



Digital
Pathways
at Oxford



CSIS Research Report

DIGITAL LITERACY AND SKILLS TOOLKIT IMPLEMENTATION IN INDONESIA: EXPERIENCE AND LESSONS LEARNED FROM SMALL SURVEY

Department of
Economics



DIGITAL LITERACY AND SKILLS TOOLKIT IMPLEMENTATION IN INDONESIA: EXPERIENCE AND LESSONS LEARNED FROM SMALL SURVEY



A Research Report by CSIS Indonesia

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Digital Literacy and Skills Toolkit Implementation in Indonesia: Experience and Lessons Learned from Small Survey

Contents

A. Background.....	4
B. Survey designs and instruments	4
C. General findings and lessons from the surveys	8
D. Digital skills and literacy Toolkit: Findings from pilot survey	21
Pillar 1: Infrastructure and Ecosystem.....	21
Pillar 2: Current state of digital literacy	24
Pillar 3: Digital skills as empowerment.....	31
Pillar 4: Digital skills for jobs	38
E. Further analysis: Digital skills, supply and demand analysis	51
F. Conclusion.....	56
References	58

List of Figures

Figure 1. Comparison between digital pilot survey and the National Socioeconomic Survey (Susenas).....	14
Figure 2. Residential proportion: Pilot survey and <i>Susenas</i> comparison.....	14
Figure 3. Age distribution of pilot survey	15
Figure 4. Proportion of respondents by educational attainment	15
Figure 5. Respondents' job status/spending most time	16
Figure 6. Proportion of respondents by industry.....	16
Figure 7. Sample distribution by occupation	17
Figure 8. Gadget ownership and usage	18
Figure 9. Access to internet.....	18
Figure 10. Firm sample by size and industry	19
Figure 11. Firms by industry (number of firms).....	19
Figure 12. Internet connection availability and types.....	20
Figure 13. Business technological adoption	23
Figure 14. Business technological adoption by firm size	23
Figure 15. Average score of digital literacy indicators	25
Figure 16. Distribution of digital literacy indicators	25
Figure 17. Digital literacy pillar by gender	26
Figure 18. Digital literacy pillar by rural-urban	27
Figure 19. Digital literacy pillar by age group.....	29
Figure 20. Digital literacy pillar by educational background	30
Figure 21. Digital literacy pillar by employment status	30
Figure 22. Empowerment pillar: General findings	31
Figure 23. Empowerment pillar: Digital financial services.....	33
Figure 24. Empowerment pillar: E-commerce	34
Figure 25. Empowerment pillar: Service provider marketplaces	35
Figure 26. Empowerment pillar: Content creating platforms	36
Figure 27. Empowerment pillar: E-learning.....	37
Figure 28. The most and least important digital skills based on business assessments	39

Figure 29. Importance of digital skills in the last five years	40
Figure 30. Firms' digital skills training	41
Figure 31. Firms by skill level	42
Figure 32. Digital skill level by occupation.....	43
Figure 33. Proportion of ICT specialists	44
Figure 34. ICT specialists by sector.....	44
Figure 35. Automation Perception and Routine Task Intensity	46
Figure 36. Using internet at work (percentage of total workers).....	47
Figure 37. Percentage of Indonesian workers who use the internet by province.....	47
Figure 38. Workers using the internet at work by educational level (percentage of total workers at the same educational level).....	48
Figure 39. Digital skill training frequency	51
Figure 40. Digital skills gap analysis using indicators of digital skills supply and demand	52
Figure 41. Digital skills gap within firms	53

List of Tables

Table 1. Pillars, elements, and indicators of the digital skills toolkit.....	2
Table 2. Survey design	4
Table 3. Results of the reliability test of the digital toolkit composing variables	9
Table 4. Broad vs narrow definitions of digital skill	10
Table 5. List of occupations/positions.....	12
Table 6. Pillar 2.....	24
Table 7. The importance of digital skills by educational level.....	49
Table 8. Job-related digital skill level by age group	50
Table 9. Number of vacancies, difficulty of hiring and digital skills gap by occupation, based on firm's assessment.....	54

Executive Summary

In Indonesia, digital skills and literacy are also a key to building resilience when grappling with the COVID-19 pandemic. Workers with digital skills are estimated to have contributed around USD 62.1 billion or 6 percent of GDP in 2019. In 2030, the contribution is projected to contribute around USD 303.4 billion. Indonesia population is more than 270 million in 2022, with this huge potentials for digital skills and literacy development, it is interesting to map and measure the digital skill and literacy development in Indonesia.

To ensure the toolkit and all indicators work accordingly in achieving the toolkit's aims (i.e.: improving the existing measurement and fill the gap from the preceded digital toolkits; providing guidance for a country to optimize the exploration of digital indicators and infrastructures to generate strategic policies for digital economic development; and, exploring the possible use and extension of measurement), a pilot survey is required to test all indicators in the toolkit, and to develop the survey approach and guideline and to complement secondary data for the toolkit. The pilot survey was conducted between October to November 2021 in Greater Jakarta, Indonesia with 500 individuals and 100 firms as target samples. This covers relatively small number of samples and only limited to a specific area.

The pilot survey results highlight some interesting points, i.e.: in terms of infrastructure and ecosystem, firms' technological adoption in Greater Jakarta is still at basic level, concentrating on project management and social media usage. Only few companies employ Industry 4.0 technologies such as Artificial Intelligence. Moreover, there is a significant difference in tech adoption between large enterprises and SMEs.

For literacy pillar, respondents have a quite good grasp of how ICT devices work. Unfortunately, respondents have the lowest scores for communication & collaboration and device security which are essential foundations for the future of jobs and skills. Therefore, a more productive and safer digital environment should be encouraged. In addition, there is a lack of variation in the critical thinking.

Digital skills are most leveraged for commerce-related digital platforms. Most respondents have regularly used e-commerce and service provider marketplaces. More than half of respondents have used digital financial platforms at least once. However, a sizable proportion of respondents is not using content creating and e-learning platforms in meaningful ways. Lack of interests and skills as well expensive internet access are also preventing respondents from taking advantage of the digital platforms to empower people livelihoods.

Lastly, the most sought-after digital skills for all occupations are office suite & project management skills. Most of companies agree that digital skills become more important in the last five years due to high business competition, high standard of product demanded and adjustment with firms' organization/strategy. Basic digital skill is required

across occupations, and it is very necessary for workers to enter the labor market. However, only 38.5 percent of firms conducted digital skills related training.

In terms of the supply for digital skills, the result indicates that the younger age group has a higher digital skill in general, particularly in internet search and content editing compared to older age groups. It also shows that the tertiary sector is the most advanced sector in terms of digital skills, followed by the secondary, and primary sectors.

A. Background

Workers with digital skills in Indonesia are estimated to have contributed Rp 908 trillion (US\$62.1 billion) – or 6% of GDP - in 2019. Additionally, all workers with any level of digital skills (digitally skilled workers) are projected to contribute Rp 4,434 trillion (\$303.4 billion) to Indonesia's GDP by 2030, which is a significant value that could account for 16% of total GDP (Statistics Indonesia, 2020). Digital skills and literacy are key to building resilience when grappling with the COVID-19 pandemic, as well as to other possible economic and social shocks in the future. Digital skills also help workers and organizations adapt to new jobs created by the rapid digitalization of the economy. Meanwhile, digital literacy allows individuals to use the internet in meaningful and beneficial ways, as proven by the massive behavioral shift to online platforms and means when the COVID-19 pandemic hit.

We have developed a digital skills and literacy measurement toolkit with the following aims: (1) to provide a measure for the improvement of digital skills and an analysis of the existing measures adopted by various governments and organizations; (2) to allow a richer analysis because the toolkit covers comprehensive pillars and elements, supply-demand, country, and occupation-level analysis across various levels of digital skills; and (3) to offer flexibility to Indonesia, optimizing the available data and survey implementation.

The proposed digital skills and literacy toolkit comprises three components, which are pillars, elements, and indicators. **There are four analytical pillars included in the proposed toolkit framework to be measured. These are: 1) Infrastructure and ecosystem; 2) Literacy; 3) Empowerment; and 4) Jobs.** These pillars enable us to measure digital skills in a more comprehensive way; and these pillars cover the core policy areas relevant to improving the digital skills in G20 members.

Each pillar has several main elements that act as key factors in this toolkit. Pillar 1 has two elements: ICT sector, access and adoption; and learning and innovation. Pillar 2 has elements of complementarity, familiarity, and security. Pillar 3 has elements regarding the user/consumer and seller; and Pillar 4 has supply and demand as the main element. Furthermore, each element has specific main indicators to be measured. For example: Element 1 in Pillar 1 has three indicators (i.e. ICT trade; ICT access and use; and technological adoption by firms). The complete pillars, elements, and indicators of this toolkit are shown in Table 1.

Table 1. Pillars, elements, and indicators of the digital skills toolkit

Pillars	1 Infrastructure & Ecosystem	2 Literacy	3 Empowerment	4 Jobs
Elements	1.1. ICT sector, access and adoption 1.2. Learning and innovation	2.1. Complementarity 2.2. Familiarity 2.3. Security	3.1 Users/consumers 3.2 Providers/sellers	4.1. Demand for digital skills 4.2. Supply of digital skills
Indicators	1.1.1 ICT trade 1.1.2 ICT access and use 1.1.3 Firm technological adoption 1.2.1 Schools with internet access 1.2.2 Number of universities in the STEM-related QS Ranking 1.2.3 Patents by origin/bn PPP\$	2.1.1 Communication and collaboration 2.1.2 Critical thinking 2.2.1 ICT familiarity 2.2.2 Data literacy 2.3.1 Device security 2.3.2 Personal security	3.1.1 Digital finance user 3.1.2 E-commerce consumer 3.1.3 Marketplace user 3.1.4 E-learning user 3.2.1 Digital finance provider 3.2.2 E-commerce seller 3.2.3 Marketplace provider 3.2.4 Social media 3.2.5 E-learning provider	4.1.1 Most-demanded digital skills 4.1.2 Firm digital skill training 4.1.3 Most digital occupations 4.1.4 Degree of automation and degree of remote working 4.2.1 Proportion of workers who use internet at work 4.2.2 Most-supplied digital skills 4.2.3 Job-related digital skills level 4.2.4 Digital skills training

Source: Compiled by CSIS (2021).

This report discusses the implementation of the pilot toolkit with a small sample in Greater Jakarta. The surveys were conducted among individuals that represent the supply side of digital skills, and among business sectors that represent the demand side. The

pilot surveys aimed to test all indicators in the toolkit, and to ensure that all indicators work accordingly in achieving the toolkit's aims. Thus, the survey results do not represent Indonesia in general.

This survey report will be divided into four parts. First, the report will show the survey designs and instruments. Second, general findings, experiences, and lessons learned from the pilot surveys will be shared to give other countries a complete picture of the toolkit process and survey implementation. Third, detailed findings on the profile of individual and firm respondents will be provided. Furthermore, a deep dive into each of the pillars and elements in the toolkit will be undertaken to discuss the results of each indicator from the surveys. Thus, the structure of this part follows the digital skills toolkit, based on the four pillars mentioned. Finally, the report will provide a further analysis on digital skills, both from the supply and demand perspective.

B. Survey designs and instruments

To achieve the aforementioned aims, two small-scale surveys were conducted, covering individuals and businesses. These surveys were intended to capture information not available from secondary data. They were also conducted to test whether certain indicators from the toolkit can be captured by the instruments of the surveys. Given these purposes, the surveys were designed to ensure that they cover the variation of the population of interest and were also able to provide sufficient statistics that can draw consistent parameters for building reliable indicators.

In the individual survey, information from individuals aged 15 years old or older was collected. The population residing in the Greater Jakarta area was also sampled. It is worth noting that this population sample is more urbanized, has access to better digital infrastructure and better human resources than the rest of the country. In the firm survey, better digital infrastructure in Greater Jakarta may have affected the quality of a firm's performance; meaning firms in Greater Jakarta may require higher digital skill levels. Thus, the results may have potentially been biased upward in regard to the digital skills in Indonesia. Yet, the results may provide enough variation to test the instruments. The sampling frame is accredited to the National Socio-Economic Survey (*Susenas*), which is one of the largest population surveys conducted by Statistics Indonesia. A multistage random sampling was then used, in which the population was divided into 12 districts. Samples proportionate to the distribution of the population in these 12 districts were allocated. Thus, the sample is representative of the Greater Jakarta area.

In the firm survey, businesses located in Greater Jakarta were initially sampled. Large firms were intentionally oversampled to capture as many jobs and occupations as possible. As Indonesia does not have a population list of operating businesses, purposive sampling was used in the sampling approach for the firm survey. Table 2 describes the survey design in more detail.

Table 2. Survey design

Criteria	Individual	Firm
Population	Working age population (above 15 years of age)	1. Chemicals and pharmaceuticals 2. Computers and electronics 3. IT services and telco 4. Finance and insurance 5. Law and accountancy services 6. Wholesale and retail 7. Transport equipment 8. Manufacturing: light manufacturing
Survey Location	Greater Jakarta	Greater Jakarta
Sampling Method	Multistage random sampling → grouped proportionately according to gender	Purposive sampling

Target Sample	500	100
Sample Characteristics	Gender proportion (50:50)	<ul style="list-style-type: none"> Firms that have legal entity Size: medium and large enterprises
Interview Method	Face-to-face interview	Drop-off and pick-up method using two modules of questionnaire: General module and occupation module, an online survey was also prepared mainly for medium and large firms

Instruments

INDIVIDUAL SURVEY

The individual survey questionnaire was divided into four sections.

Section A: General information, job status, and access to information and communication technology. Section A records the location of individuals. Information on basic socio-demographic and some economic characteristics of selected respondents was collected. Educational, marital, work, and employment status was included in this section. Questions were also asked regarding the ownership of digital device/s and a general assessment of internet speed.

Section B: Literacy and empowerment. In this section, respondents were provided with statements and were asked to what extent they agreed (or disagreed) with such statements. The statements covered aspects of communication and collaboration; critical thinking; data literacy; ICT familiarity; device security; and personal security. On the topic of empowerment, information regarding access to digital financial services; knowledge of online marketplaces; the use of social media; and online learning were also inquired about.

Section C: Jobs and innovation. In this section, information about job environment and activity was collected. Self-assessment of a respondent's degree of aptitude in utilizing certain digital technologies and software was also provided. Following this, the skills were classified into intermediate and advanced digital skills.

Section D: Digital skill training and certification. Respondents were asked the amount of digital-related training or certification they had attended or received. Information was also gathered on whether such training was conducted through digital platforms.

FIRM SURVEY

The firm survey questionnaire was divided into two modules, i.e., General and occupation modules.

The general module had three sections, i.e.:

Section A: Firm identification. Section A presented the firm's general information, information on business sector, enterprise size, and the number of workers based on gender, job status, and highest educational attainment. Questions were also asked regarding the year of establishment and share of ownership.

Section B: ICT adoption for businesses. Information related to digital access and internet connection was sought. Self-assessment of the frequency of certain digital skill or software use by each firm was also provided. The Likert scale was used for answers. Questions on challenges firms faced in adopting digital technology were also asked.

Section C: Digital skills condition analysis and training. In this section, information on the digital skills gap, its effects, and a firm's strategies when addressing the gap was collected. Information on digital skills/specific software utilized by firms was also gathered. In addition to this, information on ICT specialist workers (as part of digitally advanced workers), whether the firm outsourced certain types of work that require ICT specialists, and training provided by the firms for those ICT specialists was accumulated.

The occupation module was divided into five sections, i.e.:

Section A: Occupancy list and job vacancies. The number of vacancies for relevant occupations and the educational background required were examined. Self-assessment of the difficulty level of filling these vacancies was also provided. The Likert scale was used to measure the difficulty level: from 1 being 'very difficult', to 5 being 'very easy'.

Section B: Importance of digital skills in occupation. The importance of digital skills in performing certain occupations was examined. The Likert scale was used to measure the difficulty level: from 1 being 'not very important', to 5 being 'very important'.

Section C: Digital skills assessment in firms. A self-assessment matrix on the improvements needed in certain digital skills for an existing/current occupation was provided. The Likert scale was used to measure the improvements: 1 being 'needs huge improvement', 2 being 'needs moderate improvement', 3 'needs small improvement', and 4 being 'no need for improvement/the employee's skills are in accordance with the firms' needs'.

Section D: Digital training programs for employees. The frequency of training conducted by the firm was explored. A score was used to measure frequency: with 1 being 'never', 2 'just once', 3 'occasionally', and 4 'very frequently'.

Section E: Automation at the occupation level. This examined the automation in relevant occupations, using - as proxies - tasks that are required namely, (1) data entry, verifying accuracy of data, or calculations; (2) sorting, picking, or assembling things; and (3) the possibility of working from home; as well as the automation intensity. The answers were in a score that ranged from 1 – 5, with 1 being 'disagree', 2 'slightly disagree', 3 'neither agree nor disagree', 4 'slightly agree', and 5 'agree'.

C. General findings and lessons from the surveys

The surveys were conducted in Greater Jakarta from October to November 2021. The individual survey targeted 500 individuals, while the firm survey collected a sample of 100 firms. In general, these surveys reflected Greater Jakarta's current conditions. To select 500 individuals, a multistage random sampling grouped by region and gender was used, where the proportion of respondents per region was in accordance to the *Susenas* proportion, while the proportion of respondents per gender was balanced (50:50). For the firm survey, a purposive sampling method that considered the firm size and legal entity was used, where more medium and large firms were involved in the survey, given the complexity of occupations and digital skills. It is important to note that the main purpose of the surveys leaned more toward testing the instruments available in the toolkit rather than the provision of a representative image of Indonesia.

There are certain differences between Greater Jakarta and Indonesia on average. Firstly, the level of human resources in Greater Jakarta is above the average human resources in Indonesia. According to Statistics Indonesia (2020), the human development index (HDI) in Jakarta is 80.77, which is higher than Indonesia's average HDI of 71.94. Secondly, digital infrastructure is better on Java Island, specifically in Greater Jakarta. This is evident as internet speed in Jakarta can reach up to 10 Mbps, which is faster than that of other regions (*The Jakarta Globe*, 2020).

Thirdly, the fact that quite a few firms have their headquarters in Greater Jakarta was an advantage for this survey; the survey tried to cover firms that have a wide range of occupations in order to provide more comprehensive supply-side figures. However, the distinction between firms located in Greater Jakarta and those located outside Greater Jakarta is significant in terms of digital access and usage. Additionally, the number of samples for each industry was also relatively small. For example: the mining and quarrying, and water-supply industries were each represented by one respondent while there were only three respondents in construction, transportation, and storage. There were some possible biases that may have arisen from regional and industry/sector selection, as well as the level of firms' digital adoption. Thus, the analysis results represent Greater Jakarta conditions, but not Indonesia in general.

Despite the small sample in the individual survey, reliable indicators based on the instrument items were successfully gathered, particularly on the literacy and empowerment pillars. Using Cronbach's Alpha method,¹ it can be concluded that most of the variables were reliable, except for the e-commerce variable (as shown in Table 3).

¹ Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. The degree to which a test is reliable is determined by its stability, consistency, predictability, and accuracy. High-reliability measurements are those that generate reliable data. The rule of thumb of this test is: a variable is reliable if the minimum Cronbach's alpha value is 0.5; otherwise, it is deemed as unreliable (i.e. if the Cronbach's alpha value is less than 0.5).

Table 3. Results of the reliability test of the digital toolkit composing variables

Variable	Cronbach's Alpha	Decision
Communication and collaboration	0.83	Reliable
Critical thinking	0.68	Reliable
Data literacy	0.92	Reliable
ICT familiarity	0.91	Reliable
Device security	0.70	Reliable
Personal security	0.79	Reliable
Digital financial services	0.53	Reliable
E-commerce	0.43	Unreliable
Content creating	0.56	Reliable
Services provider marketplace	0.70	Reliable
E-learning	0.50	Reliable

Source: CSIS Survey (2021).

Experiences and lessons learned

This part discusses a few lessons learned that can be derived from the pilot survey. It may be useful for other countries to take notes and improve the survey framework, design, and implementation when seeking to implement the toolkit.

Broad vs narrow definition of digital skills toolkit

A digital skills toolkit has at least two definitions. Firstly, the narrow definition affirms that the toolkit measures digital skills and literacy in only one specific aspect, such as livelihood or development. For example: if the scope of the toolkit is digital skills and literacy in development, then the measurement will only focus on skills needed for innovation purposes, such as data analysis, coding, artificial intelligence (AI), and so on.

Secondly, the broad definition of digital skills asserts that this toolkit measures all aspects of digital skills and literacy, including the use of digital technology for both livelihood and developing the technology itself (innovation purposes). For example, the technology used in work, commerce, and creating a program, as well as the skills needed in ICT specialist professions. Both broad and narrow definitions of digital skills have some advantages and disadvantages simultaneously, as indicated in Table 4 below.

Table 4. Broad vs narrow definitions of digital skill

Aspect	Option A: Broad Definition	Option B: Narrow Definition
Use of analysis	To measure G20 countries' level of competencies in the digital era and capture the general pattern in skills transformation. To design a specific program, a further research is needed in each country.	To identify specific skills gap to help policy makers formulate certain program in order to address gap. The result of toolkit analysis is expected to help regulators directly design the required program.
Depth of analysis	The toolkit will not describe in detail the conditions and statistics of each specific task, job, and occupation. Example: capturing the overview of citizen skills in using technology, both for livelihood and develop the technology itself.	The toolkit will deep dive into skills needed in certain task, job, and occupation. Example: focus on measuring the competence of citizens in developing technology (using ICT as an engine to innovate) or using technology in daily life (e.g. work or commerce)
Indicators	Indicators that measure digital skills in a broad definition are, in general, available in global databases, such as PISA scores, number of internet users per country, etc. Unfortunately, this only provides a piece of surface-level information. Using broad definition means the survey will have a limited number of questions since there is no need to dig deeper on specific skills.	Since it uses a narrow definition of digital skills, more specific indicators are needed to obtain more in-depth information. This information may not yet be available in national or international databases, so it is crucial to extract more information from surveys. Consequently, the questions in the questionnaire, for both individuals and companies, maybe longer. The length of the questionnaire can also affect the cost of the survey. Example: How many people in the country are familiar with the data management system? How many people have a data analyst certification?
G20 countries level of acceptance	As the previous toolkit (Digital Economy Toolkit 2018) was built on existing indicators and methodologies and was well-received by G20 countries, a toolkit using a broad definition might have higher political support considering the various stages of technological development among G20 countries. Broad definition enables countries to track progress over time and identify skills gaps in general.	Using narrow definition means we need to decide which part is further examined, whether digital skills in livelihoods or digital skills in advancing ICT. The focus of every country might be different, and hence, it might influence their support to implement this toolkit. The preventive action is working closely with G20 officials in intensive consultation when developing this toolkit, however, this strategy will be more time-consuming.
Resources allocation	More information is available so that resource allocation is more efficient.	More focused resources are needed. As specific information regarding the narrow definition of digital skill is limited, more resources are needed to explore the issue.

Source: compiled by CSIS (2021)

Since this toolkit is a preliminary step toward capturing development levels in G20 members, it is important to have a comprehensive view. Hence, the broad definition is more appropriate for this initial step in order to measure the level of competencies and to capture digital skills transformation. The broad definition may also encompass the narrow definition, particularly for some pillars – by conducting individual and firm surveys to collect the data for Pillars 2-4. Thus, this toolkit can be used to further analyze workers' digital skills and empowerment.

Flow vs stock variables

A flow variable refers to a variable that is measured over a period or per unit of time; meanwhile, a stock variable is that which is measured at a point in time. It is better to use either stock or flow for consistency of indicators in this toolkit. Yet, this toolkit uses a combination of stock and flow variables. Most indicators in this toolkit are stock variables, for example: schools with internet access in Pillar 1, digital literacy score in Pillar 2, share of internet users in Pillar 3, and proportion of workers who use the internet at work in Pillar 4. Meanwhile, flow variables are also used, such as ICT goods as a percentage of total exports and imports. Moreover, some indicators based on secondary data such as the proportion of workers who use the internet at work are commonly published annually in stock form.

As this toolkit is an initial step, combining stock and flow variables can provide a better measurement of digital skills development in a country. After an initial condition is identified comprehensively, this toolkit can explore the possibility to use either flow or stock variables for uniformity.

Major vs detailed occupation lists

The International Labor Organization (ILO, 2010) defines an occupation as a set of jobs whose main tasks and duties are characterized by *a high degree of similarity*. Meanwhile, a job is defined as a set of tasks and duties performed, or meant to be performed, by one person, including for an employer or in self-employment. Since an occupation's definition considers a high degree of similarity in performing certain duties/tasks, the occupation approach provides a better analysis than the sectoral/industry approach. This is because each industry will have a wide range of occupations that require different levels of digital skills and educational backgrounds.

The ISCO-88² foregrounds nine major occupational groups,³ excluding the armed forces. One of the drawbacks of using a major group is that it is too broad, where IT specialists or other digital-related jobs cannot be captured. The two digits of ISCO-88 can capture ICT professionals (ISCO code 25), but the number of sub-major groups is

² International Standard Classification of Occupations, 1988 (ISCO-88).

³ 9 major occupations: (1) managers; (2) professionals; (3) technicians and associate professionals; (4) clerical support workers; (5) service and sales workers; (6) skilled agricultural, forestry and fisheries workers; (7) craft and related trades workers; (8) plant and machine operators and assemblers; and (9) elementary occupation.

around 40 occupations. Consequently, it would be a burden for a firm to participate in and fill the questionnaire.

This toolkit approach combines a major group with selected sub-major groups, aiming to get a broad picture of general occupations while simultaneously seeking to obtain details about particular occupations that use digital technology. For example, accountants that may use accounting and financial analysis software skills (Sage 50 Accounting, Tax Software, Delphi Tech, Oracle E-business suite). The questionnaire has 17 occupations, as shown in Table 5 below.

Table 5. List of occupations/positions

Manager	
1	Managing directors and chief executives
2	Financial and insurance managers
Professional	
3	Industrial and production engineers
4	Civil engineers
5	Graphic and multimedia designers
6	Accountants
7	Financial analysts
8	Advertising and marketing professionals
9	Web, multimedia, and software developers
Technicians and associated professionals	
10	Technicians and associated professionals
11	Commercial sales representatives
12	Computer network and system technicians
Clerical support workers	
13	General office clerks
14	Secretaries (general)
Craft and related trades workers	
15	Craft and related trades workers
Plant and machine operators, and assemblers	
16	Plant and machine operators, and assemblers
Elementary occupations	
17	Elementary occupations

However, the survey results indicate that many respondents chose other occupations (52.1%) than the ones listed. There are several possible reasons for this, i.e. respondents or enumerators did not know or were confused about the category of their occupations, or their occupations were not included in the selected classifications. Thus, specifying other occupations will help to identify more accurately the categories of respondents' occupations.

Major or detailed occupational implications of skills gap

The choice of occupational classification will have an effect on whether there is a skills gap. Based on the survey results, skills gaps do not appear in occupations that require basic and intermediate levels of digital skills. However, it may be an issue in occupations that necessitate advanced digital skills. Thus, a detailed occupational analysis for a certain digital skill level is needed to enrich the analysis.

Firm self-assessment may not be accurate in measuring the digital skills gap

Based on the firm survey results, most firms agree that the skills required by certain occupations are already in accordance with the skills supplied, or in other words, the digital skills gap does not exist. Yet, this conclusion may be biased because firms commonly conduct a recruitment or selection process to choose the best candidate among a pool of applicants; the best candidate is the individual who has the highest and most suitable digital skills for certain positions. Moreover, firms commonly provide on-the-job training, which includes digital skills training for their new employees; these are part of a firm's efforts to minimize the gap. If the firms are asked to assess the current conditions, the gap may not be present or may be very low.

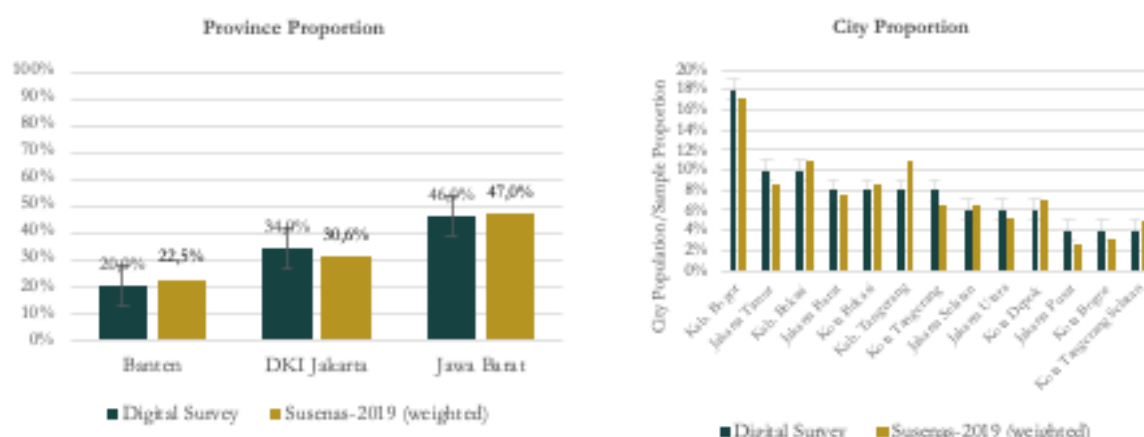
Thus, self-assessment by firms should be supplemented with other data sources to validate the existence of a digital skills gap. Firm surveys that are complemented by individual surveys can provide a better measurement of the skills gap - more specifically, by using individual surveys on fresh graduates that have not received any on-the-job training.

Detailed findings: Demographics and firm characteristics statistics

Individual survey: Demographic

The individual pilot survey was conducted on 500 individuals in Greater Jakarta and the sample formula was based on the data from *Susenas* (2019). Based on *Susenas*, the proportion of respondents who resided in West Java was 46.96%, while 22.47% resided in Banten and around 30% resided in Jakarta itself. By city/regency, Bogor, West Java, had the largest number of respondents (17.26%), followed by Tangerang, Banten, with 10.97%. On the other hand, the municipality of Central Jakarta had the lowest number of respondents (2.7%). This is because it is the smallest area among the municipalities in question, occupying a mere 7.24% of the total Jakarta area (Statistics DKI Jakarta, 2021). The proportion of the pilot survey's respondents per city or province was relatively the same as that of data from *Susenas* 2019 (Figure 1).

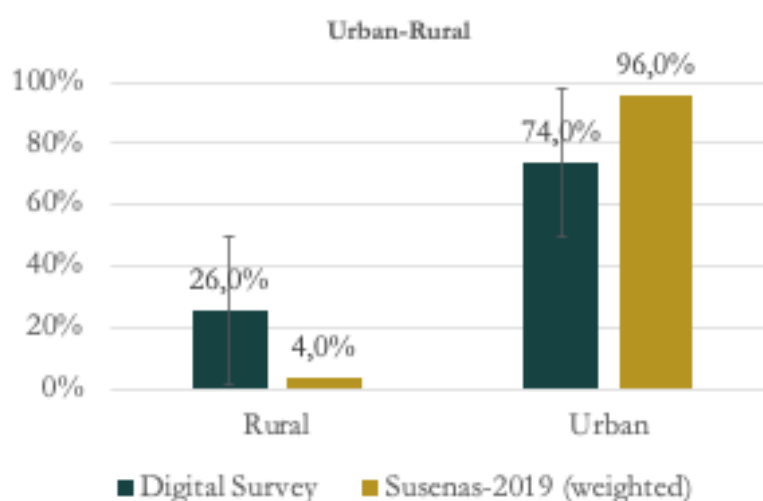
Figure 1. Comparison between digital pilot survey and the National Socioeconomic Survey (Susenas)



Source: CSIS, 2021.

As mentioned earlier, one characteristic of the Greater Jakarta population is that it is more urbanized. However, the survey results indicate that there is a higher proportion of respondents living in rural areas (26%) compared with *Susenas* 2019 data (4%). Hence, rural areas may have been oversampled.

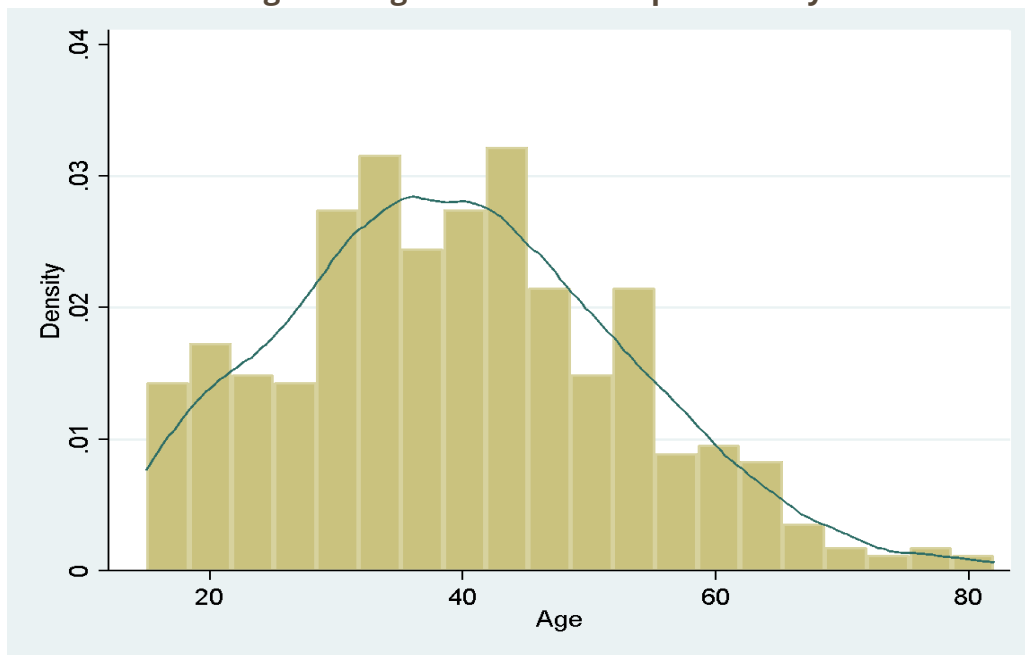
Figure 2. Residential proportion: Pilot survey and *Susenas* comparison



Source: CSIS, 2021.

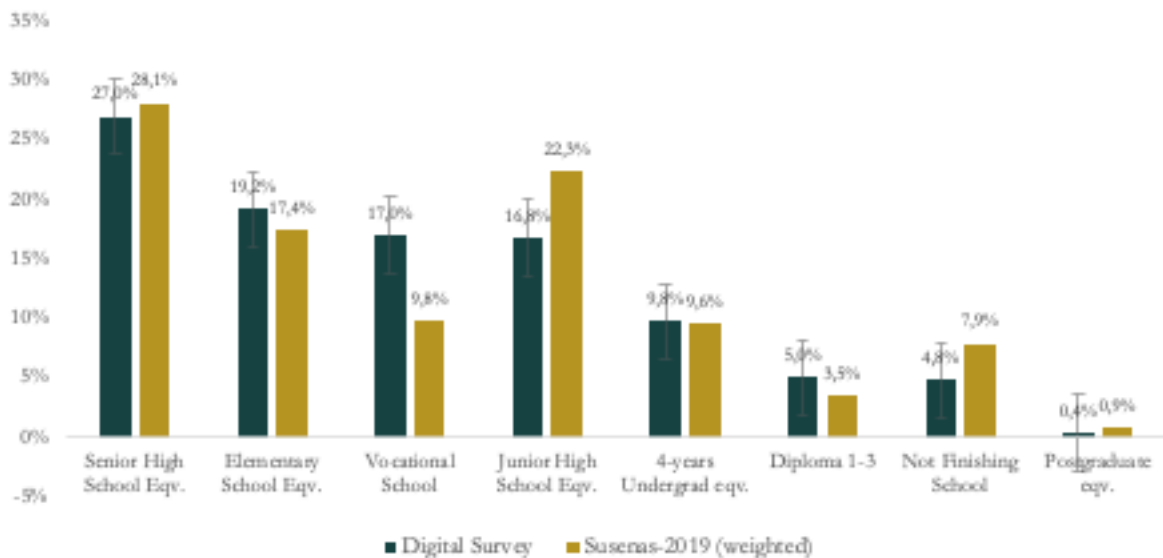
By age distribution, the average age of respondents was around 39 years old (Figure 3), which is slightly higher than the average age in the *Susenas* data (around 36-37 years old). By educational attainment, most respondents in the pilot survey were senior high school graduates who had undergone around 12 years of schooling. This average is higher than the average duration of schooling in Indonesia, which is around 8.2 years or equal to graduating junior high school (UNDP, 2020). This suggests that the level of human resources development in Greater Jakarta is above the average level of human resources development in Indonesia.

Figure 3. Age distribution of pilot survey



Source: CSIS, 2021

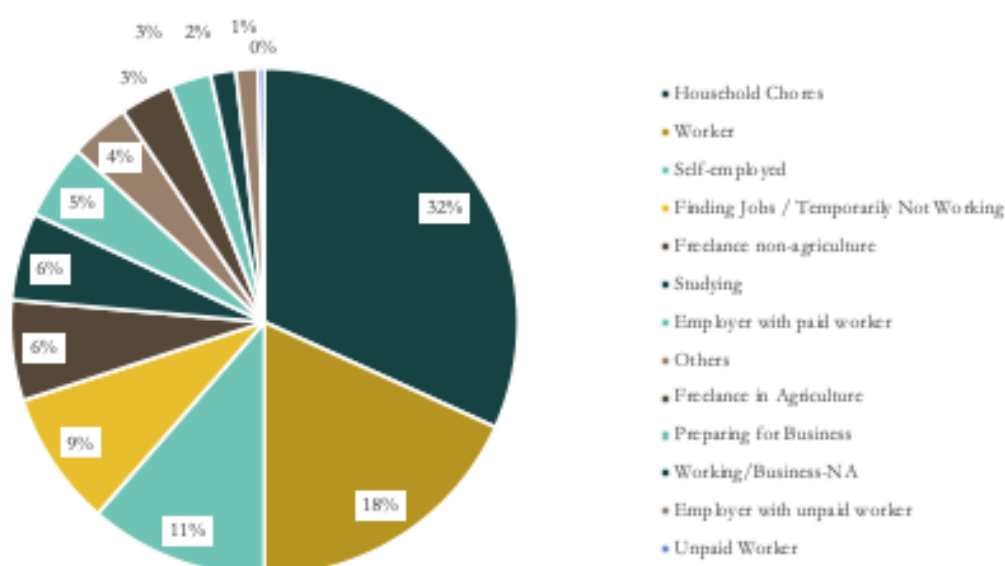
Figure 4. Proportion of respondents by educational attainment



Source: CSIS, 2021.

In terms of employment status (Figure 5), 47.6% of the respondents were working. This is lower than the proportion of workers in the *Susenas* data of 56.7%. One of the possible reasons for this is, as stated earlier, the oversampling of the rural population. Most of the respondents in the pilot survey were homemakers (31.5%), workers (18.2%), or self-employed (11.4%).

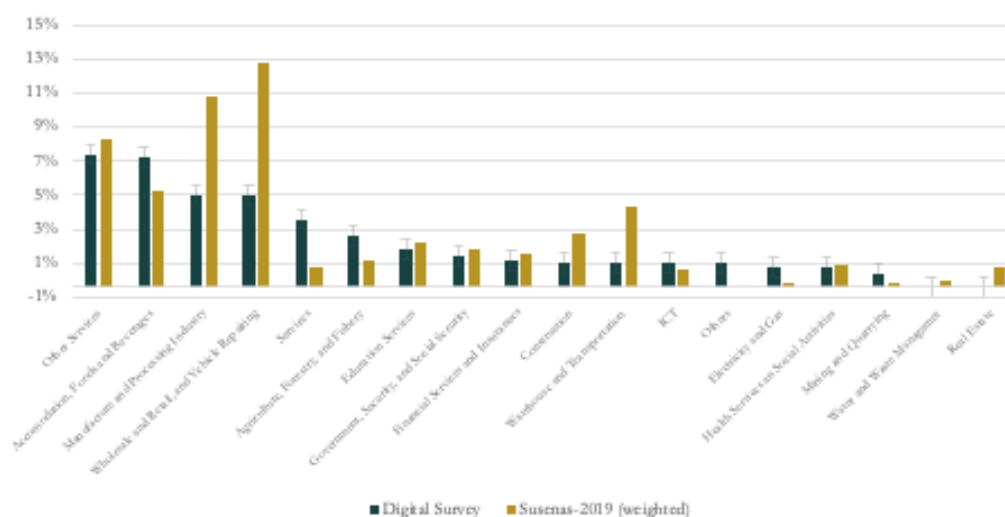
Figure 5. Respondents' job status/spending most time



Source: CSIS, 2021.

Of the respondents who are currently employed, workers were classified based on job sector or industry. Other services,⁴ accommodation, food and beverages, and manufacturing industries employed the highest proportion of respondents relative to other industries. While mining and quarrying, health services, and social activities had the lowest proportion. It is worth noting that this data set represents the job sector in the Greater Jakarta area, which is dominated by services and manufacturing (Figure 6).

Figure 6. Proportion of respondents by industry

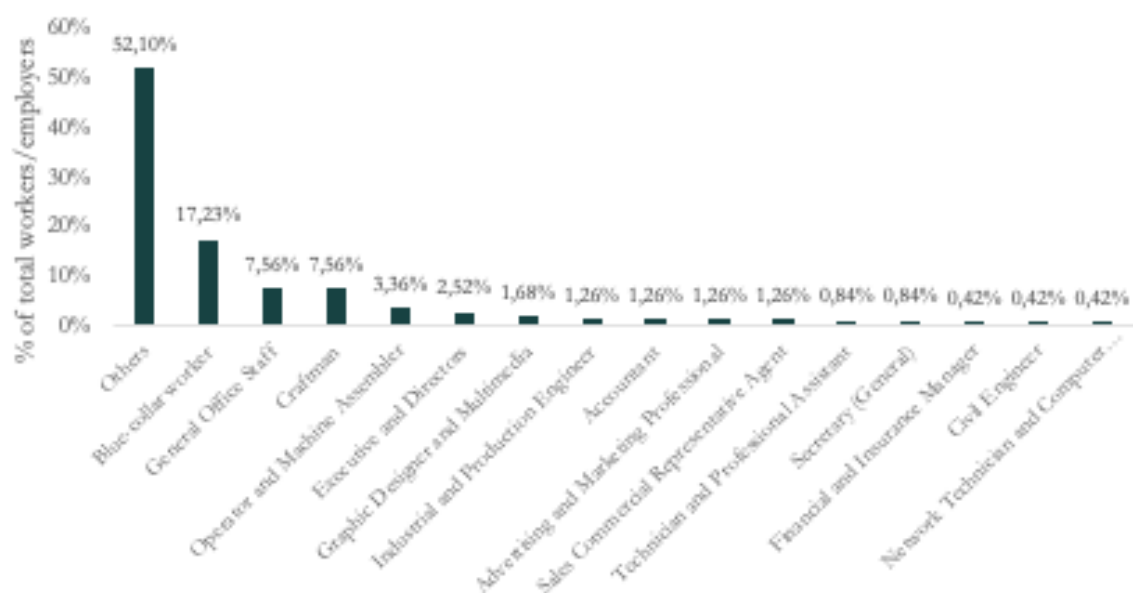


Source: CSIS, 2021.

⁴ Other services include personal services, organizational services, repair services of computers, personal goods, and household goods.

By occupation, most respondents worked at other occupations (52%),⁵ followed by blue-collar workers (17.23%). Meanwhile, ICT-related occupations, such as network technician and computer systems, had the lowest proportion of respondents, with less than 0.5 % (Figure 7). The high proportion of respondents that claimed to have other occupations besides the given list is interesting, suggesting that further investigation and re-classification of unspecified occupations are required to have a more precise analysis.

Figure 7. Sample distribution by occupation

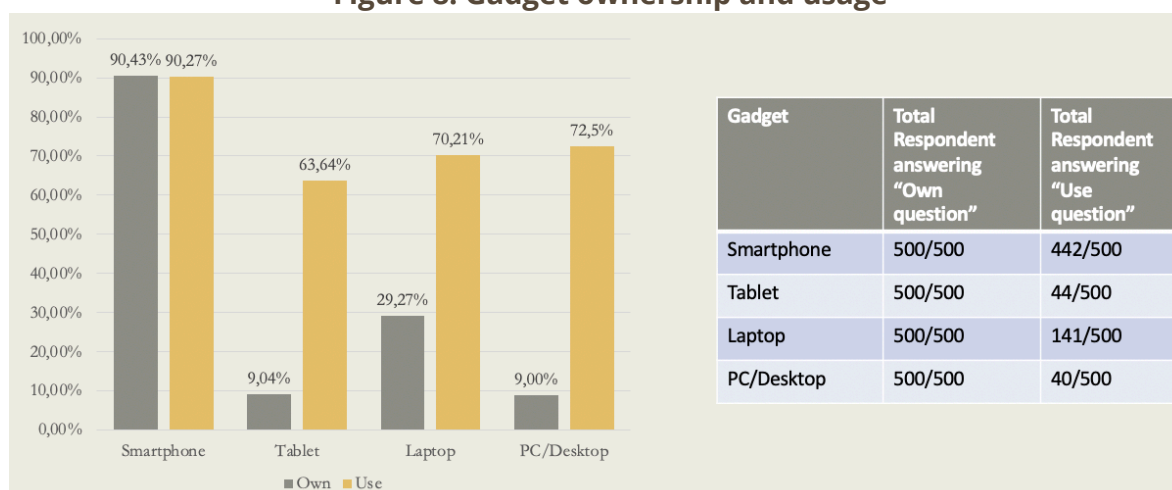


Source: CSIS, 2021.

Turning to ICT-related indicators, as shown in Figure 8, more than 90% of respondents had and use smartphones. Meanwhile, only one in every 12 individuals had a laptop, although this ratio is higher for personal computers. Although they did not have personal laptops or PCs, some respondents claimed that they still could access them. Three in 10 individuals could use/access laptops, with some of them using work-issued laptops or laptops owned by the household as a whole to share. As most of the respondents used smartphones, mobile network use is preferred when seeking to access the internet (72.8%). In contrast, 11.8% of respondents still did not have any access to the internet, as seen in Figure 9.

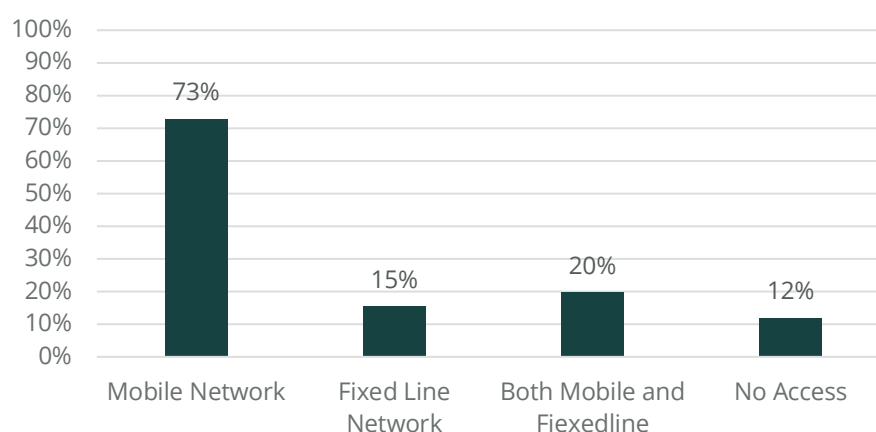
⁵ Other occupations cover those that are not included in the list of 15 occupations seen in Figure 9.

Figure 8. Gadget ownership and usage



Source: CSIS, 2021

Figure 9. Access to internet



Source: CSIS, 2021.

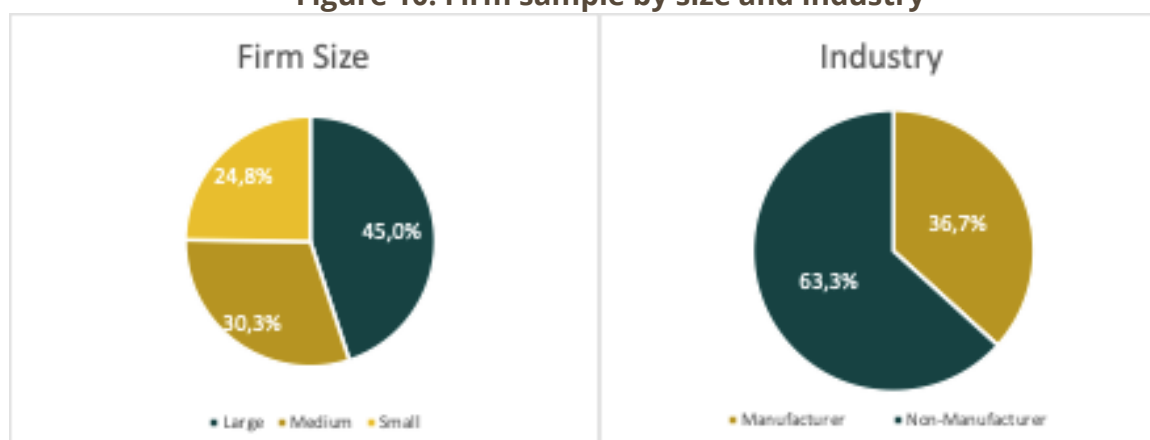
Firm-level survey: Firm characteristics

Around 109 firms were surveyed, with their locations being in Greater Jakarta and industrial zones. Of the firms surveyed 45% were large firms (more than 250 workers), 30.3% were medium-sized, while 24.8% were small. By industry, around 63% of the sample was in the non-manufacturing firms' category (Figure 10). To specify, the non-manufacturing firms' category comprised other services activities (19%); financial and insurance services (8%); information and communications (8%); and agriculture, forestry, and fisheries (8%). This is shown in Figure 11.

Due to the limited number of samples, the pilot survey allocated a larger proportion of samples to larger firms relative to the actual proportion, as they commonly have a wider range of occupations, including those that require digital skills. Accordingly, the pilot survey allocated a smaller proportion of samples to micro, small and medium-sized enterprises (MSMEs), which dominate the actual proportion of businesses in Indonesia. There are around 65.5 million MSMEs in

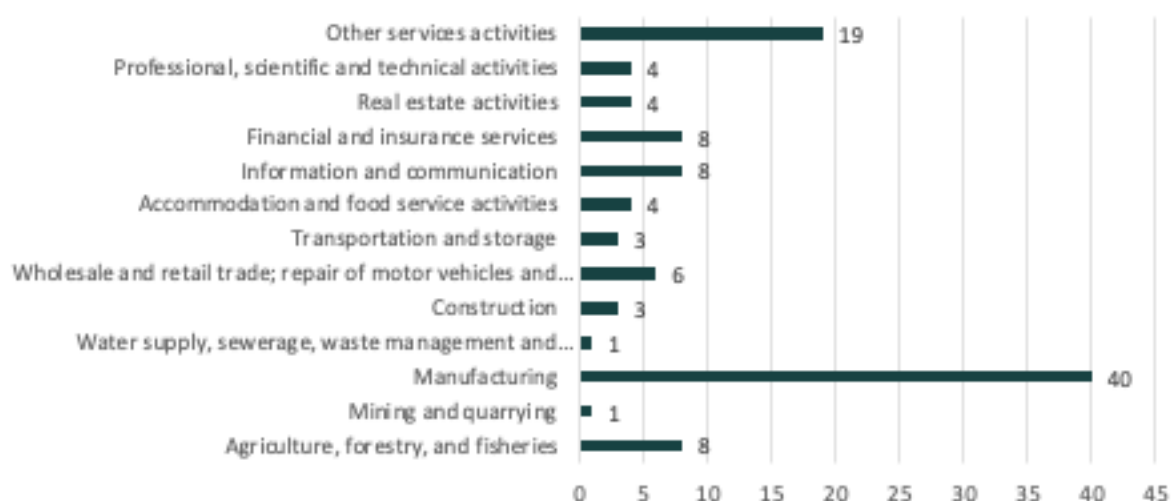
Indonesia, which account for about 99% of all businesses in the country (Statistics Indonesia, 2021).

Figure 10. Firm sample by size and industry



Source: CSIS, 2021.

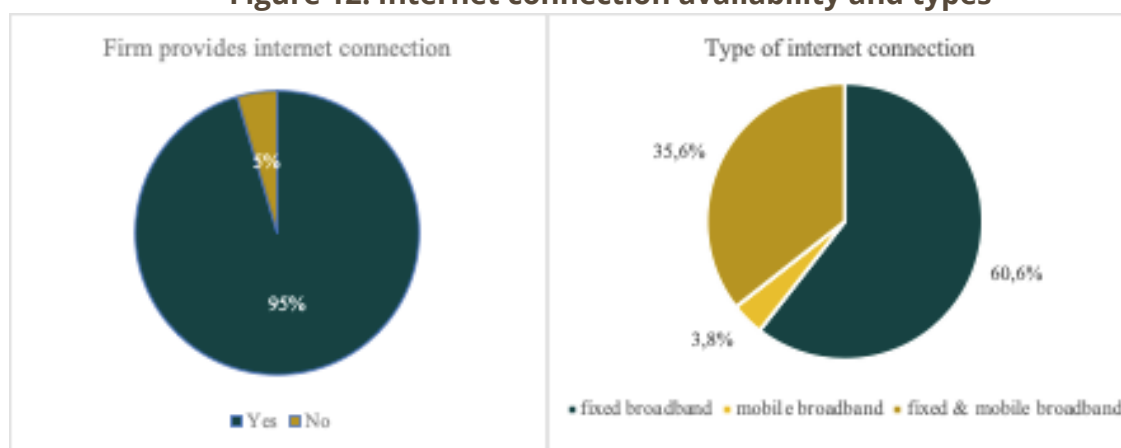
Figure 11. Firms by industry (number of firms)



Source: CSIS, 2021.

Most firms provided an internet connection (95%), with the type predominantly being fixed broadband (60.6 %), followed by fixed and mobile broadband (35.6%), and mobile broadband (3.8%). This is in contrast with the survey of individuals, where most respondents used mobile broadband.

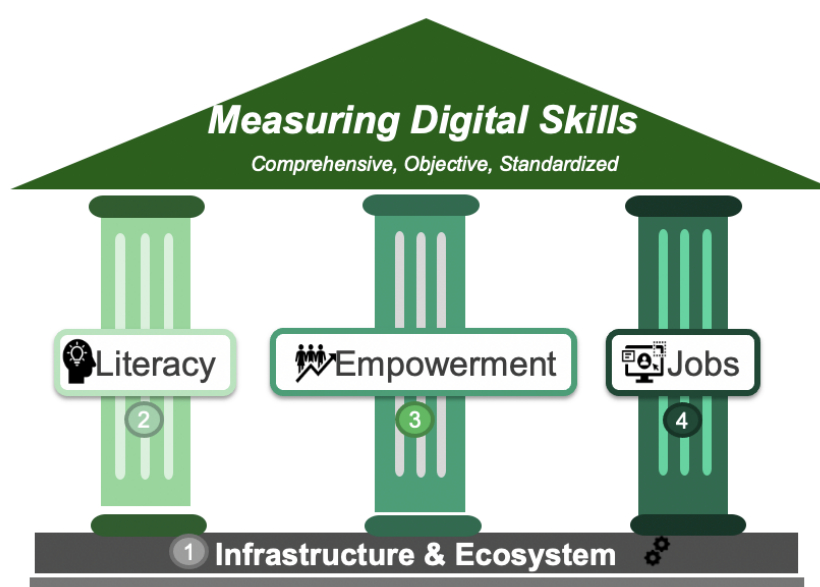
Figure 12. Internet connection availability and types



Source: CSIS, 2021.

D. Digital skills and literacy Toolkit: Findings from pilot survey

This part covers the findings from both the firm and individual pilot surveys, which followed the structure of the digital skills and literacy toolkit. Therefore, this part discusses the indicators derived from the survey of individuals and firms divided into digital skills and literacy toolkit's four pillars: 1) Infrastructure and ecosystem; 2) Literacy; 3) Empowerment, and 4) Jobs. The analysis covers the explanation of the indicators of each pillar. In the infrastructure and ecosystem pillar, the discussion consists of the level of technology adoption indicator by businesses, which was derived from the firm survey. Both the literacy and empowerment pillars discuss the individual survey results. Finally, the jobs pillar provides the link between the two surveys and discusses the supply and demand of digital skills in the context of digital skills for jobs.



Source: CSIS, 2021.

Pillar 1: Infrastructure and Ecosystem

There are two elements in the first pillar namely technological access and adoption, and the learning and innovation ecosystem. Most indicators in the first pillar are from publicly available secondary data. For example, the ICT access and use indicator uses the data from the ITU, and schools with internet access uses the United Nations Educational, Scientific and Cultural Organization (UNESCO) data. The toolkit recommends that the business technological adoption indicator should be derived from the firm survey to capture the dynamics of firms and their technology relation and analysis.

Pillar	Pillar 1. Infrastructure and ecosystem	
Elements	1.1 Technological access and adoption	1.2 Learning and innovation ecosystem

<i>Indicators</i>	1.1.1 ICT trade	1.2.1 Schools with internet access
	1.1.2 ICT access and use	1.2.2 Number of universities in the STEM-related QS Ranking
	1.1.3 Business technological adoption	1.2.3 Patents by origin/bn PPP\$
	<i>Source of Data</i>	
	Secondary data and firm survey	

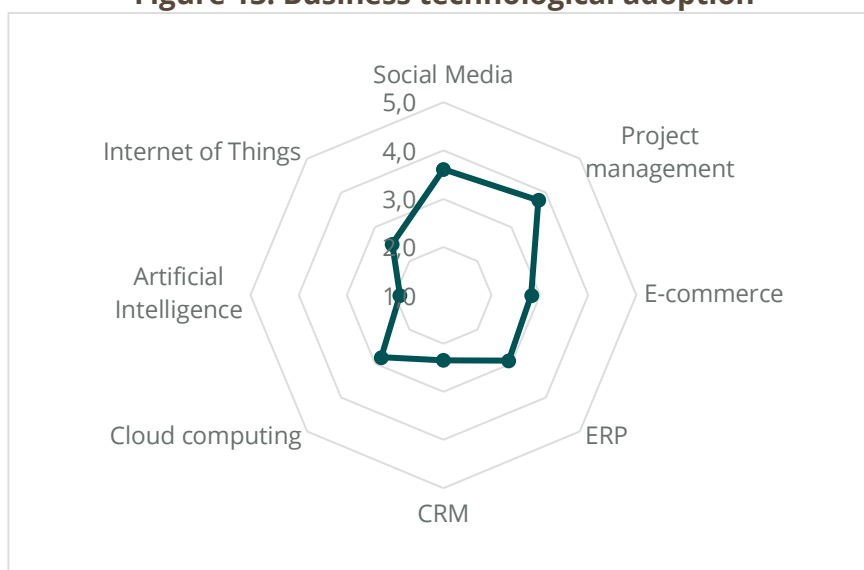
Indicator 1.1.3 Business technology adoption

The indicator of firm-level technological adoption completes the picture of the first pillar of the toolkit, which already covers the technological access and learning and innovation ecosystem. In Indonesia, there are no secondary data that reference this indicator. Therefore, the firm survey captures this indicator and gives further insights into technology adoption and its relationship with firms' size and sectoral perspectives. The firm survey includes a range of basic technology such as social media for sales and marketing and conferences for meeting purposes. In addition, Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) are counted as the more advanced level since the company needs to invest in both software and workers' skills. Lastly, the most advanced technologies such as cloud computing, AI, and IoT usually refer to Industry 4.0 technology. The firms answer their frequency of technology utilization using the Likert scale consisting of five options (1: never, 2: rarely, 3: sometimes, 4: often, 5: always) to measure their adoption level.

From the pilot survey, on average, we found that the firms used basic technology such as project management and social media quite extensively, or 3.8 and 3.6 out of 5.0, respectively (Figure 13). ERP, e-commerce, cloud computing, IoT and CRM were used occasionally. AI, one of the most advanced Industry 4.0 technologies, only rates 1.9 out of 5.0. This means that most of the surveyed firms rarely used it in their business process. This is in line with Aswicahyono & Rafitrandi's (2020) finding that most of the surveyed manufacturing firms' technological adoption is still at the basic level.⁶

⁶ Based on self-assessment. The definition of basic level is a firm that performing many activities without the use of digital tools/with basic tools such as spreadsheets and email

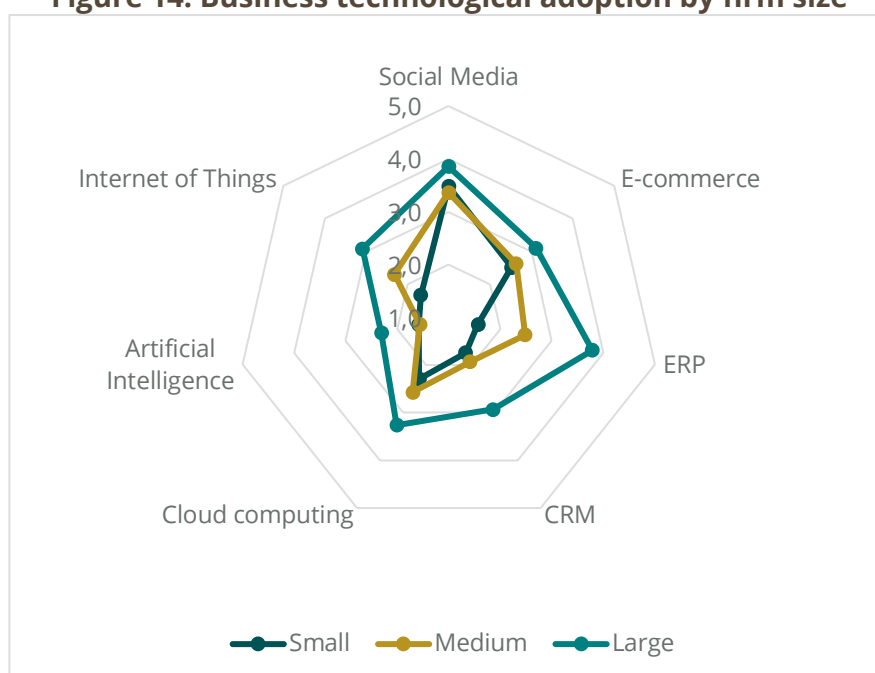
Figure 13. Business technological adoption



Source: CSIS (2021)

The pilot survey found a significant difference in technological adoption by firm size and sector (Figure 14). The largest gap in technological adoption between large companies and small and medium enterprises (SMEs) is in ERP and IoT. This finding is reasonable since social media is a marketing tool that is relatively more affordable and accessible to SMEs. Aswicahyono and Rafitrandi (2020) also found a difference in technological adoption in the manufacturing sector between large and SMEs. The digital adoption lags in SMEs are due to a lack of internet/digital skills, financing, and an infrastructure gap (OECD, 2020). It is important to note that the World Bank survey (2020) found digitalized SMEs to be more resilient in the pandemic.

Figure 14. Business technological adoption by firm size



Source: CSIS (2021)

Pillar 2: Current state of digital literacy

The toolkit digital literacy pillar derived from several sources such as the Digital Literacy Global Framework (UNESCO, 2018), DigiComp 2.1 (European Union, 2016) and took into account Indonesia's Digital Literacy Index based on the *Status Literasi Digital Indonesia* Survey (Ministry of Communications and Information, 2020). Digital literacy is defined as the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely through digital technologies (UNESCO, 2018). Based on the toolkit, there are three elements: 1) complementarity 2) familiarity and 3) security, which consist of six indicators to measure digital literacy as a crucial factor to seize the full benefits offered by the digital economy.

Table 6. Pillar 2

Pillar	Pillar 2. Literacy		
Elements	2.1 Complementarity	2.2 Familiarity	2.3 Security
Indicators	2.1.1 Communication and collaboration 2.1.2 Critical thinking	2.2.1 ICT familiarity 2.2.2 Data literacy	2.3.1 Device security 2.3.2 Personal security

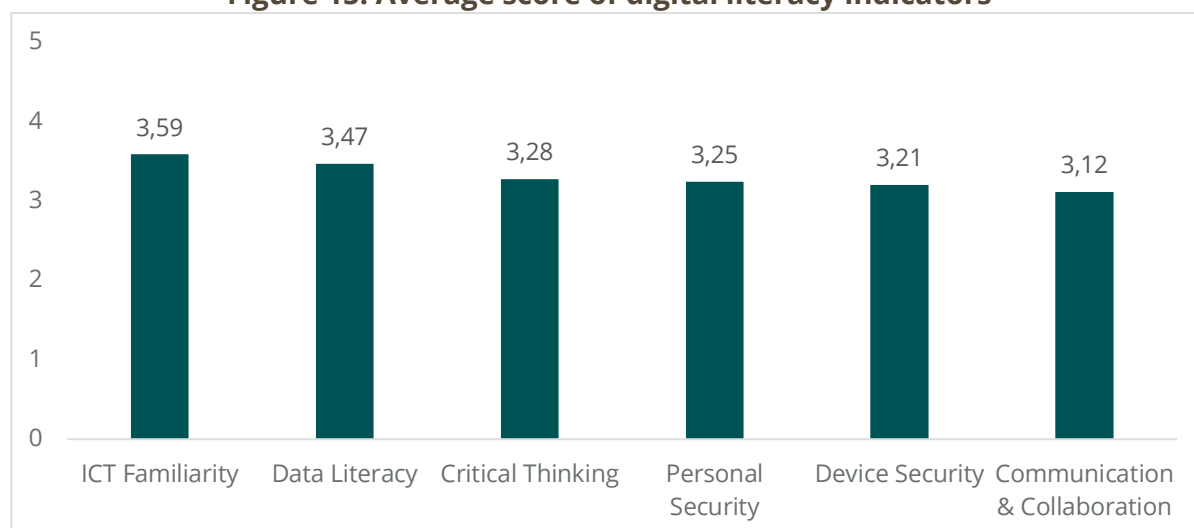
Source: CSIS (2021)

Figure 15 shows the average score for each indicator based on self-assessment questions and scored from 1 to 5 (see the individual pilot questionnaire in the appendix). The weight of all questions was the same and a higher score reflects a higher level of digital literacy. From the survey, the respondents scored the highest in the familiarity element i.e. ICT familiarity (3.59) and data literacy (3.47). The ICT indicator reflects the level of understanding of ICT device operation for daily use while the data literacy indicator examines the ability to articulate information needs and locate and retrieve digital data, information, and content.

The lowest score indicator is communication and collaboration at 3.12⁷. On average, the highest communication and collaboration indicator score is found with the instant messaging applications or social media literacy level (3.89). Meanwhile, unsurprisingly, the pilot survey respondents were not confident about using cloud services platforms to work with others. This scored the lowest among all questions in the digital literacy pillar, at 2.62. The question on cloud services and work examined the higher level of digital literacy. The result was also similar to the World Bank Digital Economy Household Survey (2020) finding, where 95% of respondents could communicate through instant messaging while only around a third (32.1%) of the respondents were comfortable working together using a cloud sharing platform. This implies that policymakers should aim to achieve more productive communication and collaboration through digital platforms.

⁷ Note that there are some drawbacks in comparing the indicators so one should be careful in making conclusion

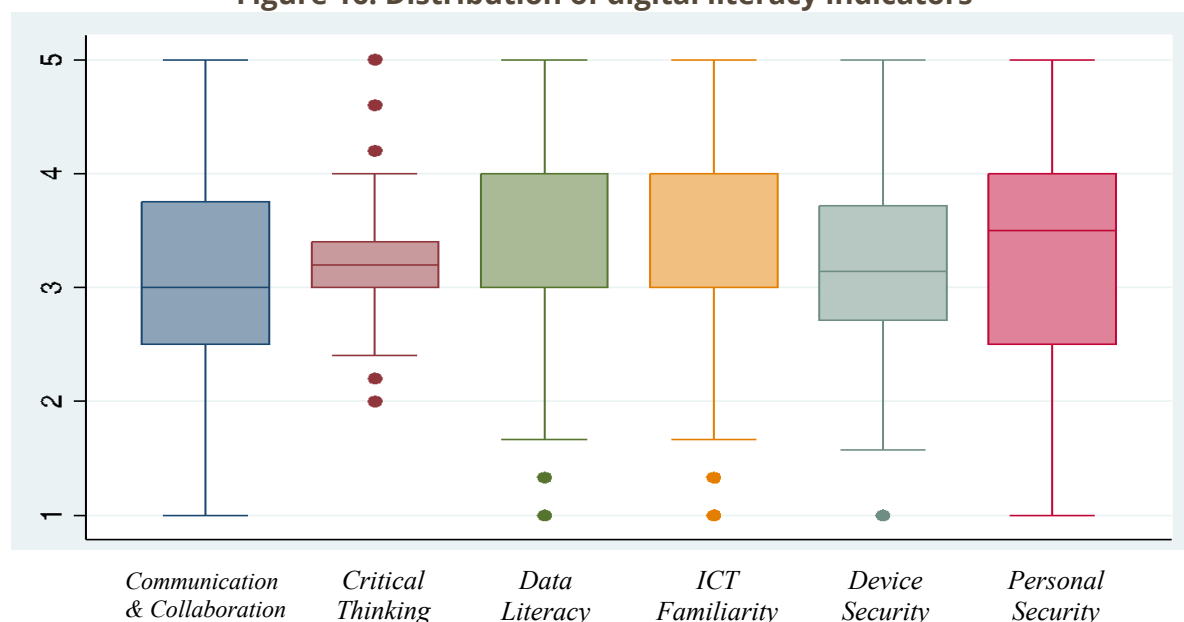
Figure 15. Average score of digital literacy indicators



Source: CSIS Survey (2021)

Figure 16 shows some interesting findings from the distribution of respondents' digital literacy levels. First, there is a lack of variation in the critical thinking indicator. Secondly, the data literacy and ICT familiarity distribution, which scored the highest on average, were almost similar. Lastly, the personal security element distribution showed that many respondents were below the average score of 3.25 out of 5.0. In other words, this element should also be one of the main priorities for policymakers to achieve better digital literacy in Indonesia.

Figure 16. Distribution of digital literacy indicators



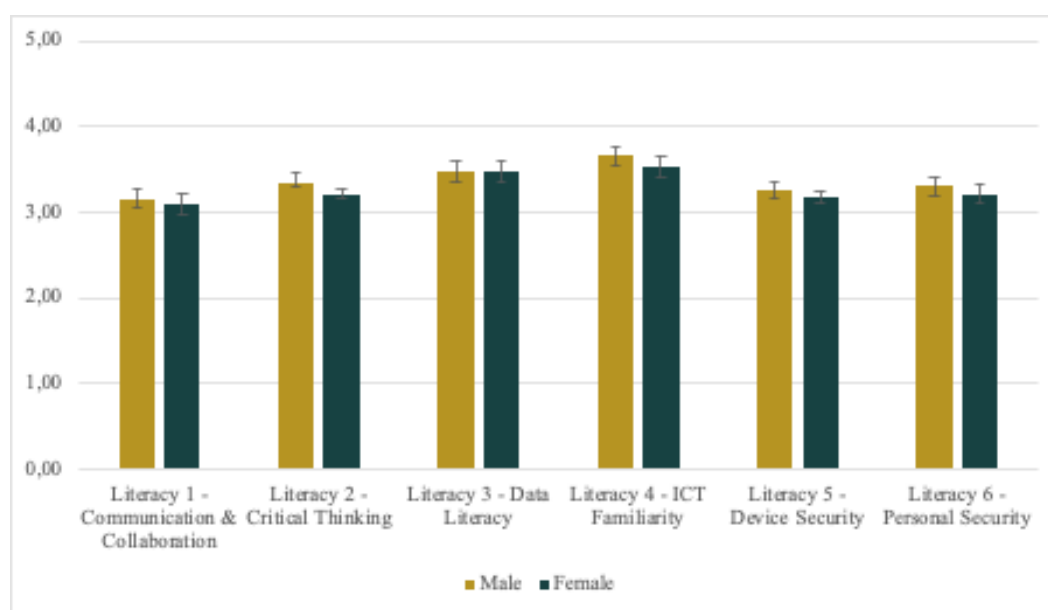
Source: CSIS Survey (2021)

Furthermore, the analysis can be expanded by gender, urban-rural, age groups, and educational background. As already mentioned in the toolkit, this exercise is aimed at producing objective and also more inclusive measurement. Therefore, it is essential to keep track of all indicators and their disaggregated data for the policymaker.

Females are in a disadvantaged position in terms of technological adoption and literacy, especially in Indonesia, where there is still a wide gap in male-female participation both in education and the labor market (Kinder, 2019; Schaner and Das, 2016). As technologies become more sophisticated, it is important to narrow the gender gap in digital literacy. Therefore, policymakers should mainstream this issue by observing the differences between males and females in terms of digital literacy in the toolkit.

From the pilot survey, male respondents had higher digital literacy level on average. However, there was no significant gap between male and female respondents in terms of digital literacy levels. The largest gap exists in the critical thinking and ICT familiarity element, although insignificant. In the communication and collaboration indicator, female respondents were more confident in using teleconferencing applications. Both males and females had relatively high ICT familiarity indicators, 3.65 and 3.52, respectively. Due to the design of the pilot survey, it is reasonable to observe a relatively small gap between male and female digital literacy levels since the location was in Greater Jakarta. If the survey was expanded to all regions in Indonesia, the gap between males and females might be much more striking. In addition, the difference might exist as well because of the lower female labor participation rate in general.

Figure 17. Digital literacy pillar by gender



Source: CSIS Survey (2021)

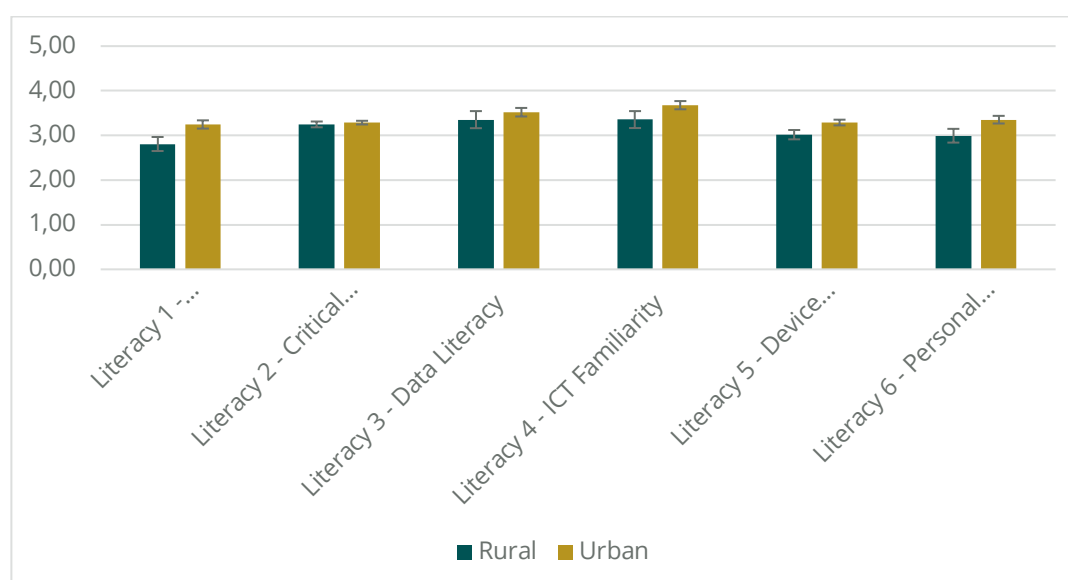
Digital literacy is closely linked to access and rural areas are usually left behind in terms of digital infrastructure. In Indonesia, 49% of the population has little to no connectivity (World Bank, 2021). In addition, the digital divide between urban and rural is also substantial. Urban households in Indonesia are almost twice as likely to access the internet, fixed broadband, computers, and radio than rural households – a clear evidence of an urban-rural and most likely rich-poor digital

divide (Hadi, 2018). The comparison between rural and urban will provide an insight to policymakers on regional perspectives and on policy adjustments to come up with a digital equality policy.

According to the pilot survey respondents, the difference between urban and rural in terms of digital literacy levels is quite negligible. However, this is because of the limitation of the pilot survey since it only covered the Greater Jakarta area, although some largely rural regencies⁸ were also included. Had the survey also covered rural areas outside of Java Island, the difference between rural and urban would likely be more pronounced. The most significant differences were in communication and collaboration, and personal security. Respondents in urban areas scored the highest on ICT familiarity and the lowest on the communication and collaboration indicators. Likewise, they scored the highest on both ICT familiarity and data literacy and the lowest on personal security. Interestingly, in one of the questions related to device security, i.e., on literacy about safe passwords, the score for urban respondents was lower than for rural ones.

Similarly, Marini et al (2020) also emphasize that one of the prominent issues of the digital divide involves utilizing technology dominated by men. Due to the social and cultural norms of many countries, especially in Indonesia, gender gaps, which are identified through the difference in education levels, imbalance in government policies, and geographical locations, create an unequal distribution of digital literacy.

Figure 18. Digital literacy pillar by rural-urban



Source: CSIS Survey (2021)

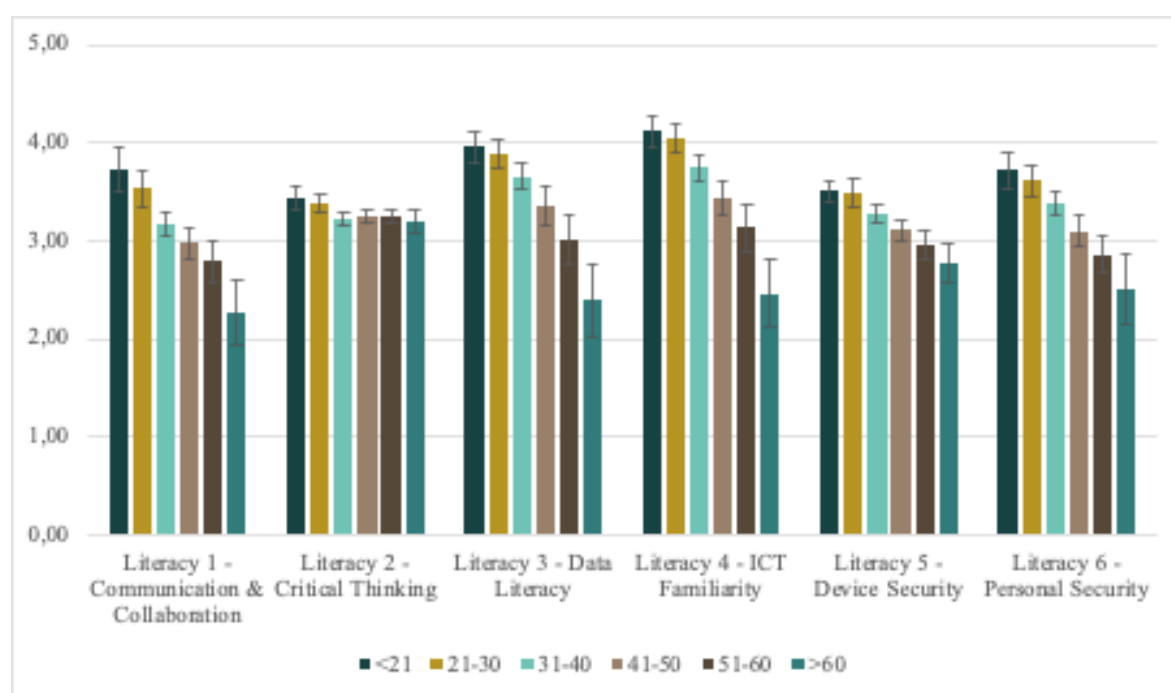
⁸ Bogor, Bekasi and Tangerang regencies

Further analysis of digital literacy levels can be done by age group, the younger generation is at an advantage in digital adoption compared with other age groups because they are exposed to technology earlier in life and study the information and technology curriculum in schools. Moreover, it is important for youth to be prepared with adequate digital literacy and skills to improve their readiness for the jobs of the future. As stated in the 2030 Sustainable Development Goals (SDGs), one of the goals is the percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills.⁹ This indicator encourages investment in the improvement of skills for young people. Therefore, the toolkit digital literacy indicator complements the SDGs goal. It should also be noted that connectivity remains a challenge for most youth where 369 million young people remain offline (ITU, 2020). This problem in terms of digital infrastructure is one of the key challenges for young people to fully be involved in the digital economy.

Figure 20 illustrates that the most significant difference between age groups is on the ICT familiarity and data literacy indicator, while the critical thinking indicator shows small variation between the age groups. On average, the largest difference between the youngest and oldest age group in the ICT literacy is 1.65 while the smallest gap is critical thinking with a 0.25 difference. Interestingly, the oldest age group scored the highest in critical thinking among other indicators while the critical thinking indicator for the youngest group was the lowest one compared with other indicators.

⁹ <http://uis.unesco.org/en/glossary-term/percentage-youthadults-who-have-achieved-least-minimum-level-proficiency-digital>

Figure 19. Digital literacy pillar by age group

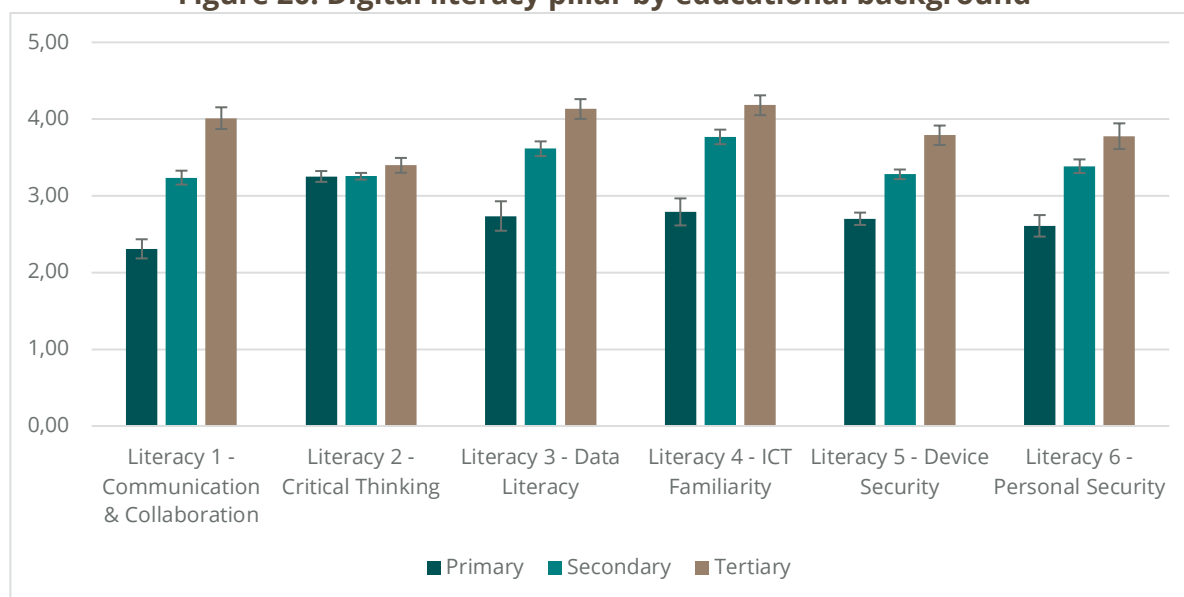


Source: CSIS Survey (2021)

Educational background is also one of the key determinants of digital literacy. Alas, the education level of around 60% of Indonesian workers is still below the secondary level. Existing literature also confirms that technology and digitalization are biased toward educated people and put those less-educated at a disadvantage. Therefore, policy intervention is needed to narrow the digital literacy gap across educational backgrounds. For example, digital literacy and skills should be included in the basic curriculum and digital vocational training should be expanded to harness digitalization's impact.

The pilot survey divided the respondents based on their educational background and found a starker gap. The difference between the most-educated group (four years undergraduate and above or tertiary education) and the least-educated respondents (elementary school and lower or primary education) is very significant in communication and collaboration, and data literacy indicators, especially for questions on email and teleconferencing platforms in communicating and working with other people. This indicator scored lower than 3.00 among the primary educational background or below respondents. For the critical thinking indicator, the gap is much closer, meaning that there is no significant difference on this indicator.

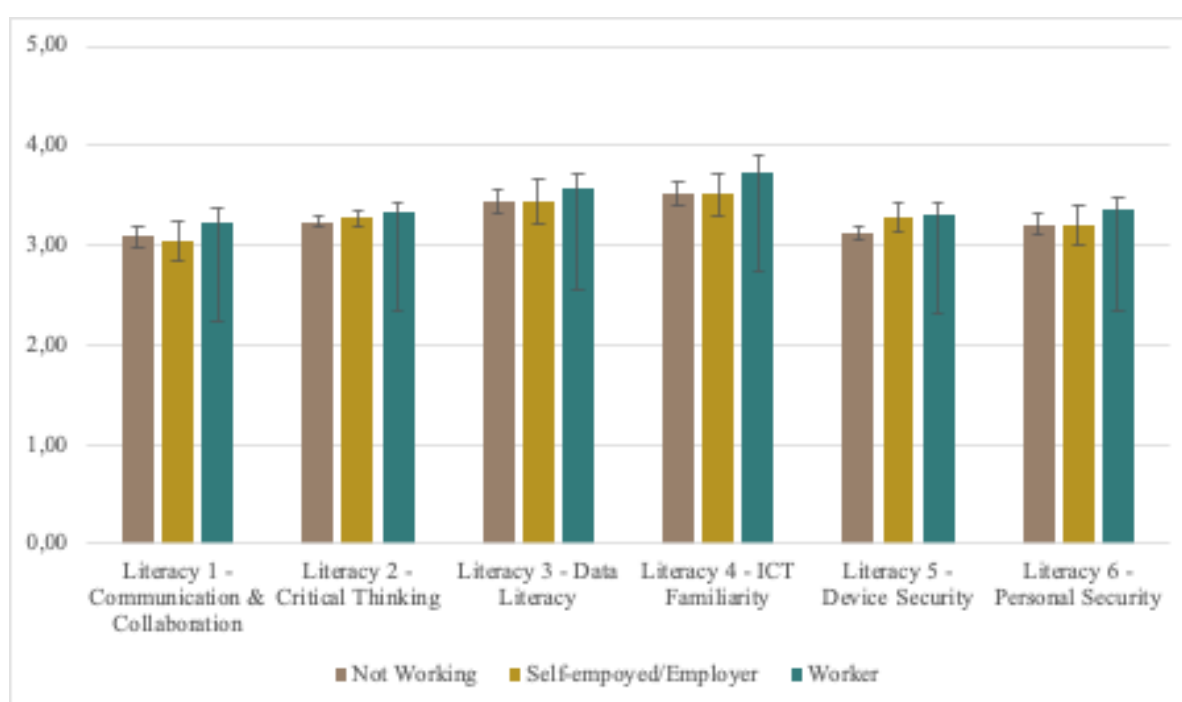
Figure 20. Digital literacy pillar by educational background



Source: CSIS (2021)

Lastly, the literacy pillar also distinguished respondents by their employment status i.e. worker, self-employed/employer or not working. Unsurprisingly, workers tended to have higher digital literacy in all indicators. This is because the workplace is one of the places where employees learn about new technology use for working purposes. The ICT familiarity and data literacy indicators were the two highest scores for the worker group, at 3.74 and 3.56, respectively. Furthermore, the self-employed/employer and not working groups were not significantly different except in the device security indicator.

Figure 21. Digital literacy pillar by employment status



Source: CSIS Survey (2021)

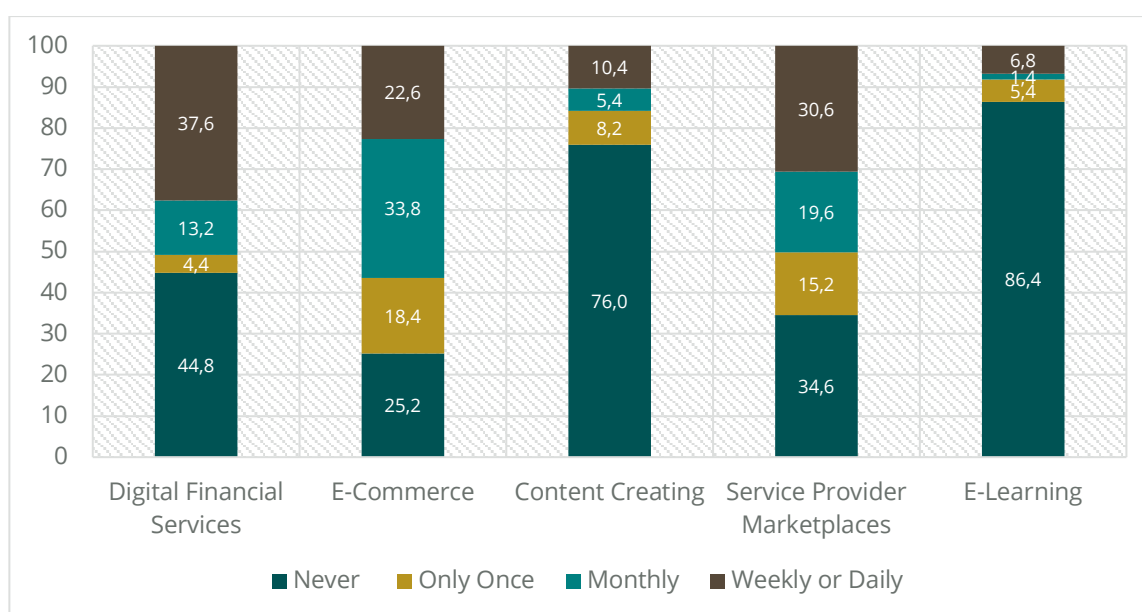
Pillar 3: Digital skills as empowerment

a. General findings and challenges

The empowerment pillar illustrates the manifestation of productive digital platform utilization. The toolkit framework divided this pillar into two elements: users/consumers and providers/sellers. The indicator for each element consisted of various digital activities such as financial services, e-commerce, content creation platforms, service provider marketplaces, and e-learning platforms. Furthermore, the indicators in both elements consisted of self-assessment questions on the intensity level and variety of digital activities. In other words, the pilot survey approached the level of digital skills in these indicators by asking how often respondents used the platforms. Therefore, more frequent users indicated a higher level of digital skills than otherwise.

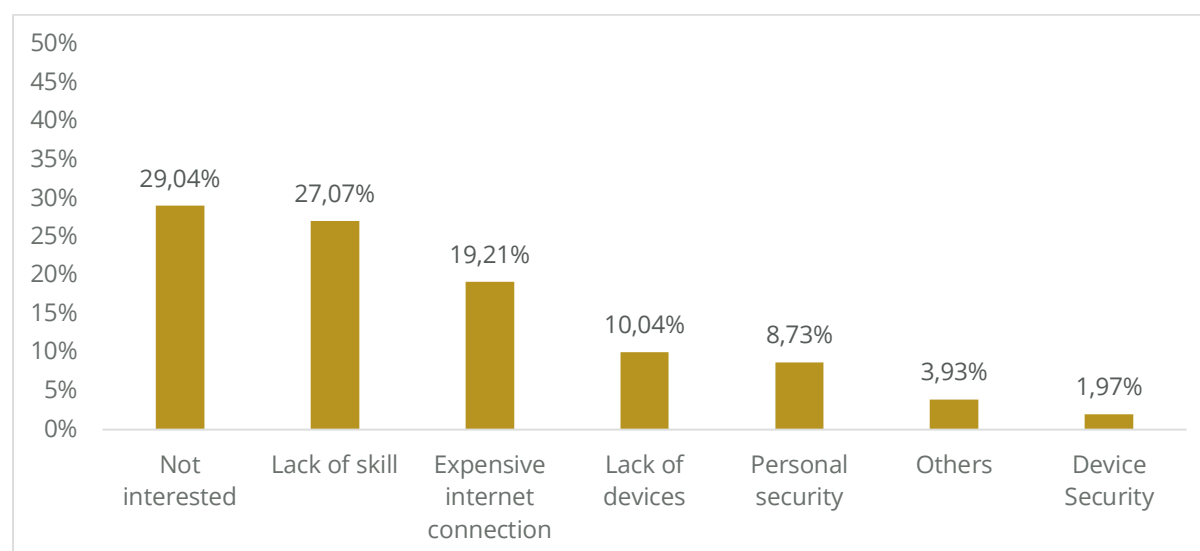
Based on Figure 22, most survey respondents regularly (weekly/daily) used e-commerce and service provider marketplaces on average. Almost 38% of respondents were regular users on a weekly/daily basis of e-commerce platforms. Service provider marketplace platforms e.g., ride-hailing and food/groceries services were at 31%. On the other hand, e-learning platform use was relatively low with only 7% of the respondents having used such platforms on a weekly/daily basis. These numbers would most likely be significantly lower had the survey been conducted countrywide due to a substantial variation in digital access and use across the country.

Figure 22. Empowerment pillar: General findings



Source: CSIS (2021)

The pilot survey also asked about any hindrances that might have been preventing respondents from using or taking advantage of the above-mentioned digital platforms. The top-three answers were 'not interested' (27%), 'lack of skill' (25%) and 'expensive internet connection' (18%). This might be related to the risk exposure on digital platforms such as personal data security and cyberattack concerns. Thus, user safety and protection regulations and implementation should be in place to ensure the use of digital platforms is safer and more productive.



The following section describes more specifically each digital platform. In addition, it also provides discussion on the disaggregated data based on gender, rural-urban, age groups, employment status, and educational background of the respondents.

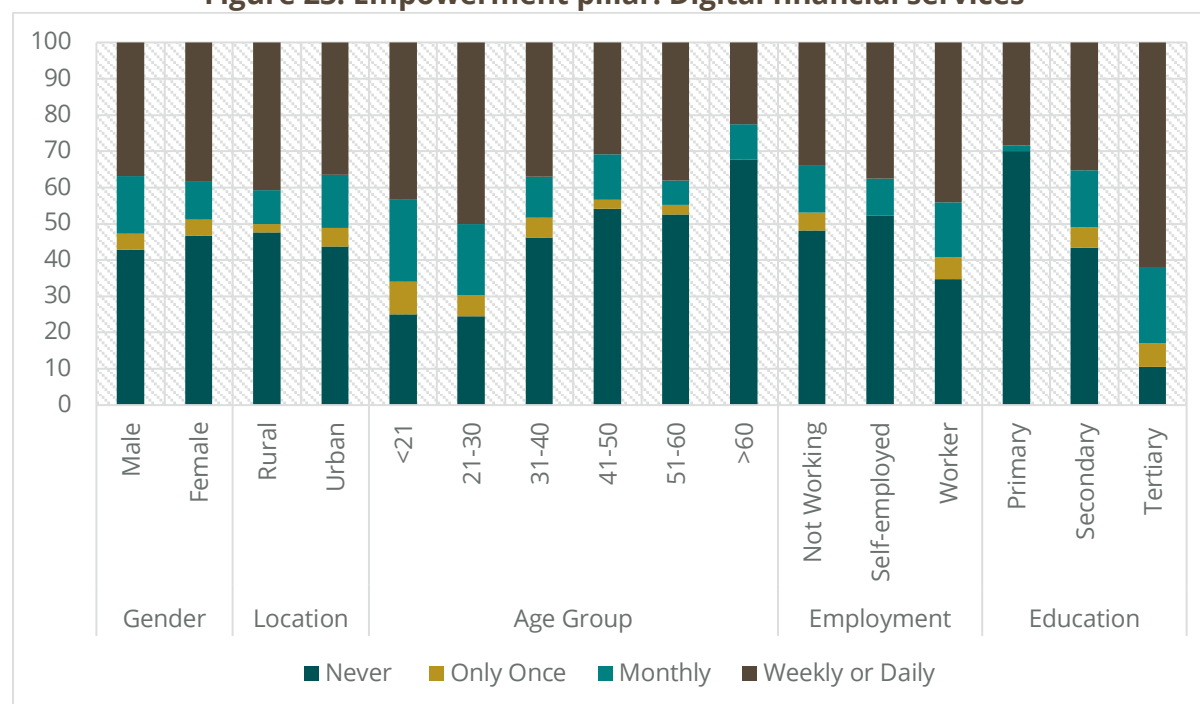
b. Digital financial services

The use of digital financial services in Indonesia is limited due to the lack of financial and digital literacy. Based on *Susenas* (2019), only 7% of all people in Greater Jakarta (excluding Kepulauan Seribu) use financial services offered through the internet/e-banking. The Global Findex Database (World Bank, 2017) also reached the same conclusion: around 7% of people in Indonesia used a mobile phone or the internet to access a financial institution account in the past year. Financial inclusion is the top priority for the government since digitalization and financial technology play an essential role in expanding financial access and participation, especially for women and rural communities.

The pilot survey reveals some interesting findings. First, the pilot survey respondents used e-wallets as frequently as e-banking with about 32% of the total respondents for each service. Both services include online transactions and payment, but e-banking provides the full range of banking products such as saving accounts, investment, and loan products. However, there is still a significant gap if we compare this with bank account owners, which is about 58% and e-banking or e-wallet users (at least once) at 47%. Second, there is a clear difference in digital financial services utilization, especially by age group and educational background. Respondents below the age of 30 are avid users,

since around 75% have used digital financial services at least once and 43-50% are weekly/daily users. On the other hand, only about 25% of respondents over 40 years of age are monthly/weekly/daily users. Thirdly, secondary and tertiary educational respondents are more likely to use digital financial services. Almost 83% of respondents with tertiary educational backgrounds used it at least once a month compared with 30% of the respondents with a primary or lower educational background.

Figure 23. Empowerment pillar: Digital financial services



Source: CSIS (2021)

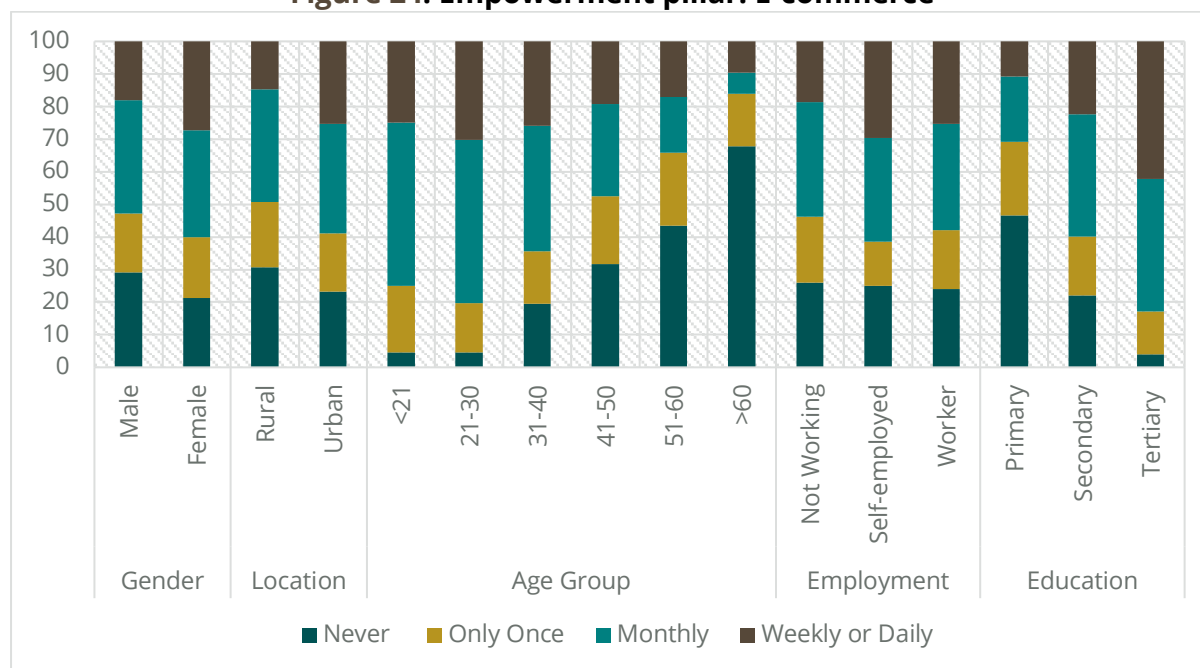
c. E-commerce

From the pilot survey, e-commerce was the most used type of digital platform and provided a vast opportunity to increase digital inclusion and productivity. According to *Susen* (2019), almost 10% of people in Indonesia use e-commerce. The Global Findex Database (2017) compares this figure and Indonesia, along with South Africa, Mexico, and India are the G20 members with less than 10% of the population using the internet to shop online.

E-commerce is the digital platform type with the most significant gap between males and females. Female respondents used it more frequently than the male users; almost 80% of female users had used it at least once and 60% were regular users. Female respondents were 14% more likely to use e-commerce than male respondents. According to IFC (2020), females comprise half of all active e-commerce vendors, although they tend to run smaller-scale businesses and feature prominently in high-competition, low-value segments in Southeast Asia and Africa. Therefore, there are a vast untapped potential for female business owners to participate in e-commerce by increasing their capacity and digital literacy and skills.

Moreover, e-commerce is also more inclusive toward respondents with a primary education background where 53% had used it and a third of them were monthly/weekly/daily users. This figure was the highest among other digital platforms. Around 80% of the respondents aged below 30 years old were regular users of e-commerce compared with 38% of the respondents above 40 years old. The difference between buyers and sellers is very significant. For example, only 10.2% of the respondents used e-commerce to sell products, while 73.2% were active buyers on e-commerce platforms.

Figure 24. Empowerment pillar: E-commerce



Source: CSIS (2021)

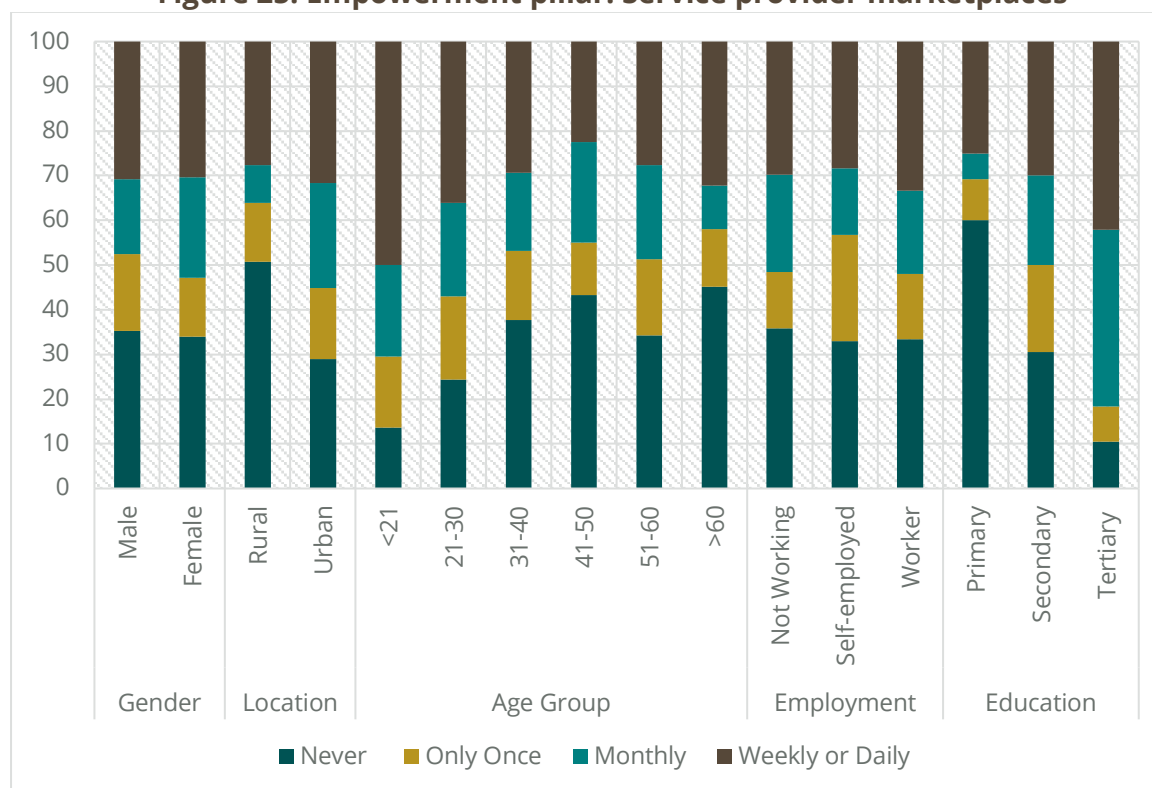
d. Service provider marketplaces

In Indonesia, the rapid development of platformization has been reflected by the accelerated number of marketplaces as a result of digital infrastructure and adoption. According to *Susen*, in the last five years, internet adoption doubled from 25% in 2016 to 54% in 2020. The result is a surge in the number of tech companies that focus on connecting supply and demand through online applications and taking advantage of the two-sided market and network effect. Some of the most popular platforms are ride-hailing, food/groceries and accommodation such as Gojek, Grab Indonesia and Traveloka, which are 'unicorn' companies in Indonesia.

Figure 26 shows that 82% of respondents with tertiary educational backgrounds were frequent service provider marketplace users. Respondents with tertiary educational background were twice as likely to use marketplace platforms as respondents with a primary education or lower. In addition, respondents who lived in urban areas were 45% more likely to use marketplace platforms than those who lived in rural areas. Interestingly, the older respondents (above 40 years old) also used the platforms quite

extensively as almost 60% of them had used them at least once. Most respondents were users of ride-hailing and food/grocery services, and online job seekers.

Figure 25. Empowerment pillar: Service provider marketplaces



Source: CSIS (2021)

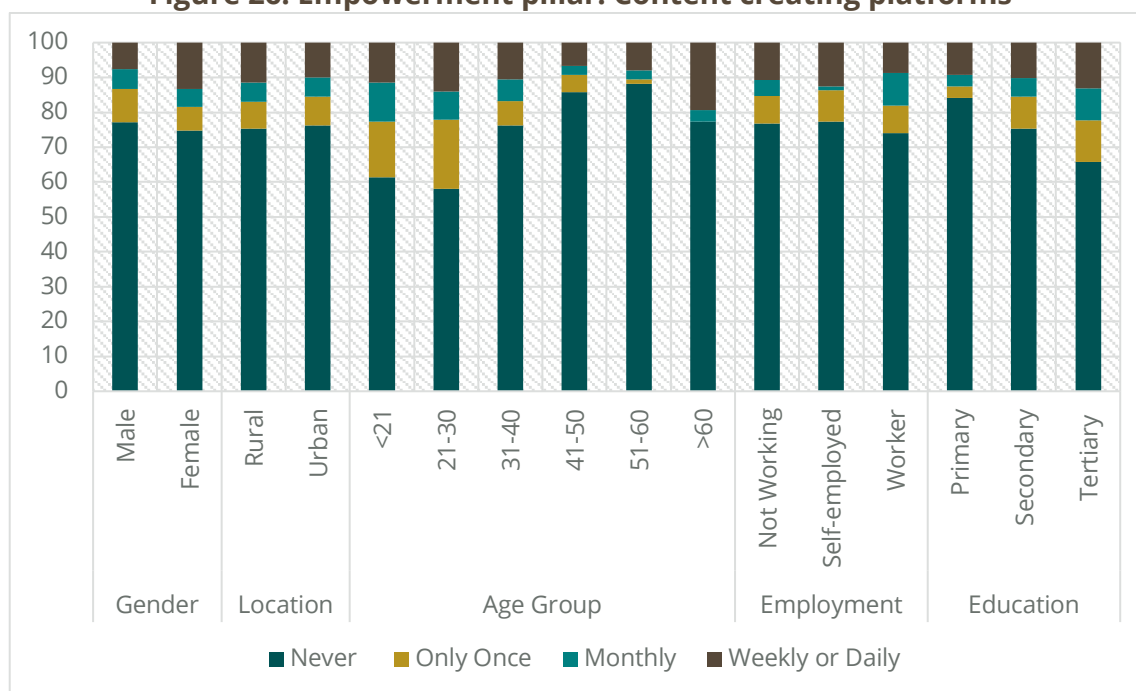
e. Content creation platforms

Content creation requires various digital skills such as photo/videography and editing, digital marketing, and users' engagement skills. Some platforms, e.g., YouTube or Instagram, are commonly used by content creators to generate income, advertisement revenue, membership, and product endorsement. According to *Susenias* (2019), 54% of people in Greater Jakarta (excluding Kepulauan Seribu) access the internet to use social media and youth respondents have a slight edge in the adoption of social media. A report from Global Web Index (2021) stated that people aged 16 to 24 spend roughly 60% of their waking lives online in Southeast Asia and spend an average of more than 10 hours per day using internet-connected devices, which means they spend close to three full days using the internet every week. Hence, it is reasonable that they excel on these platforms.

From Figure 27, 17.2% respondents used such platforms to create something at least once on average. Furthermore, respondents below 30 years old were significantly high-skilled in content creation compared with the other age groups. The likelihood that they used content creating platforms was 70% higher than the two oldest groups in the pilot survey. Around two thirds of them regularly created content and endorsed it through social media platforms and other channels. Finally, the respondents with a tertiary

educational background were twice as likely to create content on a digital platform as respondents with primary educational backgrounds or lower.

Figure 26. Empowerment pillar: Content creating platforms



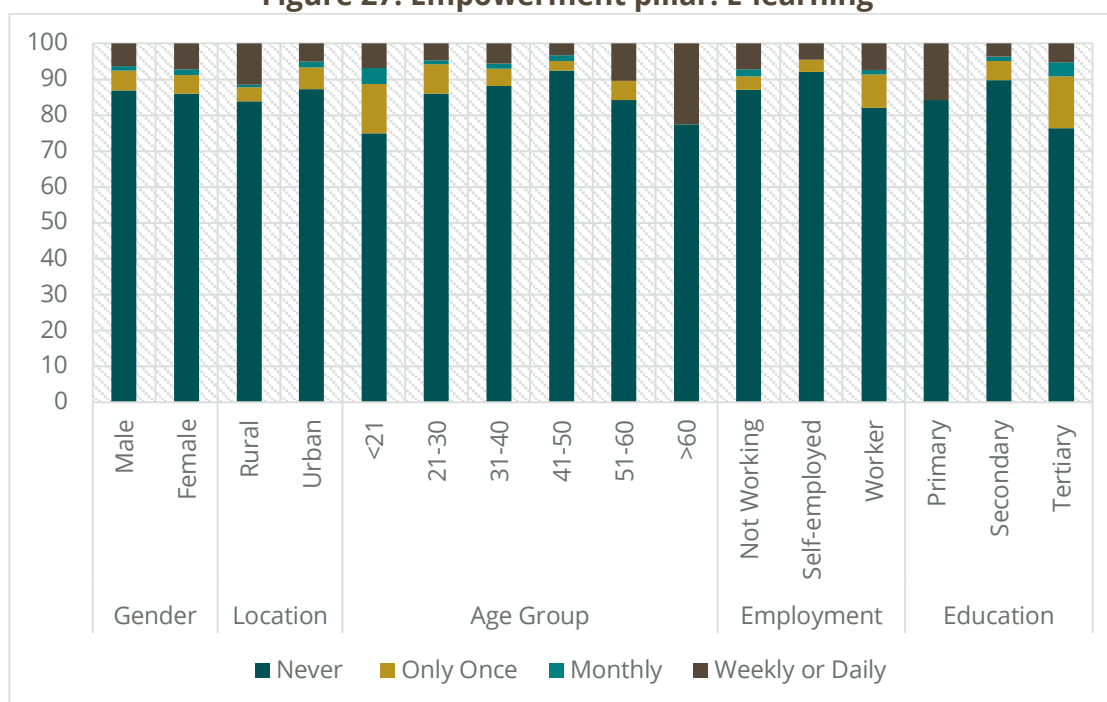
Source: CSIS (2021)

f. E-learning

Harnessing technology and online learning is the way forward to address the skill development problem in Indonesia. For example, use of education technology (ed-tech) platforms has been accelerating since the pandemic due to school closures and mobility restrictions. Some local platforms such as Ruangguru and Zenius reported a jump in new users and web hits during the pandemic. These marketplaces provide a wide range of services: self e-learning, interactive learning, and assignment/test preparation. According to *Susen*, around 14.48 % of the population received learning information through the internet in 2019. However, this development should be scrutinized more carefully. The inequitable access to these platforms might be a potential source of learning inequality since digital infrastructure and adoption are still unequal across regions in Indonesia.

Figure 28 reveals interesting findings. First, there is no significant gap between gender and rural-urban in terms of the use of e-learning platforms. Second, the highest proportion of e-learning platform users were in the school-age or below 21 years old, at 25%. However, the two oldest age groups also used e-learning platforms quite extensively compared with other age groups. This means that e-learning platforms were also useful for beyond school-age respondents. In other words, there is a growing demand for lifelong learning and the government should capture this potential to provide accessible e-learning platforms for older age groups to upgrade their skills. Thirdly, workers were only slightly more likely than those who did not work and the self-employed group to use the platforms, implying that the learning culture for workers should be improved. Finally, the pilot survey respondents who were highly educated were also more likely to use e-learning platforms compared with other educational background groups at 24 % (Figure 28).

Figure 27. Empowerment pillar: E-learning



Source: CSIS (2021)

Pillar 4: Digital skills for jobs

The COVID-19 pandemic has accelerated digital transformation, changing the way workers perform their jobs and affecting job shifting. Digital skills will be just as important in Indonesia's non-technological sectors, such as manufacturing and professional services, where companies are increasingly seeking to adopt new technologies to improve their productivity. Currently, workers with digital skills in the country are estimated to contribute Rp 908 trillion (\$62.1 billion) or 6% of Indonesia's GDP (Statistics Indonesia, 2021).

This pillar focuses on job-related digital skills, and consists of two elements: supply and demand for digital skills. Demand for labor represents the quantity of labor that firms are willing to employ at a given point of time. Demand for digital skills is proxied by certain indicators, covering the most-demanded digital skills, a firm's digital skills training, most digital occupation, and degree of automation and remote working. Most of the data are obtained from the business survey and are based on the firms' assessments, as well as from job platforms for most-demanded digital skills. Likert scales are used to measure the importance level of a specific digital skill in general and for specific occupations.

Meanwhile, the supply of labor is defined as the amount of labor, measured in person-hours, offered for hire during a given time-period (Sapsford and Tzannatos, 1993). Most of the data are self-assessment variables that come from the individual survey or the labor force survey by Statistics Indonesia. The indicators of digital skill supply consist of the proportion of workers who use the internet at work, the most-supplied digital skills, job-related digital skills level, and digital skills training.

An analysis of supply and demand indicators allows a look into the digital skills gap. As mentioned in the toolkit, there is an increasing gap between supply and demand of digital skills in Indonesia (APEC, 2020). The World Bank (2018) projected a shortage of 9 million skilled and semi-skilled ICT workers between 2015 and 2030. Further explorations of digital skill types, level, and other relevant factors are required to tackle the digital skills gap and to promote strategies in order to improve the level of digital skills in Indonesia.

Element 4.1 Demand for digital skills

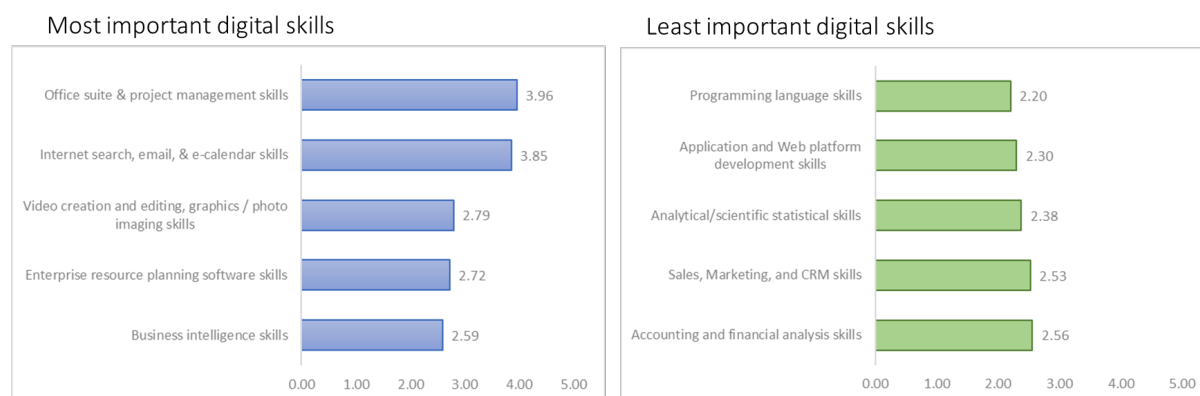
4.1.1 Most-demanded digital skills

The most-demanded digital skills refer to skills that a company deems as most important or needed in selected occupations, based on the company's subjective assessment. This indicates that companies are gravitating toward talent with certain levels of digital skills, as mentioned in the toolkit. The importance level of

digital skills is measured by the Likert scale that ranges from 1 (not important) to 5 (very important). Besides the firm survey results, job platform data can also be used to provide information on the top digital skills that firms are currently looking for.

The pilot survey reveals that the most important digital skills needed by all occupations are: (1) office suite and project management skills (score of 3.96); (2) internet search, email and e-calendar skills (3.85); and (3) video creation and editing, graphics/photo-imaging skills (2.79). Meanwhile, programming language skills, application and web platform development skills, and other specific/advanced digital skills are the least highlighted because this survey covers a wide range of occupations, including those that do not require advanced digital skills, like elementary occupations (Figure 29). This finding is in line with that of Beblavy et al. (2016), where handling various types of MS Office software – by far the most-demanded skill – is an ‘entry ticket’ to mid- and high-level jobs. Meanwhile, advanced digital skills are not generally present across most occupations, being limited only to a small number of jobs. Similarly, McKinsey (2019) stated that the demand for basic digital skills has been increasing in most jobs in Indonesia.

Figure 28. The most and least important digital skills based on business assessments



Source: CSIS, 2021.

The result might be different if only digital or computer-related occupations were measured. The ILO (2021) asserted that the most-demanded skills in the technology industry include: (1) back-end development, (2) database skills, (3) front-end development, (4) program design skills, and (5) mobile programming. Meanwhile, one of the job platforms in Indonesia, Grabjobs.com (2021), stated that the most important digital skills are data analytics, software, digital marketing, AI, and user experience design (UX design). Thus, the top demanded digital skills can be different depending on occupation and industry coverage.

The list of most-demanded digital skills can provide important information for other firms on the trends of digital skills demand. This is because the survey results also reveal that most companies agreed with digital skills having become more important in the last five years (78.9%), due to high business competition (91.86%), high standards of product demanded (89.5%), and adjustment with firms' organization/strategy (80.2%). Furthermore, this information is also useful for workers or job seekers who are looking to upskill or reskill their digital proficiency; and for the government, which is keen to develop education and training systems in accordance with the needs or demands of firms (particularly in order to improve the flow of information between employer and employee)

Figure 29. Importance of digital skills in the last five years



Source: CSIS, 2021.

4.1.2 Firm digital skills training

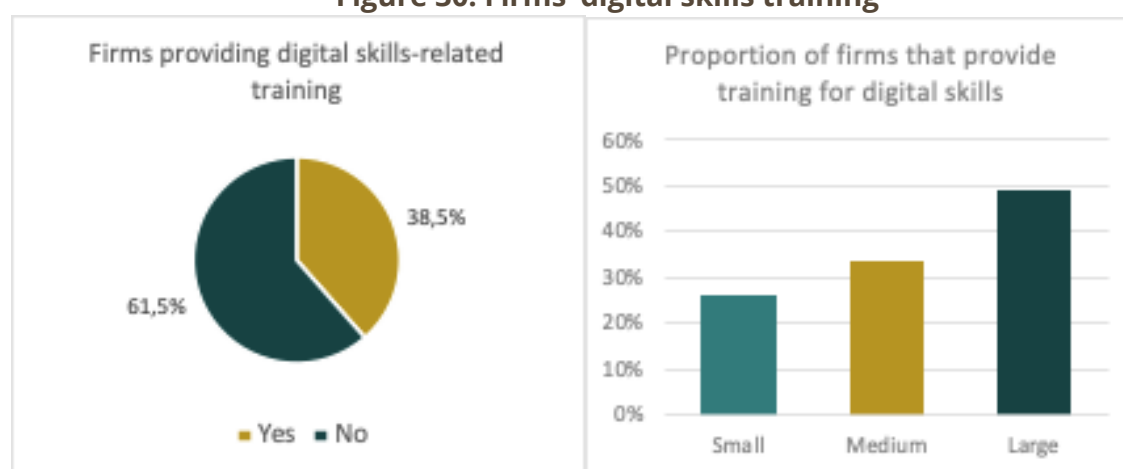
Regular training and upskilling are required to maintain performance and adapt with the latest digital technologies and business continuity at a minimum. McKinsey (2020) stated that adapting employees' skills and roles to the post-pandemic ways of working will be crucial to building operating-model resilience. The pilot survey reveals that only 38.5% of firms conducted digital skills-related training.

From this 38.5%, large firms were more likely to offer digital skills training in comparison with medium and small firms. The proportion of large firms that offered digital skills training was almost 50%. Meanwhile, a mere 33% of medium firms offered such training. This finding is in line with Indonesia's Occupational Employment Outlook's findings (2020), where only one third of medium firms provided training to employees. Additionally, of the large firms that are required by Indonesian labor regulations to provide worker training, one third fail to comply.

To increase the implementation of digital skills training in small firms, the government and private sector have employed many efforts to increase the digital

skills of MSMEs. These efforts aim to aid MSMEs in staying afloat amid the pandemic, by encouraging them to sell their products and services online. For example: since 2020, the Ministry of Cooperatives and SMEs has launched the foster brotherhood program (*Kakak Asuh*). The aim is to expand the products of SMEs by penetrating e-commerce platforms, where newly onboard MSMEs are assisted by involving e-commerce players like Blibli.com and Lazada Indonesia (TNP2K, 2021). Moreover, in the same year, Grab Indonesia introduced the *#TerusUsaha* campaign to encourage MSMEs to channel their fighting spirit and build resilience by adopting digitalization. Grab also offered training for MSMEs to help them bolster their online presence. Consequently, Grab has digitalized around 500,000 MSMEs throughout the pandemic (*The Jakarta Globe*, 2020).

Figure 30. Firms' digital skills training



Source: CSIS, 2021.

4.1.3 Most digital occupations

The digital occupations indicator is mainly derived from the firm survey based on the selected occupation and digital skills tasks, in the form of a matrix. Similar to most-demanded digital skills aforementioned, this indicator is derived using the importance level measured by the Likert scale again ranging from 1 (not important) to 5 (very important). The results are then classified into the level of digital skills.

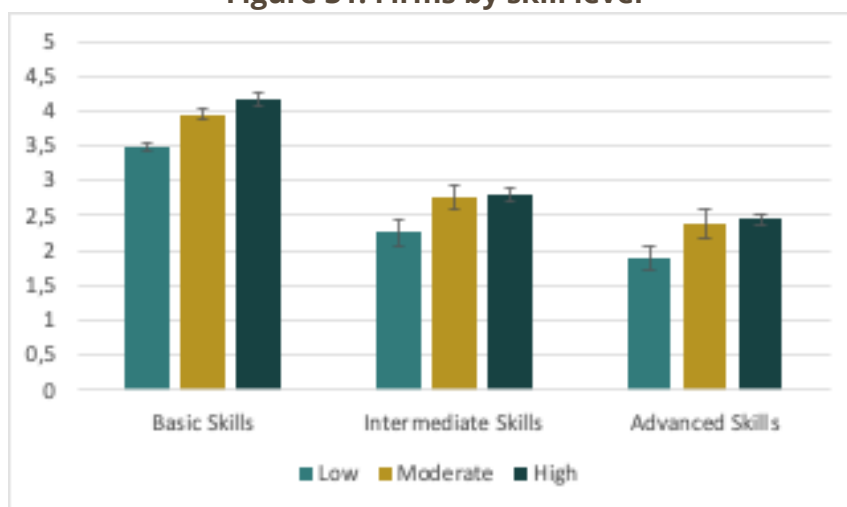
Based on the digital skill level, the demand for basic and intermediate digital skills is still higher than advanced skills¹⁰ (Figure 32). This is in line with the World Bank's

¹⁰ The definition of digital skill level is based on ITU (2018). Basic digital skills are foundational skills for performing basic tasks, which include office suite software, email and internet search, and also project management skills. Intermediate digital skills involve the use of technologies in more meaningful, beneficial, and job-ready ways, which includes accounting software, CRM, ERP, and digital graphic design. Advanced digital skills are those needed by ICT specialists, such as programming, big data, and software or web development.

claim (2020) that digital technology increases the demand for basic and intermediate digital skills (which help workers deploy these technologies) as well as advanced digital and higher-order cognitive and socio-emotional skills (which allow workers to leverage digital workplaces to engage in non-routine tasks).

When classifying the firms by their technological adoption rate,¹¹ firms with a higher rate have a higher demand for digital skills at each level. Brambilla (2018) stated that as a result of investment in ICT, firms grow, become more intensive in complex tasks, become more skill-intensive, and employ more skilled workers as long as skilled labor is complementary to ICT.

Figure 31. Firms by skill level



Source: CSIS, 2021.

By occupation, the survey results show that basic digital skills (including office suite, project management, internet search, email and e-calendar skills) are consistently required in all occupations. This implies that basic digital skills are required across most occupations, and they are necessary for workers to master when entering the labor market.

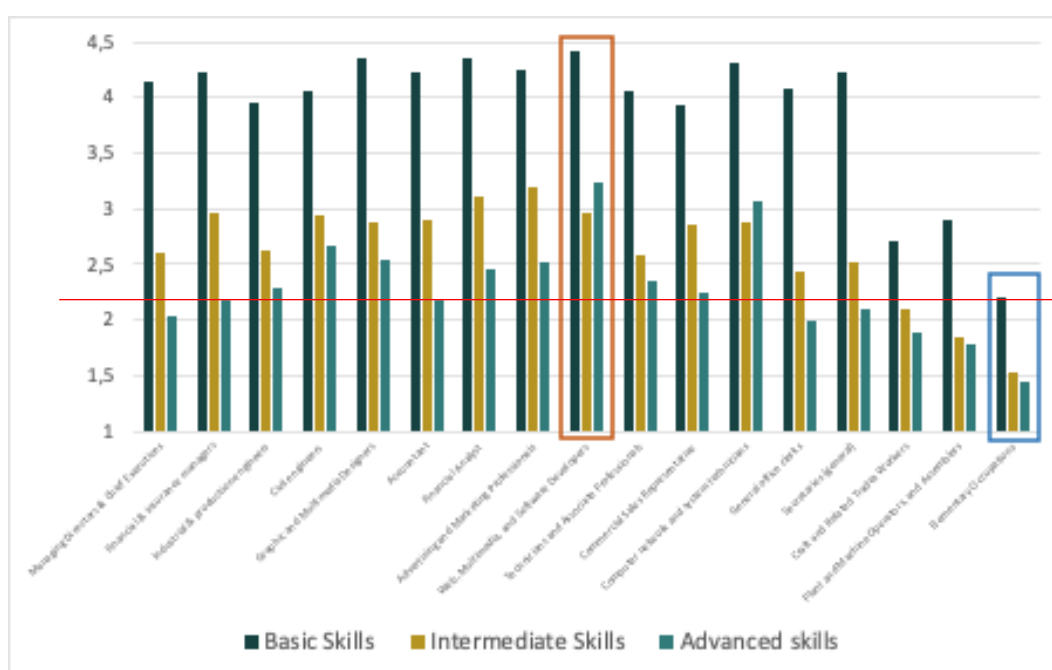
Intermediate digital skills are required for some occupations such as advertising and marketing professionals; financial analysts; financial and insurance managers; engineers; and graphic multimedia designers. For these occupations, the average importance score is higher than 2.5 (Figure 33). For advanced digital skills, some occupations that place great importance (higher than 2.5) on these skills are web, multimedia, and software developers; computer network and system technicians; and civil engineers. In addition,

¹¹ The definition of technological adoption rate is based on the estimation of z-score on how frequently the firm uses digital technology (social media, e-commerce, ERP, CRM, cloud computing, IoT, and AI). This is classified into three level categories, i.e. the upper 25th percentile is the highest adoption rate, the lower 25th percentile is the lowest adoption rate, and in between is the moderate adoption rate.

these occupations not only require advanced digital skills, but also basic and intermediate digital skills.

Akyazi (2020) identified skills needed in the civil engineering sector and concluded that civil engineers need to master digital skills from a basic to an advanced level, which encompasses: big data; AI; and business intelligence. Some specific skills are also needed in the near future such as: drone, 3D printing, and robotic construction. This conclusion is drawn from the European Multilingual Classification of Skills, Competences, Qualifications and Occupations (ESCO) database, where information like definitions and occupations, classifications, skills, competencies, and qualifications (which are consistent and suitable for the European job market), education, and training are provided.

Figure 32. Digital skill level by occupation

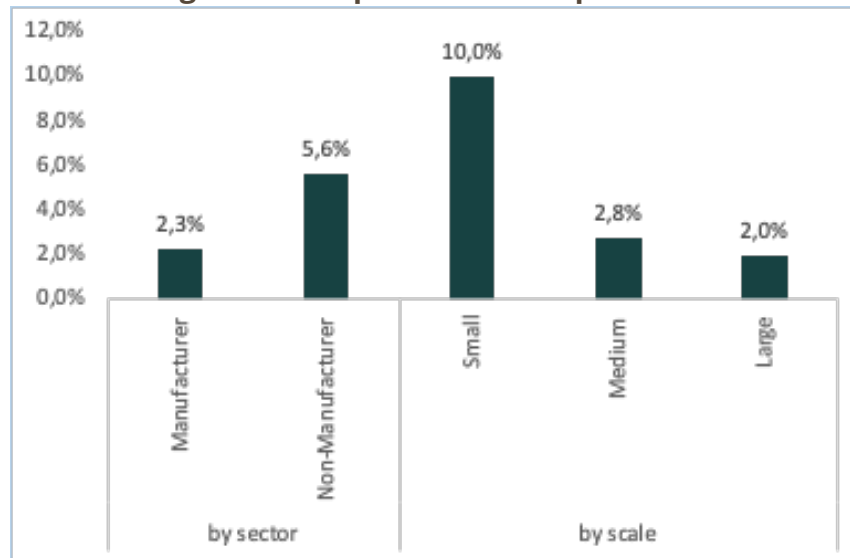


Source: CSIS, 2021.

With regard to ICT specialists as part of the advanced digital skill level, 73.4% of the sample already employs ICT specialists. Meanwhile, only 25% of firms agreed that outsourcing was still needed for their firm. However, this result may be sensitive to the firm size.

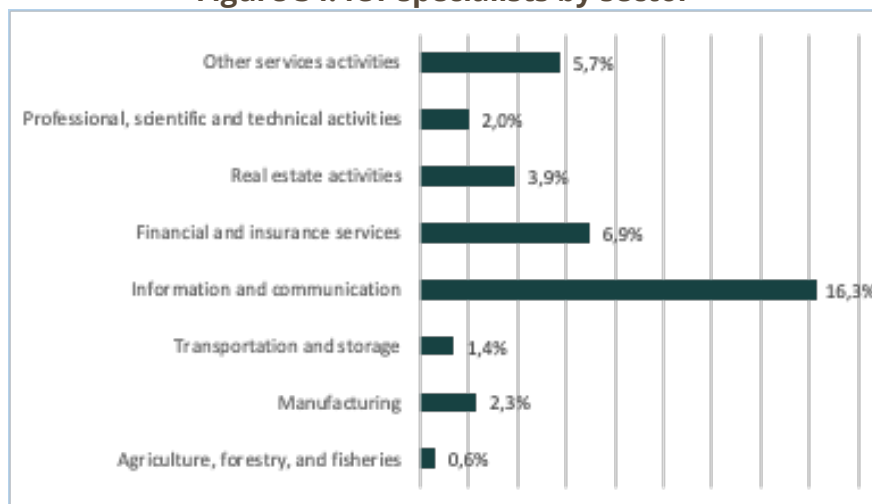
By sector, non-manufacturing firms have a higher proportion of ICT specialists (out of total employment) at 5.6%, compared with manufacturing firms (Figure 34). By firm size, the proportion of ICT specialists is highest in small firms (10%). On average, the proportion of ICT specialists in total is around 4.9%, which is slightly higher than the average proportion in the EU of 4.3%. Most ICT specialists work in information and communication (16.3%), financial and insurance services (6.9%) and other services activities (5.7%).

Figure 33. Proportion of ICT specialists



Source: CSIS, 2021.

Figure 34. ICT specialists by sector



Source: CSIS, 2021.

In addition, according to the labor force survey (LFS, 2021), there are more than 1 million individuals working in the ICT sector, where around 400,000 workers are professionals, technicians, and professional assistants. The number of ICT workers is even greater in other sectors that merely use ICT instead of being in the ICT sector itself, like in the area of e-commerce (ILO, 2019). By educational attainment, the majority of ICT specialists have university (from diploma to doctoral) degrees (more than 90%), while only 9% are senior high school graduates. (LFS, 2021) Meanwhile, the ILO (2019) highlights that half of all ICT specialists in Indonesia hold a degree from a secondary vocational high school. To specify, 15% of ICT workers have completed a level of education lower than high school, 10% have an upper vocational institution diploma, while 23% have a bachelor's degree from an academic institution. In 2018, only 2% of ICT specialists held a master's or doctorate degree. This sheds light on behavioral shifts in the

population, where the importance of education is gradually realized for those who seek to be or are ICT professionals.

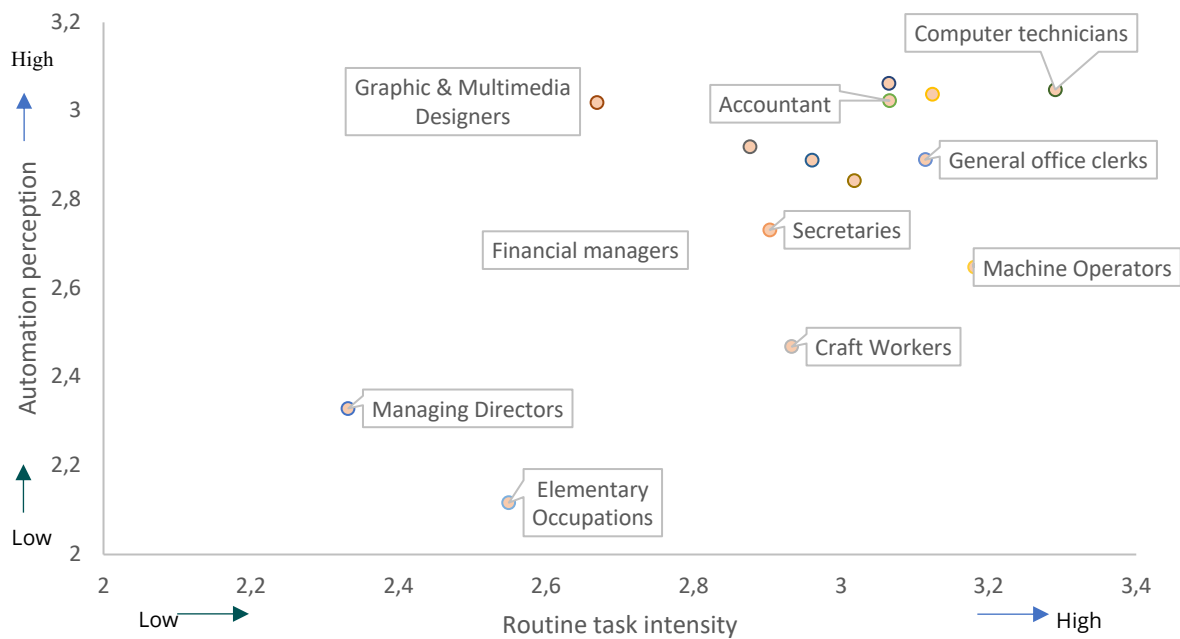
4.1.4 Degree of automation and routine task intensity

The purpose of these indicators is to identify which occupations are more easily replaced by technology or automation, and which occupations will survive or be created in the future. According to Autor, Levy, and Murnane (2003) routine tasks are more easily replaced by technology than non-routine tasks. Routine task intensity is assessed using three main questions: (1) whether the main tasks in each occupation involve data entry, and verifying accuracy of data and calculations; (2) sorting, picking, and assembling activities; and (3) setting up, monitoring/controlling, and operating a machine or equipment. The higher index of routine task intensity and automation perception implies that such occupations are more easily replaced by technology or automation.

The pilot survey results reveal that managing directors and elementary occupations have lower degrees of automation and routine task intensity, with indices that are less than 2.6. This implies that these occupations are more likely to survive. In contrast, computer technicians and general office clerks are perceived to have a higher level of automation and routine task intensity, suggesting that these occupations may possibly be replaced by technology in the future. Meanwhile, machine operators' tasks are relatively routine, but the automation perception is relatively low.

The Institute of Labor Economics (IZA) in 2019 argued that automation led to a polarization of labor markets with declining shares of middle-paid, routine-intensive occupations and rising shares of both, high- and low-paid jobs. Meanwhile, Arntz (2016) highlighted that workers typically adjust to changing technological endowments by focusing on those tasks that machines cannot perform. The reason is that new technologies may substitute for certain tasks on the job, but can typically also complement others. Targeted training and qualification measures may help workers switch to the expanding occupations and prevent increased future job inequality.

Figure 35. Automation Perception and Routine Task Intensity



Source: CSIS, 2021.

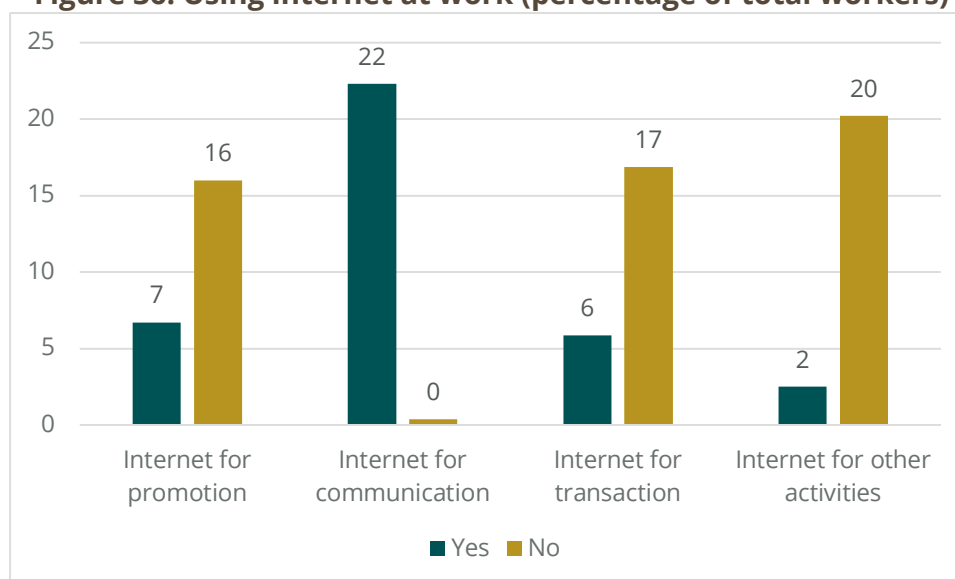
4.2 Supply of digital skills

4.2.1 Proportion of workers who use internet at work

According to the Statistics on the Utilization of ICT from Statistics Indonesia (2018), the proportion of workers who use computers at work was still relatively low at only 24.19%. By industry, the highest proportion of computer-use was found in information and communication (71.18%), followed by trade (39.02%), food and beverage (35.19%), accommodation (29.92%), with the lowest being manufacturing (15.01%).

Meanwhile, the labor force survey data (2021) reveal that the proportion of workers who use the internet is around 22.7%, while 41.1% do not use it and the remaining 36.2% did not reveal an answer. From those who use the internet at work, most of them use it for communication (22%), and 6% use it for transactions.

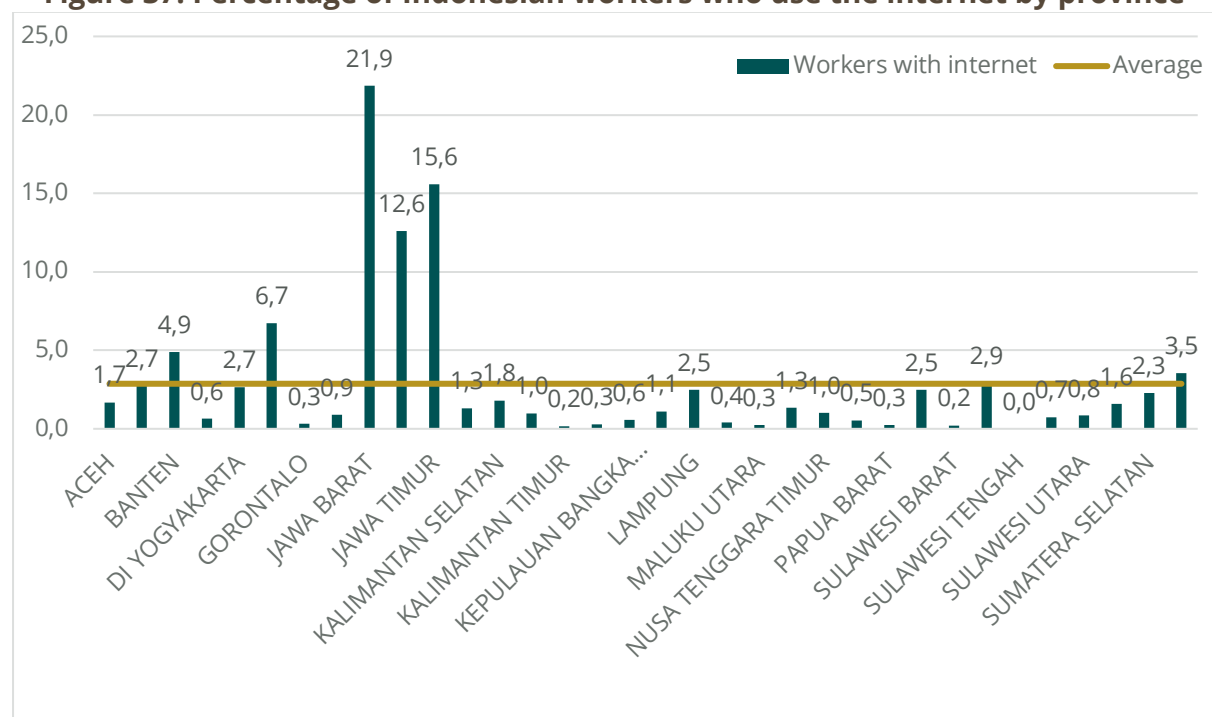
Figure 36. Using internet at work (percentage of total workers)



Source: CSIS, 2021.

Most of the respondents in the Greater Jakarta pilot survey who used the internet were located in urban areas (74%). Nationwide by province, the highest number of workers who use the internet for work was in West Java (21.9%), followed by East Java (15.6%), Central Java (12.6%), and Jakarta (6.7%). Meanwhile, the average proportion of workers who use the internet in Indonesia is 2.9 %, as seen in Figure 39. This confirms that a digital disparity occurs between Java and non-Java regions, with one of the reasons being that the Java-Bali region is more advanced in its digital-based economy (Adiningsih, 2019).

Figure 37. Percentage of Indonesian workers who use the internet by province

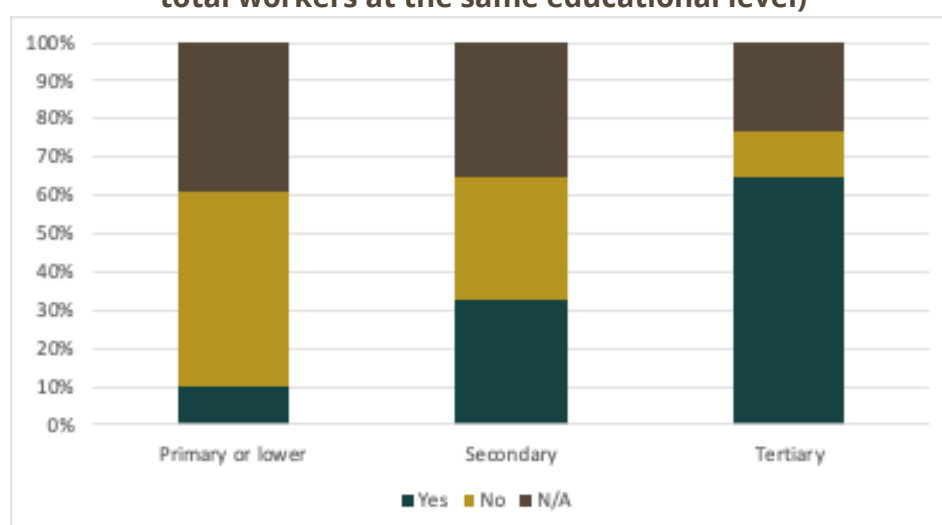


Source: CSIS, 2021.

4.2.2 Most-supplied digital skills

Education is commonly used as a proxy of digital skills, since a few previous empirical studies found a positive correlation between digital skills and educational attainment or performance (Schmitt and Wadsworth, 2006; Fairlie et al., 2010; Pagani et al., 2016). The labor force survey (2019) shows that the proportion of workers who use the internet at work increases by educational level, with the highest being workers with a tertiary educational background (57% of total workers with the same educational background), as seen in Figure 40.

Figure 38. Workers using the internet at work by educational level (percentage of total workers at the same educational level)



Source: CSIS, 2021.

Survey results can provide more detailed information, not only based on educational level approach, but also digital skills by sector. Sectors are divided into three categories: primary (i.e. agriculture), secondary (i.e. manufacturing), and tertiary (i.e. services). The higher the score of a digital skill, the higher the importance of that skill in a certain occupation or sector. Services or tertiary sectors have the highest scores for all identified digital skills, inferring that most digital skills are important for the tertiary sector. The importance of some digital skills is even higher in primary sectors compared with the other two sectors, like that of accounting, and statistical and academic software scores. This implies that digital skills are not only related to ICT sector or occupations, but also non-ICT sectors.

Table 7. The importance of digital skills by educational level

Digital Skills	Primary Secondary		
Office Application and Operating System	1.77	1.67	2.39
Internet Search, Email, and Calendar	1.91	2.69	2.81
Video, photograph, and graphic editing and making	1.35	1.58	1.82
Creating digital content	1.17	1.53	1.80
Accounting Software	1.33	1.16	1.21
Marketing, Sales, and Customer Management Software	1.07	1.05	1.30
Company planning and resources management software	1.34	1.07	1.21
Business intelligence and data analysis	1.15	1.04	1.16
Statistical and academic software	1.26	1.02	1.16
General programming	1.11	1.03	1.19
Web developing	1.05	1.02	1.19
Others	1.00	1.00	2.36
N	19	40	172

Source: CSIS, 2021.

4.2.3 Job-related digital skill level

The indicator of job-related digital skills is derived from the top supplied digital skills indicator. The skill level is divided into basic, intermediate, and advanced skills. The higher score of a digital skill implies a higher degree of importance.

Among the many intermediate digital skills, video, photograph, graphic editing and making; and digital content creation are the most popular skills for all age ranges (with a score higher than 1.30). This is in line with the fact that 94% of the population accessed YouTube in the past month, with an average usage or watching time of around 25.9 hours per month (*Kompas*, 2021). The score of these skills decreases with older age groups, because the youth population is more tech-savvy (Kinda and Yan, 2018). In addition to this, basic skills (office and internet) have higher scores, confirming the finding on the demand side that basic skill is an 'entry ticket' to the labor market.

For advanced skills, general programming skills have scores between 1.1 and 1.4. Meanwhile, business intelligence and data analysis and company planning, and resources management software have lower scores that are less than 1.1. General programming skills may be more important than the other advanced digital skills based on the firm's assessment, because general programming commonly has a larger size of employment (UNCTAD, 2019). As a comparison, in the US, computer programmers held about 185,700 jobs in 2020. The largest employers of computer programmers were computer system design and related services; finance and insurance; manufacturing; software publishers; and self-employed workers (US Bureau of Labor Statistics, 2021). This suggests that the need for digital skills it is not limited to the ICT sector.

By age range, the highest score of advanced digital skills is for the age range 15-25 for general programming and web developing. Digital technology has always been easily embraced by the young (Bradford, 2018). This implies that the younger generation understand the significant role digital literacy and proficiency plays in their future careers, although this does not mean that they have acquired the skills.

Table 8. Job-related digital skill level by age group

Digital Skills	15-25	26-35	36-45	46-55	>55
Office Application and Operating System	2.92	2.14	1.95	1.82	1.77
Internet Search, Email, and Calendar	3.43	2.79	2.73	2.01	2.10
Video, photograph, and graphic editing and making	2.15	1.76	1.76	1.39	1.32
Creating digital content	2.64	1.94	1.83	1.29	1.47
Accounting Software	1.29	1.20	1.17	1.13	1.15
Marketing, Sales, and Customer Management Software	1.22	1.17	1.23	1.16	1.23
Company planning and resources management software	1.09	1.16	1.12	1.14	1.12
Business intelligence and data analysis	1.06	1.08	1.12	1.10	1.17
Statistical and academic software	1.13	1.11	1.08	1.12	1.23
General programming	1.32	1.23	1.15	1.13	1.23
Web developing	1.19	1.18	1.11	1.06	1.11
Others	2.00	2.10	1.00	.	3.00
N	78	123	141	97	61

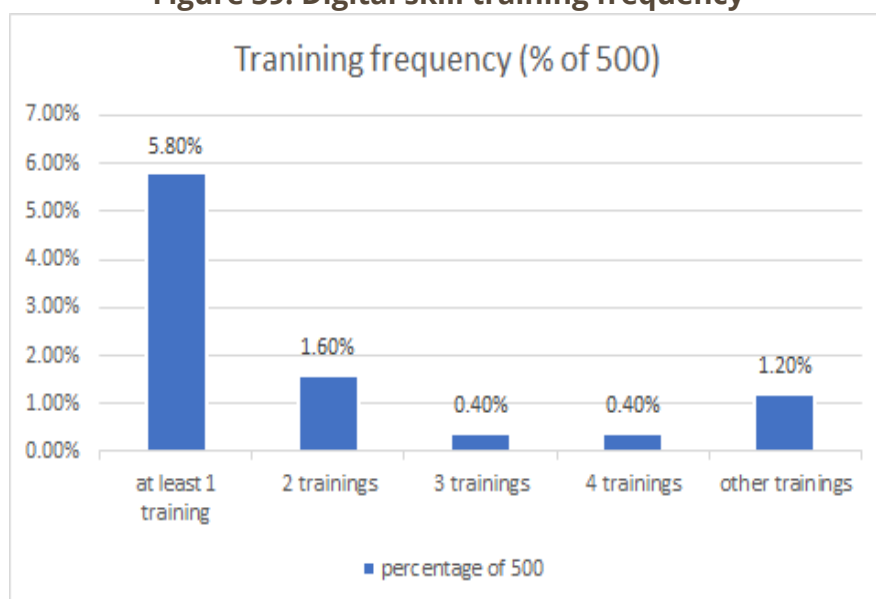
Source: CSIS, 2021.

4.2.4 Digital skills training

It is not only firms who are conducting on-the-job training for upskilling, as some workers are also voluntarily taking courses to improve their digital skills.

The pilot survey shows that fewer than 10% of workers had taken training (46 out of 500 samples) in the last three years. In terms of frequency of courses undertaken, most of the respondents only followed one course (Figure 41) in the last three years. By software that can represent certain digital skills, training on Microsoft Office was the most popular course taken by workers. Aside from this, video and design graphics training are gradually increasing in value due to the rapid development of YouTube and social media. This result confirms that basic and intermediate digital skills are still in high demand, with their training having room for improvement. For advanced digital skills, only a small proportion of workers reveal that they have undertaken a limited amount of digital training such as: UI path and network engineering.

Figure 39. Digital skill training frequency



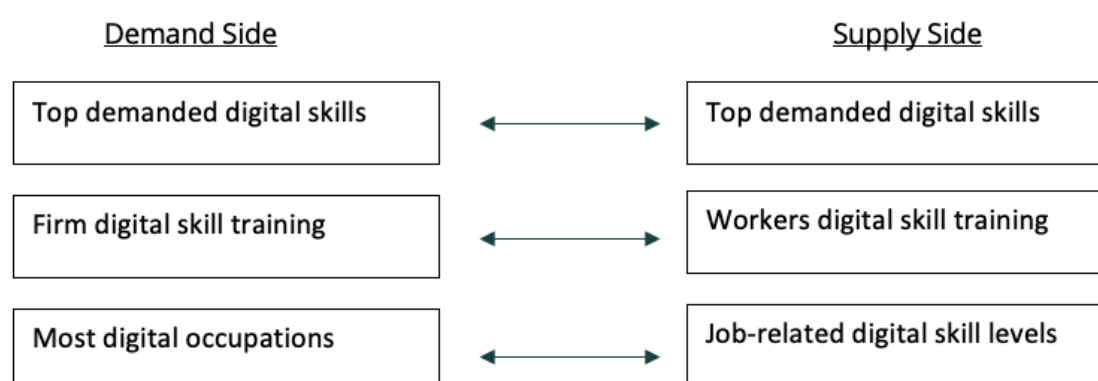
Source: CSIS, 2021.

E. Further analysis: Digital skills, supply and demand analysis

The analysis of supply and demand allows us to explore the skills gap analysis. A skills gap or skilled labor shortage occur when the skill levels of workers are insufficient to meet the requirements of their current job (McGuinness and Ortiz, 2015). Consequently, the resulting shortage will normally put upward pressure on wages, thereby increasing the supply of knowledge workers while reducing the quantity of workers demanded. In contrast to traditional economic analysis, wages are not rising, and the skilled labor shortage is not dissipating. Rather, the skills gap is growing (Whittaker and Williams, 2016).

Demand is analyzed based on the survey of firms, while the supply is analyzed from the survey of individuals. Matching supply and demand indicators can provide a comprehensive analysis of the skills gap.

Figure 40. Digital skills gap analysis using indicators of digital skills supply and demand



Firstly, the most-demanded and supplied digital skills indicate that office suite and project management skills; internet search, email and e-calendar skills; and video creation and editing, graphics/photo imaging skills are three essential digital skills for most occupations across industries as well as educational levels. This also confirmed that basic digital skills (including office suite and project management skills; internet search, email and e-calendar skills) are the 'entry ticket' to mid- and high-level jobs. However, this result is obtained from general occupational classification. If occupation is specified only for the ICT industry, results may differ.

For digital skills training, 38.5% of firms conducted such training, and large firms are more likely to offer these training programs compared with medium and small firms. On the other hand, fewer than 10% of workers had undergone training. This may indicate that the process of skilling, upskilling, and reskilling still have large room for improvement. There are many efforts to accelerate the skilling, upskilling, and reskilling process conducted by the government and private sector. The government and private sector have many programs to increase digital skills, like the digital talent scholarship offered by the Ministry of Communications and Information. By law, Indonesian labor regulations require firms to provide worker training; moreover, the government has launched super tax deductions that provide incentives to businesses involved in implementing vocational education programs. Thus, law enforcement and incentive schemes are key factors in tackling these issues.

Turning to most digital occupations and job-related digital skills, video, photograph, graphic editing and making, as well as digital content creation, have become popular intermediate digital skills that attract both workers and firms. This is in line with the rapid development of Indonesia's digital economy.

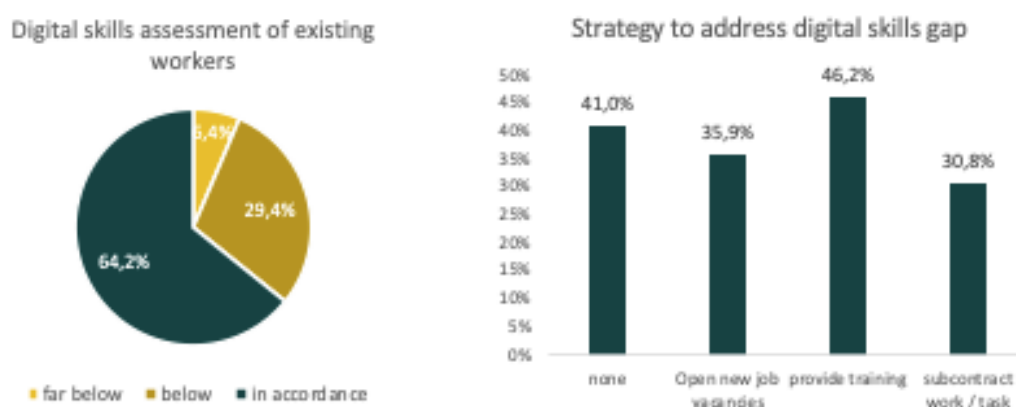
For advanced skills, the individual survey indicates that general programming is one of the most popular advanced digital skills. However, the firm survey indicates that the need is beyond general programming, as some occupations require digital skills related to web,

multimedia, and software development; computer network and system technology; and civil engineering. The gap may occur in this skill level; thus, improvements in knowledge and skill acquisition of advanced digital skills are essential to tap into the potential of the current rapid development and adoption of digitalization.

Besides the matching analysis, direct questions were asked of firms on the occurrence of a digital skills gap in their business. Most of them (64.2%) claimed that the skills required were already in line with the skills supplied, or in other words, the digital skills gap was not their main issue (Figure 43). This also confirms the previous findings. Some possible explanations for this include the pursuit of digital skills training by firms, which effectively closes the digital skills gap; the selective assessment of potential workers, wherein a company chooses the best candidate from the pool of applicants; and the struggle businesses are facing in the digital transformation, despite the pressures of the pandemic and the hurrah over digitalization amid a tech start-up boom in the country (*The Jakarta Post*, 2021). Thus, the digital skills required change more slowly than expected. Another possible reason is related to the survey's technical issue on data confidentiality.

Furthermore, only 6.4% of the sample revealed that skills supplied were far below the skills required, meaning that workers are underqualified for the job. From those who asserted that there was a digital skills gap, 46.2% of the firms provided relevant training as one of the strategies to address the digital skills gap. Meanwhile, 41% of firms were doing nothing or pursuing no strategy (with one possible reason being capital limitation to upskill or provide workers with more advanced skills), and 35.9% of firms opened new job vacancies (Figure 43 – the right-side graph).

Figure 41. Digital skills gap within firms



Source: CSIS, 2021.

The lack of digital skills becomes an issue for occupations that require advanced digital skill levels, such as: web, multimedia, and software developers (50% of firms reported this); Graphic and multimedia designers (45.2%); computer network and system technicians (42.2%); and civil engineers (41.7%). This finding confirms the existence of an advanced digital skills gap.

Akyazi et al. (2020) assert that civil engineers should be able to master some advanced digital skills, such as technical drawing software. In addition to this, the future may also require them to upskill by learning and mastering 3D printing and robotic construction. Thus, civil engineering jobs - as well as other occupations that necessitate advanced digital skills - need to update workforce qualifications in order to grow progressively and become a competitive industry. In line with this, the education sector also needs to update its curricula.

In terms of difficulty of hiring, occupations that have lower levels of automation and routine task intensity tend to find more difficulties when finding the best candidates. Examples of these occupations include managing directors (with a difficulty level in hiring of 4.02 out of 5) and financial and insurance managers (with a score of 3.6). Yet, this difficulty is not related to the lack of digital skills.

Table 9. Number of vacancies, difficulty of hiring and digital skills gap by occupation, based on firm's assessment

		(1)	(2)	(3)	(4)
		Number of samples for occupation analysis (N)	Number of people needed in vacancy	Difficulty level in hiring (1-5)	Applicant's lack of digital skills required as one of the constraints in hiring
1	Managing directors and chief executives	100	55	4.02	19%
2	Financial and insurance managers	67	281	3.63	23%
3	Industrial and production engineers	57	192	3.60	26%
4	Civil engineers	29	135	3.33	41.67%
5	Graphic and multimedia designers	49	181	3.03	45.24%
6	Accountants	93	344	2.92	24%
7	Financial Analysts	72	154	3.33	31.15%
8	Advertising and marketing professionals	60	220	2.90	37.74%
9	Web, multimedia, and software developers	69	329	3.17	50%
10	Technicians and associated professionals	70	1733	2.96	20.37%
11	Commercial sales representatives	42	1411	3.03	19.35%
12	Computer network and system technicians	70	223	3.05	42.19%
13	General office clerks	87	764	2.50	20.97%
14	Secretaries (general)	65	142	2.77	21.57%
15	Craft and related trades workers	36	95	2.74	8%

1 6	Plant and machine operators, and assemblers	60	6687	2.53	15.91%
1 7	Elementary occupations	84	1738	2.03	9.62%

Source: CSIS, 2021.

Finally, the other indicator that can reflect the presence of a skills gap is an increase in wages (Whittaker and Williams, 2016). Based on a salary survey in 2020, IT-related occupation wages range from Rp 16 million per month for data scientists to Rp 62 million per month for heads of IT; these amounts are far higher than the Jakarta provincial minimum wage of Rp 4.2 million (Statistics DKI Jakarta, 2020). These wages increased by 20-30%, compared with wages in 2019 (Walters, 2020). Thus, a shortage of ICT occupations, in particular ICT specialists, may be occurring in Indonesia.

From the analysis above, we can conclude that a digital skills gap may not be present in basic and intermediate digital skill levels. Many workers have these skills and agree that office suite and project management skills; internet search, email and e-calendar skills are necessary to enter the labor market. However, digital skills training in the workplace should be strengthened, as efforts for skilling, upskilling, and reskilling can continue to minimize the digital skills gap in the workplace. For advanced digital skills, the analysis indicates that the gap may exist because there is a different perspective or assessment of the digital skills required from the worker's and the firm's point of view. In other words, there is asymmetric information between employers and employees, where firms demand higher and more advanced digital skills than the workers have.

Yet, considering the limitation of the pilot survey's sample - small and limited to only Greater Jakarta - matching supply and demand can be used as an indicative result of Greater Jakarta conditions, but should not be used to generalize Indonesia's current situation. It is worth noting that the average education and skills level of Greater Jakarta is higher than the average for Indonesia. Statistics Indonesia (2020) stated that the HDI in Jakarta is 80.77, the highest index compared with all other provinces; meanwhile, the average HDI in Indonesia is 71.94. As a result, the skills gap in the pilot survey may be lower than the actual digital skills gap in Indonesia.

F. Conclusion

The objective of the pilot survey analysis was to observe the workability of the toolkit using Indonesia as a case. The pilot survey also tested the survey approach and guidelines and used complementary secondary data for the toolkit. Several notes should be highlighted. First, the provided data and analysis come from the pilot firm and individual surveys, which were conducted in Greater Jakarta. Therefore, the findings should not be generalized as being representative nationally. Second, the secondary data for the toolkit should be disaggregated by gender, urban-rural, age groups, educational background, and employment status for individual data. This is important since the goal of the toolkit is to achieve a more inclusive and productive digital economy by improving digital skills and literacy. Lastly, countries are encouraged to implement the toolkit using a national survey disaggregated by regions (e.g. provincial-level or district-level) and adding more elements (e.g. digital culture or values).

From the firm-level pilot survey for the first pillar, we found that a firm's size matters in regard to technological adoption. Large companies are more likely to adopt advanced technology. The analysis also found some interesting findings from the second and third pillars. The pilot survey found aligned results, with our hypotheses such as education, age group, and occupations being heavily associated with digital skills and literacy for the second pillar. However, we found that gender and rural-urban are not correlated with digital literacy. Some of these contrary results—from previous similar surveys—may be caused by the different sample characteristics between this small survey (sample from Greater Jakarta) and the previous (national) surveys with more heterogeneous characteristics. For the empowerment pillar, the pilot survey revealed that e-commerce and service provider platforms are the most inclusive platforms especially for females and less-educated people. Policy makers should consider developing a concrete strategy to improve digital literacy and skills specifically for utilizing e-commerce platforms more productively and inclusively.

For the fourth pillar, the analysis confirmed that basic digital skill level is an 'entry ticket' to mid- and high-level jobs. The intermediate skills level has become more important in the pandemic era. We can also expand the approach to analyze the digital skills gap in any digital skills level. The pilot survey result revealed that a digital skills gap may not exist at the basic and intermediate digital skill levels in Greater Jakarta, but it may occur at the advanced digital skills level. Yet, a different result could well be found at the national level, since the Greater Jakarta area has more advanced development in human resources and digital infrastructure.

From the pilot survey result and experience, there are some lessons learned that can improve the survey framework and design to be implemented at the national level of G20 members.

LESSON 1: BROAD VS NARROW DEFINITION OF DIGITAL SKILLS TOOLKIT

A broad definition can measure all aspects of digital skills and literacy, including the use of digital technology for both livelihood and developing the technology itself. While a narrow definition measures a specific aspect of digital skills and literacy. Broad and narrow definitions of digital skills have some advantages and disadvantages simultaneously. As an initial step to measuring the level of competencies and capturing the digital skills transformation, a broad definition is more appropriate and may also encompass a narrow definition in some pillars.

LESSON 2: FLOW VS STOCK VARIABLES

It is better to use either stock or flow for uniformity of indicators in this toolkit. A flow variable refers to a variable that is measured over a period or per unit of time; meanwhile, a stock variable is that which is measured at a point in time.

LESSON 3: MAJOR VS DETAILED OCCUPATION LISTS

This toolkit approach combines a major group of the ISCO-88 from the ILO, with selected sub-major groups, aiming to get a broad picture of general occupations while simultaneously seeking to obtain details about particular occupations that use digital technology. Moreover, the choice of occupational classification will affect the presence of a skills gap. A detailed occupational list of IT-related occupations is needed to enrich the gap analysis at the advanced digital skills level

LESSON 4: FIRM SELF-ASSESSMENT MAY NOT BE ACCURATE IN MEASURING THE DIGITAL SKILLS GAP

To minimize the biases, self-assessment by firms should be supplemented with other data sources to validate the existence of a digital skills gap, such as individual surveys or other secondary data. Firms commonly make efforts to minimize skill gaps, e.g., on-the-job training, thus a firm's assessment of the current digital skills gap may not be accurate.

Finally, the application of this toolkit at the national level of G20 members, with a cautious interpretation and representative sampling distribution, can provide a comprehensive picture of current digital skill conditions, in order to help G20 members to identify digital skills' strengths and weaknesses, to map digital skills structure, and to support efforts to close the digital skills gap, as aimed at by the toolkit.

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