SMERU RESEARCH REPORT NO. 5/2024

ANALYSIS OF DIGITAL SKILLS DEVELOPMENT IN THE PUBLIC SECTOR IN INDONESIA

The SMERU Research Institute, GIZ, and Blavatnik School of Government, University of Oxford

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Editor

Mohammad Gabriell Firdausy Erfan

The SMERU Research Institute

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Authors: The SMERU Research Institute, GIZ, and Blavatnik School of Government, University of Oxford

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Abstract

Analysis of Digital Skills Development in the Public Sector in Indonesia

The SMERU Research Institute, GIZ, and Blavatnik School of Government, University of Oxford

Using the four aspects of e-government (governance, services, infrastructure, and human capital), this mixed methods study seeks to provide an analysis of the digital skills development in the Indonesian public sector. Focus is given to the issue of supply and demand of state civil apparatuses (ASN) and their quality to implement e-government in the public sector. The study finds that information and communication technology (ICT) officers (*pranata komputer/prakom*) have the largest contribution to the implementation of e-government compared to the other ICT functional positions. However, the proportion of ICT officers in the total number of ASN is too low, and the current quality of ICT officers has raised concerns. Furthermore, the current delayering policy is indicated to contribute to the increasing number of unqualified ICT officers. Meanwhile, there are no plans so far of organizing a competency test for ICT officers. The study identifies three possible channels to fill the gap between the supply and demand of ICT officers: (i) the recruitment channel to onboard additional civil servants (PNS), contract-based government employees (PPPK), or individual consultants for contracts shorter than PPPK; (ii) the capacity building channel to optimize the currently available resources; and (iii) the retention channel to address the high turnover rate of ICT professionals. This study examines some good practices in five digital government units, which are (i) the Digital Transformation Office (Ministry of Health); (ii) GovTech Edu (Ministry of Education, Culture, Research, and Technology); (iii) Central Transformation Office (Ministry of Finance); (iv) Jakarta Smart City (Jakarta Provincial Government); and (v) Jabar Digital Service (West Java Provincial Government). These digital government units give lessons related to the necessity to improve recruitment method to attract digital talents into the public sector, the urgency of upskilling capacity through in-house capacity building, and flexible working arrangements, collaborative work, as well as less hierarchical culture. This study recommends that the government should prioritize PPPK as the most strategic channel to attract qualified digital talents; therefore, regulations related to PPPK recruitment for the ICT functional positions should be made. The government should offer competitive salaries and opportunities to contribute to the creation of social impacts. Meanwhile, Statistics Indonesia (BPS), as the supervisory institution for ICT officers, should organize a competency test for capacity building. Upskilling programs through formal education is important for underqualified officers. Finally, the training for government leaders should include materials related to collaborative and nonhierarchical work culture as a strategy for retention measures, especially to handle ICT officers, who are predominantly millennials and generation Z.

Keywords: digital skills, public sector, e-government, civil servant, state civil apparatus

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List of Abbreviations

AAKI	Asosiasi Analis Kebijakan Indonesia	Policy Analyst Association
ASEAN		Association of Southeast Asian Nations
ASN	*aparatur sipil negara*	state civil apparatus
Bappenas	Badan Perencanaan Pembangunan Nasional	National Development Planning Agency
BNSP	Badan Nasional Sertifikasi Profesi	National Professional Certification Agency
BKN	Badan Kepegawaian Nasional	National Civil Service Agency
BLUD	Badan Layanan Umum Daerah	Regional Public Service Agency
BPK	Badan Pengawas Keuangan	Audit Board
BPKP	Badan Pengawas Keuangan dan Pembangunan	Financial and Development Supervisory Board
BPS	Badan Pusat Statistik	Statistics Indonesia
BRIN	Badan Riset dan Inovasi Nasional	National Research and Innovation Agency
BSSN	Badan Siber dan Sandi Negara	State Cyber and Signal Agency
CASN	*calon aparatur sipil negara*	candidate of state civil apparatus
CTO		Central Transformation Office
corpu		corporate university
DTO		Digital Transformation Office
GoI		Government of Indonesia
GTA		Government Transformation Academy
GACUA		Global Association of Corporate Universities & Academies
ICT		information and communication technology
prakom	*pranata komputer*	ICT officer
manggala informatika		information security manager
JSC		Jakarta Smart City
JDS	Jabar Digital Service	West Java Digital Service

KADIN	Kamar Dagang Indonesia	Indonesian Chamber of Commerce
LAN	Lembaga Administrasi Negara	State Administration Agency
Kemenkominfo	Kementerian Komunikasi dan Informatika	Ministry of Communication and Informatics
Kemenkeu	Kementerian Keuangan	Ministry of Finance
Kemenkes	Kementerian Kesehatan	Ministry of Health
Kemendagri	Kementerian Dalam Negeri	Ministry of Home Affairs
Kemenkumham	Kementerian Hukum dan Hak Asasi Manusia	Ministry of Law and Human Rights
Kemenaker	Kementerian Ketenagakerjaan	Ministry of Labor
Kementerian PANRB	Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi	Ministry of Administrative and Bureaucratic Reform
PMO		Project Management Office
PNS	*pegawai negeri sipil*	civil servant
PPPK	*pegawai pemerintah dengan perjanjian kerja*	contract-based government employees
pusdiklat	*pusat pendidikan dan pelatihan*	education and training center
SPBE	*sistem pemerintahan berbasis elektronik*	electronic-based government system
STAN	Sekolah Tinggi Administrasi Negara	College for State Administration
THR	*tunjangan hari raya*	religious festivity allowance
WBK	*Wilayah Bebas Korupsi*	Corruption-Free Area
WBBM	*Wilayah Birokrasi Bersih dan Melayani*	Clean and Attending Bureaucracy Area

Executive Summary

The COVID-19 pandemic has proven that digital transformation is a must for the public sector. In fact, the initiative to go digital in Indonesia has started since the issuance of Presidential Instruction No. 3 of 2003 on National Policy and Strategy for E-Government Development, which was further reemphasized with Presidential Regulation No. 95 of 2018 on E-Government. However, it takes digital skills in the public sector to implement e-government. In reality, there are only a limited number of government employees that possess adequate digital skills, as explicitly written in the presidential regulation. This is in line with the current condition of the labor market in the country. A study from Amazon Web Service and AlphaBeta (2021) found that 19% of workers have basic digital skills, and 6% have intermediate digital skills. Quite in the same vein, a recent study conducted by SMERU, Oxford, and UNESCAP (2022) highlighted the fact that fewer than 1% of Indonesian workers have advanced digital skills. At the same time, the public sector in many countries cannot compete with the private sector in the war for talent.

In order to study e-government, one needs to understand the context and evolution of Indonesia's public sector. Therefore, in this report, the regulatory framework has been mapped to understand the state civil apparatus (ASN) as well as the broader context of bureaucratic reform in the Indonesian public sector. Data on the number of ASN over the periods is also discussed.

ASN consists of two groups, which are (i) civil servants (PNS) with permanent employment contract; and (ii) contract-based government employees (PPPK) with a one-to-five-year contract. Currently, Indonesia's public sector employs 4.3 million ASN, consisting of 3.9 million (92%) PNS and 352,000 (8%) PPPK. From those figures, it can be seen that ASN is still dominated by PNS. However, the government will increase the number of PPPK in the following years. In 2022, the government recruited 1.1 million ASN, 95% of whom are PPPK. In terms of structure, ASN consists of three broad positions, namely high leadership position (*jabatan pimpinan tinggi*), administrative position (*jabatan administrasi*), and functional position (*jabatan fungsional*). The high leadership and administrative positions are commonly referred to as structural positions, which predominantly perform managerial functions. Meanwhile, functional positions are focused more on specific technical jobs that require certain skills and competencies. There are currently at least 27 clusters of functional positions comprising 288 roles within the Government of Indonesia (GoI). Besides ASN, there are several other types of government employees, such as contract staff, individual consultants, vendors, and others. However, contract staff and individual consultants will not be employed anymore by November 2023, as they will be replaced by PPPK.

This study adopts the four aspects of e-government as stipulated under Presidential Regulation No. 95 of 2018 as its research framework, namely (i) governance; (ii) service delivery; (iii) infrastructure; and (iv) human resources. *First*, the main objective of governance is to ensure that e-government is implemented in an integrated and effective manner across government institutions. *Second*, effective and efficient service delivery can boost the productivity of ASN, reduce services costs, and improve the

bureaucratic and administrative functions within and across levels of government. *Third*, e-government infrastructures, including all hardware, software, and facilities, are the main support for the government institutions in running their own work systems and in delivering public services. *Lastly*, the human resources, namely the ASN, stand at the forefront of the public sector. As e-government becomes more essential, they need to be equipped with digital skills. However, information and communication technology (ICT) experts are needed to allow for the upskilling activities for ASN to optimize the use of technology.

In order to identify relevant digital skills in e-government, we need the definitions of ICT competences in the public sector. However, there is no document providing such definitions. Therefore, we utilized the ICT occupation map developed by the Ministry of Communication and Informatics to identify the ICT job families and specific jobs. There are nine ranks of qualification, and this map provides the rank of each job family and specific job. We used this information and found 283 digital skills or specific jobs that are relevant to the implementation of e-government. Since the ICT occupation map also specifies the competence units of these jobs, we were able to match them with the job descriptions of each functional position. Our matching analysis revealed that, among the ICT functional positions in Indonesia's public sector, ICT officers (*pranata komputer/prakom*) have the largest contribution to the implementation of e-government, as 90% of their job description match the skills required to implement this system. In contrast, the rest of the functional positions only contribute insignificantly, with information security manager (*manggala informatika*), cryptographer (*sandiman*) (both are classified into ICT functional positions), and other roles contributing 6%, 2%, and 1%, respectively. In conclusion, ICT officers, particularly the expert-level ones, hold an essential role in e-government, implying that higher quality ICT officers are needed to support its implementation.

The importance of ICT officers in the implementation of e-government can also be seen from their significantly higher number compared to other ICT professionals. The National Civil Service Agency (BKN) recorded that at least 77% (7,954 out of 10,281) ICT professionals are ICT officers. However, despite their importance, the proportion of ICT officers in the total number of ASN (4,344,552) is too low, i.e., 0.24%. Meanwhile, the demand for this role exceeds far beyond the available supply. Based on the data obtained from Statistics Indonesia (BPS), we found that during the 2020–2024 period, all ministries and institutions at the central government level need at least 16,348 people to fill in the ICT officer positions, while the current supply is only 2,831 people. In other words, an additional 13,517 people are needed to fill in the ICT officer positions between that period.

In addition to this quantity issue, the current quality of ICT officers also raises concerns. The delayering policy is indicated to contribute to 23% of the ICT officers having non-ICT educational background or having lower than a three-year diploma (D-3). In other words, they are unqualified even for the skilled-level ICT officers. Moreover, only 56% of ICT officers are of expert-level, i.e., those with at least a four-year diploma (D-4) or university graduate with an ICT educational background. This is below the requirement, as our matching analysis shows that it takes 91% of expert-level ICT officers to implement e-government. However, in terms of age composition, ASN are dominated by boomers and generation X in general, while the ICT officers are dominated by millennials and

generation Z. In addition to concerns over the educational background, there are no plans so far regarding the competency test for ICT officers.

The gaps between the supply and demand need to be addressed through three possible channels. First, the recruitment channel can be used to onboard additional PNS, PPPK, or individual consultants for contracts shorter than PPPK. Recruitment could also be applied to procure services from vendors when the government intends to outsource the work. Furthermore, a new source of internal recruitment, i.e., through internal job vacancies, also emerges. All these different types of recruitment will be discussed from their positive and negative sides. Second, the capacity building channel optimizes the currently available resources. There are various types of capacity building, starting from short courses, academic degrees, skill certifications, expert consultation or in-house training, and conferences. They will also be elaborated by addressing their positive and negative sides. Third, the retention channels to address the high turnover rate of ICT professionals, which include issues such as remuneration, career path, work arrangement, work culture, and leadership, are explored.

Several digital government units have applied good practices that they draw from the private sector's experience to improve the e-government implementation. For this reason, the study examines some good practices in five digital government units, particularly on three channels that address the supply and demand gap. These digital government units are (i) the Digital Transformation Office (Ministry of Health); (ii) GovTech Edu (Ministry of Education, Culture, Research, and Technology); (iii) Central Transformation Office (Ministry of Finance); (iv) Jakarta Smart City (Jakarta Provincial Government); and (v) Jabar Digital Service (West Java Provincial Government). Having learned from the experience of these digital government units, we underline the necessity to implement an improved and updated recruitment method—less-bureaucratic, innovative, and flexible—to attract digital talents into the public sector. This strategy needs to be supported by competitive remuneration as well as nonfinancial benefits. In recruiting the best candidates, the digital government units also employ a strategy of "selling" the opportunity for the candidates to generate social impacts and contribute to improving the lives of the people on a large scale. In terms of capacity building, the digital government units make good use of in-house capacity building as the most strategic channel to upskill their employees' capacity. In-house capacity building is considered relatively low-cost and can be frequently organized by utilizing internal human resources. Digital government units also implement flexible working arrangements, allowing ICT professionals to work from anywhere and at any time, as long as the targets can be achieved in a timely manner. They also maintain a less hierarchical and collaborative work culture with fewer layers of decision-making. These are necessary to retain the digital talents in the public sector.

Our analysis shows that the problems facing the ICT officers are not only related to quantity, but also regarding the very basic quality. This can be described by skill competence, but unfortunately, the available data only shows their educational relevance, which could hardly reflect skill competency. However, even their educational relevance is unfulfilled. Therefore, despite its central role in the implementation of e-government, this study does not perceive recruiting ICT officers to fulfill the demand as the only solution for addressing the supply and demand gap. Instead,

using professionals available in the market through vendors would be a better solution. Above all, in many countries, the public sector is not attractive for the best ICT talents. We are aware that out of almost 8,000 ICT officers, there might be small percentage outliers whose technical capabilities are on a par with those of the ICT talents in the private sector. However, with the above-mentioned analysis, it might not be appropriate to force all ICT officers to compete technically with them. Instead, they should take the complimentary and supervisory roles to ensure that (i) the organization's needs are well identified and communicated to the vendors; (ii) the work of the vendors are supervised and assessed; (iii) the knowledge is sufficiently transferred; and (iv) a simple support system be developed, if necessary.

In conclusion, this study recommends the following:

a) Of all **recruitment channels**, the government should prioritize PPPK as the most strategic channel to attract qualified digital talents. This needs to be followed by regulations related to PPPK recruitment for the ICT functional positions. By mimicking the strategies applied in digital government units, the government also needs to implement more flexible, less bureaucratic, and innovative strategies to attract digital talents. These strategies should be supported by competitive salaries as applicable in Indonesia's labor market rate and opportunities for the digital talents to contribute to the creation of social impacts.

b) To strengthen the **capacity building**, Statistics Indonesia (BPS), as the supervisory institution for ICT officers, should organize a competency test that will serve as the placement test for further capacity building activities. As a response to the delayering program, which led to a considerable number of ICT officers who used to perform administrative tasks, they should reskill themselves independently through learning management systems. Upskilling programs through formal education also need to be carried out to fit their education level and competence with their qualification. Furthermore, the government should make an arrangement where skill certification is tied to a work bond for several years after the certification. This can be a win-win solution to reduce the high turnover rate among the certification graduates who eye for better jobs in the private sector.

c) The training for government leaders should include materials related to collaborative and nonhierarchical work culture as a strategy for **retention measures**, especially to handle ICT officers, who are predominantly millennials and generation Z. Furthermore, flexible work arrangements should be made possible, starting with ICT professionals with possibilities to spread across other jobs. The process to determine the demand for ICT officers by government units should be carried out prudently to avoid mismatch. With the limited supply of ICT officers, they should be placed appropriately in accordance with their competence.

I. Introduction

1.1 Background

The coronavirus disease 2019 (COVID-19) pandemic has proved that, for the public sector to improve in providing its services, digital transformation is a must. Going digital offers public services provision huge potential for improvement. Daub et al. (2020) suggest that digitalization will allow services to (i) be provided 24/7; (ii) save time for providers by up to 50%; (iii) cost less by up to 50%; and (iv) lead to up to 60% cases to be handled. While digitalization could revolutionize the way the government provides services as the OECD (2001) echoes, it also results in fewer monotonous tasks and, eventually, employees in the public sector are expected to be happier performing the job with greater satisfaction.

Prior to the COVID-19 pandemic, the global trend of e-government started in early 2000. In 2003, the Government of Indonesia (GoI) issued Presidential Instruction No. 3 of 2003 on National Policy and Strategy for E-Government Development. In 2018, digital transformation in the public sector was even more intensified with the issuance of Presidential Regulation No. 95 of 2018 on Electronic-Based Government System (hereinafter referred to as the Presidential Regulation on E-Government). To enable this digital transformation, adequate digital skills are needed. Unfortunately, the public sector all over the world, including in Indonesia, cannot keep up with the private sector in acquiring digital skills.

At the global level, a study conducted by Deloitte (2015) revealed that, of 1,200 government officials in 70 countries, the majority perceive that they cannot compete with the private sector in terms of digital capability. The difficulties in acquiring talents have become more intensified post-COVID-19 where "war for talent" has become more widespread not only within the private sector itself, but also between the private and public sectors (Accenture, 2021). Compared to the public sector, digital transformation in the private sector started earlier and has occurred at a faster pace. The private sector has used new technologies in its organization and business process to win the fierce market competition. This means that private companies understand how to meet their needs for digital skills. Remunerated with a much higher salary, people with the best digital skills will prefer working in the private sector, such as for unicorns or social media or gaming companies, over the public sector. Kinsey (2018) argues that the lack of funding is one of the challenges that the public sector has to deal with, and such an issue leads to a deficit of talent in the sector. McKinsey's survey in 28 European Union (EU) countries revealed an estimated deficit of 8.6 million individuals by 2023—a sum of 1.7 million people in technological skills, 3.2 million in digital citizenship skills, and 3.7 million in classical skills—to carry out an end-to-end e-government (Daub et al., 2020).

In the context of Indonesia, the availability of digital talents in the market is a real problem. Quoting the study of Amazon Web Service and AlphaBeta, Kemenkominfo (2022) states that 19% of workers have basic-level digital skills, and 6% have middle-level digital skills. Meanwhile, a recent diagnostic report from SMERU, Oxford, and UNESCAP (2022) highlighted that fewer than 1% of Indonesian workers have advanced-level digital

skills. Moreover, the study underlines that the state's capacity to manage digital skill development remains limited. In fact, the appendix of the Presidential Regulation on E-Government has explicitly acknowledged the fact that the number of state civil apparatus (ASN) with adequate digital skills, particularly those with information and communication technology (ICT) expertise, is still limited.

1.2 Existing Evidence

There is only scant systematic information on how to develop digital skills in the public sector. Despite the fact that ASN with relevant digital skills is the key to successful digital transformation, the Presidential Regulation on E-Government does not specifically outline a strategy for digital skill development in the public sector. At the same time, digital skills in the public sector in Indonesia is a rarely investigated topic. The World Bank published two reports in 2020 on this topic. The first report, "Accelerating Indonesian Digital Government Transformation Journey", identifies three barriers in e-government implementation, namely the (i) lack of political leadership and implementation discipline; (ii) fragmented authority and lack of coordination; and (iii) absence of key capabilities in delivering digital transformation (Ariadharma et al., 2020). The study concludes, among others, that it takes a clear and strong governance to achieve digital government transformation. Meanwhile, the government should define its strategy to acquire and develop the talents. The second report, "Enabling the Indonesian Digital Government Transformation", finds that the government has no clear definition of digital competency. Some programs are available to develop digital skills, but they are scattered and uncoordinated. Furthermore, the public sector suffers from the absence of critical competency, partly because it has neither the strategy for talent acquisition nor overarching policy and regulation to nurture digital capability (World Bank, 2020).

Finally, a study conducted by Prospera[1] (forthcoming) proposes a framework of digital capabilities consisting of individual and organizational capabilities; both are bound to digital culture which enhances digital practice in the workplace. The individual capability includes digital literacy, i.e., capability to use data and tools in daily work, whereas the organizational capability includes work environment and digital infrastructure. The study collects perceptions from ICT professionals, ICT users, and leaders on the framework. It finds that work environment, infrastructure, and culture—instead of digital literacy—are what ICT professionals and users consider challenges. Meanwhile, the leaders consider digital literacy and culture as the challenges. While useful, Prospera's study takes the best practices in Australia as its starting point. Our approach is different, as we take the framework set out in the Presidential Regulation on E-Government as our starting point.

[1]Prospera (Australia Indonesia Partnership for Economic Development) is a grant-funded partnership between Australia's Department of Foreign Affairs and Trade and Indonesia's Coordinating Ministry for the Economy. Prospera has been working with 20+ Indonesia ministries to provide evidence-based analysis to support policy formulation on socioeconomic development-related issues. For details, see https://prospera.or.id/id/beranda-2/.

1.3 Research Objectives and Methodology

Using the four aspects of e-government (governance, services, infrastructure, and human capital), this mixed methods study seeks to provide an analysis of the digital skills development in the Indonesian public sector. In particular, we address the issue of supply and demand of ASN, as well as its quality to implement e-government in the public sector, an issue that no one has investigated until recently. In particular, our study will be focused on

a) examining the supply and demand, both quantity and quality, of ICT and relevant non-ICT professionals to carry out strategic initiatives of e-government;
b) assessing the good practices applied in several digital government units; and
c) providing policy recommendations to address the gap in digital skills of the public sector.

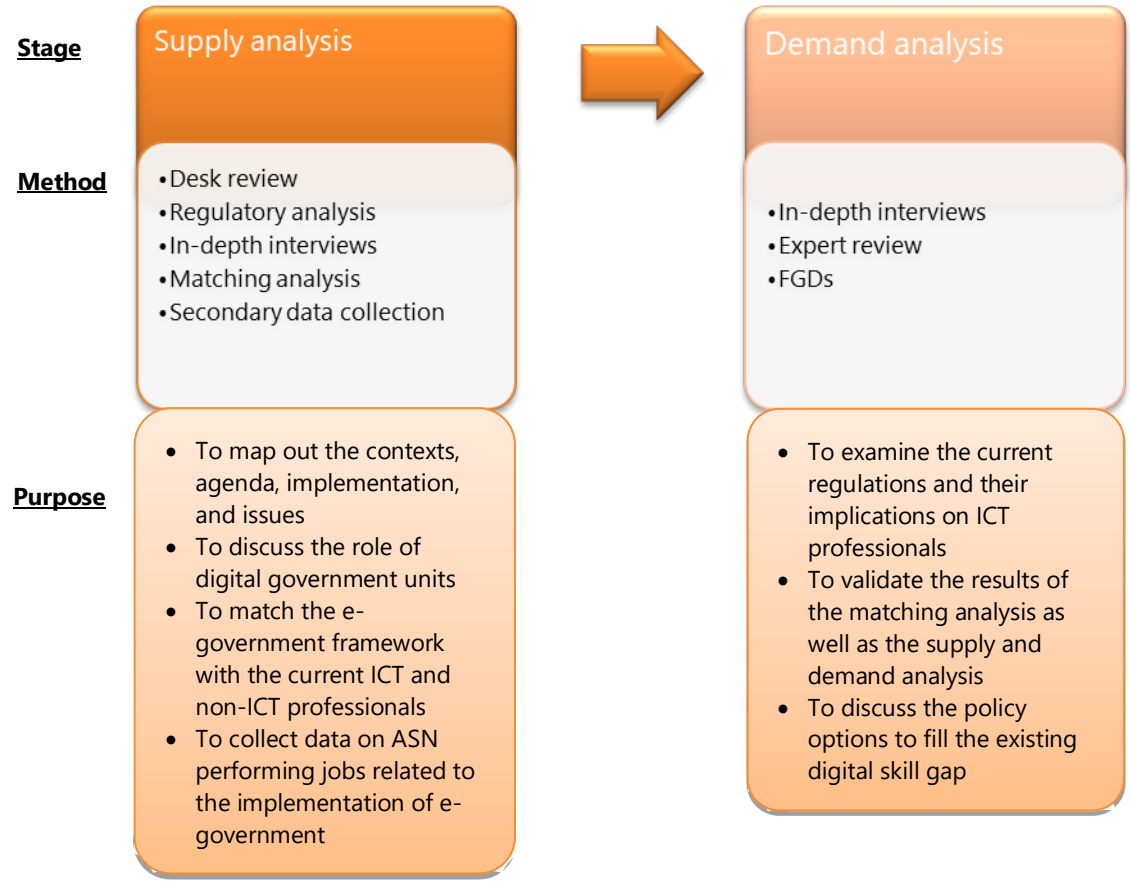
Due to the difficulties in collecting data at the regional government level, most of the collected data are limited to the central government level, or national level (direct aggregation of the central government and regional governments). As the implementation of e-government requires support from those in functional positions, which implies both ICT and non-ICT professionals, we used a multidisciplinary approach in calculating the supply and demand of digital talents in the public sector, the proxies of which were obtained from our matching analysis.

The study consists of two components. The first component is the supply analysis. The supply analysis began with a desk review of literature on e-government as well as regulatory analysis of ASN, the people who are responsible for the implementation of e-government. We then analyzed the supply through in-depth interviews to map the contexts, agenda, and issues related to ASN, as well as to discuss the role of digital government units in filling the digital skills gap in the public sector. The most important element of this component is the matching analysis, in which we matched the strategic initiatives under the e-government framework with the ICT competencies from an occupation map produced by the Ministry of Communications and Informatics (Kemenkominfo) in collaboration with other line ministries and the private sector. As the ASN could not be immediately identified from their competencies, we had to once again match this list of ICT competencies with the ICT professionals' job descriptions. From the matching analysis, we could identify which ICT and non-ICT professionals are required to implement e-government. We validated our matching analysis results with our informants. Once the results were validated, we then collected secondary data of these professionals from the National Civil Service Agency (BKN) and Statistics Indonesia (BPS). This secondary data then serves as the supply of ICT professionals.

The second component is the demand analysis. Having collected data from various line ministries regarding their needs for ICT and non-ICT professionals, we conducted in-depth interviews and an expert review to validate the results of the supply and demand analyses. Finally, we carried out focus group discussions (FGDs) with selected informants to discuss the policy options to fill the existing digital skill gap. The informants for the in-depth interviews and FGDs are mostly government officers from line ministries, officers in the digital government units, and association of government ICT professionals. The list of the

informants interviewed and the overview of issues discussed in the interview session is provided in Appendix 1.

Figure 1. Stages of the Study



Source: authors

This study is structured as follows. Chapter 2 provides the relevant context and situation of the Indonesian public sector. Chapter 3 explores the aspects of Indonesian e-government based on its regulation as well as the results of the matching analysis between the aspects of Indonesian e-government and relevant functional positions to implement e-government. Chapter 4 presents the follow-up analysis from the matching process with the analysis of supply and demand of public sector workers in operating e-government. It also compares the situation of the current public administration to the existing digital government units in Indonesia in assisting a broader digital transformation and bureaucratic reform in ministries, institutions, and regional governments. The final chapter of our report, Chapter 5, concludes this report by summarizing our analysis and provides recommendations to support the digital skill development within the Indonesian public sector.

II. The Context of E-Government

2.1 The State Civil Apparatus (ASN)

2.1.1 Context and Data

ASN is the core element in the Indonesian bureaucratic system whose key responsibility is to deliver public services to a diverse citizenry on behalf of the GoI. As laid out in Law No. 5 of 2014 on State Civil Apparatus,[2] ASN are divided into two based on their employment status, namely (i) civil servants (PNS); and (ii) contract-based government employees (PPPK). Both PNS and PPPK are hired through the national recruitment for probationary state civil apparatus (CASN).[3] PNS are hired with a permanent contract, whereas PPPK are hired to carry out the public sector function as a professional under a short-term contract (ranging from one to five years at a maximum, according to Government Regulation No. 49 of 2018 on the Management of PPPK). They are recruited to fill specific positions/functions in the governmental sector that PNS cannot fulfill—however, they cannot be recruited as PNS due to administrative requirements, such as age limits (Sumantoro, 2019).[4] Both types receive various monetary compensations during their tenure, but, unlike PNS, PPPK will not receive retirement benefits.[5] Following the issuance of Government Regulation No. 49 of 2018, the first recruitment of PPPK was held in early 2019 and the first official data on the number of PPPK in Indonesia was released in June 2022 (CNN Indonesia, 2019; BKN, 2022).

To date, Indonesia's public sector workforce makes up around 1.58% of its population, which is comparable to the size of bureaucracies in other countries at the subnational level (Asian Development Bank, 2021). Based on Table 1, in 2022, Indonesia's public sector employs 4.3 million ASN, comprising 3.9 million (92%) PNS and 352,000 (8%) PPPK (BKN, 2022). Furthermore, ASN are spread across two levels: national and subnational governments. In 2022, 963,171 (22%) PNS and 15,481 (1%) PPPK were employed by the national government, with the remaining 3 million (70%) ASN and 339,305 (7%) PPPK being hired by subnational governments (both provincial and *kabupaten* [district] levels). In terms of their sociodemographic characteristics, 48% of the total ASN are male and around 54% are female. Furthermore, 66% of ASN are those in their forties and fifties, and 33% are under 40 years old. Around 1% ASN are 60 years old or older who usually hold a position at the expert/senior rank. This group represents a limited number of ASN who have a mastery in certain areas of expertise, either managerial or technical. Considering their educational levels, 70% of ASN have at least a bachelor's degree, while the other 30%

[2]Before the law promulgated, there was no such concept regarding ASN and PPPK in Indonesia.

[3]According to Regulation of the Minister for Administrative and Bureaucratic Reform No. 27 of 2021 on CASN Recruitment, CASN selection is under the authority of BKN. The recruitment of CASN is held annually, except during the COVID-19 pandemic in 2020 and 2021 (The Jakarta Post, 2020).

[4]According to Government Regulation No. 11 of 2017 on the Management of PNS, individuals may be recruited as PNS if they are between 18 and 35 years old.

[5]Other than basic salary, ASN are provided with (i) performance allowance; (ii) spouse allowance; (iii) children allowance; (iv) meal allowance; (v) position allowance; and (vi) general allowance.

hold a one-year to four-year diploma (D-1–D-4) and have graduated from junior/senior secondary schools. Appendix 4 shows the latest and more detailed data of ASN based on several demographic characteristics.

Table 1. Number of Employees in Indonesia's Public Sector in 2022

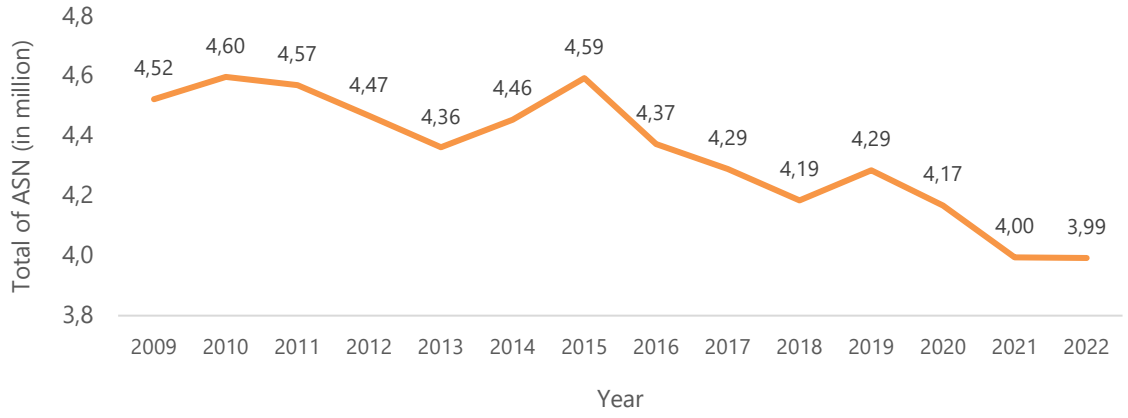
	National	Subnational	Total
PNS	963,171 (22%)	3,029,595 (70%)	3,992,766 (92%)
PPPK	15,481 (1%)	336,305 (7%)	351,786 (8%)
Total	978,652 (23%)	3,365,900 (77%)	4,344,552 (100%)

Source: BKN, 2022

Although there are more PNS than PPPK, their numbers have decreased significantly over the years, especially since 2016 (Figure 2). Moreover, in the next CASN recruitment, the GoI will recruit nearly 1.1 million ASN, 95% of whom are PPPK—meaning that only 5% are PNS (Kontan.co.id, 2022). These facts support the statement from the Head of BKN in 2021.

> Following the presence of technological innovations, PNS might become irrelevant in the next ten years. There would be a need for a transition toward PPPK. (CNBC Indonesia, 2021)

Figure 2. Number of PNS, 2009–2022



Source: BKN, 2022

The structure of Indonesia's public sector consists of three positions with broad categories, namely high leadership position (*jabatan pimpinan tinggi*), administrative position (*jabatan administrasi*), and functional position (*jabatan fungsional*). In Indonesia's bureaucracy terminology, high leadership and administrative positions are commonly referred to as structural positions that predominantly perform managerial functions. These positions are also equal to echelon-level employees where high leadership positions are equivalent to echelons 1 and 2 and administrative positions are equivalent to echelons 3, 4, and 5. Meanwhile, functional positions focus more on specific technical jobs with certain skills and competencies. The issue of digital skills in the public sector, both ICT- and non-ICT-based positions, is included in the functional position category.

In Indonesia's public sector, functional positions are divided into two, namely functional-expert and functional-skilled positions. Each of them has four ranks in order of seniority, as shown in Table 2 below.

Table 2. Composition of ASN in Indonesia's Public Sector in 2022

Position	Role	Echelon	No. of Employees	Total
High leadership	Lead expert	Echelon 1	16	19,808 (0.5%)
	Middle-level expert	Echelons 1a and 1b	494	
	Junior expert	Echelon 2	19,298	
Administrative	Administrator	Echelon 3	94,449	339,457 (7.8%)
	Supervisor	Echelon 4	234,127	
	Implementer	Echelon 5	10,881	
Functional - expert (professional)	Lead expert	Nonechelon	3,633,513	3,985,287 (91.7%)
	Senior expert	Nonechelon		
	Middle-level expert	Nonechelon		
	Junior expert	Nonechelon		
Functional - skilled (operator)	Supervisor	Nonechelon		
	Senior	Nonechelon		
	Middle level	Nonechelon		
	Junior	Nonechelon		
Total				4,344,552

Source: Ministry of Administrative and Bureaucratic Reform (Kementerian PANRB), 2014; BKN, 2022

On the other hand, functional positions have various clusters. Currently, there are at least 27 clusters of functional positions, comprising 288 roles within the GoI (INFOASN, n.d.). However, in general, functional positions can be classified into five: (i) teacher; (ii) lecturer; (iii) medical professional; (iv) technical professional; and (v) organizer/administrator. Table 3 provides the number of ASN holding functional positions based on the general classification in 2022.

Table 3. Number of ASN by Their Functional Positions in 2022

Category	PNS	PPPK	Total
Teacher	1,295,416 (33%)	321,265 (8%)	1,616,681 (41%)
Lecturer	74,888 (2%)	1,344 (0.03%)	76,232 (2%)
Medical professional	399,411 (10%)	9,616 (0.2%)	409,027 (10%)
Technical professional	313,535 (8%)	6,055 (0.2%)	319,590 (8%)
Organizer/administrator	1,550,263 (39%)	13,494 (0.3%)	1,563,757 (39%)
Total	3,633,513 (91%)	351,774 (9%)	3,985,287

Source: BKN, 2022

2.1.2 Responsible Parties

There are five key government institutions that are responsible for the management and competency development of ASN in Indonesia's public sector. Kementerian PANRB is the leading actor in formulating and synchronizing overall policies on ASN management as well as in overseeing the implementation of policies related to ASN in Indonesia. Meanwhile, BKN is responsible for performing the leadership function in CASN recruitment and maintaining the ASN database. Moreover, the State Administration Agency (LAN) plays an important role in leading the implementation of ASN competency development programs, especially managerial and sociocultural competencies (generally, nontechnical skills for ASN in the structural positions) (Kementerian PANRB, 2014).

Regarding the digital skill development for ASN, two institutions are in charge of it, namely Kemenkominfo and supervisory institutions of functional position. Kemenkominfo mandated the Institute of Human Resource Research and Development (Balitbang SDM) to oversee the ICT technical trainings and provide voluntary general ICT technical trainings across government institutions (World Bank, 2020).[6] Meanwhile, the supervisory institutions are responsible for developing and implementing specific ICT competency development programs for ASN holding functional positions in certain government institutions. In Indonesia, these supervisory institutions consist of BPS for the functional positions of ICT and the State Cyber and Signal Agency (BSSN) for the functional positions of ICT security (World Bank, 2020). Table 4 below summarizes the government institutions' roles and functions in implementing ASN-related policies.

[6]This mandate is based on Decree of the Minister for Communications and Informatics No. 47A of 2003 on the Guidelines for the Implementation of Information and Communication Technology Technical Education and Training in Supporting E-Government.

Table 4. Government Institutions' Roles and Functions in Implementing Policies on ASN Management

Function	Responsible Institution	Role
ASN recruitment and human resources management	Kementerian PANRB	• Formulating and synchronizing overall policies on ASN management • Overseeing the implementation of ASN-related policies
	BKN	• Performing leadership function in probationary civil servant (CPNS) recruitment • Maintaining the HR database of ASN
ASN competencies development	LAN	• Creating and implementing ASN competency development programs (managerial and sociocultural competencies)
	Kemenkominfo (Balitbang SDM)	• Overseeing the ICT technical training across government institutions • Providing voluntary general ICT technical trainings to every government institution
	Supervisory institutions of functional position	• Developing and implementing specific ICT competencies for ASN holding functional positions in certain government institutions

Source: Kementerian PANRB, 2014; World Bank, 2020

2.1.3 Another Type of Government Employees

Other than recruiting ASN, Indonesia's public sector also utilizes various other channels to fulfill their human resources needs. According to Presidential Regulation No. 16 of 2018 on the Procurement of Goods and Services, every government institution is allowed to recruit individual consultants to carry out certain functions based on their specific skills and expertise (Hukum Online, 2018). Individual consultants are non-ASN employees hired through a procurement of goods and services mechanism with a relatively short-term contract. Considering their expertise, individual consultants whose contract is generally shorter than PPPK receive higher remuneration based on the average labor market rate.

Furthermore, the government also uses vendors to carry out certain short-term projects. For example, the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) uses the services of PT Telkom Indonesia to establish a digital government unit called GovTech Edu. Some other government institutions also use other vendors' services to develop certain digital platforms/applications. However, aside from requiring strong financial resources, using vendors' services is challenging, especially in ensuring that knowledge is transferred by the vendor to government employees to strengthen their in-house capability. This is necessary considering that the government employees will be responsible for running and operating the platform after it is established.

Moreover, Government Regulation No. 14 of 2010 on Education of Government Officials maintains that ministries and institutions with strong fiscal capacities should manage their own educational institutions to meet their human resources needs. Those admitted to these educational institutions will receive a full scholarship, i.e., free tuition fees for their education. Once they graduate, they will be employed as PNS. For example, Kemenkeu obtains qualified employees to fill the positions related to finance and ICT from the State Finance Polytechnic of STAN, whereas BPS obtains 500 human resources supplies annually through its cooperation with STIS Polytechnic of Statistics to fill the statistical functional positions and ICT positions. However, it is possible for the students of a government-affiliated educational institution to be placed in government institutions other than their affiliate institution. For example, for STAN graduates, they have a chance to be placed in the Financial and Development Supervisory Board (BPKP) and the Audit Board of Indonesia (BPK).

2.2 Bureaucratic Reform Agenda

Indonesian bureaucrats used to be huge in number and powerful during the New Order regime (Liddle, 2018). Civil servants were the main employees in every city, town, and village of the country and they belonged to the ruling party; bureaucrats also had strong relations with the military. This reflects the fact that the Indonesian bureaucracy is far from being politically neutral, a principle that would entail professionalism in service of the public. Liddle (2018) explains that it was, consequently, rife with corruption and public services were delivered poorly and inefficiently. For this reason, one of the milestones of the Reform era was bureaucratic reform, following the economic and political reforms. It began when Law No. 43 of 1999 was issued to amend Law No. 8 of 1974 on Civil Services. According to this regulation, Indonesia's public service employees are divided into three, namely PNS, Indonesian Army (TNI), and Indonesian Police Force (POLRI)

A major effort to reform Indonesia's bureaucracy had been made during the second term of President Yudhoyono's administration in the 2009–2014 period. In January 2010, he issued Presidential Regulation No. 5 of 2010 on the 2010–2014 National Medium-Term Development Plan (RPJMN), in which he specified bureaucratic reform as one of the 11 national development priorities. In June 2010, he issued Presidential Decree No. 14 of 2010 on the Establishment of the Bureaucratic Reform Steering Committee and National Bureaucratic Reform Team, in which the then Vice President Boediono was appointed its chairperson. Finally, in December 2010, he issued Presidential Regulation No. 81 of 2010 on the 2010–2025 Grand Design for Bureaucratic Reform, which was immediately followed by the issuance of Regulation of the Minister for Administrative and Bureaucratic Reform No. 20 of 2010 on the 2010–2014 Roadmap for Bureaucratic Reform (KSI, 2020; Turner et al., 2022).

The appendix of Presidential Regulation No. 81 of 2010 underlines three main areas of current bureaucracy where reform was needed: (i) bureaucratic quality; (ii) public services; and (iii) competence of human capital. It also sets the expected objectives to be achieved by 2014, namely (i) a "clean" government that is free from corruption, collusion, and nepotism; (ii) improved public services; (iii) capacity and accountability of bureaucracy; and (iv) professionalism of human capital. By 2019, all these objectives were expected to show significant improvement. Finally, it was expected that by 2025 the country would already

have good governance and the bureaucrats and public servants to deliver public service with professionalism and high integrity.

The bureaucratic reform journey is divided into three periods: (i) 1998–2003; (ii) 2003–2010; and (iii) 2010 onwards (Turner, Prasojo, and Sumarwono, 2022). They identify the first period as a sporadic change. Although a democratic political system was already in place, decentralization had been initiated, and the police were separated from the military, there was a road map prepared for long-term bureaucratic reform during this period. The second period was one of targeted reforms where actors at the international and domestic levels were eager to see improvement in the fight against corruption, collusion, and nepotism. The third period came when Presidential Decree No. 14 of 2010, envisioning the creation of world-class public services by 2025, was issued. There are several important changes between 2010 and 2014. Some of these changes include (i) a recruitment moratorium in 2010 and 2011 to avoid the increasing number of civil servants; (ii) computer-based test system for recruitment; (iii) open promotional system for senior officials; and (iv) a performance allowance for employees to embrace the reform (Turner, Prasojo, and Sumarwono, 2022). One important event was the issuance of Law No. 5 of 2014, which marks the introduction of a merit-based system. The characteristics of the New Public Management (NPM) and New Public Service (NPS) paradigms became even clearer when President Joko Widodo assumed the office from 2014 onwards (Turner, Prasojo, and Sumarwono, 2022). For example, every official has to sign a contract of performance targets. Annual performance evaluation is also set for every government institution. Furthermore, it states that planning, budgeting, and performance in government institutions have to be integrated. Finally, it creates an integrity zone where a unit of government institution is selected to be a role model in the implementation of the bureaucratic reform road map.

Box 1
The Law on ASN: The Tip of the Iceberg in the Bureaucratic Reform

Law No. 5 of 2014 was proposed by the parliament in July 2011 to replace Law No. 43 of 1999. However, the government, particularly the senior executives, showed strong resistance despite the support from President Yudhoyono. After 30 months of waiting and being deliberated in more than 80 meetings, the law was finally passed in December 2014.

The law introduces a career leader service for senior executives and an independent committee to formulate regulations for a meritocratic civil service. This marks a paradigm change from personnel management to human resources management; from seniority and tenure to skill and competence; and from being hierarchical and rigid to being agile and flexible. The law also sets up a scheme of single salary and a defined contribution pension scheme for PNS. These features will ensure that there will be no more "wet and dry" position. It also prohibits the bureaucrats from participating in politics. Moreover, the law stipulates that PNS who have been sentenced for a crime related to their position should be dishonorably dismissed.

However, BKN reported that 2,674 ASN are involved in corruption cases with enforceable verdict. Of this number, only 317 have been dismissed, while the rest are still active and receive salaries. To handle this problem, BKN will redo the registration and conduct a further investigation to find out where these people are.

Source: Effendi, 2014; Widyastuti, 2018

2.3 Delayering Policy

In his inaugural speech in 2019, President Joko Widodo enthusiastically expressed how he intended to accelerate the bureaucratic reform, which was one of his five national priorities later outlaid in Presidential Regulation No. 18 of 2020 on the 2020–2024 Medium-Term National Development Planning.

> The President says, "Bureaucracy should be cut back, and echelons should be simplified. Why do we have echelons 1 to 5? Can't we just have only two echelons? In exchange, they can hold functional positions with skills and competence that we rate highly." (Widyastuti, 2019)

The President believes that too many layers in structural positions, as reflected in the number of echelons, will delay the decision-making process and, therefore, hamper improvement in the public service provision. Following the president's request, Kementerian PANRB immediately issued Regulation of the Minister for Administrative and Bureaucratic Reform No. 28 of 2019 on Redirection of Administrative Positions into Functional Positions, also known as the "delayering policy". This policy aims to develop a more professional public sector by splitting the roles of ASN at the levels categorized as echelons 3, 4, and 5 into functional positions (CNBC Indonesia, 2020). This policy was expected to restructure 430,000 ASN jobs of echelons 3, 4, and 5 (The Jakarta Post, 2019). In addition, it is expected to simplify the bureaucratic structure by reducing the number of ASN employed in administrative and structural positions and encourage them to become experts/specialists who can contribute to the specific functional positions in the government. By doing so, the state institutions will become increasingly specialized in terms of their functions.

Box 2
Are Functional Jobs the Future of Work?

Moving away from administrative jobs allows civil servants to be more professional. Indeed, there are many advantages to holding functional jobs compared to the administrative ones. These jobs allow them to become experts and specialists with a clear career path. Moreover, those holding functional positions can continue to build their capacity and collect credit points for fast-track promotion. One of the informants, however, underlines the important issue regarding the characteristics of functional jobs in the public sector.

> Functional jobs in the public sector are not in line with the future of work. They are already outdated. It would be difficult to match them with the needs of e-government. For example, out there, people are talking about big data, software development, and so on. Meanwhile, our functional positions are still ICT officers [*pranata komputer/prakom*] and information security manager [*manggala informatika*], etc. I suppose we need to do a reform that makes the relevant jobs for e-government available in the public sector. (Informant, female, 5 August 2022)

The implementation of the delayering policy is plagued with various challenges. First, ASN in structural positions are not ready to work professionally and independently. They used to have power and be more familiar with the managerial functions with subordinates. Now, they are holding functional positions that require more specific and technical skill

sets. Moreover, Indonesia's public sector also requires ASN in functional positions to earn and accumulate credit points as a prerequisite to get promoted. This policy tends to render the ASN employed in functional positions more individualistic to earn their own credit points, but less likely to contribute to the state institutions. These facts were also confirmed during our in-depth interview with the representative of Kementerian PANRB.

> This delayering policy indeed makes the organizational structure more agile and efficient. However, ASN in functional positions must earn and accumulate credit points for a promotion. It tends to make them ignore their primary responsibilities to contribute to the institution. Kementerian PANRB is currently formulating a policy to address this issue. (Informant, female, 25 July 2022)

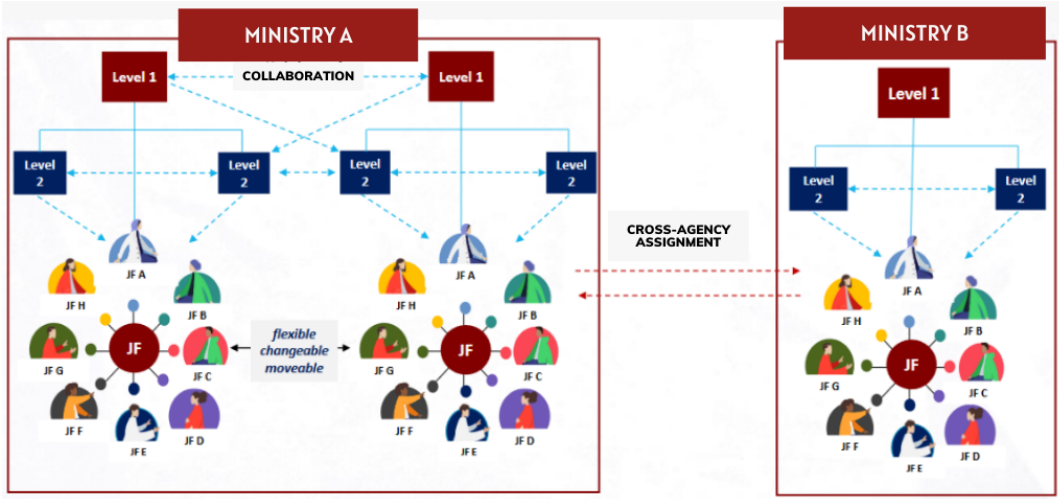
Furthermore, ASN previously employed in a structural position that has just been transferred to a functional position also needs to match their passion, interest, and expertise with the available functional positions. Should there be a skill mismatch, the GoI requires a new functional role to be established to accommodate their expertise, which has resulted in the creation of a large number of new functional positions in Indonesia's public sector. For instance, in 2020, more than 200 new functional positions were created to accommodate the newly transferred ASN from structural positions. This seems to contradict the government's priority to develop an agile and efficient bureaucratic structure. In response to this issue, Kementerian PANRB implemented a moratorium on the establishment of new functional positions as per Circular of the Minister for Administrative and Bureaucratic Reform No. B/653/M.SM.02.03/2021. This policy was also implemented to better prepare the management system of ASN in the functional positions, especially to address the issue related to the absence of credit points in the newly established functional positions.

Since the policy was immediately implemented without any proper preparation, after two years of continuous monitoring of its progress, Kementerian PANRB issued Regulation of the Minister for Administrative and Bureaucratic Reform No. 17 of 2021 on Redirection of Administrative Positions into Functional Positions which clarifies the previous Regulation of the Minister for Administrative and Bureaucratic Reform No. 28 of 2019. This regulation specifies the steps that need to be taken in the delayering policy. It urges that delayering policy takes place after the simplification of organizational structure. It also ensures that the remuneration of those who shift from administrative to functional positions remains the same.

Moreover, to actualize the bureaucratic reform agenda in Indonesia, Kementerian PANRB also issued Regulation of the Minister for Administrative and Bureaucratic Reform No. 7 of 2022 on the Work System in Government Agencies for Bureaucracy Simplification. This regulation pursues a breakdown of silos of the government's working culture, emphasizes the importance of a collaborative work style, and strengthens the teamwork mindset among government institutions. This regulation is expected to build an effective and coherent horizontal coordination in the government. In practice, every government unit is allowed to temporarily lend or transfer their talents to another government unit that needs more resources and where a skill gap occurs. This "talent exchange policy" offers a huge opportunity to fulfill the need for relevant digital talents in certain government units.

Figure 3 below illustrates the implementation of the talent exchange policy under Regulation of the Minister for Administrative and Bureaucratic Reform No. 7 of 2022.

Figure 3. Talent Exchange Policy across Ministries



Source: adopted from Kementerian PANRB, 2022

Moreover, since Law No. 5 of 2014 recognizes only two types of employees (PNS and PPPK), the use of other types of employees such as individual consultants and honorary staff should be brought to an end. The direction on this matter is contained in the Instruction Letter of the Minister for Administrative and Bureaucratic Reform No. B/165/M.SM.02.03/2022 on Employment Status in the Central and Regional Government Institutions (CNBC, 2022). Following the law, the contracts of 400,000 honorary employees should be terminated by the end of 2023 (Tamsir, 2022).

Eliminating individual consultants will generally impact the supply of competent human resources needed to operate public services, including those related to the implementation of the e-government policy. This is because recruiting them is one of the most strategic channels for certain government institutions to obtain a supply of qualified human resources—even though it is only in a short-term working period and the government has to pay relatively high remuneration. These facts were also confirmed through our in-depth interview with an informant.

> The recruitment of individual consultants is actually very important to fulfill the needs for human resources in a short-term period. They are recruited through a "pro-hire" mechanism where their remuneration is adjusted to the labor market rate or similar positions in the private sector. (Informant, male, 4 August 2022)

III. E-Government Framework and Relevant Digital Skills

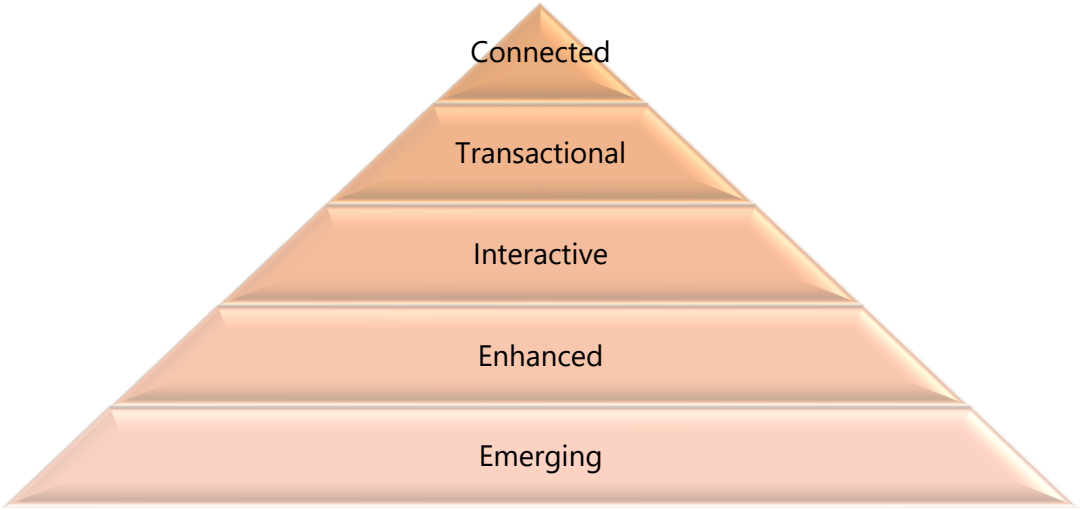
This chapter explores the past and current approaches to e-government. These two approaches are discussed in the first subchapter to explain the e-government journey in the last two decades. Following this, we discuss the e-government framework. This framework is used to determine the relevant digital skills in the public sector—discussed in the subsequent subchapter—as well as in analyzing the digital government units in Chapter 4.

3.1 Understanding E-Government

E-government, according to the Presidential Regulation on E-Government, is the use of ICT by the government in providing public services. Meanwhile, in defining e-government, OECD (2001) emphasizes the potential of ICT in networking and in changing the structure of the government as well as the way it operates. On the other hand, World Bank (2015) specifically mentions that ICT brings a change in the relations between the government and citizens, businesses, and other arms of government.

However, e-government also has a spectrum. The UN (2008) specifies five stages of e-government evolution (Figure 4). The first at the bottom is the emerging stage, in which e-government means that the government provides official websites at the national and subnational levels. These websites contain static information and offer minimal interaction. The second stage is the enhanced stage. At this stage, the government provides information on public policy and governance, including accessible information related to laws and regulation, reports, newsletters, and so forth. Moving forward from the previous stages, the third stage is the interactive stage where the government's services, such as tax payment and license renewals, are accessible and downloadable from the websites for citizens' convenience. The fourth stage is the transactional stage where the government services enable not only a two-way interaction and 24/7 access, but also online payment for taxes, license renewal, and others. The final one is the connected stage, which takes place when the government develops an integrated back office. At this stage, digital transformation of the government has taken place and various government institutions can use the same server, applications, and database to respond to people's needs.

Figure 4. Stages of E-Government



Source: UN, 2008

The ultimate stage of this UN's (2008) e-government, which is the connected stage, is similar to the World Bank's (2020) definition of digital government transformation. To achieve that stage, ASN will need to develop their digital skills and competencies. Ariadharma et al. (2020) underlines the challenges in achieving this ultimate stage of e-government, namely the (i) absence of framework on digital competency; (ii) lack of policy to nurture digital capability; and (iii) inadequate strategy to acquire talent.

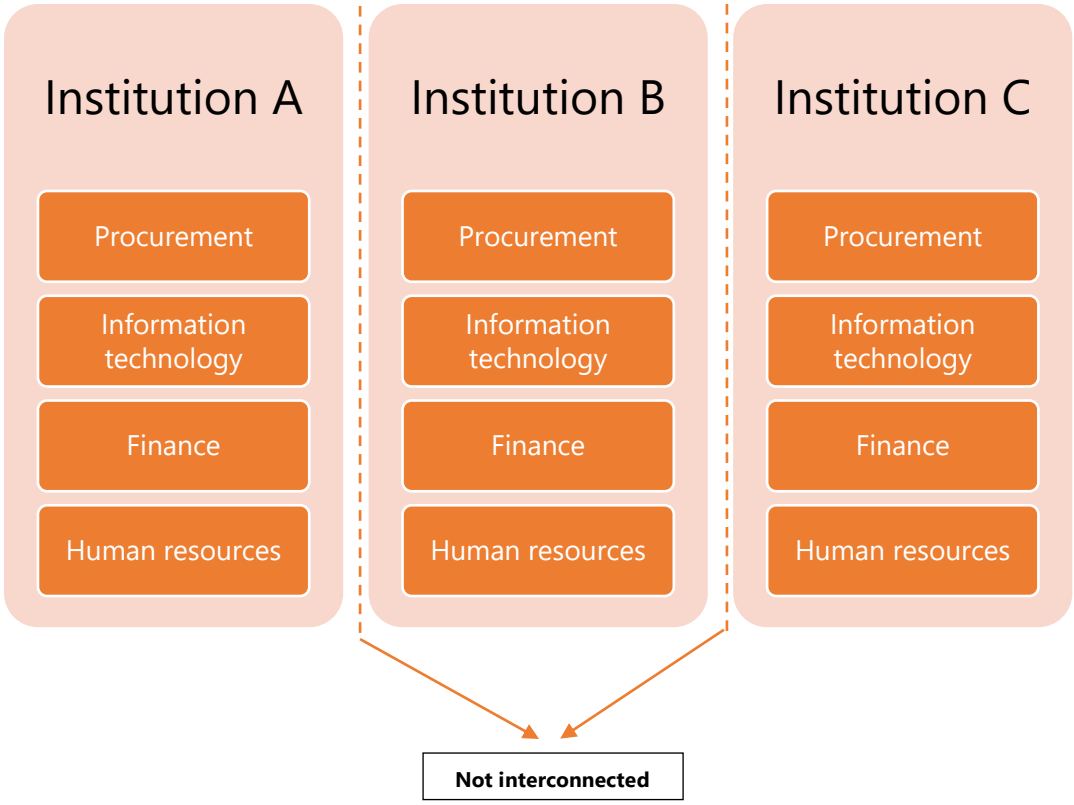
3.1.1 Past Approach to E-Government in Indonesia

E-government in Indonesia was initiated in the early 2000s when Presidential Instruction No. 3 of 2003 was issued. This is considered the starting point for Indonesia's digital government transformation journey. The objective of the instruction is to adopt e-government by accelerating the use of ICT in all government agencies at the central and regional government levels in order to improve public services, particularly for transparency purposes. It also aims to change the way the government provides information to the public—from using paper-based media to using electronic media. The instruction provides six strategies, including the targets and stages. Upon the issuance of the instruction, Decree of the Minister for Communications and Informatics No. 41 of 2004 on Guidance for Quality Standard and Application Development for E-Government was issued, which was later followed by Regulation of the Minister for Communications and Informatics No. 41 of 2007 on General Guidance of National Information and Communication Technology Governance (Susanto, 2017). These regulations serve as technical directions for designing websites and other back-office information.

In practice, the approach to e-government in the past focused on developing government websites and digitizing government documents. This approach fits with the emerging and enhanced stages as shown in Figure 4. Particularly for regional governments, the road is still long and winding. Wahid (2008) revealed that out of 456 *kabupaten*, only 67% have their own websites. The rest is either placed on the website of the provincial government or simply unavailable. Meanwhile, Nurdin, Stockdale, and Scheepers (2012) underline the

fact that the majority of *kabupaten* governments' websites are still in their emerging stage. In addition, several *kabupaten* governments also fail to abide by the technical direction in the E-Government Implementation Blueprint launching in 2004, while others fail to manage and maintain their websites accordingly. As shown in Figure 5, at the central level, e-government is developed sectorally, creating agency silos (Kementerian PANRB, 2018).

Figure 5. Past Approach to E-Government: Sector-Based Approach



Source: adopted from UN, 2008; and Kementerian PANRB, 2018

Moreover, in terms of its e-government policy, Indonesia underperforms compared to other countries. Table 6 below shows Indonesia's ranking on e-government implementation according to the United Nations (UN) E-Government Survey. In the 2018 E-Government Development Index (EGDI), Indonesia managed to climb 19 ranks from the previous year's survey to the 107th place. Later in 2020, further progress was made by the country, as it ranked 88th out of 193 countries, scoring 0.6612 from a maximum score of 1.[7] Among Southeast Asian countries (Figure 6), Indonesia was constantly ranked 6th throughout the years. However, in 2020, Indonesian e-government improved significantly (~26% growth in the EGDI score) compared to the top 5 of the Southeast Asian region, i.e., Singapore, Malaysia, Thailand, Philippines, and Vietnam.

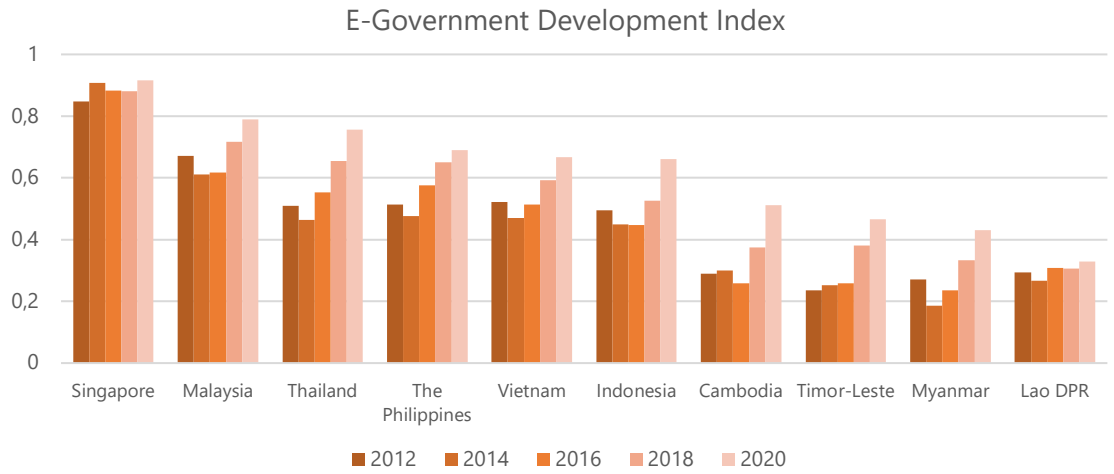
[7]The EGDI uses three domains, which are online service index, telecommunication infrastructure index, and human capital index.

Table 5. Indonesia's Ranking and Accomplishments on the EGDI

	2012	2014	2016	2018
Rank	97	106	116	107
Score	0.4949	0.4487	0.4478	0.5258

Source: UN E-Government Surveys 2012, 2014, 2016, 2018, and 2020

Figure 6. Indonesia's Ranking on the EGDI Compared to Other Southeast Asian Countries



Source: UN E-Government Surveys 2010, 2012, 2014, 2016, and 2018

Despite the progress, as can be seen from both Table 6 and Figure 6, it is safe to say that the promise of e-government to improve efficiency and effectiveness has not been achieved to date. While German government could save 59% of work hours thanks to their use of new technology (Stern et al., 2018), it is not the case with Indonesia. Kemenkominfo reported that the use of technology as reflected in the continuous increase of annual ICT spending has had no impact on Indonesia's rank in the EGDI—on the contrary, the performance has experienced a downturn (Jamaludin, 2017). Moreover, Kementerian PANRB (2018) showed that, between 2014 and 2016, government spending increased by more than Rp4.23 billion per year for purchasing hardware and software, yet 65% of that was used to develop similar applications in different government institutions. Therefore, it can be said that the past approach to e-government was marked by huge, yet ineffective government spending on ICT.

3.1.2 Current Approach to E-Government

To date, the GoI has strengthened its commitment to pushing digital transformation in the public sector, as shown by the issuance of the Presidential Regulation on E-Government. This commitment highlighted the GoI's serious effort to address the issue of bureaucratic ineffectiveness by utilizing digital technologies.[8] The e-government policy becomes a key

[8]For the last two decades, Indonesia and all countries around the world have paid attention to the issue of bureaucratic ineffectiveness as a part of the bureaucratic reform agenda and good governance campaign

ingredient to achieving high performance of the bureaucracy and public service at the same time—as mentioned in the vision of world-class bureaucracy 2024 by Kementerian PANRB (Lembaga Administrasi Negara, 2021c). This policy enables the government to integrate all government bodies and institutions, both at the central and subnational levels, to adopt a common and interlinked enterprise architecture using ICT, and to establish a national team to resolve common issues related to public services (World Bank, 2021). Moreover, the e-government policy also offers the potential to improve efficiency in day-to-day operations of the government as well as the citizen service experience.

> Some important differences between the past and current approaches to the implementation of e-government are that the former simply allows government institutions to develop their own applications, whereas the latter specifies what applications can and cannot be internally developed. This is to avoid duplication and unnecessary spending. For the same reason, the procurement of data center and ICT infrastructure, including devices, should also get clearance from Kementerian PANRB and Kemenkominfo. (Informant, female, 14 July 2022)

The current e-government policy chaired by Kementerian PANRB involves various ministries and other government institutions with different roles under the National E-Government Coordination Team, as described in Table 5 below.

Table 6. The National E-Government Coordination Team in Indonesia

No	Ministries	Roles
1.	Kementerian PANRB	Coordinates all e-government activities, including the business process, and determining general applications
2.	National Development Planning Agency (Bappenas)	Coordinates the planning of e-government, including data management
3.	Kemenkeu	Coordinates the budget of e-government
4.	Kemenkominfo	Coordinates the development of applications, ICT infrastructure, and policies of ICT audit
5.	Ministry of Home Affairs (Kemendagri)	Coordinates the business process of provincial and *kabupaten* governments, including implementation of e-government at the subnational level
6.	BSSN	Ensures the security of e-government, prepares the security standard, and is in charge of security audit of e-government
7.	National Research and Innovation Agency (BRIN)	Coordinates audit of general application and infrastructure, as well as knowledge management and technology transfer

Source: Presidential Regulation No. 95 of 2018

promoted by the UN through the Millennium Development Goals (MDGs)—later, this agenda has evolved to Sustainable Development Goals (SDGs). Addressing this issue through digital government transformation holds the promise of (i) creating a better government; (ii) boosting accountability and transparency; (iii) avoiding mismanagement of governance; (iv) eliminating corruption; and (v) improving public service delivery to every citizen.

The most significant factor that hinders the GoI from implementing the e-government policy more effectively is what has been described as each government institution's "sectoral ego" and "silo perspective". These characteristics triggered every government body to build their own digital products (e.g., platform, application, and data center), regardless of their low utilization. Some in the Indonesian public sector also hold the perspective that the number of digital products measures the degree of innovation—the more digital products they build, the more innovative they are.

Moreover, Kementerian PANRB also issued Regulation of the Minister for Administrative and Bureaucratic Reform No. 10 of 2019 on the Amendment to Regulation of the Minister for Administrative and Bureaucratic Reform No. 52 of 2014 on the Development Guidelines for Integrity Zone towards Corruption-Free Area (WBK) and Clean and Attending Bureaucracy Area (WBBM) in Government Institutions. This regulation stimulated the government institutions to "compete" in building as many digital platforms as possible while expecting that their performance accountability be strengthened and corruption be eradicated.

> WBK and WBBM programs are parts of the bureaucratic reform which are aimed at establishing a bureaucracy with capable and accountable organization, clean government, and quality public services. One of the indicators in the WBK and WBBM programs is innovation. Many government officials interpret innovation simply as developing applications. Government institutions are racing to pass the evaluation of WBK and WBBM. Prior to the evaluation, they develop applications to show the innovation, regardless of their usability. (Informant, male, 4 August 2022)

In the meantime, there has been a tendency for government institutions to make these efforts just before Kementerian PANRB conducts a clean and corruption-free bureaucracy assessment. Once the assessment is done, the platforms and applications are no longer usable. To make matters worse, the developed applications require the users to input personal data, such as information on their national ID cards, when the data security system is still weak and no personal data protection law has been issued in Indonesia (Sugandi, 2022). Thus, many of those unused applications pose a high security risk and waste human and financial resources.

Box 3
24,000 Government Applications Have Proven the Ineffectiveness of Public Service

The Indonesian public sector has developed 24,000 digital-based applications to date—an issue that Kemenkeu concerns itself with (CNBC, 2022). Most of these applications have malfunctioned and even the Minister of Finance Sri Mulyani Indrawati complains that it has wasted the state budget (Kompas, 2022). This shows that although the regulation on e-government has set an e-government enterprise architecture (EA), its implementation has not yet been effective. Each government unit's attempt to develop their own internal applications has only prioritized quantity over quality, and no consideration is given to the ways to avoid duplication in activities/initiatives and budget, synchronize policies and regulations, and continuously evaluate the progress.

The facts above were also confirmed through our in-depth interview with the representative of Kemenkeu.

> We do not have a good e-government EA, so that all ministries/institutions "compete" to make their own applications. Consequently, we found integrating all those applications difficult because the data structure, programming language, and framework are different. If only we had a good EA from the beginning. In that case, we can identify the kind of applications/services we need to create to free up resources (e.g., budget and talents) tied up in the duplication/repetitive digital products. (Informant, male, 4 August 2022)

Despite the issue of ineffective e-government EA, the Indonesian public sector has made a relative degree of progress in driving major e-government initiatives, as proven by the GoI's success in developing first-generation e-government services, such as LAPOR![9] and e-Filing.[10] However, the issue of competent human capital with relevant digital skills has been scarcely discussed, even though the current regulations on e-government have mandated it. Aside from competent ICT technical talents, the Indonesian public sector also requires high-level leaders with a strong political vision and awareness to push the e-government agenda, especially leaders with sufficient knowledge to reengineer the whole business process of the e-government policy.

On the other hand, the current evaluation from the Indonesia E-Government Ranking (PeGI)[11] conducted by Kemenkominfo and Kementerian PANRB shows remarkably slow progress in the implementation of the e-government policy (Table 7).[12] Indonesia's 2020–2024 RPJMN underlines the GoI's target to achieve a score of at least 2.6 (out of 5) by 2024, but in reality, it has stagnated at around 2.2 since 2019.[13] However, in 2021, most of the ministries have surpassed the score of 2.5 (good), yet a number of ministries are still exceeding only 1.5 (enough) and some others are higher than 3.5 score (very good) (Appendix 3).

[9]This stands for Layanan Aspirasi dan Pengaduan Online Rakyat (Citizens' Online Aspiration and Complaint Service), a complaint-handling platform that enables citizens to submit their aspirations and complaints about government services. It was developed in 2011, and since 2016, this platform operates under Kementerian PANRB. In English, "*lapor*" means "to report".

[10]An online tax reporting system developed by the Directorate General of Taxes under Kemenkeu to simplify the taxpaying process for taxpayers.

[11]PeGI is a tool used to measure e-government maturity in every government institution (both at the national and subnational levels). Kemenkominfo and Kementerian PANRB established this tool based on three domains, namely policy, governance, and service.

[12]These facts were quoted in Decree of the Minister for Administrative and Bureaucratic Reform No. 1503 of 2021 on Result of E-Government Evaluation for Ministries, Institutions, and Regional Governments.

[13]These facts were quoted in the appendix of Regulation of the Minister for Administrative and Bureaucratic Reform No. 24 of 2020 on the 2020–2024 Strategic Plan of the Ministry of Administrative and Bureaucratic Reform.

Table 7. PeGI, 2018–2021

	2018[a]	2019[a]	2020[b]	2021[c]
National average	1.98	2.18	2.26	2.24
- Ministries average	N/A	N/A	2.64	2.84
- Institutions (at the national level) average	N/A	N/A	3.02	2.58
- Provincial level average	N/A	N/A	3.03	2.45
- *Kabupaten* level average	N/A	N/A	3.00	2.15

Source: Kementerian PANRB, 2018–2021

[a]No official publication regarding the achievement of each government institution is available.

[b]Official published data in 2020 only captures 9 ministries, 18 institutions, 7 provincial governments, and 93 *kabupaten* governments.

[c]Official published data in 2021 captures 34 ministries, 38 institutions, 34 provincial governments, and 392 *kabupaten* governments.

3.2 E-Government Framework

We adopted four aspects in the Presidential Government on E-Government as our research framework and starting point to identify the digital skills needed to implement e-government. Table 8 lists down a total of ten strategic initiatives in these four aspects. The implementation of these initiatives can bring the government's digital transformation to the final stage of e-government, the connected stage.

Table 8. Aspects of Indonesian E-Government

Aspects	Strategic Initiatives
Governance	E-government EA
	Data and information
	Business process
Service delivery	Electronic-based administration services
	Electronic-based public services
Infrastructure	National Data Center
	Intragovernmental national network
	Government services connection system
Human capital	Learning management system (LMS)
	Knowledge management system (KMS)

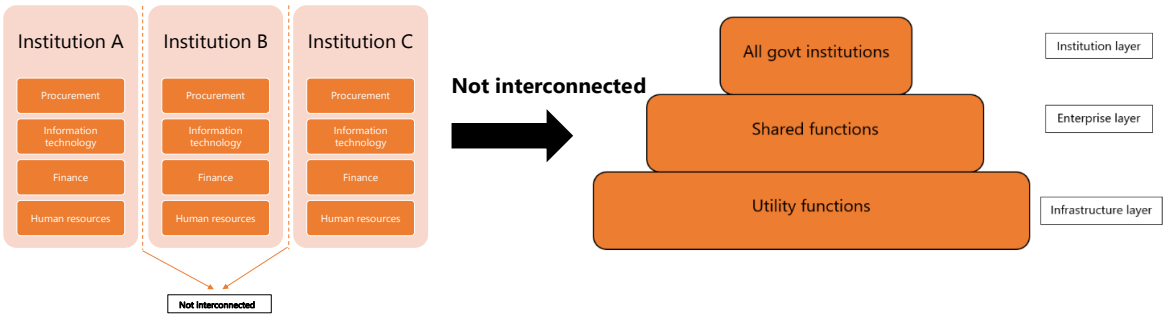
Source: Presidential Regulation No. 95 of 2018; Kementerian PANRB, 2018

3.2.1 Governance

Governance is an aspect of paramount importance, yet is missing in the e-government framework in the past approach. For this very reason, governance is addressed in the

Presidential Regulation on E-Government to ensure that the e-government implementation in every government institution can be integrated (Figure 7). This is because without proper governance, e-government will be implemented as agency silos.

Figure 7. Transformation from Sector-Based to Connected E-Government Approach



Source: adopted from UN, 2008

> E-government has not been effective, as government institutions are still working in a fragmented way like silos. For example, we have a general nationwide application known as SP4N Lapor, which is developed by Kementerian PANRB. This application gives the citizens their right to report their experiences in using public services to the government. In theory, all line ministries and regional governments should use this application. In reality, every government institution is still using their own public reporting system. Because of this, the integration could not be achieved. Silo mentality has to be first eradicated for e-government to be effective. (Informant, female, 14 July 2022)

To make e-government more effective, governance has to be directed toward strengthening the management, coordination, and regulations to push the integration of government services. As central and regional governments have to proceed with transformation efforts, they have to use resources more optimally by avoiding duplication in their activities/initiatives and budgets. Also, within and across central and regional governments, coordination has to be integrated by intensifying coordination, harmonizing policies and regulations, and continuously evaluating the progress. Policies and regulations have to involve various stakeholders at all levels.

Table 8 shows three strategic initiatives under e-government. The first strategic initiative is to develop a national e-government EA as the foundation of e-government. The Presidential Regulation on E-Government defines e-government EA as the basic framework defining the integration of the business process, data and information, infrastructure, application, and security of e-government to provide integrated services. The national e-government EA includes that basic framework at the central and regional government levels.

Article 8 of the Presidential Regulation on E-Government stipulates that e-government EA shall be developed by Kementerian PANRB. Therefore, in mid-2022, Decree of the Minister for Administrative and Bureaucratic Reform No. 255 of 2022 on E-Government Enterprise Architecture was issued (Kementerian PANRB, 2022). This e-government EA includes six domains: (i) business process; (ii) services; (iii) data and information; (iv) application; (v) infrastructure; and (vi) security. Moreover, e-government EA is formulated based on the business process nationwide. While the business process is ideally consistent and

comprehensive, it should also be adaptive towards the services, the stakeholders' needs, and regulatory changes. Nevertheless, applications should be developed—and integrated across sectors and government levels—not only based on the needs, but also in harmony with the objectives and target of e-government.

The second strategic initiative pertains to data and information. Article 9 of Presidential Regulation No. 39 of 2019 on One Data Initiative and Article 33 of the Presidential Regulation on E-Government instruct Kemenkominfo to regulate the standard of data interoperability. In June 2020, Kemenkominfo conducted public consultations to discuss the draft ministerial regulation on data interoperability (Kemenkominfo, 2020). The final version of the regulation is yet to be issued, partly because of the delay in the passing of the personal data protection bill, which was initiated in 2016 and is still being deliberated in the parliament. Meanwhile, the regulatory framework on the digital transformation agenda is overarching. The GoI has issued the one data policy (Presidential Regulation No. 39 of 2019) and one map policy (Presidential Regulation No. 23 of 2021 which revised Presidential Regulation No. 9 of 2016 on the Acceleration of the Implementation of One Map with Map Scale Level of Accuracy of 1:50,000). This one data policy aims to synchronize the data collected by each ministry and institution to ensure that they are accurate and up to date. Meanwhile the one map policy aims to identify plots of land with overlapping utilization plans. This will allow the government to immediately resolve problems when they arise. Nevertheless, without regulation on data interoperability, it is impossible to share data across government institutions and levels smoothly.

Finally, the third strategic initiative is the simplification of the e-government business process. Simplified business process is important not only for e-government, but also for the bigger context of bureaucratic reform. For this reason, Kementerian PANRB issued Regulation of the Minister for Administrative and Bureaucratic Reform No. 7 of 2022. The regulation consists of three parts: (i) simplification of organizational structure; (ii) delayering; and (iii) adaptation of the work system. Business process is discussed in the third part. It is simplified by reviewing and evaluating the current business process and adapting the standard operational procedure.

3.2.2 Service Delivery

The GoI has embarked on the journey of digital government by establishing various services through digital technology adoption through the Presidential Regulation on E-Government. This aims to boost the productivity of ASN, reduce services cost, and improve bureaucratic effectiveness and efficiency (administrative simplification) within and across levels of government. According to the Indonesian e-government strategic plan, digital government service is divided into two: electronic-based government administration services and electronic-based public services.

The electronic-based government administration service is a "back-office service" aiming to streamline and make administrative processes within government bodies (ministries and institutions) coherent. It also aims to make current regulations easier to understand and clearer to apply to the other government levels (national and subnational governments). This service benefits the public sector by making the business process more effective and efficient—this is known as government-to-government (G2G) interaction.

In Indonesia, G2G interactions are performed through common sharing platforms[14] developed and operated by the central government. In 2008, the GoI has developed Electronic Procurement Services (LPSE), a platform aimed to actualizing a clean and good government in the procurement of government goods/services.[15] In 2016, the GoI also developed a platform called Planning and Budget Performance Information Collaboration (KRISNA) to strengthen the accountability and efficiency in government planning and budgeting processes (Knowledge Sector Initiative, 2020). Furthermore, to manage the human resources aspect in the public sector more efficiently, the GoI, through BKN, has developed a platform called MySPAK[16]. Every ASN can update their personal data through this platform and integrate it with the national ASN database.

Meanwhile, electronic-based public services are a "front office service" aiming to deliver services to every citizen more efficiently, ensure citizens' satisfaction toward the government services, and increase public trust and positive perception of the government (Bellantoni, 2010). This service facilitates an interface between the government and the public or citizens (government to citizen/G2C) and between the government and the business sector (government to business/G2B).

Since the first issuance of regulation on e-government in 2003, the GoI has made a relative degree of success in developing the first-generation of e-government services. As discussed earlier, in 2011, the GoI developed LAPOR! to facilitate G2C interactions.[17] Under the authority of Kementerian PANRB, LAPOR! has now been successful in integrating 623 government institutions (including 34 ministries, 74 line institutions, and 515 subnational governments) and receiving around 560 daily reports for the past two years (World Bank, 2021).

Another progress the GoI has made in digitizing government services was developing e-Filling in 2015. In 2019, the Directorate General of Taxes collected 13.4 million annual income taxes, 93% of which was reported through the e-Filling platform (Pajakku, 2020). This accomplishment illustrates the increased public awareness of using digital technology to report their income tax.

Moreover, to create a conducive climate for doing businesses and facilitate the G2B interactions, the government has developed a platform known as Online Single Submission (OSS). This platform aims to make it easier for people to do business in Indonesia by creating an easy and integrated business licensing system.[18]

[14]Platforms with common standards to be used jointly by all ministries and other government institutions. Aside from the common sharing platforms, each government institution also develops and utilizes their own platforms to accommodate their internal needs.

[15]The platform can be accessed at https://lpse.kominfo.go.id/eproc4/.

[16]The platform can be accessed at https://mysapk.bkn.go.id/.

[17]The platform can be accessed at https://www.lapor.go.id/.

[18]The platform can be accessed at https://oss.go.id/en.

Table 9. Examples of E-Government Services under Strategic Initiatives in E-Government Services[19]

E-Government Strategic Plan	Stakeholders of E-Government	Types of Service
Electronic-based government administration services	Government (G2G)	LPSE, KRISNA, MySPAK
Electronic-based public services	Business (G2B)	OSS
	Citizen (G2C)	LAPOR!, e-Filling

Source: authors

3.2.3 Infrastructure

The Presidential Regulation on E-Government states that e-government infrastructure is one of the essential elements to implement e-government among government institutions. This includes all hardware, software, and facilities that become the main support for the government institutions to run their work systems, applications, data communication, data processing and storage, integration/connection devices, and other electronic devices. According to the regulation, e-government infrastructure consists of two elements: 1) national e-government infrastructure; and 2) e-government infrastructure in central and regional government institutions. In the national e-government infrastructure, the strategic plans of the government include the establishment of national data center, intragovernment network, and government services connection system. For those in the central and regional government institutions, the e-government infrastructure focuses on the strategic plans of intragovernment network as well as the government services connection system in the central and regional government institutions.

As a strategic plan, the establishment of a national data center[20] aims to increase work efficiency among governments at the central or regional level by providing data resources that can be used nationally by the central and regional government institutions. Several policies are taken for the implementation of the national data center. The first policy is infrastructure sharing. For example, 630 central and regional government institutions are currently having around 2,700 data centers/server rooms (Direktorat Layanan Aplikasi Informatika Pemerintahan, 2021). With its mere 30% utilization, there is an urgent need for efficiency, which can be achievedby integrating these data centers with the national data center of e-government. This allows the number of data centers to be reduced to only between 10 and 20. Second, there is a need to set up a standard for technical feasibility and security of these data centers, including the operational and security eligibility. In its use, the national data center needs to be reviewed by Kemenkominfo for its operation eligibility and by BSSN for its security eligibility.

Another strategic plan, intragovernment network, is a closed electronic system network used within institutions to maintain the security in transmitting data and information

[19]The services listed in this table are only examples and do not fully represent all the types of e-government services the government provides.

[20]Currently, the GoI has established four national data centers to implement e-government and to support an efficient, effective, and transparent public services. They are located in Jakarta, Bogor, Depok, Tangerang, Bekasi (Jabodetabek), Batam, Balikpapan, and Labuan Bajo.

between the network nodes of central and regional government institutions. Intragovernment network is the most required basic infrastructure of e-government, as it reflects how the governments, either at the central or regional level, are communicating with each other. Therefore, in the e-government acceleration plan, this becomes one of the programs that needs to be completed within three years after the issuance of the Presidential Regulation on E-Government (Dewan TIK Nasional, 2019). Similar to the national data center, this strategic plan requires a review both from Kemenkominfo for the operational eligibility and BSSN for the security eligibility.

The government services connection system, or system sharing, is directed at facilitating the integration of e-government services between government institutions. All government institutions at the central and regional levels are required to use this system in providing e-government services, which then leads to the need for an interoperability standard between e-government services. This interoperability standard is determined by the ministry in charge of government affairs in communication and informatics, Kemenkominfo. In line with that, and similar to the previous strategic plans, Kemenkominfo also has the responsibility to review the operational eligibility of this plan, while BSSN is responsible for providing reviews on the security eligibility.

3.2.4 Human Capital

The framework of e-government places human capital as one of the essential elements in realizing high-quality and reliable electronic-based bureaucracy and public services. ASN are assigned at the frontline to conduct e-government. Thus, they need to be equipped with adequate digital skills—the ability to operate, organize, comprehend, consolidate, appraise, and obtain information securely and conveniently (Bashir and Miyamoto, 2020). The inadequate digital skills to operate e-government poses the risk of losing its potential to improve public services over time. Also, since e-government needs to be developed sustainably and continuously to create proper mechanisms to provide fast, efficient, and accurate public services to the government itself and all citizens,[21] the GoI demands ASN to be competent and innovative with knowledge and skills in digital technologies through digital skills development.

According to Article 51 of the Presidential Regulation on E-Government, the agenda to produce high-quality human capital in the Indonesian public sector can be pursued by developing technical competencies for ASN. However, no specific moves have been arranged in the regulation. Nevertheless, through the education and training center (*pusdiklat*) and corporate university (corpu)[22] of each institution (see Box 2), some government institutions have initiated LMS to support ASN's upskilling and reskilling agenda. LMS is a software system for managing all educational and training activities, i.e., administration, documentation, tracking, reporting, automation, and execution of activities (Ellis, 2010). Modern LMS can utilize data analytics to identify skills gaps of individuals to

[21]This statement is from "Grand Development Design of ASN 2020–2024: Strategies in Developing ASN with Integrity and Discipline", a presentation from Dr. Ir. Setiawan Wangsaatmaja, Dipl. S.E., M.Eng (Medan, 4 April 2019).

[22]Based on the definition from the Global Association of Corporate Universities & Academies (GACUA), corpu is a competency and organizational development system in matching the needs of the organization and its employees' competencies, i.e., link and match approach, to achieve its strategic goals.

the ideal condition. Individuals may use this tool to arrange training needs, select relevant materials, and choose the desired learning methods to develop competencies (Mooney, 2021). LMS is expected to serve as a medium for facilitating various electronic-based competency development (e-learning) activities, both full e-learning and blended learning. It assists in providing skills and knowledge based on the needs of each directorate and bureau to support their agenda towards the goals of their overall institution (Kemenkominfo, 2021). The existence of LMS also gives opportunities for ASN to take distance learning, assisting them in attending 20-to-24-hour upskilling and reskilling programs within a year without leaving their job behind.[23]

On the other hand, Article 52 of the Presidential Regulation on E-Government mandates the importance of having KMS to manage each government institution's intellectual assets. KMS is a structured and systematic effort to develop knowledge by identifying, acquiring, evaluating, and distributing intellectual assets, including data, information, knowledge, and policies of an organizational governance within a computational system (Koenig, 2018). The presence of KMS assists government institutions in many ways, such as (i) time and cost savings; (ii) increased number of intellectual assets; (iii) adaptability to sudden changes in governance; and (iv) increased productivity (Satoto, 2017). In the context of human capital, this system can be utilized to reduce the risks of high turnover rates in the public sector, especially those government institutions with a significant number of non-ASN employees. It helps the GoI record their intellectual assets in a system that might be produced by resigned employees and creates standards for operating, improving, or repairing specific actions. Because of its functions, KMS also assists the GoI in mapping relevant skills needed for the public sector to support the continuous improvement of LMS and the government's human resources.

[23]according to Government Regulation No. 11 of 2017 and Government Regulation No. 49 of 2018

Box 4
ASN Corpu

LAN is seeking to produce ASN with future-proof skills by mainstreaming ASN corpu[24] within an integrated system between ministries, institutions, and regional governments. Corpu is currently still an output of each institution's initiative, e.g., Kemenkeu, the Ministry of Law and Human Rights (Kemenkumham), the Ministry of Industry (Kemenperin), the Provincial Government of DKI Jakarta, and others. ASN corpu will complement each institution's corpu, providing an integrated system between all government institutions to construct national strategic plans and actions in developing the competencies of ASN. Prior to mainstreaming ASN corpu, LAN utilized the ASN Competency Development (Bangkom ASN). However, the approach is outdated, simply due to its inability to provide future-proof skills to ASN (Lembaga Administrasi Negara, 2021b).

In supporting the implementation of ASN corpu, LAN will build ASN corpu with two pillars, which are LMS and KMS. Previously, LAN has released an LMS platform called ASN Unggul.[25] ASN Unggul is expected to support effective, efficient, and high-quality learning and training in developing ASN's competencies at various levels. ASN Unggul currently can facilitate several modern education and training mechanisms, such as social learning, retrieval practice, blended learning, and massive open online course (MOOC), helping them access modules from anywhere and anytime (Lembaga Administrasi Negara, 2021a). These methods also offer benefits for the public sector. By providing flexible learning and training systems, public sectors will not be unnecessarily afraid of losing employees when their employees participate in an upskilling and reskilling agenda. Unlike individual government institution's corpu, the scope of the learning and training materials from ASN Unggul covers general soft skills, such as leadership, digital literacy, and others. On the other hand, LAN is still developing its KMS, assisting the LMS to create a nationally integrated system of ASN corpu and becoming the center of excellence which can serve as a model for the private sector and universities in the future.

3.3 Digital Skills for the Implementation of E-Government

In 2017, Kemenkominfo along with the Ministry of Labor (Kemenaker), Bappenas, National Profession Certification Agency (BNSP), as well as the Indonesian Chambers of Commerce and Industry (KADIN) came together to pass an occupation map as a national qualification framework for ICT professionals (Kemenkominfo, 2018).

The document is developed to anticipate the ASEAN (Association of Southeast Asian Nations) Economic Community where professionals are allowed to move freely within ASEAN countries. ICT professionals are expected to move intensively, considering the high demand for them. For this reason, the GoI took the initiative to issue a reference to be used by the public and private sectors to develop ICT competencies that are in line with the education and training systems in Indonesia.

[24]according to Government Regulation No. 11 of 2017

[25]The platform can be accessed at https://asn-unggul.lan.go.id/.

The ICT occupation map (Bappenas, 2020) consists of 16 job families[26] that have been harmonized with those in other ASEAN countries. The development of this map includes not only the line ministries and private sector, but also academics, training institutions, and professional associations. According to Kemenkominfo (2018), the ICT occupation map is a living document whose contents are expandable depending on the needs and latest development of the industry.

Due to the absence of ICT competence definition in the public sector, the ICT occupation map cannot be utilized to directly identify which digital skills are needed to implement e-government. As a context, digital skills are proxied by the 16 ICT job families available in Indonesia. Based on the possible digital skills inside of the public sector, we can identify relevant functional positions to carry out e-government strategic initiatives (Table 10). The result is expected to provide insights on which functional positions are essential to operate e-government. The result of this process will be used to estimate whether the supply quantity and quality of that functional position in the public sector are sufficient to carry out e-government strategic initiatives as well as the demand-side problem in becoming ICT professionals in the public sector (discussed in Chapter 4).

We used a matching approach to identify the digital skills and roles needed to operate e-government. Two steps were organized to obtain the results in Table 10. *First*, we matched the e-government strategic initiatives with the ICT occupation map to identify the skills needed for e-government. After we found the relevant digital skills needed, we matched the skills with the job descriptions of each functional position in the ICT job family and relevant functional position in the non-ICT job family.[27] The results were quantified to check which functional positions are essential in e-government.

[26]In this document, we unfortunately could only identify 15 ICT job families that could be matched to the e-government strategic initiatives. The full version and details can be accessed through https://petaokupasi.bappenas.go.id/wp-content/plugins/algori-pdf-viewer/dist/web/viewer.html?file=https%3A%2F%2Fpetaokupasi.bappenas.go.id%2Fwp-content%2Fuploads%2F2020%2F09%2FPeta-Okupasi-Bidang-TIK.pdf.

[27]We conducted the matching according to Regulation of the Minister for Administrative and Bureaucratic Reform No. 32 of 2020 on Functional Position of ICT Officers; Regulation of the Minister for Administrative and Bureaucratic Reform No. 6 of 2020 and No. 31 of 2022 on Change of Functional Position of Information Security Managers; Regulation of the Minister for Administrative and Bureaucratic Reform No. 44 of 2021 on Functional Position of Cryptographers; Regulation of the Minister for Administrative and Bureaucratic Reform No. 34 of 2017 on Functional Position of Information System for Population Administration (SIAK) Operator; Regulation of the Minister for Administrative and Bureaucratic Reform No. 35 of 2017 on Functional Position of Population Database Administrator; and Regulation of the Minister for Administrative and Bureaucratic Reform No. 86 of 2020 on Functional Position of Scientific Data Analyst.

Table 10. Digital Skills for the Implementation of E-Government

E-Government Aspects	Strategic Initiatives	Occupation Map		Government's Functional Positions in thd ICT Job Family
		ICT Job Family	Types of ICT Professionals	
Governance	Data & information	Data management system	16	90% ICT officers 6% information security manager 1% cryptographer (*sandiman*) 2% others
Human capital	LMS			
Human capital	KMS			
Service	Electronic-based administration services & public services	Programming & software development	30	
Human capital	LMS			
Human capital	KMS			
Infrastructure	Intragovernmental national network	Hardware & digital peripherals	14	
Infrastructure	Government services connection system	Network & infrastructure	16	
Infrastructure	Government services connection system	Operation & system tools	17	
Service	Electronic-based administration services & public services	Information system & technology development	24	
Governance	Business process	IT governance & management	22	
Governance	Business process	IT project management	22	
Service	Electronic-based administration services & public services			
Governance	EA	IT EA	8	
Governance	Data & information	IT security & compliance	37	
Human capital	KMS			
Infrastructure	National data center	IT services management system	15	
Infrastructure	National data center	IT & computing facilities management	12	
Human capital	LMS	IT multimedia	18	
Human capital	KMS			

E-Government Aspects	Strategic Initiatives	Occupation Map		Government's Functional Positions in thd ICT Job Family
		ICT Job Family	Types of ICT Professionals	
Service	Electronic-based administration services & public services	IT mobility & internet of things (IoT)	11	
Human Capital	LMS			
Service	Electronic-based administration services & public services	Integration application system	21	
Total				
4	9	15	283	100%

Source: authors

Note: This is based on the authors' matching process between Presidential Regulation No. 95 of 2018 and the ICT occupation map.

Table 10 shows that 90% of the skills required for e-government can be delivered by the functional role of ICT officers. They take the majority of responsibilities in all aspects of e-government: governance, services, infrastructure, and human capital. In fact, this result supports our qualitative findings.

> We are not surprised by SMERU's findings. Kementerian PANRB once intended to make another functional position specific for e-government. However, ICT officers have done all e-government work. So, why make another one? Internally in the association, we tried matching e-government with our job descriptions. From our attempt, it was found that none of the job descriptions do not support e-government. (FGD participant, female, 20 October 2022)

> Our attempt showed that 100% of e-government tasks can be carried out by ICT officers. However, there are areas where our skills are not that deep. SMERU sees that other functional roles can play better roles in these areas. (FGD participant, male, 20 October 2022)

ICT officers are responsible for developing and running the entire ICT system, starting from designing, building, implementing, deploying, and maintaining the system. To deliver e-government services more efficiently, they are also responsible for creating new applications and platforms, supporting the existing platform, and ensuring that the system runs smoothly. Thus, they require a deep understanding of computer hardware and software as well as the ability to quickly identify and troubleshoot problems related to ICT issues. They should have digital capabilities in hardware and digital peripheral, network and infrastructure, and IT computing facilities management: the basic competencies required to implement e-government infrastructure, including the use of cloud storage for the daily work of ASN.

These are all professional jobs. However, in reality, ICT officers are associated with very rudimentary duties.

> There is a tendency that [for issues related to] cables, electricity, air conditioner with remote control and sensor, or anything that does not work and needs to be fixed, [simply] ask the ICT officers to fix it. Typing is also their job, as it is related to computers. (FGD participant, male, 20 October 2022)

> Our colleagues at the regional level are doing ICT end to end to support activities in their units. They have to deal with simple tasks, such as those related to computer cables, personal computer setup, and developing small applications and the governance. (FGD participant, male, 20 October 2022)

Aside from ICT officers, information security managers and cryptographers also acquire skills to operate e-government. However, unlike ICT officers, they only have 6% and 1% of skills to implement e-government, respectively. It is understandable, because while ICT officers have a wide range of job descriptions, information security managers and cryptographers are only responsible for ensuring its system's security, from building digital security protocols/standards to operating an IT security system, intragovernment network, and government services connection system, both at the central and regional government levels. Information security managers become the frontline defense against malicious actors and threats, such as data theft and vandalism. Meanwhile, as language coders, cryptographers specifically handle cybersecurity, with responsibilities such as risk management, network security monitoring, and product security testing. Lastly, there are 2% of skills related to the job descriptions of data analysts, statisticians, accountants, human resources analysts, human resource supervisors, and human resource safety and security staff.

Moreover, if we break down each functional position from column 5 of Table 10 based on their category, i.e., expert level and skilled level,[28] e-government works apparently require expert-level functional positions. An expert-level functional position is expected to possess higher technical skills and work experiences, combined with high-level managerial skills such as leadership and decision-making. Hence, it can be concluded that high-quality human resources are required not only to operate e-government, but also to continuously improve its implementation.

[28]It is not mandatory to have both levels for each functional position. However, the expert-level category has a higher level than the skilled-level category. To be eligible for the expert-level, ASN/CASN are required to have at least higher level of educational attainment or relevant work experiences. From each category, there are four levels of position: (i) expert level, consisting of (from highest to lowest) lead expert, senior expert, middle-level expert, and junior expert; and (ii) skilled level, consisting of (from highest to lowest) supervisor, senior, middle level, and junior.

Table 11. Career Level of Each Functional Position for the Implementation of E-Government

	Expert Level	Skilled Level
ICT officer	91%	9%
Information security manager	100%	0%
Cryptographer	100%	0%
Others	100%	0%

Source: authors

Note: This is based on the authors' matching process between Presidential Regulation No. 95 of 2018 and the ICT occupation map.

IV. Analysis of Supply and Demand Sides

At the end of Chapter 3, we learned that 90% of the skills required to implement e-government can be delivered, at least theoretically, by ICT officers. This implies that it is the most prominent ICT profession to maintain government transformation. However, it is imperative to examine further to find out whether, in practice, ICT officers as public sector ICT professionals can perform as expected. In this chapter, we will explore the quantity and quality of ICT officers as well as the demand for them. Exploring them will allow us to identify possible gaps and ways to address them.

Box 5
Two Versions of Data on ICT Officers

The data on ASN, including ICT officers, are held by two institutions: BKN and BPS as their supervisory institutions. ASN data are surprisingly very difficult to collect. While educational background and age cohort are obtainable, we were unable to acquire data at the level of ICT officers. In contrast, from BPS, we could obtain the data at the level of ICT officers, but not their education level and age. In addition, there is also a discrepancy issue. While the total number of ICT officers nationwide according to BKN is 7,954, BPS suggests that Indonesia only has 4,835 of them. At this point, the assumption is that the data collection process of these government agencies contains error or unstandardized procedures. Another possibility is that the BKN data include the additional ICT officers from the delayering program. In any case, this qualifies a momentum to standardize the ASN data collection process.

For practicality, this report will utilize both sources of data. When the quality of the ICT officers is to be analyzed, the data from BKN are used. Meanwhile, BPS data are used for comparing supply and demand for ICT officers at the central government level.

4.1 Quantity of the Supply Side

The matching analysis identifies five categories of ICT job families in the public sector that are relevant with e-government. Table 12 shows the roles and current supply of ASN with the ICT job family.

Table 12. Number of ASN by ICT Job Family

ICT Roles under the ICT Job Family	Number of ASN (Person)	% Total ASN
ICT officer	7,954	
Information security manager	165	
Cryptographer	724	
Population administration system operator	57	
Population database administrator	1,356	
Scientific data analyst	82	
Total	**10,338**	**0.24%**

Source: BKN, 2022

Note: The number of ASN reflects real-time data until July 2022. The total number of ASN in functional positions used for the percentage is 3.9 million (June 2022).

As shown in Table 12, there are only less than 1% of the ICT roles, in terms of all available functional roles and ASN. This percentage is quite astonishing. While e-government agenda are essential to support the digital transformation in the public sector and the main actors of the agenda are ICT roles, i.e., ICT officers, information security managers, and cryptographers, they only make up less than 1% of all ASN. Several factors contributed to this lack of ICT roles. *First*, the public sector with its inflexibility might not be a popular sector for ICT professionals.

> Adopting ICT in the public sector means adopting a market approach. There should be a balance between keeping the rigidity of the public sector for ICT professionals and the accountability principle. This is a big challenge. (Informant, male, 4 August 2022)

Second, the competency test to become an ICT officer is notoriously difficult for ASN candidates. This reduces the attractiveness of ICT officer compared to other public sector jobs, even among ICT graduates.[29]

> Once we open vacancies and candidates for ICT roles [ICT officers], we will organize a competency test. Unfortunately, this test has failed many candidates albeit their ICT educational background. (Informant, female, 31 October 2022)

Third, there is an issue of insufficient information regarding specific ICT roles when the government publishes job vacancies.

> The lack of dissemination can contribute to the low supply. Vacancies for ICT roles [ICT officers] are not well-spread. It should be displayed intensively in various media platforms. (Informant, female, 31 October 2022)

While the ideal number of ICT roles in the public sector to support the e-government agenda is still unclear, we can conclude that the current number is insufficient to support a

[29]There are opinions that ICT graduates applying for government jobs are the ones that cannot compete in the private sector.

massive agenda like e-government. This is proven by the fact that the public sector sometimes recruit contractual-based experts or hire vendors to assist in the provision of websites, applications, and others.

ICT officers possess the majority share of ICT roles. Since they can essentially do anything, there is less demand for other ICT roles. This accounts for the low number of other ICT roles compared to ICT officers. According to Regulation of the Minister for Administrative and Bureaucratic Reform No. 32 of 2020, ICT officers are mandated to work in the areas of IT governance, IT infrastructure, information system, and multimedia. Nevertheless, they are sometimes assigned by ASN to work on another IT-relevant field, such as advanced tasks like data analysis or digital security or basic tasks like repairing printers or photocopy machines. In contrast, information security managers and cryptographers are specialized in the field of digital security.[30] The low demand for non-ICT officer job roles is in line with the matching analysis where 90% of the skills required to implement e-government can be performed by them. For further discussion, we will limit our analysis only on ICT officers as the main actors of e-government.

> We have ICT officers that basically can do anything [generalists who have no specialization]. On the other hand, we also have information security managers [and cryptographers] with very high specialization [in the field of digital security]. This is quite problematic. (Informant, male, 16 June 2022)

According to Regulation of the Minister for Administrative and Bureaucratic Reform No. 32 of 2020, ICT officers are classified into two categories namely skilled-level and expert-level ICT officers. Skilled-level ICT officers are those possessing technical skills and knowledge of ICT, whereas expert-level ICT officers are responsible for utilizing their ICT knowledge for decision-making and leadership roles.

4.2 Quality of the Supply Side

Digital skills in the public sector are not only about quantity. A closer look at the issue of quality is needed.

> Solving the [issue of] quantity of digital skills through recruitment does not automatically solve the problem. There are issues related to quality. ICT is very specific knowledge with a short cycle that changes rapidly due to fast transformation. (Informant, male, 28 October 2022)

> It has become a public secret: Good applications and software are not the ones developed by ASN. (Informant, male, 1 August 2022)

As a proxy to quality of the supply side, two approaches are used: (i) the relevant educational background of ICT officers; and (ii) the age cohorts of ICT officers.

[30]According to Regulation of the Minister for Administrative and Bureaucratic Reform No. 44 of 2021, a cryptographer is primarily focused on coding, cybersecurity, and information security. Meanwhile, based on Regulation of the Minister for Administrative and Bureaucratic Reform No. 6 of 2020, an information security manager has an expertise on security management information system.

4.2.1 The Relevant Educational Background of ICT Officers

Regulation of the Minister for Administrative and Bureaucratic Reform No. 32 of 2020 states that the main requirement to become an ICT officer is having at least a three-year diploma (D-3) in ICT (for the skilled-level)[31] and be recruited either through first appointment, transfer, or promotion. Nevertheless, the delayering policy—as mentioned in the previous chapter—has resulted in the presence of ICT officers who come from a non-ICT background or have a lower education level (Table 13).

> Skilled-level ICT officers are required to obtain at least a three-year diploma in ICT. The existence of ICT officers who come from general or vocational high school, one- or two-year diploma, or non-ICT graduates is the impact of the delayering policy. None of the other functional positions correspond to their previous position—most of them held administrative functional roles prior the implementation of the delayering policy—so that they need to be allocated to the ICT officer role. (FGD participant, female, 20 October 2022)

Table 13. ICT Officers by Educational Background

Educational Attainment	Number of ICT Officers Based on Educational Background (Person)		Total	Proportion (% of All ICT Officers)
	ICT	Non-ICT		
Vocational/senior high school	0	118	118	1.5%
D-1 and D-2	3	18	21	0.3%
D-3	1,674	115	1,789	22.5%
Bachelor's degree	3,933	878	4,811	60.5%
Master's degree	505	703	1,208	15.2%
Doctoral degree	3	4	7	0.1%

Source: BKN, 2022

Note: The number of ICT officers reflects all-time data received by BKN until July 2022. The total number of ICT officers used for this percentage is 7,954 people.

The regulation also states that by 2024, all ICT officers are required to meet the minimum criteria of having at least a three-year diploma in ICT for the skilled level or at least a bachelor's degree in ICT for the expert level. If they fail to meet the condition in time, they will be disqualified for the role.

Two scenarios were employed in the attempt to examine the quality. Scenario 1 uses the relevant educational background of the skilled-level ICT officers as the benchmark. Meanwhile, Scenario 2 uses the relevant educational background of the expert-level ICT officers as the benchmark. However, with limited data, we made the following

[31]We use similar rule as the study from SMERU, Oxford, and UNESCAP (2022) in classifying ICT graduates. Individuals are classified as ICT graduates if their field of study is computer sciences, logic, mathematics, information sciences or information systems, computer/telecommunication/informatics/software engineering, or related fields.

assumptions. *First*, ICT officers with a master's or doctoral degree are assumed to have a bachelor's degree in ICT. *Second*, as the portfolios of the ICT officers are unobserved, relevant educational background is assumed to represent their quality. Further exploration is needed to include portfolio as well as independent learning activities, as these variables are highly important to determine the quality of the ICT officers and feasible to obtain in the internet era.

Table 14 identifies the proportion of ICT officers that qualify for the skilled level (Scenario 1) and expert level (Scenario 2). Unfortunately, 24% of the ICT officers still could not satisfy the minimum criteria of the skilled level. In other words, only three-fourth of the ICT officers are basically capable of performing the job's basic tasks. This percentage is below the standard of e-government, as the matching analysis found that the e-government agenda requires 91% activities to be performed by the expert-level ICT officers and only 9% by the skilled-level ones.

Table 14. Scenario of Educational Qualification

Scenario 1 (D-3 or Higher)		Scenario 2 (Bachelor's Degree or Higher)	
Number of ICT Officers (Person)	% of All ICT Officers	Number of ICT Officers (Person)	% of All ICT Officers
6,112	76.8%	4,441	55.8%

Source: BKN, 2022

Note: The number of ICT officers reflects all time data received by BKN until July 2022. The total number of ICT officers used for this percentage is 7,954 people.

Meanwhile, Table 14 shows that, when the benchmark is increased (Scenario 2), 44% of the ICT officers failed to meet the requirement. In other words, almost half of them need to improve their quality in integrating technology with leadership and decision-making processes.

4.2.2 Age Group

Age also indicates the distinction of work approach and work performance of each generation. In general, the current ASN consists of four generations: (i) baby boomers; (ii) generation X; (ii) generation Y (millennials); and (iv) generation Z.[32] These four generations have their own unique approach to technological device utilization in their work activities—although younger generations (millennials and generation Z) are classified as digital natives.[33] Older generations (baby boomers and generation X) usually only utilize technology to complete specific given tasks and require procedures to be able to use it. On the other hand, younger generations have capabilities in utilizing the latest generations of technology to create a more convenient way of working (Berkup, 2014). As a result, the older generations tend to be slower in utilizing the latest technologies.

[32]Here are the details of each generation's range of birth year: baby boomer (1955–1964); generation X (1965–1980); generation Y/millennials (1981–1996); and generation Z (1997–2012) (Beresford Research, n.d.).

[33]Both generation Y and generation Z are born in a digital, media-saturated world. Generation Y acts as a pioneer of digital natives and generation Z as the true digital natives (Moran, 2016; McKnight, 2018).

Otherwise, they might have the capabilities to employ technology, but tend to be more confident to employ the usual paper-based procedures.

> Older generations of ASN actually have the capabilities to transform their work approach. However, they feel more comfortable with the work procedures they have become accustomed to. (Informant, female, 28 July 2022)

Table 15. ICT Officers by Age Group

Age Group	Number of ICT Officers	% of All ICT Officers
21–30	958	12.0%
31–40	3,985	50.1%
41–50	2,420	30.4%
51–60	590	7.4%
61 or older	1	0.0%

Source: BKN, 2022

Note: The number of ICT officers reflects all-time data received by BKN until July 2022. The total number of ICT officers used for this percentage is 7,954 people.

Table 15 shows the composition of ICT officers by age group. This role is currently dominated by the younger generations—more than 60% of them are between 21 and 40 years old—meaning that they are in the millennials and generation Z categories.[34] In contrast, the overall ASN is dominated by the older generations, as more than 60% of ASN are categorized as generation X or baby boomers. The greater presence of younger generations in this role is relevant to its operating model, which is agile, firm, outcome-driven, and collaborative. These are more likely to come from the millennials and generation Z than baby boomers and generation X.

The ICT officer role, filled by the younger generation, may serve as the backbone to support the sustainable agenda of e-government over time. Meanwhile, the adaptability of older generations that dominate the ASN composition might become a hindrance to the agenda. On the other hand, having abundant younger generations that may have desire to obtain instant success and sentiment towards the lack of remuneration may also undermine the progress of the e-government agenda. The role of leaders who embrace every generation's potential is becoming more essential in this period.

4.3 Quantity of the Demand Side

The essential role that ICT officers play in the implementation of e-government must be supported by their adequate availability. In other words, ideally, no gap should be allowed between the supply and demand of ICT officers for all government institutions. In this section, we attempt to analyze the gap between their supply and demand. We obtained the supply and demand data from government institutions at the central government

[34]The data we received were categorized into age groups, limiting us in separating them into each generation.

level. The number of supply was collected from the current availability of ICT officers in ministries or institutions. Meanwhile, the number of demand, i.e., the ideal number of ICT officers in each ministry or institution, was obtained from the position analysis (*anjab*) and workload analysis (ABK) for the period of 2020–2024.[35] A gap can be identified when the demand exceeds the supply. Negative values of the gap indicates that the demand for ICT officers is higher than its current availability. Furthermore, this gap can be considered as the number of ICT officers that should be recruited by 2024.

Table 16. The Supply, Demand, and Gap of ICT Officers in Government Institutions at the Central Government Level

Category of ICT Officers	Supply	Demand	Gap
Skilled level	601	5,674	-5,073
Expert level	2,230	11,074	-8,844
Total	**2,831**	**16,348**	**-13,517**

Source: BPS, 2022

Note: The data were collected from 71 ministries and institutions at the central government level.

Table 16 provides the data on supply, demand, and gaps of both skilled- and expert-level ICT officers in all ministries and institutions at the central government level. The data were collected from BPS in November 2022. The data suggest that the demand for the expert-level ICT officers is more than two times the demand for the skilled-level ones. It supports our previous finding that ICT officers in the expert category are more essential to support the e-government agenda. On the other hand, the amount of demand for ICT officers (16,348) significantly exceeds its supply (2,831), meaning that the gap between the demand and supply reaches more than 13 thousand. While we were unable to find the demand at the regional government level and there is no demand for ICT roles in four ministries,[36] these findings at least capture the importance of ICT officers as an ICT role that can perform any ICT-related tasks and support the e-government agenda in all government institutions.

Based on the data obtained from BPS, we found that for the 2020–2024 period, all ministries and institutions at the central government level need at least 16,348 individuals to fill in the ICT officer position. However, as of now, they only have 2,831 ICT officers. In other words, they need an additional 13,517 individuals to fill the position between 2020 and 2024.

[35]According to Kementerian PANRB, the position and workload analyses are conducted once every five years.

[36]Before we utilized the data from BPS, we attempted to collect data from four ministries, which are Bappenas, Kementerian PANRB, Kemendikbudristek, and Ministry of Health (Kemenkes). As we found that there is a significant gap between the demand and supply of ICT officers (1,640 vs 488), they do not have the demand and supply of other ICT roles (information security managers and cryptographers).

4.4 Quality of the Demand Side

In addition to discussing the quantity of demand which exceeds that of the supply, there is also an important issue of quality of the demand side. The quality of demand pertains to whether (i) the organization really needs certain qualifications; (ii) the placement is in line with the skills of the ICT professionals; and (iii) the tasks allocated to the ICT professionals are within their job description.

At the demand side, we can wrap these concerns into the issue of skill mismatch. This can be serious because, while the number of supply is already much lower than expected, misplacement occurs in the public sector where overqualified ICT professionals are put in positions that do not require their high skills.

> I don't understand how the regional governments plan their needs. They must have done it in a hurry. They say they need expert-level ICT officers—those with at least a bachelor's degree. In fact, these people were placed as an entry data operator that is a part of job description for the skilled-level ICT officers. (FGD participant, female, 20 October 2022)

> What the employers want is we contribute to the organization, irrespective of our skills. (FGD participant, male, 20 October 2022)

Meanwhile, for ICT officers, working against their job descriptions means misplacement. Misplacement or mismatch damages their career path.

> There might be a mismatch in the public sector. The training and daily work of ASN is not in line with their career. They have difficulties in collecting credit points for promotion. Training is carried out to support their daily work, not their career. (Informant, male, 28 June 2022)

When ICT officers do tasks that are not in line with their job descriptions, they will have difficulties in collecting credit points for promotion. Moreover, those who work hard but are unable to get promotion due to insufficient credit points will get demotivated.

> We all know that in ICT, things change very fast, and regulation is formulated much slower and cannot keep up with it. For example, credit points are regulated much later than the real work of ICT professionals. Therefore, the regulation on ICT skills have to be made more flexible. We cannot let our ICT officers get demotivated because their tasks are already too much, but these are not counted in [their] credit points. (Informant, male, 15 July 2022)

> We have to be professional and only do our job descriptions. For example, if we are assigned to take care of procurement outside of [our] job description, we have to be able to say no. Our job description is formulated by BPS as the supervisory institution. If we violate this, we betray ourselves. (FGD participant, male, 20 October 2022)

The uphill battle is to mediate between ICT officers as individuals fighting for their career interest and the organization leaders struggling to achieve their immediate targets. Ensuring that they can claim their work for promotion is important to maintain high motivation of these ICT professionals. This motivation is pivotal for them to contribute their best in achieving the targets of their organization units.

4.5 Closing the Supply and Demand Gap

From the in-depth interviews, it is clear that there are three channels that can be utilized to address the gap between the quantity of supply and demand of digital skills. These channels are in line with the Organisation for Economic Co-operation and Development's (OECD) framework that the public sector can use to bridge the gap in talents and skills (OECD, 2021). First, government institutions can recruit PNS, PPPK, individual experts, internal employees, and vendors. Second, the government can upskill the current supply through short courses, scholarships for academic degrees, skill certifications, conferences, and in-house training. These two channels are very common for all ASN. However, as ICT professionals are dominated by millennials and since the high turnover rate prevails, there is an urgency to consider the third channel, namely retention. In this channel, remuneration, career path, work culture, and leadership are all key.

4.5.1 Recruitment Channel

Recruitment of PNS candidates would mean permanent addition of supply or sustainable knowledge for the organization (Table 17). For PPPK, it is more flexible, as candidates can be recruited for a minimum of one year and extendable up to five years, depending on their performance.

Table 17. Recruitment Channels of Digital Skills

	Positive Side	Negative Side	Some issues
CPNS	• Permanent • Sustainable knowledge with low turnover	• Lengthy recruitment • Centralistic	• Unattractive for ICT professionals • Dilemma of having civil servants vs. using digital talents from the market
PPPK	• More flexible • No career path needs to be considered	• Lengthy recruitment • Centralistic • Unsustainable for organization • Lack of knowledge transfer	• Recruitment should be accelerated and made more frequent in a year
Individual consultants and experts	• Flexible depending on the needs • Hirable at any time • No overhead cost • Working together with government employees	• More expensive than PPPK • Lack of knowledge transfer • Only applicable prior to November 2023	• Unclear of what will happen after November 2023
Vendor	• Hirable at any time • Guaranteed quality	• Expensive due to overhead cost	• Dependency issue

	Positive Side	Negative Side	Some issues
		• Not necessarily working together with government employees • Lack of knowledge transfer • Issue of after-sale services	
Internal job vacancy	• Can be a temporary placement for short-term needs • Candidates can be easily traced internally	• Administration procedure is rather complex	• Career path might be disrupted

Source: authors

In general, the turnover rate of ASN is expected to stay low, but the rate is higher for ICT professionals.

> It used to be low, but in the last five years, the turnover rate in our ministry has been increasing. In the past, we thought that civil servants were those with high loyalty. Recently, we realized that this is not the case, as we also experience an increase in turnover rate although at a lower percentage than in the private sector. (Informant, male, 26 July 2022)

> At our institution, the turnover rate is increasing. The opportunities out there are also promising. Even though we are tied as we are graduates from government-affiliated vocational college, with sanction of not less than Rp500 million, some graduates are leaving the job. It seems like they will get salary of more than Rp10 million, which is much better than working as government ICT professionals. (FGD participant, male, 20 October 2022)

However, the recruitment of CPNS and PPPK is centralistic. It is lengthy and could not be used to fulfill the immediate needs of the organization.

> The procedure of ASN recruitment is rigid and fully controlled by Kementerian PANRB. (Informant, male, 1 August 2022)

It is no longer a secret that being a government employee is unattractive for youths (millennials and generation Z). In particular, the best ICT professionals would prefer to work for the private sector or unicorns. It remains a dilemma for the government when deciding whether to recruit civil servants for lifetime employees or just use digital talents in the market according to the needs of the organization.

> The public sector is unattractive for ICT professionals. In the end, we will not get the best talents. The government should be ready to pay more for talents with above-average competence. (Informant, male, 4 August 2022)

> We are faced with difficulties in recruiting digital talents from well-known state universities. We could only acquire the second, third, or even the fourth ring. ASN salaries are not attractive for graduates from the first ring. (Informant, male, 4 October 2022)

> Should we recruit ICT officers as ASN to solve the problem? There are issues like low capacity, unbalanced remuneration, and so on. However, let's think about this. Should our ASN develop applications? I don't think this is what an ASN should do. Why not use those whose daily task is developing applications—it is their professional work. We just pay them. It is expensive, but you are demanding good quality. (Informant, male, 12 July 2022)

Currently, the most common practice to close the gap is by using individual consultants, in which the issue regarding knowledge transfer still prevails.

> We have to hire consultants as a solution, considering the current quality of [ASN with] functional jobs. It is almost impossible to use the public sector's approach if we want to go for the best digital products. (Informant, male, 16 June 2022)

However, individual consultants are preferable than vendors, as they are more likely to involve their government counterparts in their services. They are also less expensive than vendors in terms of overhead cost. However, starting from the end of next year, individual consultants are no longer eligible for government use.

> This is really a dilemma for us. We are used to having their services for short-term needs. If we cannot do this anymore starting next year, then the only possible way is PPPK. However, it would take one year to acquire the service of PPPK. We find this inefficient for immediate needs. (Informant, male, 4 August 2022)

> For new technologies, we have to use vendors, as we have no capacity to do that. However, when we order services, we have to be strict with the specifications, so that we can still supervise their work. The key is that their technologies should be within our range. (Informant, male, 15 July 2022)

Lastly, internal job vacancy could also be an alternative. For example, when there is a need for service, an offer is made internally within the ministry. The candidates can come from different directorate generals.

> Internally, our ministry gives an opportunity for those [the employees] who are interested in filling the demand for ICT officer positions. Still, the candidates must satisfy the prerequisites. (Informant, female, 13 October 2022)[37]

4.5.2 Capacity Building Channel

Among different ways of skilling, reskilling, and upskilling, expert consultation or in-house training and short courses are the most preferrable channels (Table 18). When the organization requires big data analysis, they can invite experts, organize in-house training, or send one or two ICT professionals for short courses to learn about specific applications.

[37]This statement was sent by the informant in a written response.

Table 18. Capacity Building Channels of Digital Skills

	Positive Side	Negative Side	Some Issues
Expert consultation or in-house training	• Relevant for immediate needs • Many beneficiaries at once • Free of charge when using the internal source	• Expensive when using external source • Finding capable trainer can be extremely hard	• Additional work for internal source to prepare the training
Short courses	• Suitable for immediate needs • Time and cost efficient	• Less extensive knowledge • Requiring frequent training activities • Less impact for career path	• Difficult to evaluate the impact
Skill certificates[a]	• Proof of competence	• Fear of turnover for better remuneration	• Dilemma of skill certificate[b]
Academic degrees	• Suitable for skills needed in the future • Long-term investment • The government provides scholarships • Good for career path	• Expensive tuition and long time away from the office, hence the high opportunity cost	• Reward for academic degree could be counterproductive, particularly for irrelevant knowledge
Conferences[c]	• Expanding network	• Increasing knowledge, but not skills • Might be irrelevant to organization's need	• Used as nonfinancial benefits
LMS	• Can be done independently at any time and less costly	• Requiring strong motivation and endurance • Can be combined with offline training	• Not all learners can finish the whole training videos

Source: authors

[a]Despite its urgency, it has not been used for career ladder.

[b]For more explanation about this issue, refer to Box 6 below.

[c]only for high-ranking officials

Expert consultation or in-house training is preferred, as it is different from mainstream classroom training. Instead, it serves as a space where the trainers and trainees can work together on a small project. The trainers can also conduct a coaching clinic after the training activities. Thus, knowledge transfer is ensured once the training is finished. This is another way of upskilling where experts are invited to work in tandem for a short term, such as for two weeks.

> It is a short course that is organized like a bootcamp. The course is directed toward the current project being undertaken. Training materials can be directly applied in the project. (FGD participant, female, 20 October 2022)

Short courses are also popular because, unlike academic degrees that require deployment, they do not interrupt the routine work. However, short courses might not leave much effect on promotion and, therefore, they do not have significant impacts on career path. This becomes the main difference between short courses and academic degrees.

> Short courses are much more effective than independent learning. Short courses provide a learning map. However, it has no impact on one's career, as the government has not tracked one's experience. Our career mostly advances with time, and remuneration depends on educational background. That is why scholarships for academic degrees are better for remuneration. (FGD participant, female, 20 October 2022)

There are issues related to the evaluation on the effectiveness of short courses in improving skills in day-to-day work.

> The best we can do is to compare the pretest and posttest to see whether the trainees are learning effectively. (Informant, male, 4 August 2022)

Short courses can be more useful if they are combined with skill certificates. This is one of the ways to prove the learners' competence and boost their level of confidence.

> When we partner with vendors, we require them to have a certificate. Funny enough, we ourselves so far do not have certificates, but we have to assess those with certificates. In the public sector, certificates have not yet become a scheme for a career path. Certificates have no impact on promotion. Meanwhile, a certificate is important for ICT professionals. It is also difficult to get permission from the office to obtain certification. We will be asked what the use of certificates in career advancement is. (FGD participant, female, 20 October 2022).

Box 6
Dilemma in Certification for ICT Professionals in the Public Sector

Certification is extremely important to show that an organization has capable ICT professionals to carry out the work. Yet, it is not included in the career development options for government employees, including for ICT professionals. Unlike formal education with which the government could tie their employees with work tenure (e.g., 2n+1 for master's degree, 3n+1 for doctoral degree), certifications are considered informal education where binding is not applicable. Regrettably, once ICT professionals have their certifications, their selling value increases, and they are more likely to demand a higher salary. However, the government's regulation on salary is rigid. Meanwhile, out there, the private sector is willing to pay them accordingly. This has happened quite often. In some cases, they are even willing to pay for the compensation in order to leave a government job. If left unaddressed, this might damage the organization when many of its ICT professionals resign at the same time. Considering this possibility, the current solution is to put ICT professionals in training, such as short courses for skill upgrading, but not for certification. As a result, although without proof, the organization can have good engineers, i.e., those with high capacity for ICT works.

Source: in-depth interview with informant (male, 4 August 2022)

Meanwhile, startups and unicorns value skills more than an academic degree. In startups and unicorns, candidates can win the vacancy without an academic degree as long as they can prove their skills and capability. The case of the public sector is completely different. This is also against the ICT industry.

> There is a bureaucratic culture in the government that honors academic degrees more highly. Meanwhile, the knowledge acquired in these degrees might not be the ones that the organization needs. (Informant, male, 28 October 2022)

4.5.3 Retention Channel

Issues of turnover of ICT professionals must not be overlooked. Those managing data centers can be an example of how serious this matter is. Being an important facility, these data centers cannot be handled by outsourced employees—only PNS are allowed to take care of them. However, taking care of the data centers for several continuous years can be a boring task. Managing data centers, as well as contact centers, are among the jobs with the highest turnover. Therefore, it is important to consider all tools under the retaining channels to slow down the turnover rate among ICT professionals (Table 19). At the same time, this also ensures that, at least, the gap is not widened.

Table 19. Retention Channel of Digital Skills

	Aspects to Be Improved
Remuneration	Financial and nonfinancial
Career path	Talent management
Work arrangement	Work-life balance, flexible working hours, work from everywhere, noncubical workplace
Work culture	Competition, collaboration, lifelong learning
Leadership	Visionary and egalitarian leadership, intergenerational approach, coaching, mentoring, counseling, eager to learn

Source: authors

Remuneration has been cited to be the main cause of turnover. Considering the rigid salary for government employees, nonfinancial incentives have to be considered.

> For those with good performance, they should be given priority for academic scholarships and access to training even in foreign countries. Some training activities have nothing to do with skill development, but more of travelling. These are nonfinancial incentives. (Informant, male, 4 October 2022)

Meanwhile, career advancement is also equally important.

> Talent management is for all ASN, not only for ICT professionals. However, chances for promotion should be more abundant for ICT professionals, as they are low in number, making the competition (between them) not so stiff. Moreover, the more work for them to do should mean a higher opportunity to prove their performance, and, therefore, a faster career path. (Informant, male, 4 October 2022)

Box 7
Talent Management

The government is developing talent management for ASN that will be the embryo for a merit-based system. Although this has not yet been optimally implemented, the government is certainly moving in that direction. With talent management, ASN can be mapped according to their performance, competence, and attitude. Talent management consists of nine boxes. The higher the box where an employee is in, the more likely they get promoted. When employees are in box three, for example, they will know what they lack and will learn more to improve their competency. Those in box seven, eight, and nine will move up and they know their possible positions.

Source: in-depth interview with informant (female, 31 October 2022)

According to our informant, aside from talent management, the ICT occupation map can also be used for career paths. The certification in each level can be taken according to one's passion as well as market need. A certificate is valid for three years.

Also, it is time that the government adopts the work arrangements for ICT professionals as implemented at unicorns.

> Last week, I signed an approval for resignation of some CPNS. They are millennials who on paper justify their leaving because of family matters, education pursuit, and other reasons. I asked their working units to find out the real reasons. Apparently, their priority is not only about salary, but also the freedom to work from anywhere at any time. However, civil servants are tied with the 07.30–16.00 working hours. At startups, they can work from home. You cannot do this in a government office during a normal condition [not during the COVID-19 pandemic]. I wonder if in the future civil servants will be allowed to work from home using online tools, as long as their output is achieved. (Informant, male, 3 October 2022)

In terms of work culture, the ICT industry is competitive in nature. Things change rapidly that the culture has to allow competitiveness for innovation to be generated. At the same time, industry also requires collaborative working to protect the organization from working in a silo. With good collaboration, the organization will become more agile to new ideas, as they usually come from close collaboration where knowledge is shared. Moreover, in this digital era, collaboration is even easier because people can use many tools for communication without having to meet face-to-face. On top of that, ICT professionals should not stop learning, and they have to always be challenged to come up with new innovations.

The one responsible for creating this kind of work culture is the leader. Leadership, therefore, is important not only to retain the ICT professionals, but also to optimize their capabilities. For that reason, the leader has to be visionary.

Moreover, to allow competitiveness and to enable collaboration, a leader has to be egalitarian and nonhierarchical. They should not take criticism personally, as what is criticized is the idea, instead of the person. They have to apply two-way communication because being directive and unreachable is not suitable for the ICT industry.

No matter how good the product of ICT professionals is, if the leader is not supportive, there will be no impact to organizational change.

> With bureaucratic reform, we are entering the era of functional positions. Unlike the structural positions where hierarchy prevails, there should not be an issue of leaders and subordinates in functional positions. (Informant, male, 1 August 2022)

Moreover, as ICT professionals are dominated by millennials (Table 15), it becomes even more important to have a leader who applies intergenerational approaches. They have to understand how the other generations work. While the boomers and generation X might be used to working hard and receiving orders, the millennials are different. According to our informant, millennials have to be given challenges, and they need to be listened to. Therefore, the leader has to give coaching, mentoring, and counselling, which are all important for millennials.

V. Digital Government Units: Additional Supply of Digital Skills

The public sector must adopt private sector management practices to attract and retain qualified talents as well as to ensure that the institutions receive a sufficient supply of competent digital talents.[38] Improving the public sector's performance by applying the lessons learned from the private sector's experiences is inevitable, considering the assumption that private sector organizations have a much better understanding of digital talent management (UNDP, 2015). The private sector is also one step ahead of their public counterpart in developing ICT governance and ICT services, providing decent infrastructures, and setting up a conducive working environment to support the digital talents' performance and maintain them in the organization. The GoI can adopt several good practices and adjust them to the public domain accordingly.

The GoI has made some progress in fostering digital transformation by mimicking the private sector's strategy. They establish various working units at multiple levels of government, both at the ministry and regional levels, to lead the digital transformation agenda in the public sector, which are so-called "digital government units".[39]

At the central government level, Indonesia's public sector has Digital Transformation Office (DTO) established by Kemenkes, Central Transformation Office (CTO) by Kemenkeu, and GovTech Edu (locally known as Warung Teknologi, or WarTek) by Kemendikbudristek. Meanwhile, Jabar Digital Service (JDS) established by the West Java Provincial Government and Jakarta Smart City (JSC) by DKI Jakarta Provincial Government are the pioneers of the digital government units at the regional level. These working units play influential roles in supporting the government to provide and deliver digital services to every citizen in the domains of health, education, social protection, population administration, and others.

This chapter aims to provide good practices recommended for the public sector to attract sufficient digital talents as drawn from the digital government unit's experiences. These following sections will begin by describing each digital government unit in Indonesia, followed by an analysis of the digital government unit's strategies to recruit, retain, and build the capacity of digital talents.

[38]This approach is relevant to the NPM concept introduced in the 1980s that aims to fix government by running it like a business sector (Richard, 2009).

[39]Although digital government units are considered something new in Indonesia's public sector, the GoI has had many relevant experiences in establishing special government working units to carry out certain government missions. For example, in 2009, President Yudhoyono established the Presidential Working Unit for Development Supervision and Control. Furthermore, in 2012, the then DKI Jakarta Governor Joko Widodo established the Governor's Team for the Acceleration of Development in DKI Jakarta Province.

5.1 DTO: Turning a Crisis into an Opportunity to Accelerate Digital Transformation

In Indonesia, the challenges of healthcare access and quality were already clear even before the pandemic (Hoeng, 2020). As the COVID-19 pandemic continued to fluctuate over the last two years, Kemenkes has been forced to deliver healthcare processes and solutions in a new model by utilizing data and digital technology. This aims to build modern operating models and deliver more efficient healthcare services to citizens by adopting remote-care options to improve patient experiences, such as telemedicine, remote patient monitoring, and remote intensive care units (Kolding and Sundblad, 2021). This digital transformation is fundamental, considering that healthcare issues will remain essential for the foreseeable future.

To drive the digital transformation in the healthcare sector in Indonesia, Kemenkeu established DTO through Decree of the Minister for Health No. HK.01.07/MENKES/635.2022 on the Digital Transformation Office. This working unit has three priority missions: (i) to make electronic medical records (EMR) accessible for every individual and across healthcare facilities; (ii) to simplify the system for health workers, that is to make them more focused on saving lives rather than administrative matters; and (iii) to propel policy innovation in strengthening health technology (healthtech) (Kemenkes, 2021).

However, establishing a digital government is incredibly difficult without each department's political support. Therefore, the government has set up internal alignment between DTO and Kemenkes' organizational structures. DTO's organizational structure consists of nine tribes[40], each of which will work daily with the directorate generals and working units at Kemenkes (Kemenkes, 2021).

Table 20. Kemenkes and DTO's Organizational Structures

Kemenkes' Organizational Structure	DTO's Organizational Structure
Directorate General of Health Services	Tribe for Primary Healthcare
	Tribe for Secondary Healthcare
Directorate General of Public Health	Tribe for Health Security
Directorate General of Pharmacy and Health Equipment	Tribe for Pharmacy and Health Equipment
Center for Health Financing and National Health Insurance	Tribe for Health Financing Service
Human Resources for Health Development and Empowerment Agency	Tribe for HR Service
Health Research and Development Agency	Tribe for Health Innovation Ecosystem
Unidentified	Tribe for Internal Service
Unidentified	Tribe for Biotechnology

Source: Kemenkes, 2021

[40]In a business and organizational context, "tribes" are associated with social groups linked by leaders, shared purposes or goals, and common culture and organizational boundary.

Since its establishment in March 2021, DTO has succeeded in building two leading platforms that have become the pioneers in supporting the transformation of healthtech in Indonesia as well as to combat the COVID-19 outbreak, namely the Indonesia Health Service (IHS) platform and a citizen health application (PeduliLindungi).

The IHS platform has an essential role in integrating 400+ different internal systems under Kemenkes, consolidating various healthcare applications built by 30+ growing healthtech startup players in Indonesia, and centralizing over ten million data to be hosted and protected centrally (Kemenkes, 2021).

Meanwhile, PeduliLindungi is an integrated health platform that stores all personal health data of the citizens. It provides a tracing and testing feature that helps the government monitor the spread of the COVID-19. Through this application, citizens can access their personal health reports through its electronic personal health report features and obtain recommendations to maintain optimum health through telemedicine service integration, health promotion, and health insurance features.

5.1.1 Recruitment

In a year, DTO employs around 261 young digital talents. Most of them have a distinguished profile and background: they graduated from top-notch universities worldwide and have many experiences of working with the top technology companies in Indonesia, such as Tokopedia, Gojek, Grab, and others. These talents have a significant responsibility to accomplish Kemenkes' special mission to accelerate digital transformation in Indonesia's healthcare sector.

DTO recruits experienced young professionals through the goods and service procurement with employment status as experts. However, such an employment status means that these talents receive less attractive compensation and remuneration compared to the private sector that offers religious festivity allowance (THR), insurance, bonuses, and a relatively higher salary rate. Moreover, their employment status as temporary employees with a short-term contract also makes it tough for them to fulfill their personal needs, such as applying for bank loans, which usually requires them to be in a permanent employment contract. These constraints hinder DTO's opportunity to attract many qualified digital talents.

Despite its less competitive monetary benefit, DTO offers another value for its employees by allowing them to get involved in a meaningful project and contribute to the creation of social impacts, especially in saving the lives of millions of people during the COVID-19 pandemic. Putting this aspect as a strategy in attracting qualified talents also allows DTO to keep a low turnover rate (only 8–9% a year).

5.1.2 Capacity Building

In order to improve their talents' capabilities, DTO is currently establishing a corpu as a center of digital skills development in the public sector—both for the DTO staff and ASN at Kemenkes. This strategic channel is complementary to the annual performance evaluation and review conducted by DTO's top management to assess each DTO's staff capacity and ensure whether their performance still fits the organization.

5.1.3 Retention

In terms of digital leadership of high-level leaders, the establishment of DTO is directly supported by the minister for health of the Republic of Indonesia and its operations are funded by the State Budget (APBN). This shows that high-level leaders at Kemenkeu have a strong commitment and clearly show a vision to embrace digital transformation as a key to transforming healthcare delivery in Indonesia.

Moreover, DTO offers a work culture where every employee has a chance to be working closely with the high-level policymakers at Kemenkeu. DTO also arranges flexible ways of working where all individuals have the freedom to choose their working place and time with a fast and efficient decision-making process at the top management level.

To address the aforementioned challenges, DTO rebrands its institution to attract more experienced digital talents to work in the governmental sector. It is done by promoting an agile working culture, less bureaucratic, and simpler process of decision-making, as well as offering an opportunity to work closely with the strategic policymakers at Kemenkes.

5.2 GovTech Edu: Utilizing Technology as the Driving Force for the Education System Transformation in Indonesia

The COVID-19 pandemic presents a dramatic change in Indonesia's education system. Even though it forced students to study at home due to school closures, it also stimulated the need for digital solutions to ensure a smooth operation of the education system during the COVID-19 crisis and its aftermath. Indonesia also has a long experience of a learning crisis and a steep disparity in the quality of education between regions and social groups (Kurniawati and Suryadarma, 2019). Especially during the COVID-19 pandemic, digital technology is marked as one of the most powerful tools to address such challenges.

In 2020, the Kemendikbudristek established a collaboration with GovTech Edu, an independent unit that operated under the Directorate of Digital Business and Technology of Telkom Group.[41] This collaboration is one of the forms of early efforts to digitally transform Indonesia's education system. GovTech Edu holds a key position as a "shadow organization"[42] or "ad-hoc team"[43] to solve various problems related to education by building large-scale, high-quality, and user-centric technology products to transform Indonesia's education system.

After three years of its establishment, GovTech Edu has contributed significantly to

[41]Telkom Group is one of the best technology companies in Indonesia with the highest value (>$26 billion). It is also the most profitable (>Rp135 trillion of annual revenue) company that ranked 299th globally by Forbes World's Best Employers 2022.

[42]This term was mentioned by the Minister of Education, Culture, Research, and Technology Nadiem Anwar Makarim in Transforming Education Summit 2022 at the United Nations Headquarters, New York, in September 2022.

[43]GovTech Edu works with Kemendikbudristek through the mechanism of procurement of goods and services or tender, as can be seen from https://lpse.kemdikbud.go.id/eproc4/evaluasi/11984025/pemenang.

building various technology products to support each episode of the Merdeka Belajar (Freedom to Learn) policy.[44]

To support the execution of the Kampus Merdeka (Independent Campus) program, GovTech Edu plays an important role in developing the Kampus Merdeka portal[45] that aims to centralize information related to the program and offer students a better experience of participating in the program.

GovTech Edu also developed the Merdeka Mengajar (Freedom to Teach) portal[46] that provides various features to help teachers gain inspirations to prepare suitable learning materials to be used in the classroom, assess the readiness and ability of each student to participate in learning activities, and enable teachers to participate in various trainings related to pedagogical skills independently.

Moreover, in April 2022, the Minister for Education, Culture, Research, and Technology Makarim launched the Rapor Pendidikan platform[47] to help teachers, principals, and regional governments evaluate the teaching quality and develop plans to identify, reflex, and fix the core problems in their respective schools (GovTech Edu, 2022). This platform provides data on education system evaluation results which are formulated from various instruments, surveys, and systems related to education. By utilizing this product, the evaluation process of education quality conducted by teachers and principals will take place in a simpler and more centralized way (no more manual form-filling).

However, even though GovTech Edu has been progressively helping the digital transformation journey in Indonesia's education sector,[48] there is a different perception among citizens regarding this shadow organization.

Box 8
A Public Debate on the Establishment of GovTech Edu

In September 2022, Indonesia's Minister for Education, Culture, Research, and Technology, Nadiem Anwar Makarim, gave a speech about the role of GovTechEdu in driving the digital transformation in Indonesia's education sector at the United Nations Headquarters, New York. He said, "Right now, we have 400 product managers, software engineers, and scientists that have created a shadow organization attached to our ministry." This statement sparked a public debate on digital government units like GovTech Edu, which might potentially undermine Indonesia's bureaucratic system, as external parties can completely replace and take over its operation (CNN Indonesia, 2022).

[44]The Merdeka Belajar policy is a new vision of the Indonesia's education policy framework containing 22 episodes/series of policy, launched by the Minister for Education, Culture, Research, and Technology Makarim in 2020. For details, see http://ditpsd.kemdikbud.go.id/hal/merdeka-belajar.

[45]The platform is accessible for public at https://kampusmerdeka.kemdikbud.go.id/.

[46]The platform is accessible for public at https://guru.kemdikbud.go.id/.

[47]The platform is accessible for public at https://raporpendidikan.kemdikbud.go.id/app.

[48]The platform is accessible for public at https://teknologi.kemdikbud.go.id/.

5.2.1 Recruitment

To date, GovTech Edu has employed more than 400 young professionals from diverse backgrounds and experiences. Most of them have been working with tech unicorns, FAANG (Facebook, Amazon, Apple, Netflix, Google), multinational companies, management consulting firms, and leading institutions, such as the United Nations, World Bank, Office of the Presidential Staff, and more. At GovTech Edu, they occupy specific positions according to their expertise and skill, such as product manager, UX researcher, UI designer, and so forth.

Regarding the human resources recruitment strategy, GovTech Edu utilizes digital communication channels, such as LinkedIn and Medium, and professional networks through the employee referral program.[49] This strategy allows the employees to endorse qualified candidates from their professional networks to fill the current positions needed at GovTech Edu. In return, they will receive rewards once the proposed candidate is accepted.

The employees of GovTech Edu also receive competitive remuneration equal to the applicable rates in leading organizations and companies in the Indonesian labor market. In addition to the competitive remuneration, GovTech Edu also offers nonfinancial benefits to its employees, such as the opportunity to create positive social impacts on 5 million teachers and 24 million students in Indonesia. This aspect becomes the most determinant factor to push the low turnover rate at GovTech Edu, besides the strict and competitive selection process that has been administered since the beginning to attract candidates with suitable values to the institution. This was confirmed by one of the employees' stories who chose to work at GovTech Edu instead of receiving an exciting material offer from a giant company like Facebook.

Box 9
Not Only about Financial Advantages, but Also about Creating Impacts[50]

In 2020, Ibrahim Arif, Chief Technology Officer of GovTech Edu, declined an offer from Facebook London and decided to work with GovTech Edu instead. While joining Facebook would be one in a thousand opportunities to build a career in Europe, he decided to join GovTech Edu because he believed that sometimes it was not only about money, but also a sense of fulfillment. When he was hired by GovTech Edu, he thought it was a rare opportunity to show the world that Indonesia can do something better with technology.

5.2.2 Capacity Building

GovTech Edu implements in-house capacity building to upskill their employees' digital skills. It is done by inviting internal employees with certain skills/expertise to provide training to their fellows. To date, GovTech Edu has conducted in-house training in project

[49]The platform is accessible for public at https://teknologi.kemdikbud.go.id/.

[50]Read Ibrahim Arif's full story through https://medium.com/govtech-edu/sometimes-it-isnt-about-the-money-8faceb1c9f7f.

management, data-driven communication, and stakeholder communication management. Moreover, GovTech Edu also initiates interdivision sharing sessions on each division's good practices in managing the operationalization of partnership and community programs.

5.2.3 Retention

The establishment of GovTech Edu is inseparable from the role of the the Minister for Education, Culture, Research, and Technology, Nadiem Anwar Makarim, who was previously the CEO of Gojek, Indonesia's first unicorn that has now transformed into Southeast Asia's leading multiservice tech platform providing access to a wide range of services (transport, payment, food delivery, etc.). His broad background in the technology industry suggests that he has sufficient knowledge and experiences in developing user-centric and high-quality technology products, as well as a good understanding of creating effective business processes and conducive work culture to support digital transformation. When President Widodo assigned him to become the minister for education, culture, research, and technology in 2019, he brought his knowledge and experiences along with his career-switching from the private to public sector.

To nurture the organization's sustainability, GovTech Edu also implements a flexible working arrangement that is based on target achievement, responsibility to comply with the deadline, and accountability at work. GovTech Edu also enforces a working culture where everyone has the opportunity to work closely with the strategic policymakers at Kemendikbudristek. This effort is in line with the function of GovTech Edu as a policy execution accelerator and to report its progress to high-level leaders at the ministry, mainly to the directorate generals and the minister.

5.3 CTO: Advancing the Digital Transformation and Institutional Reform in Indonesia's Financial Sector

Kemenkeu began the bureaucratic reform and institutional transformation (BRIT) as a consequence of the economic crisis that hit Indonesia in 1998 (Kemenkeu, n.d. a). The crisis caused people's distrust toward the government. People's demand prompted the government to issue two legal packages[51] that served as the foundation to enforce reforms within the GoI, including Kemenkeu. Recently, Kemenkeu has gone through five stages of BRIT, starting from 2002.[52]

During the third stage of BRIT, precisely between 2013 and 2016, Kemenkeu designed the Blueprint on the Institutional Transformation Program for 2014–2025. The blueprint has 87 transformation initiatives, divided into 5 themes consisting of core, taxation, budgeting,

[51]Decree of the People's Consultative Assembly No. XI of 1998 on Clean and Free-of-Corruption State Actors and Law No. 28 of 1999 on the Implementation of Clean and Free-of-Corruption State Actors.

[52]The stages of BRIT are as follows: (i) modernization of state financial management (2002–2006); (ii) massive bureaucratic reform (2007–2012), (iii) setting and implementing the blueprint of BRIT (2013–2016); (iv) connecting the dots (2016–2018); and (v) digital transformation (2019–present).

treasury, and customs and excise. It mandates, among others, the establishment of CTO, which was then founded in 2014.

CTO plays a role in formulating and overseeing the reform and transformation agenda within Kemenkeu as well as supporting and investigating the implementation of strategic initiatives in priority echelon I units, such as General Secretariat, IT, Human Resources, Directorate General of Taxes, Directorate General of Customs and Excise, Directorate General of Budgeting, and units with treasury functions. In addition, the CTO team coordinates with the Program Management Office (PMO)[53] team to implement the reform and transformation at the echelon I unit level. Through the cooperation between CTO and PMO, they can identify and escalate potential issues that might hinder the implementation of the strategic initiatives.

The organizational structure at CTO is relatively unique compared to the other units at Kemenkeu, supporting the mandate from the Decree of the Minister for Finance No. 36/KMK.01/2014 on the Ministry of Finance's Blueprint on the Institutional Transformation Program for 2014–2025 to execute flexible staffing model. While serving at CTO, ASN will not be incorporated into any structural or functional positions. CTO has three working teams that are tasked to handle (i) change management; (ii) reporting; and (iii) digital transformation. Table 21 shows the functions and roles available in the current CTO team.

Table 21. Functions and Roles Available at CTO

Function	Team Leader	Staff
Change management	Change Management Officer I	Change Management Officer I A
		Change Management Analyst I A
		Change Management Officer I B
		Change Management Analyst I B
	Change Management Officer II	Change Management Officer II
		Change Management Analyst II
Reporting	Chief Reporting Officer	Reporting Officer
		Reporting Analyst
Digital transformation	Chief Digital Transformation Officer	Digital Transformation Officer I
		Digital Transformation Analyst I
		Digital Transformation Officer II
		Digital Transformation Analyst II

Source: Kemenkeu, n.d.

[53]PMOs at Kemenkeu are various teams from each of the echelon I units with responsibilities in formulating transformation initiatives from research and evaluation of strategic initiatives for their respective units.

5.3.1 Recruitment

CTO currently has 27 employees led by the secretary general. Its daily chief executive is from the Expert Staff of Organization, Bureaucracy, and Information Technology of Kemenkeu, as well as the CTO secretariat (Kemenkeu, n.d. b).

As a newborn unit in 2014, the employees of CTO were appointed directly by the minister for finance by considering certain criteria, such as education background, capabilities, and experiences during their tenure as ASN. Nonetheless, today, CTO uses a standardized examination to recruit employees from outside Kemenkeu or within Kemenkeu by transferring them to CTO. Kemenkeu is well-known for its environment that provides the best experiences for ASN to improve their quality. As a result, this attracts demands for its talents from other ministries or institutions, making Kemenkeu a "leader's factory" for the government.

In addition, CTO provides distinctive experiences to its staff compared to the other units at Kemenkeu, that is to contribute to reforming and transforming Kemenkeu. However, CTO still offers remuneration using similar salary standards as other public servants, which are based on the wage regulation to pay ASN and contract values to pay non-ASN. Challenges remain for Kemenkeu, especially in securing reliable and experienced talents, if the offered remuneration cannot compete with that from the private sector.

5.3.2 Capacity Building

CTO and other working units at Kemenkeu use corpu to develop their employees' competencies. The provided materials are expected to develop specific skills in assisting the improvement of CTO and Kemenkeu's performance as a whole. Three learning models are offered, namely structured learning[54], social learning[55], and learning-while-working models.[56]

5.3.3 Retention

CTO and other units at Kemenkeu have conducted new working methods in the public sector due to the pandemic, namely compressed work schedule (CWS) and flexible working space (FWS) since 2021.[57] CWS is an arrangement of flexible working hours by providing leisure-time compensation, i.e., working hour reduction or compensation leave,

[54]This model can be administered using a classical method as provided in *pusdiklat* or Balai Latihan Keuangan (Financial Training Center) or using a digital approach through the Ministry of Finance Learning Center (KLC). It can also be conducted with several learning approaches, which are education, training, course, upgrading, seminar/conference/workshops, technical guidance, socialization, outbound, distance training, synchronous e-learning, asynchronous e-learning, and digital collaboration.

[55]Collaborative deep learning in the community can be provided in several ways, such as coaching-mentoring, community of practice, benchmarking, and job shadowing.

[56]Experiential working learning activities aim to provide real experiences. To learn from experience, one can join activities such as internship, secondment, exchange program between civil servants and state-owned enterprises, action learning, job enlargement, job enrichment, task force, and assignments.

[57]This arrangement is stipulated under Regulation of the Minister for Finance No. 221/PMK.01/2021 on Working Days and Hours and Enforcement of Discipline in Relation to Allowance Payment for Employees within the Ministry of Finance.

for employees who have excessive accumulated working hours and meet certain criteria as stipulated under the applicable regulations. Meanwhile, FWS is a regulation that offers a work-from-anywhere arrangement during a certain period by maximizing ICT to increase and maintain employee productivity and ensure that the duties and functions of Kemenkeu continue to be implemented.

5.4 JSC: Pioneering the Development of Smart City in Indonesia

Smart cities started to become popular globally in 2008 when Palmisano, the then IBM CEO, proposed his "3 I's: instrumented, interconnected, intelligent" idea. Indeed, the use of ICT systems can only be enabled when they are interconnected and decisions are made based on analysis, modelling, and artificial intelligence (Van den Bosch, n.d.). Since then, cities have been claiming to be smart for various reasons—not only for employing ICT systems, but also for having educated citizens.

In 2020, Kemenkominfo along with other ministries initiated the so-called 100 Smart City Movement (Kemenkominfo, 2017). In three years, it is expected that 100 cities can be established to inspire other cities to use ICT systems in solving problems and developing a smart government (Rizkinaswara, 2020).

To support the central government's initiative in developing smart cities, DKI Jakarta Provincial Government took an early action by establishing JSC, which was first launched in 2014 and intended to act as a grievance-handling mechanism using ICT. Citizens can immediately post their complaints on the Qlue application, and the government and police can respond to them through the Crop application (Rudi, 2014). These applications enable the government to monitor the performance of the upper management and award them on this basis. When the administration changed in 2017, JSC, or the so-called "smart city 4.0" shifted to an ecosystem development approach, knowing that the government alone cannot solve the city problems (CNN Indonesia, 2020).

In 2020, JSC, which was a technical implementation unit (PLT), turned into a regional public service agency (BLUD) as stipulated in Regulation of the Governor of DKI Jakarta No. 17 of 2020. This was a milestone for JSC becasuse with its new institutional standing, JSC is allowed to manage its own finances and no longer relies on the province's budget. It can also establish collaborations with external parties to improve the delivery of services to people (Wildan, 2019).

With its status as a BLUD, JSC is obliged to generate revenue from its services. In 2021, the DKI Jakarta Provincial Government issued Regulation of the Governor of DKI Jakarta No. 44 of 2021 on the Tariff of JSC Services. The regulation lists ten services that JSC can charge: (ii) research; (ii) replication of smart city; (iii) report writing; (iv) advertising; (v) dissemination; (vi) data analysis; (vii) application development; (viii) digital content; (ix) ICT architecture; and (x) consultation.

5.4.1 Recruitment

As a BLUD, JSC will be allowed to administer an immediate recruitment process in the case of staff resignation. It can also recruit talents flexibly based on its needs. The non-PNS talents are contract-based, with the contract terms varying from 3 to 12 months. They receive relatively competitive salaries at the national level, even possibly equal to the unicorn level.

JSC is a home of about 100 non-PNS talents and about two dozen PNS talents. The latter are those assuming functional positions with digital competencies. The organizational structure of JSC itself basically consists of four units: (i) research and analysis; (ii) communication and marketing; (iii) infrastructure and ICT; and (iv) system development. The government occupies the managerial line as well as finance, institute secretary, and procurement.

5.4.2 Capacity Building

There are two types of training in JSC: (i) sharing among staff members; and (ii) training from external sources—from the government or private sector—to staff. Technical training is also conducted whenever new instruments are installed in the field. For example, the water resource agency conducts training to introduce how the new pumps work. As JSC has established partnerships with other provinces and *kabupaten/kota* (city), a plan is set to organize training for these provinces and *kabupaten/kota* on ICT skills, such as data analytics, data science, and product development.

5.4.3 Retention

JSC's employees are offered flexible working arrangements. For example, they are allowed to moonlight, and some talents are even allowed to work outside JSC as lecturers. Moreover, JSC arranges a conducive learning culture to enable talents to work longer and nurture the organization's sustainability. This is to prevent a high turnover rate that inhibits the organization from accelerating the achievement. For example, talents are expected to work for two years in the website development of Jakarta Kini (JAKI). This duration enables them to accumulate knowledge and perspectives to improve the website. If they can only work for three months instead of two years, the ideas are not complete and, therefore, the product development will be suboptimal. On top of that, there are intangible costs attributed to the recruitment process, such as knowledge transfer and onboarding process. It is also burdensome for the leaders and manager to get to know and learn how the newly recruited staff work in such a short time.

One important issue in JSC is the high turnover rate, particularly because most, if not all of their talents are millennials who always like new challenges. Their expertise while working in JSC is an important asset for them to apply to the private sector. However, startups also experience a high turnover rate. This is unsurprising, considering the limited number of digital talents in the market.

To manage this shortcoming, JSC has developed a system to allow their employees to report on a monthly or quarterly basis to those in the upper levels. As a result, when one

talent resigns, their successor can take over the work. Certainly, having worked for JSC will give talents a better bargaining position to work elsewhere.

> Our supervisor always says that JSC serves as a campus for talents and a stepping stone [for future career]. (Informant, female, 12 July 2022)

Moreover, JSC combines the mode of work of the government, where bureaucracy still exists, and the quick-paced work of startups. Being bureaucratic is not necessarily bad. In a way, reporting to the supervisor and receiving their feedback are necessary as JSC should be accountable to the public. However, pace is also important in achieving deliverables. As an example, when new talents are needed, as long as the need is properly defined, the process is sufficiently fast. In terms of security reasons, data management in JSC is kept in a repository that can only be accessed by the government staff.

5.5 JDS: Pioneering Digital Government Transformation at the Subnational Government Level

After Ridwan Kamil was inaugurated as the Governor of West Java (2018–2023), he and the JDS founding team immediately began to construct the ideal ways to realize West Java as the first "digital province" in Indonesia. However, they were faced with significant challenges in accomplishing this mission. *First*, West Java Province ranked 19th in the list of provinces with the highest proportion of internet users across Indonesia.[58] *Second*, there was a significant gap in internet users between the urban and rural populations in West Java.[59] This phenomenon is caused by the limited digital infrastructures in rural areas, making it difficult for the villagers to reap maximum benefits from digital technology.[60] *Third*, the government's human capital, especially at the *kabupaten/kota* level, still performs their work manually, resulting in inefficient and suboptimal public services. Moreover, at the bottom of the government level, namely *kecamatan* (subdistricts)/*kelurahan*[61]/villages, many ASN are still incapable of using digital technology (BisnisBandung, 2022).

> Within the government structure, there are still roles [honorary staff] that provide minimum benefits in delivering public services. They are tasked with retrieving files, numbering letters with manual methods, delivering letters, and other roles. (Informant, male, August 5, 2022)

JDS, or the Regional Technical Implementation Unit (UPTD) of the Center for Digital Services, Data, and Geospatial Information, was officially established on 29 July 2019. JDS is a unit that operates under the Communications and Informatics Agency of West Java Province, which was established to narrow the digital divide, improve the efficiency and accuracy of providing evidence-based policies, and revolutionize the technology utilization among residents and all government institutions in West Java. JDS has three main

[58]This rank is based on the data from the West Java Provincial Government in 2021. The data can be accessed at https://opendata.jabarprov.go.id/id/visualisasi/akses-internet-di-jawa-barat.

[59]Based on our raw estimation from the 2021 National Socioeconomic Survey (Susenas), there is a significant gap between the number of people accessing internet in urban areas (68%) and rural areas (49%).

[60]based on our raw estimation from the 2021 Susenas

[61]A *kelurahan* is a village-level administrative area located in an urban center.

missions: (i) to actualize data-driven policymaking; (ii) to accelerate the West Java Provincial Government's digital transformation; and (iii) to facilitate residents' lives with digital technology.[62]

Since its establishment, JDS has succeeded in implementing various projects and bringing digital ecosystem transformation in West Java (Jabar Digital Service, 2022). In 2019, JDS has been operating a "super application" called Sapawarga as a one-stop portal of digital services to provide convenient public services and information for the residents of West Java. This application contains a wide variety of information, such as the latest news and employment opportunities, media for conveying aspirations to the West Java Provincial Government, public administration, and RW[63] activities. JDS also established the West Java's Data Ecosystem that aims to provide an open and easy access to high-quality and up-to-date data to the residents and all government institutions. Lastly, JDS established Digital Village[64], West Java's COVID-19 Information & Coordination Center (Pikobar)[65], and West Java's Command Center[66].

5.5.1 Recruitment

There are three career levels for JDS employees, which are junior, senior, and coordinator. Junior positions are open for fresh graduates, whereas senior and coordinator positions are available for experienced individuals. JDS provides a range of opportunities for applicants working in various positions that are not linear with their educational background or previous work experiences. These opportunities are wide open, especially for those who have working experiences or good portfolios. Moreover, each applicant has an equal opportunity to fill vacant positions. Pretest is the most essential part of the application. Therefore, regardless of their educational background or working experiences, as long as they have the capabilities and strong desires to create social transformation for all, applicants can fill the positions.

> Our product manager graduated from the School of Pharmacy at ITB [Bandung Institute of Technology]. (Informant, female, 5 August 2022)

As most employees are non-ASN, JDS has a high turnover rate—with its highest rate in 2020 due to the first COVID-19 outbreak in West Java. As soon as the outbreak occurred, JDS employees were ordered to develop Pikobar. This left JDS employees with no choice but to work overtime, or even need to be prepared for a 24-hour working day. However, as no-permanent employees, even experts working for JDS were not entitled to any monetary benefits other than their remuneration, such as health insurances and overtime

[62]According to Regulation of the Minister for Home Affairs No. 12 of 2017 on the Guidance in Forming and Classifying Branch Offices and Regional Technical Implementation Units, UPTD is an organization that carries out operational and technical activities and/or certain supporting technical activities at the regional agency.

[63]RW is a unit of local administration consisting of several RT (neighbourhood units) within a *kelurahan*.

[64]Locally known as Desa Digital, this program aims to reduce digital gap in West Java. This program provides digital infrastructures, digital literacy, and digital marketplace training for villages, as well as ways to optimize the use of the internet through IoT or e-commerce to improve the villagers' productivity.

[65]Pikobar is a healthcare information system for all West Java citizens.

[66]West Java's Command Center is West Java's center of data visualization and integration to assist the monitoring, coordination, and decision-making agenda.

allowances. In response to this, contracts of experts are renewed every year and their remuneration uses the standards of specific costs (SBK)[67] created by the Governor of West Java Ridwan Kamil. This is to justify the salaries of JDS employees that are relatively more competitive than the usual remuneration in the public sector.

5.5.2 Capacity Building

In 2021, to reduce the high turnover rate, various online courses were provided for JDS employees. However, they are no longer receiving any free online courses in 2022, since the budget to handle the COVID-19 pandemic has been reduced. JDS has shifted to a self-development approach for its employees by providing specific budgets for every department to invite experts as speakers for their upskilling agenda.

> Every morning until lunch break on Friday, we call it "no-meeting day". Employees have some spare time to conduct any type of upskilling agenda. (Informant, female, 5 August 2022).

5.5.3 Retention

JDS offers flexibility to its employees in carrying out their work—they can work online from anywhere or offline from the office. Moreover, JDS has implemented a full work-from-anywhere approach exclusively for several roles, such as data engineer and other operational or technical roles. JDS employees may also carry out their tasks outside the official working hours. However, employees are still obligated to submit a monthly performance report as a prerequisite of monthly earnings (Kemenkeu, 2009).

> Our working approach [shift] to work-from-anywhere has been reprimanded [by regional institutions whose approach is different from that of JDS]. However, this method does not provide any failure but success within our projects and goals. (Informant, female, 5 August 2022)

However, JDS still has limited operational budgets to implement various projects. Unlike JSC that can generate income thanks to its status as BLUD, JDS is still a UPTD that basically reserves no rights to generate income from their projects. However, once JDS becomes BLUD, the digital services that they provide for free will be monetized. JDS is still internally discussing which methods that it will use to provide maximum benefits to the residents and all government institutions in West Java (Kemenkeu, 2009).

5.6 Analysis of the Digital Government Units

The insights in this section were gleaned from the digital government units' experiences. This section analyzes the digital government units's strategies to attract qualified digital talents, build their capacity, and retain the essential talents in their public sector roles.

[67]SBK is standard costs that are utilized for specific activities by ministries, institutions, or regional governments in certain areas (Kemenkeu, 2009).

5.6.1 Recruitment

The public sector in general is well-known for having an outdated hiring method that involves a rigorous and lengthy recruitment process. This renders the digital talent candidates unattracted to joining the governmental sector. Unlike the public sector in general, the digital government units underscore the necessity to implement better recruitment methods to bring digital talents into the public sector, including utilizing social media platforms, such as Instagram, LinkedIn, and Medium. In the case of GovTech Edu, they also implement a unique strategy through an employee referral program that allows the public sector to receive competent candidates by harnessing the internal professional network.

Additionally, the digital government units also offer a comparative advantage to their employees in addition to the financial benefits, which is the opportunity to create social impacts and improve the lives of society at a large scale. This is one of the most strategic ways to rebrand the public sector as a digitally innovative institution while simultaneously attracting more competent talents to join the public sector.

Moreover, the private sector tends to be more successful in recruiting digital talents because they offer more attractive remunerations than the public sector. Considering that low compensation hampers the public sector in attracting digital talents, digital government units eliminate this constraint by offering competitive salaries equal to similar positions in Indonesia's labor market. However, digital government units only provide a single salary without additional monetary benefits like what the private sector offers, such as insurance, bonus, and THR. Addressing this constraint requires the digital government units to provide additional values in the form of nonmonetary benefits, such as flexible working arrangements and dynamic working culture, as described in the following section.

Table 22. Digital Government Units' Strategies to Attract Competent Digital Talents

	Strategy	Remuneration	Calling
DTO	• Using the procurement of goods and services mechanism to recruit individual consultants • Utilizing social media platforms (LinkedIn, Instagram)	• Competitive salary compared to the similar industry in Indonesia's labor market • Single salary (no insurance, bonuses, and THR)	• Promoting the opportunity to create social impacts in Indonesia's healthcare sector
GovTech Edu	• Using the procurement of goods and services mechanism to employ vendors • Utilizing digital communication channels (LinkedIn, Medium) • Utilizing internal professional networks	• Competitive salary compared to the similar industry in Indonesia's labor market	• Promoting the opportunity to create social impacts in Indonesia's education sector

	Strategy	Remuneration	Calling
	through the employee referral program		
CTO	• Internal recruitment: recruiting and allocating talents from other units of Kemenkeu	• Remuneration rate similar to salary standards of other public servants (based on the ASN salary standard regulation)	• Offering distinctive experiences to contribute to the reform and transformation of Kemenkeu and Indonesia's financial sector
JDS	• Using the procurement of goods and services mechanism to recruit individual consultants • Utilizing digital platforms (LinkedIn, Instagram, website)	• Competitive salary in Indonesia's labor market • Single salary (no insurance, bonuses, and THR)	• Promoting the opportunity to create social impacts and accelerating the digital transformation in West Java
JSC	• Annual recruitment through the procurement of goods and services mechanism to recruit individual consultants • Recruiting ASN employees through CASN recruitment according to BKN's policy	• Competitive salary in Indonesia's labor market, even competing with that of the unicorns • Single salary (no insurance, bonuses, and THR) • For ASN employees, remuneration rate similar to salary standards of other public servants (based on the ASN salary standard regulation)	• Promoting the opportunity to create social impacts and contribute to the state development

5.6.2 Capacity Building

The digital government units build their employees' digital capacity through various means. Most of them foreground in-house capacity building by allowing their internal staff with certain digital skills to provide regular training and share their knowledge with

their peers. This is the main strategy to improve the government employees' digital skills considering its efficiency, low costs, and the possibility of being conducted regularly.

Other strategies are also implemented, such as organizing training by inviting external experts and utilizing training centers from external parties and other government units, like corpu.

Table 23. Digital Government Units' Strategies to Improve Employees' Digital Capacity

	Capacity Building
DTO	Establishing a corpu as the training center
GovTech Edu	Conducting in-house capacity building by inviting internal employees with certain digital skills to provide training
CTO	Utilizing corpu to provide training
JDS	Inviting experts to provide capacity building
JSC	• Conducting in-house capacity building by inviting internal employees with certain digital skills to provide regular training • Utilizing training centers provided by the government and private sector

5.6.3 Retention

Retaining digital talents in their government jobs has been a persistent challenge for the public sector. This is because the competitor (the private sector) offers so many comparative advantages for digital professionals, such as a clear career path, competitive compensation, and easier access to ICT development programs.

Realizing these challenges, digital government units reform the public sector that is renowned with its image as a slow-moving bureaucracy with a traditional work environment. Digital government units transform the public sector's ways of working by implementing flexible working arrangements. Especially in the case of JSC, flexibility is manifested through the freedom for its staff to find other jobs outside the JSC, but with a target-based orientation, responsibility to comply with the deadline, and the obligation to perform accountability at work.

Regarding the work culture, digital government units enforce a working culture where everyone has the equal opportunity to work closely with the strategic policymakers in each institution, such as working with the directorate general, governor, and minister. Furthermore, rather than perpetuating the public sector's reputation as an institution with a strict hierarchy and multiple layers of decision-making, the digital government units rebuild their image by promoting fast and efficient decision-making, nonhierarchical relationships between the senior and junior staff, and collaborative working culture between the divisions.

Table 24. Digital Government Units' Strategies to Retain Digital Talents

	Ways of Working	Work Culture
DTO	Flexible working arrangement with a target-based orientation	• Nonhierarchical relationship between the senior and junior staff • A chance to work closely with strategic policymakers • Fast and efficient decision-making
GovTech Edu	Flexible working arrangement with a target-based orientation, compliance with deadline, and accountability at work	• Nonhierarchical relationship between the senior and junior staff • A chance to work closely with strategic policymakers • Fast and efficient decision-making
CTO	Flexible working arrangement with a target-based orientation	• Nonhierarchical relationship between the senior and junior staff • A chance to work closely with strategic policymakers • Fast and efficient decision-making
JDS	Flexible working arrangement with a target-based orientation, except for the general affairs, human resources, and monitoring and evaluation teams	• Nonhierarchical relationship between the senior and junior staff • A chance to work closely with the governor of West Java • Fast and efficient decision-making
JSC	• Flexible working arrangement with a target-based orientation • Allowing staff to find other jobs outside JSC	• Conducive learning culture • Collaborative arrangement between the units • Nonhierarchical relationship between the senior and junior staff • A chance to work closely with strategic policymakers • Fast and efficient decision-making

VI. Conclusion and Recommendations

Using the ICT occupation map produced by Kemenkominfo along with other line ministries and the private sector, this study identifies the necessary ICT skills for the implementation of e-government. It takes 283 digital skills under 15 job families to carry out the 4 aspects of e-government, and 90% of these skills can be delivered by ICT officers. While ICT officers take the majority share of responsibilities in the implementation of e-government, the rest of ICT functional positions perform insignificant contributions, with 6% from information security managers, 2% from cryptographers, and 1% by other functional positions. This is because ICT officer is a highly generalist position, whereas the other ICT jobs are highly specialist roles. At the same time, this implies their central role in implementing e-government.

The essential role of ICT officers in the implementation of e-government can also be seen in their dominant number compared to the other ICT professionals. It is recorded that at least 77% (7,954 out of 10,281) ICT professionals are ICT officers. Nevertheless, their number is far below that of total ASN, lower than even 0.24% to be precise. Meanwhile, contrary to their low number—despite their essential roles—the demand for them exceeds far above the supply. Based on the data obtained from BPS, we found that during the 2020–2024 period, all ministries and institutions at the central government level need at least 16,348 people to fill in the ICT officer position. However, as of now, they only have 2,831 ICT officers, meaning that they need an additional 13,517 people to fill in the position between 2020 and 2024. Despite the great demand, ICT professionals show little interest in working for the government. Moreover, the competency test to become an ICT officer is notoriously difficult, even for ICT graduates. Some other administrative factors also contribute to the low number of ICT officers. One of them is the fact that the ASN recruitment process is long and rigid. Candidates need to wait for more than eight months to complete all selection stages. This is too lengthy compared to that of the private sector or startups.

In addition to quantity issues, the current quality of the ICT officers also raises concerns. The delayering policy is indicated to contribute to 23% of ICT officers having non-ICT educational background or lower than three-year diploma. In other words, they are actually unqualified, even for the skilled level. Moreover, only 56% of them are of the expert level, i.e., those with at least a four-year diploma or academic degree with ICT educational background. This is below the requirement, as our matching analysis shows that it takes 91% (not only 56%) expert-level ICT officers to implement e-government.

As a conclusion, the problems facing the ICT officers are not only related to quantity, but also regarding the very basic quality. This relates to their educational relevance and, more importantly, skill competency. Therefore, despite their central role in implementing e-government, this study does not perceive recruiting civil servant ICT officers as the only solution for addressing the supply and demand gap. Instead, using professionals available in the market through vendors can be a better solution. Above all,

in many countries, the public sector is not attractive for the best ICT talents. We are aware that out of almost 8,000 ICT officers, there might be a small percentage of outliers whose technical capabilities are equivalent to those in the private sector. However, with the above-mentioned analysis, it might not be appropriate to force all of them to compete technically with the ICT professionals of the private sector. Instead, they should take complementary and supervisory roles to ensure that (i) the organization's needs are well identified and communicated to vendors; (ii) the work of vendors is supervised and assessed; (iii) the knowledge is sufficiently transferred; and (iv) a simple supporting system is developed, if necessary.

This study recommends improvement in recruitment channels. Of all recruitment channels, the government should prioritize PPPK as the most strategic channel to attract qualified digital talents. However, regulations related to PPPK recruitment for ICT functional positions should be formulated. The only existing regulation for PPPK is the Regulation of the Minister for Administrative and Bureaucratic Reform No. 72 of 2020 on the Amendment to Regulation of the Minister for Administrative and Bureaucratic Reform No. 2 of 2019 on the PPPK Recruitment of Teachers, Lecturers, Health Workers, and Agricultural Extension Workers. Furthermore, the recruitment process has to be more flexible, less bureaucratic, and innovative by mimicking the strategies applied in digital government units. These digital government units have been using social media in spreading information related to ICT job vacancies and rebranding the public sector as an innovative institution. Job vacancies should also be posted based on the job category, rather than user category, such as the ministries or institutions. They also "sell" the opportunity for ICT candidates to contribute to the creation of social impacts and improvement of people's lives. Lastly, providing competitive salaries according to the market rate is important to attract the best talents. This powerful strategy needs to be adopted by the public sector to win the war for ICT talents.

This study also recommends the provision of capacity building. As the supervisory institution for ICT officers, BPS is supposed to organize the competency test for them. This competency test will serve as a placement test for further capacity building activities. As a consequence of the delayering program, there are quite a considerable number of ICT officers who used to perform administrative tasks. In their new position as ICT officers, they need to reskill themselves independently through LMS. Therefore, the contents and materials for them should be prepared as soon as possible. Meanwhile, upskilling programs through formal education should also be ensured in such a way that educational qualification and competence fit with the requirements. Our study also finds that the government is faced with a dilemma to support skill certification. Although the government really needs it, it might result in a high turnover rate among the graduates who eye better jobs in the private sector. To address these problems, we recommend that skill certification be tied to a work bond for certain years after the certification. Thus, this mimics the commitment applied in formal education. This is a win-win solution for both the government and ICT officers. Finally, improvement and regular updates in the ASN database is a must for better planning and decision-making. To ensure that the update takes place, the annual performance evaluation should be based on the updated ASN database.

As our analysis shows that 60% of the ICT officers are millennials and generation Z. Therefore, strategies for retention are important. The ICT officers from these generations require a different approach, such as with two-way communication instead of instruction-based order. Therefore, it is imperative that leaders in government organizations be equipped with such a skill. Since civil servants have to go through compulsory training sessions to be leaders, we recommend that the training includes topics related to collaborative and nonhierarchical work culture, which are important for retention measures. We also recommend the implementation of flexible work arrangements, starting with ICT professionals with possibilities to spread across other jobs. This has been applied at Kemenkeu, meaning that it is not a novel idea in the public sector. Finally, the process to determine the demand for ICT officers by government units should be carried out prudently to avoid mismatch. With their limited supply as ICT professionals, they should be placed according to their competence.

Finally, we would like to emphasize that research and publication on the public sector are still scarce. This diagnostic study focuses on the implementation of e-government to achieve high performance of bureaucracy and public services. With limited time to finish the study, our main informants, except for the digital units of DKI Jakarta and West Java, include only government officials from various ministries and institutions at the central level. Meanwhile, e-government should also include regional governments. Their realities are way too different from those at the central level, particularly when taking into account the development stages of the region. Hence, it is important to conduct research focusing on challenges facing the regional governments in the implementation of e-government.

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Appendices

Appendix 1
Table A1. List of Informants

No.	Ministry/Institution	Directorate/Division
1	Ministry of Administrative and Bureaucratic Reform	E-Government Policy Implementation
2		Human Resource, Organization & Law Bureau
3	Ministry of Communication and Informatics	Human Resource R&D Agency
4	National Development Planning Agency (Bappenas)	State Apparatus and Bureaucracy Reform
5		Center of Data & Information of Development Planning
6		Human Resources Bureau
7	Ministry of Education, Culture, Research, and Higher Education	Organization and Governance Bureau
8		GovTech Edu
9	Ministry of Health	Digital Transformation Office
10		Human Resources Management Bureau
11	Ministry of Finance	Central Transformation Office
12		Center for Information and Technology
13		Center for Education and Training
14		General Directorate of Budgeting
15	Jakarta Smart City (JSC)	Development and Data Analyst Team
16	Jabar Digital Service (JDS)	Human Resources/General Affairs Team
17	Statistics Indonesia (BPS)	Education and Training
18		Human Resources Bureau
19	State Administration Agency (LAN)	Center for Policy Analyst Training
20		Center for Competency Development
21	National Civil Service Agency (BKN)	Personnel Information System
22	Association of Policy Analysts (AAKI)	N/A
23	Association of ICT Officers (IPRAKOM)	N/A
24	World Bank Jakarta (WB)	Digital Government Team
25	Prospera-DFAT (Prospera)	Public Sector Reform

Source: authors

Appendix 2
Table A2. E-Government Development Index in ASEAN, 2012–2018

Country	Year	Online Service Index	Telecommunication Infrastructure Index	Human Capital Index	Total Score
Singapore	2012	1	0.6923	0.85	0.8474
	2014	0.9921	0.8793	0.8515	0.9076
	2016	0.971	0.8414	0.836	0.8828
	2018	0.9861	0.8019	0.8557	0.8812
Malaysia	2012	0.7908	0.451	0.7691	0.6703
	2014	0.6772	0.4455	0.7119	0.6115
	2016	0.7174	0.4397	0.6953	0.6175
	2018	0.8889	0.5647	0.6987	0.7174
Thailand	2012	0.5098	0.2361	0.7819	0.5093
	2014	0.4409	0.2843	0.664	0.4631
	2016	0.5507	0.4117	0.6942	0.5522
	2018	0.6389	0.5338	0.7903	0.6543
The Philippines	2012	0.4967	0.2082	0.8341	0.513
	2014	0.4803	0.2451	0.7051	0.4768
	2016	0.6667	0.3791	0.6839	0.5765
	2018	0.8819	0.3547	0.7171	0.6512
Vietnam	2012	0.4248	0.3969	0.7434	0.5217
	2014	0.4173	0.3792	0.6148	0.4705
	2016	0.5725	0.3715	0.5989	0.5143
	2018	0.7361	0.389	0.6543	0.5931
Indonesia	2012	0.4967	0.1897	0.7982	0.4949
	2014	0.3622	0.3054	0.6786	0.4487
	2016	0.3623	0.3016	0.6796	0.4478
	2018	0.5694	0.3222	0.6857	0.5258
Cambodia	2012	0.1895	0.0814	0.5997	0.2902
	2014	0.1732	0.2075	0.5189	0.2999
	2016	0.0507	0.2486	0.4785	0.2593
	2018	0.25	0.3132	0.5626	0.3753
Timor-Leste	2012	0.2157	0.0649	0.429	0.2365
	2014	0.2047	0.0704	0.4831	0.2528

Country	Year	Online Service Index	Telecommunication Infrastructure Index	Human Capital Index	Total Score
	2016	0.2174	0.0728	0.4843	0.2582
	2018	0.3125	0.2937	0.5387	0.3816
Myanmar	2012	0.1046	0.1046	0	0.2703
	2014	0.0236	0.0084	0.5288	0.1869
	2016	0.1594	0.0655	0.4837	0.2362
	2018	0.2292	0.2565	0.5127	0.3328
	2020	0.2588	0.5234	0.5125	0.4316
Lao DPR	2012	0.2157	0.0998	0.5651	0.2935
	2014	0.1417	0.1618	0.4941	0.2659
	2016	0.2826	0.1537	0.4907	0.309
	2018	0.1667	0.2246	0.5254	0.3056

Source: UN E-Government Surveys 2012, 2014, 2016, and 2018

Appendix 3
Table A3. Result of the Government of Indonesia's Ranking of E-Government 2021

Ministry	2021
Ministry of Communication and Information Technology	3.82
Ministry of Finance	3.72
Ministry of Law and Human Rights	3.68
Ministry of Public Works and Public Housing	3.44
Ministry of Agriculture	3.44
Ministry of Trade	3.42
Coordinating Ministry for Human Development and Culture	3.38
Ministry of Education and Culture	3.33
Ministry of Home Affairs	3.17
Ministry of Agrarian Affairs and Spatial Planning/National Land Agency	3.05
Ministry of Energy and Mineral Resources	2.99
Ministry of Cooperatives and Small and Medium Enterprises	2.99
Coordinating Ministry for Economic Affairs	2.95
Ministry of Women's Empowerment and Child Protection	2.92
Ministry of Labor	2.9
Ministry of State Secretariat	2.88
Ministry of Foreign Affairs	2.87
Ministry of Transportation	2.84
Coordinating Ministry for Maritime Affairs	2.8
Ministry of Investment/Investment Coordinating Board	2.8
Ministry of Health	2.79
Ministry of Maritime Affairs and Fisheries	2.75
Ministry of Environment and Forestry	2.62
Ministry of Administrative and Bureaucratic Reforms	2.61
Ministry of Tourism/Tourism and Creative Economy Agency	2.59
Ministry of National Development Planning/National Development Planning Agency	2.56
Ministry of Defense	2.48
Ministry of Sports and Youth	2.48
Ministry of Religion Affairs	2.35
Ministry of State-Owned Enterprises	2.16
Coordinating Ministry for Political, Legal, and Security Affairs	1.98
Ministry of Social Affairs	1.56
Ministry of Industry	1.38

Source: Kementerian PANRB, 2021

Appendix 4
Table A4. Number of ASN in 2022 by Selected Demographic Characteristics

Type of ASN	Characteristics	Total	Proportion
PNS	Sex		
	- Male	1,868,915	47%
	- Female	2,123,851	53%
	Level of education		
	- Primary–senior high school	650,807	16.3%
	- Diploma/associate degree	629,217	15.8%
	- Bachelor's degree	2,712,742	67.9%
	Age		
	- 18–20	1,144	0.02%
	- 21–30	317,041	8%
	- 31–40	916,143	23%
	- 41–50	1,245,421	31%
	- 51–60	1,476,137	37%
	- >60	36,880	0.9%
PPPK	Sex		
	- Male	122,164	35%
	- Female	229,622	65%
	Level of education		
	- Primary–senior high school	5,823	2%
	- Diploma/Associate degree	11,063	3%
	- Bachelor's degree	334,900	95%
	Age		
	- 21–30	55,923	15%
	- 31–40	167,777	48%
	- 41–50	102,695	29%
	- 51–60	27,274	7.7%
	- >60	117	0.03%

Appendix 5
Table A5. ICT Roles by Educational Attainment

ICT Roles	Scenario 1 (Associate Degree in ICT or Higher)			Scenario 2 (Bachelor's Degree in ICT or Higher)		
	Number of ASN (Person)	% of All Employees in Each ICT Role	% of All Amployees in All ICT Roles	Number of ASN (Person)	% of All Employees in Each ICT Role	% of All Employees in All ICT Roles
ICT officer	6,112	76.8%		4,441	55.8%	
Information security manager	49	24.9%		48	24.2%	
Cryptographer	235	32.5%		208	28.7%	
Population administration information system operator	23	19.30%		1	1.8%	
Population database administrator	153	11.3%		148	10.9%	
Scientific data analyst	5	6.1%		5	6.1%	
Total	6,577		63.2%	4,851		46.9%

smeru
RESEARCH INSTITUTE

Jl. Cikini Raya No. 10A
Jakarta 10330 Indonesia

+62 21 3193 6336

+62 21 3193 0850

smeru@smeru.or.id

smeru.or.id

The SMERU Research Institute

@SMERUInstitute

@smeru.institute