavy Equipment Servicing (Mechanical) NC II | 44.4 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 11.1 |
| HEO (Backhoe Loader) NC II | 22.2 |
| HEO (Crawler Crane) NC II | 11.1 |
| HEO (Hydraulic Excavator) NC II | 11.1 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 11.1 |
| HEO (Rigid On-Highway Dump Truck) NC II | 11.1 |
| HEO (Road Roller) NC II | 11.1 |
| HEO (Rough Terrain Crane) NC II | 11.1 |
| HEO (Tower Crane) NC II | 11.1 |
| HEO (Wheel Loader) NC II | 11.1 |

| | |
|------------------------------|----------|
| Mobile Crane Operator | % |
|------------------------------|----------|

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 12.5 |
| Heavy Equipment Servicing (Mechanical) NC II | 12.5 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 12.5 |
| HEO (Backhoe Loader) NC II | 12.5 |
| HEO (Crawler Crane) NC II | 25.0 |
| HEO (Forklift) NC II | 12.5 |
| HEO (Gantry Crane) NC II | 12.5 |
| HEO (Hydraulic Excavator) NC II | 12.5 |
| HEO (Motor Grader) NC II | 12.5 |
| HEO (Paver) NC II | 12.5 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 12.5 |
| HEO (Rigid On-Highway Dump Truck) NC II | 12.5 |
| HEO (Road Roller) NC II | 12.5 |
| HEO (Rough Terrain Crane) NC II | 62.5 |
| HEO (Tower Crane) NC II | 12.5 |
| HEO (Truck Mounted Crane) NC II | 62.5 |
| HEO (Wheel Loader) NC II | 12.5 |

| | |
|-------------------------------------|----------|
| Hydraulic Excavator Operator | % |
|-------------------------------------|----------|

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 33.3 |
| Heavy Equipment Servicing (Mechanical) NC II | 33.3 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 33.3 |
| HEO (Backhoe Loader) NC II | 33.3 |
| HEO (Crawler Crane) NC II | 33.3 |
| HEO (Forklift) NC II | 33.3 |
| HEO (Gantry Crane) NC II | 33.3 |
| HEO (Hydraulic Excavator) NC II | 66.7 |
| HEO (Motor Grader) NC II | 33.3 |
| HEO (Paver) NC II | 33.3 |

| | |
|--|------|
| HEO (Rigid Off-Highway Dump Truck) NC II | 33.3 |
| HEO (Rigid On-Highway Dump Truck) NC II | 33.3 |
| HEO (Road Roller) NC II | 33.3 |
| HEO (Rough Terrain Crane) NC II | 33.3 |
| HEO (Tower Crane) NC II | 33.3 |
| HEO (Truck Mounted Crane) NC II | 33.3 |
| HEO (Wheel Loader) NC II | 33.3 |

| | |
|-------------------------------|----------|
| Vibro Machine Operator | % |
|-------------------------------|----------|

| | |
|--|------|
| Heavy Equipment Operation (Bulldozer) NC II | 25.0 |
| Heavy Equipment Servicing (Mechanical) NC II | 25.0 |
| HEO (Articulated Off-Highway Dump Truck) NC II | 25.0 |
| HEO (Backhoe Loader) NC II | 25.0 |
| HEO (Crawler Crane) NC II | 25.0 |
| HEO (Forklift) NC II | 25.0 |
| HEO (Gantry Crane) NC II | 25.0 |
| HEO (Hydraulic Excavator) NC II | 25.0 |
| HEO (Motor Grader) NC II | 25.0 |
| HEO (Paver) NC II | 25.0 |
| HEO (Rigid Off-Highway Dump Truck) NC II | 25.0 |
| HEO (Rigid On-Highway Dump Truck) NC II | 25.0 |
| HEO (Road Roller) NC II | 50.0 |
| HEO (Rough Terrain Crane) NC II | 25.0 |
| HEO (Tower Crane) NC II | 25.0 |
| HEO (Truck Mounted Crane) NC II | 25.0 |
| HEO (Wheel Loader) NC II | 25.0 |

| | |
|---------------|----------|
| Rigger | % |
|---------------|----------|

| | |
|---------------------------------|------|
| Rigging NC I | 83.3 |
| HEO (Truck Mounted Crane) NC II | 16.7 |

| | |
|----------------------------|----------|
| Hydraulic Operators | % |
|----------------------------|----------|

| | |
|---------------------------------|------|
| HEO (Backhoe Loader) NC II | 25.0 |
| HEO (Hydraulic Excavator) NC II | 25.0 |

| | |
|------------------|----------|
| Steel Man | % |
|------------------|----------|

| | |
|-------------------------------|------|
| Reinforcing Steel Works NC II | 16.7 |
| Structural Erection NC II | 16.7 |

| | |
|------------------|----------|
| Carpenter | % |
|------------------|----------|

| | |
|-----------------|------|
| Carpentry NC II | 75.0 |
|-----------------|------|

Tile Setters

| | |
|--------------------|-------|
| Tile Setting NC II | 100.0 |
| Tile Setting NC II | 33.3 |

Rebar

| | |
|--|---|
| | % |
|--|---|

| | |
|---|------|
| Pipefitting NC II | 50.0 |
| Plumbing NC II | 50.0 |
| Reinforcing Steel Works NC II | 50.0 |
| Scaffolding Works NC II (Supported Type Scaffold) | 50.0 |
| Structural Erection NC II | 50.0 |

Scaffolder

| | |
|--|---|
| | % |
|--|---|

| | |
|---|------|
| Scaffolding Works NC II (Supported Type Scaffold) | 87.5 |
|---|------|

Pipefitters

| | |
|--|---|
| | % |
|--|---|

| | |
|-------------------|------|
| Pipefitting NC II | 87.5 |
| Plumbing NC II | 25.0 |

Excavators

| | |
|--|---|
| | % |
|--|---|

| | |
|---------------------------------|------|
| HEO (Backhoe Loader) NC II | 33.3 |
| HEO (Hydraulic Excavator) NC II | 33.3 |

Electrician

| | |
|--|---|
| | % |
|--|---|

| | |
|---|------|
| Electrical Installation and Maintenance NC II | 50.0 |
|---|------|

Plumber

| | |
|--|---|
| | % |
|--|---|

| | |
|----------------|------|
| Plumbing NC II | 50.0 |
|----------------|------|

Installer


| | |
|--|---|
| | % |
|--|---|

| | |
|-----------------|------|
| Carpentry NC II | 50.0 |
|-----------------|------|

Table 35. Distribution of responses to "In what areas are the following sustainable industry developments relevant to your (current and near future) business needs?"

| Industry Development | Knowledge | | | Skills | | | Competencies | | |
|--|-----------|----------|---------------|--------|----------|---------------|--------------|----------|---------------|
| | Low | Moderate | Highly Needed | Low | Moderate | Highly Needed | Low | Moderate | Highly Needed |
| Sustainable Construction Standardization | 3.7 | 48.1 | 48.1 | - | 29.6 | 70.4 | - | 25.9 | 74.1 |
| New Technologies Applied To Building Maintenance and Refurbishment | - | 35.3 | 64.7 | - | 41.2 | 58.8 | 5.9 | 41.2 | 52.9 |
| Environmental Labelling | - | 46.2 | 53.8 | 7.7 | 46.2 | 46.2 | - | 53.8 | 46.2 |
| Engineering, Procurement, and Construction (EPC) and Design-Build Capabilities | 9.5 | 42.9 | 47.6 | 4.8 | 47.6 | 47.6 | 4.8 | 42.9 | 52.4 |
| Virtual Design Construction (VDC) | - | 50.0 | 50.0 | - | 37.5 | 62.5 | - | 37.5 | 62.5 |
| Energy Labelling | - | 37.5 | 62.5 | - | 37.5 | 62.5 | - | 37.5 | 62.5 |
| Sustainable Building Certification Systems | 9.1 | 36.4 | 54.5 | 9.1 | 36.4 | 54.5 | 9.1 | 45.5 | 45.5 |
| Selection of Construction Materials and Products In Terms of Sustainability | - | 56.3 | 43.8 | - | 62.5 | 37.5 | - | 56.3 | 43.8 |
| Low Environmental Impact Materials | 6.7 | 33.3 | 60.0 | 6.7 | 46.7 | 46.7 | 6.7 | 40.0 | 53.3 |
| New and Innovative Materials | - | 62.5 | 37.5 | - | 68.8 | 31.3 | - | 56.3 | 43.8 |
| Deconstruction Techniques | 12.5 | 50.0 | 37.5 | 12.5 | 37.5 | 50.0 | 12.5 | 50.0 | 37.5 |
| Prevention of Construction and Demolition Waste (CDW) | 9.1 | 63.6 | 27.3 | 9.1 | 54.5 | 36.4 | 9.1 | 54.5 | 36.4 |
| Reuse and Recycling of CDW | 20.0 | 20.0 | 60.0 | 20.0 | 10.0 | 70.0 | 20.0 | 10.0 | 70.0 |
| Efficient Insulation | 30.0 | 30.0 | 40.0 | 30.0 | 30.0 | 40.0 | 30.0 | 30.0 | 40.0 |
| Efficient Windows | 37.5 | 25.0 | 37.5 | 37.5 | 25.0 | 37.5 | 37.5 | 25.0 | 37.5 |
| Efficient Lighting | 40.0 | 40.0 | 20.0 | 40.0 | 60.0 | - | 40.0 | 60.0 | - |
| Micro-Wind Systems for | 50.0 | 50.0 | - | 50.0 | 50.0 | - | 50.0 | 50.0 | - |

| Industry Development | Knowledge | | | Skills | | | Competencies | | |
|--|-----------|----------|---------------|--------|----------|---------------|--------------|----------|---------------|
| | Low | Moderate | Highly Needed | Low | Moderate | Highly Needed | Low | Moderate | Highly Needed |
| Building Applications | | | | | | | | | |
| Biomass for Water and Space Heating | 50.0 | 50.0 | - | 50.0 | 50.0 | - | 50.0 | 50.0 | - |
| Life Cycle Assessment of Sustainable Construction | - | 66.7 | 33.3 | - | 66.7 | 33.3 | - | 66.7 | 33.3 |
| Life Cycle Costing of Sustainable Construction | - | 50.0 | 50.0 | - | 50.0 | 50.0 | 100.0 | 100.0 | - |
| Integration of Sustainability Criteria In The Design Process | - | 50.0 | 50.0 | - | 50.0 | 50.0 | - | 50.0 | 50.0 |



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