

**READINESS OF ARTIFICIAL INTELLIGENCE TO ACCELERATE  
BUREAUCRATIC REFORM IN INDONESIA**

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**ABSTRACT**

The national use of AI in the government sector is necessary to achieve effectiveness and efficiency in supporting bureaucratic reform and policy decision making in order to implement good governance. The research uses qualitative descriptive methods by reviewing previous research, and reviewing policies related to the use of AI in government and bureaucratic reform. The results show that in terms of governance, AI systems do not yet have specific laws governing and ensuring the security and protection of citizen data and the use of algorithms against the misuse of electronic transactions. In terms of governance, AI development is needed as an effort to maintain public trust and government legitimacy. In terms of infrastructure Indonesia is still constrained by the creation of data that is very difficult and does not allow for reuse. In terms of skills and education, the digital skills of workers in Indonesia are still middle level. In terms of government and public services, Indonesia still has to continue to increase the availability of public services digitally. In order to improve the management of AI Indonesia builds artificial intelligence industry research and innovation collaboration (KORI-KA), a quadruple-helix approach between government, industry, academia and the community. At a strategic level, AI management is conducted with policy, accountability, and accountability approaches. At the operational level, cybersecurity against data includes infrastructure security and the use of anonymous data methods to keep data owners unidentified.

**Keywords:** *artificial intelligence, bureaucratic reform, Indonesia*

**A. INTRODUCTION**

Bureaucratic reform is considered in line with the view of good governance, where good governance contains at least principles such as (1) participation, (2) legal certainty, (3) transparency, (4) responsibility, (5) agreement-oriented, (6) fairness, (7) effectiveness and efficiency, (8) accountability, and (9) strategic vision (UNDP 1999). The basic principle must be attached to government organizations to achieve state goals, in addition to improving state and community relations in order to optimize public services. Good governance in Indonesia began to become a strategic issue when the New Order collapsed. As is commonly known, there were some problems that occurred in the Indonesian bureaucracy at that time. The New Order in Indonesia is synonymous with corrupt, not transparent, convoluted, rigid, and full of other bureaucratic pathologies. In Indonesia, bureaucratic reform occurs when there is a crisis of public confidence in the public bureaucracy. The New Order period made public bureaucracy a tool

to maintain power where the interests of the ruler tended to be central to the life and behavior of the public bureaucracy (Dwiyanto et al. 2008).

For more than 20 years after the New Order collapsed, Bureaucratic Reform remained a major focus in the administration in Indonesia. Various regulations and road maps were issued accompanied by national-scale programs to speed it up. Entering the 21st century, the development of information and communication technology (ICT) is inevitable. This development will usually also create new advantages and conveniences can even get maximum results if used in conjunction with existing methods. Similarly, Artificial Intelligence (AI) technology or Artificial Intelligence (KA). Various countries around the world have developed AI environments including the United States, China, Britain, France, Finland, and South Korea followed by a national strategy to answer opportunities and challenges for its national interests. But according to previous research from Groth and Nitzberg (2019), there are weaknesses of the country's national strategy, namely vague definitions, vague target setting, and rule out creating an ecosystem solution.

According to a report from AustCyber in 2019, Indonesia accounts for 40% of ASEAN's population with a proportion of gross domestic product of approximately US\$ 4,174.9. Unfortunately, Indonesia is underinvested in cybersecurity, thus facing obstacles to implementing sophisticated cybersecurity. Indonesia is estimated to spend 1.6% of GDP on digital infrastructure, compared to Malaysia at 4.5% and Singapore at 6.6% (AustCyber 2019). This makes room for an acceleration of cybersecurity in Indonesia. The development of government automation in Indonesia developed into ai procurement initiated by President Joko Widodo in November 2019. President Jokowi stated that the government will replace some positions with AI. For starters, he instructed ministers to remove echelons III and IV with AI to cut bureaucratic red tape and expected to accelerate bureaucratic reform. Meanwhile, Coordinating Minister for Economy Airlangga Hartarto said that the government will push for a single submission and single map policy online as part of its initiative to use AI in government work. One of the AI designs will be used in the registration process, for example in simplification of the licensing process where it will be based on a risk-based approach (Akhlas 2019).

Previous research conducted by LIPI shows that there are 9 strategies carried out by involving three main functions (organization, consumer, and government) namely: 1) AI applications are directed to help the work has flexi space and hour; 2) AI is developed in the form of open source and functioned to meet the primary needs of the community such as financial planning, research, education, and others; 3 and 4). Regular improvements to AI systems accompanied by consumer education; 5) AI is supported by environmentally friendly facilities as well as minimizing the cost of maintenance such as solar panels; 6) Joint venture to develop AI; 7) Strengthen ai integrated system so that it better meets the needs of consumers and does not need to look to foreign markets; 8) Active in asking for advice and criticism of AI consumers as well as potential AI users; 9) AI facilities must be rentable so that their operational costs are met or sharing profit in AI ownership (Ririh et al. 2020 The results showed that increased

effectiveness and efficiency of companies are the main factors driving the high level of AI implementation. However, the implementation and development of AI technology will be less than maximum if not considered in detail or juxtaposed with other technologies (food technology, security defense, etc.).

## **B. THEORETICAL FRAMEWORK**

### **Artificial Intelligence in Government**

AI was originally known in the world of computers, automation, and ICT that adapts human intelligence using computer machines and systems so as to be able to carry out work that requires human intelligence such as decision making, problem solving, and introduction (Beam and Kohane 2016). The development of technology since the 1950s makes AI technology not a new concept. This certainly brings development to AI applications and research. The purpose of AI at the beginning of p is to solve traditional problems on reasoning, representation of knowledge, planning, learning, natural language processing, perception and the ability to move and manipulate objects (Luger 2005; Nilsson 1998; Poole, Mackworth, and Goebel 1998; Russell and Norvig 2010). The approach used is not far from statistical methods, computerization and the use of symbols. Massive developments in all fields have led AI to be utilized in almost all sectors to facilitate jobs, one of which is in the government sector.

The use of AI in government is nothing new. In the 1990s, the U.S. Postal Service used this technology to recognize handwriting, making it easier to deliver mail (Mehr 2017). Although AI in the government sector has not been able to rival the private sector, its use is able to reflect the general applications of both sectors. Deloitte states that cognitive technology can revolutionize every aspect of government operations (Eggers, Schatsky, and Viechnicki 2017). According to Mehr (2017), there are about 6 main problems in government that can be solved by the use of AI, namely:

- a. Allocation of resources in the framework of administrative support so that work is completed faster.
- b. Data sets in large sizes, employees have difficulty in managing large amounts of data. In fact, if combined, it can generate broader insights.
- c. Lack of experts so simple problems can not be solved properly.
- d. Prediksi, adanya histori data membuat situasi lebih mudah diramalkan.
- e. Procedure, is a repetitive task between input or output with binary answers.
- f. Diverse data, data in both visual and linguistic form need to be summarized regularly.

In addition, there are three main functions of ai use that contribute to the government sector, namely:

- a. Contribute to public policy goals. In this function, the activities that can be done by AI are very diverse. In education services, AI can help provide personalized education depending on each student's needs and provide test scores. In the field of defense and security, AI has been utilized for military purposes such as communication tools, sensors and radar, integration, and interoperability (Slyusar 2019). In hospitality, AI is used as a solution to reduce staff workloads and improve efficiency by cutting repetitive jobs, trend

analysis, interaction analysis to predict future customer desires (Bhattacharjee 2017).

- b. Assisting public interaction with the government. This function can be found in some government applications that allow the public to chat and submit complaints or opinions to government channels. In addition, it can also be the scheduling of appointments and document searches (Institute of Public Administration Australia 2019; Mehr, 2017).
- c. Other uses include legal drafting and document translation (Mehr, 2017). Unbabel, an AI-based start-up in translation, combines crowdsourcing and machine learning to translate business operations into 14 languages. Unbabel uses algorithms to translate customer service emails and web pages, and a team of human editors to verify its accuracy, they complete the service at a much cheaper rate, \$0.02 per chat, than traditional translation services.

However, of these benefits, AI also holds some risks. These risks include.

- a. Prone to “bias” (Mehr, 2017).
- b. Lack of application transparency in decision making (Mehr, 2017).
- c. Accountability to decisions made (Tinholt, 2017).

#### **AI as an Acceleration of Bureaucratic Reform in Indonesia**

The definition of reform in the Great Dictionary of The Indonesian Language (KBBI) is a drastic change for improvement (social, political, or religious fields) in a society or country. The collapse of the New Order government was motivated by demands from the Indonesian people so that the government could abolish knn practices and reform in the field of government for good governance practices. Years after the reforms were made, no meaningful changes have been found. Bureaucrats still seem arrogant, still have a mental pangreh praja, and the case of KKN can still be found in the government sector. President Susilo Bambang Yudhoyono then issued Presidential Regulation No. 80 of 2011 on Grand Design of Indonesian Bureaucratic Reform year 2010-2025. The purpose of Bureaucratic Reform in Indonesia is to create a professional bureaucracy with characteristics, integrate, high performance, free and clean KKN, able to serve the public, neutral, prosperous, dedicated, and uphold the basic values and code of ethics of the state apparatus.

In order to support the Grand Design of Indonesian Bureaucratic Reform year 2010-2025, the government issued Presidential Regulation No. 95 of 2018 on Electronic-Based Government System (SPBE). This presidential regulation was issued to realize clean, effective, transparent, and accountable governance as well as quality and reliable public services. SPBE utilizes ICT in an integrated manner to enable an integrated and comprehensive sharing system. This is the main foundation towards Digital Government in Indonesia.



**Figure 1. National SPBE Framework**  
 Source: Kementerian Sekretariat Negara Republik Indonesia (2018)

The revolution in information and communication technology (ICT) encourages the government to innovate through the application of e-government, one of which is in improving the quality of services. This innovation is expected to get ease in obtaining services from the government and not complicated by bureaucratic relations between governments. SPBE and the utilization of AI in government in Indonesia are included in the strategic issues mapped in the National Strategy on Artificial Intelligence (Strana KA). Strana KA is a national policy direction that contains the focus areas and priority areas of artificial intelligence technology that as a reference of ministries, institutions, local governments and other stakeholders in carrying out activities in the field of artificial intelligence technology in Indonesia. Strana KA targets 5 priority areas directly related to the relationship of the country and its people, namely health



services, bureaucratic reform, education and research, food security, and mobility and smart cities.

**Figure 2. Strana KA Priority Area**  
 Source: Badan Pengkajian dan Penerapan Teknologi (2020)

The use of AI for bureaucratic reform is considered in line with the 2020-2024 Bureaucratic Reform Road Pet listed in Ministerial Regulation of PAN-RB Number 25 of 2020. There are 8 areas of change that are the focus of development, namely Change Management, Policy Deregulation, Organizational

Arrangement, Governance Arrangement, Personnel Human Resources Arrangement, Strengthening Accountability, Strengthening Insights, and Improving the Quality of Public Services. Therefore, it is expected that there will be structural reforms made to make the bureaucracy simpler, agile, newer-thinking, and efficient. As stated in the Strana KA (Agency for The Assessment and Application of Technology 2020) there are at least 3 things that will be realized, namely:

1. Strengthening economic resilience for quality growth through improved innovation and quality of investment which is the main capital to encourage higher, sustainable, and equitable economic growth.
2. Building the environment, improving resilience to disasters, and climate change through national development that needs to pay attention to the carrying capacity of natural resources and the capacity of the environment, disaster vulnerability, and climate change.
3. Strengthening the stability of Polhukhankam and the transformation of public services where the state must continue to be present in protecting the whole nation, providing a sense of security and quality public services to all citizens and upholding the sovereignty of the state.

### **C. METHOD**

The research method used uses qualitative descriptive methods. Data collection was conducted by reviewing previous research related to the utilization of AI in government, the current condition of the AI climate and Bureaucratic Reform in Indonesia. In addition, we also conduct policy studies and data collection from government web portals and NGOs to obtain the necessary supporting data.

### **D. RESULT AND DISCUSSION**

#### **Overview of AI Readiness in Indonesia**

According to data from the Government AI Readiness Index in 2020, Indonesia showed the position of 62 out of 172 countries studied with a score of 47,528. This position is down 5 ranks from 57 in 2019. The data was taken by paying attention to 4 hypothetical clusters, namely the government side, infrastructure and data, skills and knowledge, as well as government and public services. The four clusters were then broken down again to analyze the readiness of AI in the framework of public services of the Government of Indonesia.

**Table 1. AI Readiness Measurement Indicators in Indonesia**

Cluster	Indicators
<b>Governance</b>	Data Protection / Privacy National AI Strategy Data Availability
<b>Infrastructure and Data</b>	Procurement of advanced technology products by the government Data / AI Capabilities in Government Technology Skills
<b>Skills and Education</b>	Private Sector Innovation Capabilities Number of AI Start-ups Digital Public Services
<b>Government and Public Services</b>	Government Effectiveness The Importance of IT for the Government's Vision for the Future

**Source: Miller and Stirling (2019)**

1. Governance

In terms of governance, AI development is needed as an effort to maintain public trust and government legitimacy. This effort requires a legal and ethical framework that ensures assurances from the government on citizen data and the use of algorithms. Regarding Data Protection/Privacy, until now Indonesia does not have laws that specifically regulate the protection of privacy and data. Whereas with the increase of digital transactions, there is an urgency of the existence of regulations that specifically regulate the security and privacy of data. On the official page of the United Nations Conference on Trade and Development (UNCTAD), data found in the Data Protection and Privacy Legislation sector in Indonesia is only recorded as having the Law of the Republic of Indonesia Number 11 of 2008 on Information and Electronic Transactions (ITE). The ITE Law was changed in 2016 to Law No. 19 of 2016, with a focus on articles relating to defamation, interception/interception, search/seizure and arrest of detention, strengthening the role of investigators, and strengthening the role of the government in providing protection from all kinds of interference due to misuse of information and electronic transactions by inserting additional authority. The ITE Law does not contain specific personal data protection rules but has set a new understanding of the protection of the existence of data or electronic information either public or private. This law has a lot of derivative regulations, one of which is Government Regulation No. 82 of 2012 on The Implementation of Electronic Systems and Transactions (PP PSTE).

The National Ai Strategy of the Government of Indonesia is demonstrated by the issuance of Presidential Regulation No. 53 of 2017 and the amendment of Presidential Regulation No. 133 of 2017 establishing the State Cyber and Password Agency (BSSN) in charge of implementing cybersecurity effectively and efficiently by utilizing, developing and consolidating all elements related to national cybersecurity. BSSN develops Indonesia's Cyber Security Strategy as a reference with all national cybersecurity stakeholders in drafting and developing

cybersecurity policies in their respective agencies. The national cybersecurity strategy is prepared in line with the basic values of national and state life, namely: Sovereignty, Independence, Security, Togetherness, and Adaptive. In addition to forming BSSN, the government also invited Presidential Regulation No. 95 of 2018 on Electronic-Based Governance System. This presidential regulation was followed up with the Establishment of spbe coordination team and strategic plan containing general guidelines for the implementation of SPBE development. Spbe's strategic plan is divided into 4 sectors, namely SPBE Governance, SPBE Services, Information and Communication Technology, and Human Resources. The focus of AI in SPBE is in the Strategic Plan section of Information and Communication Technology as stated in the following table.

**Table 2. SPBE Strategic Plan for ICT**

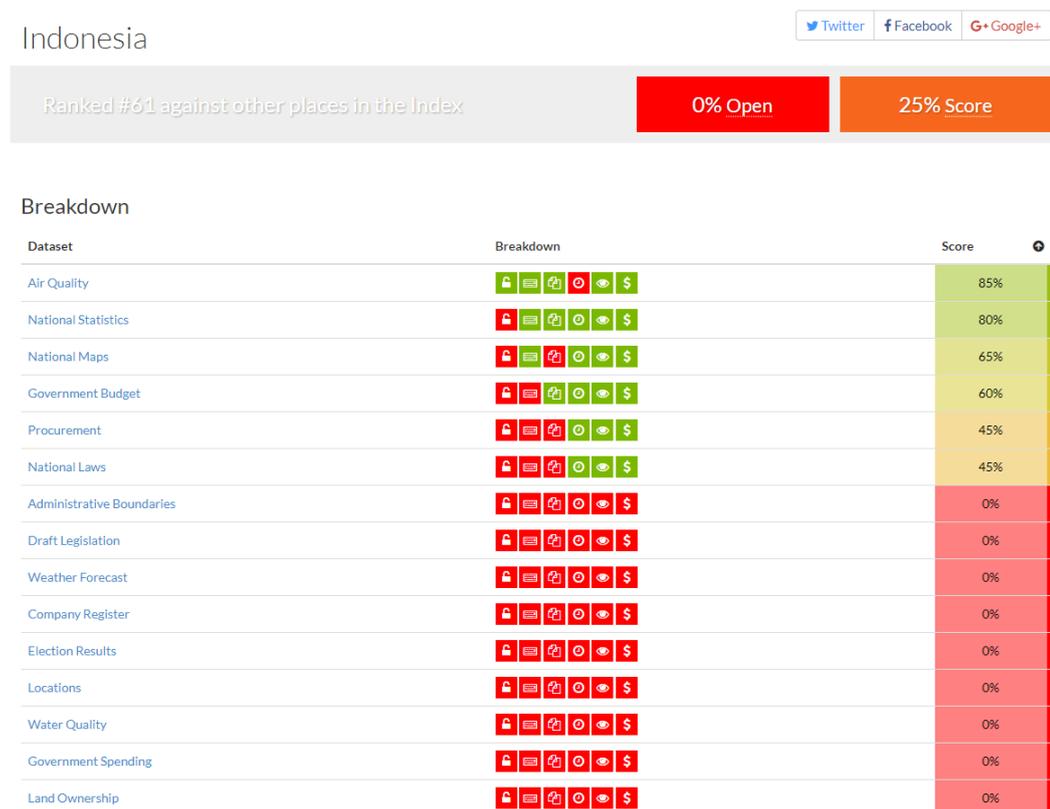
<b>Information and Communication Technology</b>		
<b>Strategic Initiatives</b>	<b>Output</b>	<b>Target Time</b>
<b>Provision of National Data Centers</b>	National Data Center	2018-2022
	Intra-Government Control and Network Center	2018 - 2022
	Intra-Agency Network Center	2018 - 2022
<b>Provision of Intra-Government Network</b>	Intra Provincial Government Network	2018 -2022
	Intra Network of District/ City Government	2018 - 2022
	Government Service Liaison System	2018 - 2022
<b>Provision of Government Service Liaison System</b>	Government Service Liaison System	2018 - 2022
<b>Providing Quality Access to SPBE Services throughout Indonesia</b>	Quality Broadband Network	2018 - 2025
	<i>Cloud Service</i>	2018 -2025
<b>Development of Technology-Based Services Sharing Services</b>	Service Channel Integration	2018 - 2025
	Common Application Repositories	2018 - 2025
	Cloud Service Technology Review	2018 -2025
	National Data Portal ICT support	2019 - 2025
<b>National Data Portal Development</b>	Data Integration and Management of National Data Portal	2019 - 2025
	Information Security Management	2018 - 2020
<b>National Information Security System Development</b>	Information Security Technology	2018 -2025
	Information Security Culture	2018 - 2025
<b>Pengembangan Teknologi</b>	Artificial Intelligence	2019 - 2025

<b>Kecerdasan Buatan Untuk Pengambilan Keputusan yang Cepat dan Akurat</b>	Technology Studies Government Big Data Implementation	2019 - 2025
	Application of Artificial Intelligence	2019 - 2025

(Sumber: Portal SPBE Nasional 2020)

## 2. Infrastructure and Data

The data availability indicator is taken from the Global Open Data Index/GODI page. Based on the search, Indonesia is ranked 61<sup>st</sup> out of 94 countries recorded. GODI evaluates the open data portal of 15 data disclosure indicators measured from Air Quality, National Statistics, National Maps, Government Budget, Procurement, National Laws, Administrative Boundaries, Draft Legislation, Weather Forecast, Company Register, Election Results, Locations, Water Quality, Government Spending, and Land Ownership.

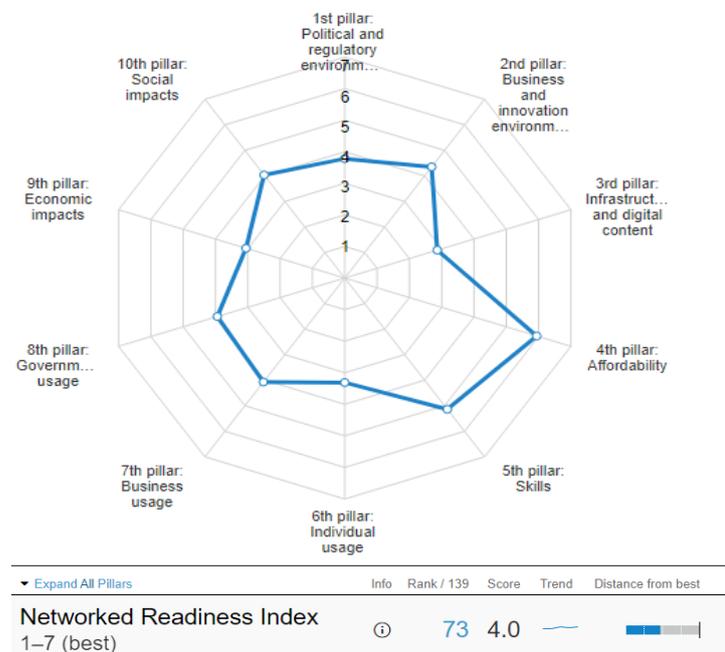


**Figure 3. Indonesia's Position in the Global Data Open Index**  
**Source: Global Open Data Index (2019)**

Indonesia has a data disclosure score of 0%, this indicator is based on the percentage of fully open datasets. The 25% score listed is a scaled rank score between 0-100%, based on weighted questions, displayed as a percentage of the score to the maximum extent possible. By looking at these results does this show indonesia's data is not open? According to GODI's alert on the data interpretation

guide, a score of 0% does not mean the government does not publish open data at all. That means that the identified data is relevant according to GODI criteria, but not available as open data. This happens because governments publish data in various forms, not only as a data set of tables but also visualizations, maps, graphs and text (*Global Open Data Index 2019*). While this is a good effort to make data relevant, it can sometimes make it very difficult or impossible to reuse. It is important for governments to revise the way they produce and provide good quality data for reuse in their original form.

Related to the indicators of procurement of advanced technology products by the government, this is more on the extent to which the government encourages innovation. The data source is taken from the World Economy Forum Executive Opinion Survey which examines government innovation as well as technical capacity to build and run AI.



**Figure 1. Indonesia Ranking in Global Information Technology Report 2016**  
**Source: World Economic Forum (2016)**

From the results of the report, Indonesia climbed six spots to 73rd in 2016, partly driven by increased affordability and strong increases in individual use. To take advantage of this positive trend, infrastructure needs to be maintained as the number of users increases, the existing infrastructure begins to be improved. Business and government use is already high with a flat trend line for businesses and a slight decline for the government. Newly reformed regulation and business environment provide a good foundation for building a digital economy with several supporting indicators (legislative, legal system, availability of the latest technology, and number of procedures for starting a business) (*World Economic Forum 2016*).

**Table 3. Indonesia Innovation Ranking based on Global Innovation Index (GII) and Ranking in South East Asia, East Asia and Oceania (SEAO)**

Year	Score	Ranking GII	Ranking in SEAO
2016	29,07	88	13
2017	30,10	87	14
2018	29,80	85	14
2019	29,72	85	14
2020	26,49	85	14

(Sumber: Cornell University, INSEAD 2020)

In addition, Indonesia's innovation ranking based on GII and South East Asia, East Asia and Oceania (SEAO) can be seen in the table above showing that the innovation score in Indonesia based on gii report in 2016-2020 tends to be volatile. Innovation ranking in Indonesia in GII ranking has increased in the period of three years, namely 2016-2018 while in 2018-2020 it is ranked 85th. However, Indonesia's ranking in SEAO shows that in the last four years Indonesia has not increased, ranking 14th out of 17 countries. This shows that Indonesia's innovation ranking at the Asian level is still not able to compete with 13 other countries.

In the Data Capability Indicator / AI refers to the results of the UN E-Government Survey 2020 which combines data from three dimensions of e-government: online services, telecommunication connectivity and human capacity. It measures government e-capabilities that act as proxies for technology/AI skills.



**Figure 5. Indonesia Index at EGDI 2020**  
**Source: United Nations (2020)**

There has been an increase in rankings for Indonesia in the online-based public service sector. If in 2018 the UN's assessment of e-government services in Indonesia was ranked 107th, the results of the UN survey in 2020 stated that Indonesia rose 19 places to 88th. This includes including the global Covid-19 pandemic variables, Indonesia's ranking is one level better than Iran's 89th and India's 100th. According to Rini Widyantini, Deputy for Institutional affairs and Governance of the Ministry of PAN-RB, this rating increase is influenced one of

them because of the implementation and evaluation of SPBE that has been implemented by the government. The commitment of the leadership to government agencies is important in making continuous improvements to realize the overall improvement of SPBE (Portal Informasi Indonesia 2020).

### 3. Skills and Education

Technology Skills indicators are taken from the third and sixth pillar sub-indicators of the Global Competitiveness Index (GCI) 4.0 framework namely Information and Communication Technology (ICT) Adaption and Skills. E-government benefits people who are literate. ICT and e-government applications will achieve effectiveness when public sector entities and users have appropriate digital skills.

<b>3rd pillar: ICT adoption 0–100</b>		-	55.4 ↓	72
3.01	Mobile-cellular telephone subscriptions per 100 pop.	119.8	99.9 ↓	64
3.02	Mobile-broadband subscriptions per 100 pop.	87.2	N/Apl.	52
3.03	Fixed-broadband Internet subscriptions per 100 pop.	3.3	6.6 ↑	97
3.04	Fibre internet subscriptions per 100 pop.	1.5	N/Apl.	63
3.05	Internet users % of adult population	39.8	39.8 ↑	104

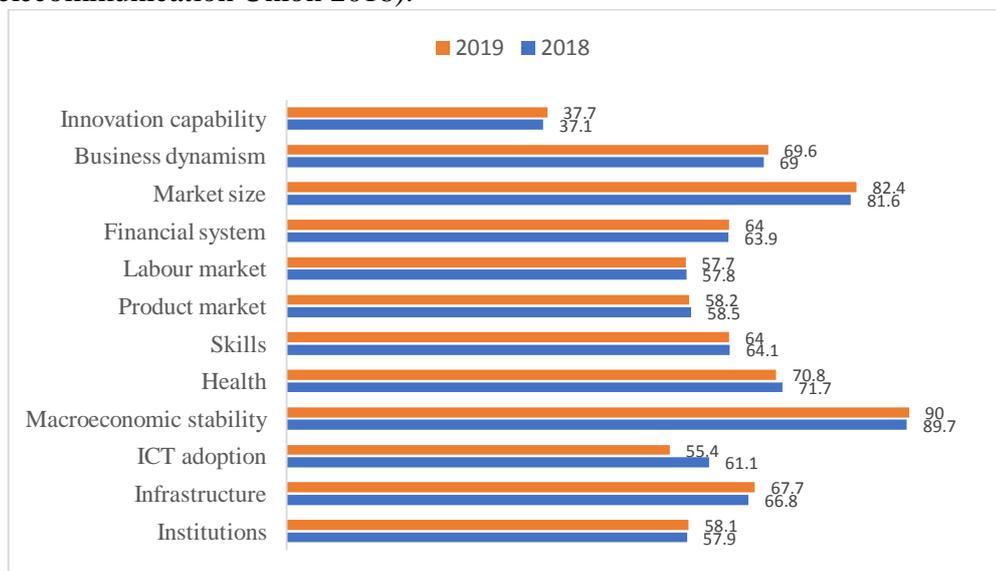
**Figure 6. ICT Adoption Pillar Index Constituents**  
**Source: Schwab (2019)**

From the sub-indicators in Figure 6, it can be seen that from the number of mobile phone subscriptions in Indonesia recorded as much as 119.8 per 100 population. This indicates that each person has the possibility to have more than one device and/or mobile number. About 87.2 out of 100 of the population are also connected to a mobile broadband subscription indicating they have access to the internet. While access to fixed-broadband and fiber internet subscriptions still ranges between 1.5 and 3.3 out of 100 population. This is because some areas of Indonesia have not been able to connect to wired internet, influenced by signal strength in certain areas and natural conditions because the installation of communication towers and planting underground fiber cables require sufficient surveys before finally being able to access the area.

<b>6th pillar: Skills 0–100</b>		-	64.0 ↓	65
<b>Current workforce 0–100</b>		-	56.3 ↓	73
6.01	Mean years of schooling years	8.0	53.2 ↑	92
<b>Skills of current workforce 0–100</b>		-	59.4 ↓	36
6.02	Extent of staff training 1–7 (best)	4.6	60.3 ↓	33
6.03	Quality of vocational training 1–7 (best)	4.6	60.1 ↑	37
6.04	Skillset of graduates 1–7 (best)	4.5	59.0 ↓	37
6.05	Digital skills among active population 1–7 (best)	4.5	58.5 ↓	52
6.06	Ease of finding skilled employees 1–7 (best)	4.6	59.2 ↓	45
<b>Future workforce 0–100</b>		-	71.7 ↑	64
6.07	School life expectancy years	13.4	74.2 ↑	80
<b>Skills of future workforce 0–100</b>		-	69.3 ↓	40
6.08	Critical thinking in teaching 1–7 (best)	4.2	53.7 ↑	29
6.09	Pupil-to-teacher ratio in primary education ratio	16.1	84.8 ↓	54

**Figure 7. Skill Pillar Index Components**  
**Source: Schwab (2019)**

Overall, in the field of skills, Indonesia ranked 64th out of 141 countries with an average score of 64 out of a scale of 100. Regarding the utilization of AI, the level of digital skills among active population is at a score of 4.5 out of 7. This shows that the digital expertise of workers in Indonesia is still classified as average and medium. Especially as a result of stagnant performance in variables that include "support environments", "human capital", "markets", and "innovation ecosystems". A report released by the International Telecommunication Union (ITU) identifies educational attainment rates as one of the strongest indicators of digital skills proficiency; countries with larger segments of the population with higher education also tend to have higher levels of digital skills (International Telecommunication Union 2018).

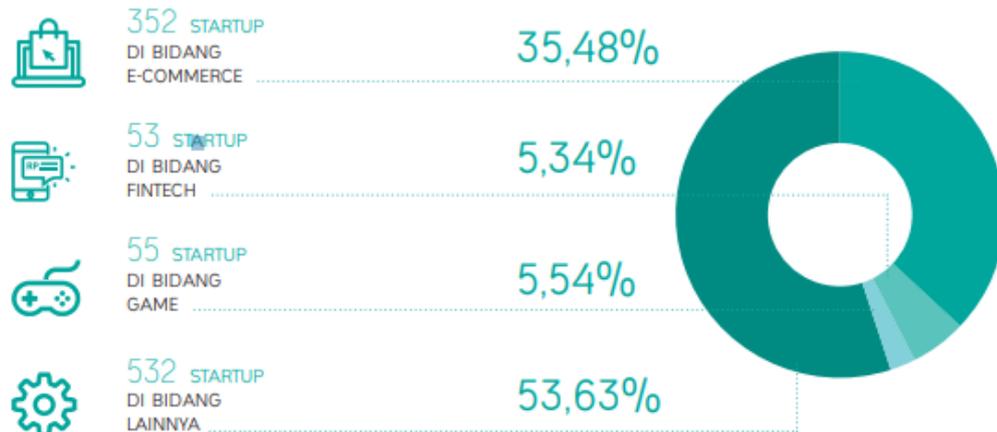


**Figure 2. Indonesia Government Competitiveness Index 2019**  
 Source: Schwab (2019)

Regarding innovation capabilities in the private sector, the GCI 2019 report from the World Economic Forum (WEF) noted Indonesia's competitiveness dropped five spots to 50 out of 141 countries in the world. The decline was in line with the decline in the GCI index score from 64.9 to 64.6. The report also mentions several components that caused GCI Indonesia to decline. The highest component of the GCI decline was ICT adoption by 5.7 points from 61.1 to 55.4. The next highest decline was in the health component by 0.9 points from 71.7 to 70.8. Other components decreased in the product market by 0.3 points, as well as skills and the labor market by 0.1 points. These are clear obstacles that affect the competitiveness of the country. Meanwhile, the other components that scored the increase were just under 1 point. The highest component of the increase was infrastructure at 67.7, up 0.9 points from 66.8 a year earlier.

Another indicator is the number of AI-based start-ups. According to the Association of Indonesian Internet Service Providers (APJII), internet users in Indonesia reached 143 million people in 2017. This trend is one of the influences why digitalization occurs very quickly and evenly in various sectors in Indonesia. The growth of the digital industry is also growing rapidly. One of the other trends

is the growth of digital-based start-up companies. Indonesia has 4 out of the top 7 start-ups in Southeast Asia. Startups from Indonesia are Go-Jek, Tokopedia, Traveloka, and Bukalapak. MIKTI, Teknopreneur Indonesia, and Creative Economy Agency released Mapping Database Start-up in 2018.



**Figure 9. Number of Start-Ups in Indonesia by Business**  
 Source: MIKTI and Teknopreneur Indonesia (2018)

Recorded number of startups in Indonesia a total of 992 startups with details of 352 *start-up e-commerce*, 53 *start-up financial technology*, 55 *start-up game*, and 532 *start-up* in other fields. In the same year, Nanalyze, an online media based in New York, researched the development of technology in Indonesia especially how Indonesia competes in the race in the WORLD of AI. Nanalyze did some Crunchbase searches, combed the company's website, did a lot of interviews and talked to the founders of the start-up. As a result, there are 11 AI start-up versions in Indonesia today, namely Snapcart, Kata.ai, BJtech, Sonar, Nodeflux, Bahasa.ai, Prosa.ai, Dattabot, Eureka.ai, AiSensum and Deligence.ai. This is one indicator of the readiness of the private sector to build AI devices and can be one solution for the government.

#### 4. Government and Public Services

The mapma indicator is Digital Public Service which is measured using an index from the Local Online Service Index (LOSI) that captures the development of e-government at the local level, by assessing information and services provided by local governments through the official website. It consists of 80 indicators, which are compiled into the following four criteria: technology, content provision, service provision, as well as community participation and engagement.

**Table 3. Indonesia's Position in EGDI 2020**

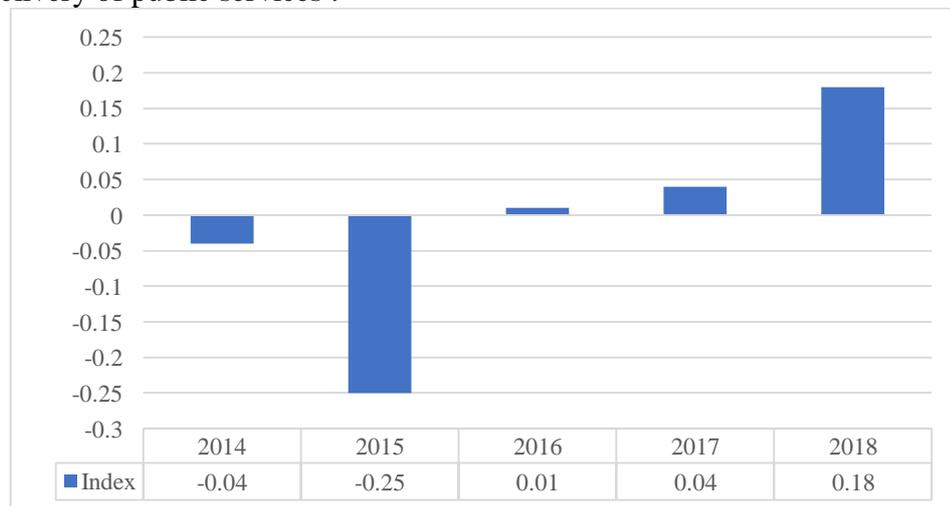
Country	EGDI Level	Rating Class	Rank	EGDI	Online Service Index	Telecommunications Infrastructure Index	Human Capital Index
Iceland	Very High EGDI	VH	12	0.9101	0.7941	0.9838	0.9525

India	High EGDI	H2	100	0.5964	0.8529	0.3515	0.5848
Indonesia	High EGDI	H3	88	0.6612	0.6824	0.5669	0.7342
Iran	High EGDI	H3	89	0.6593	0.5882	0.621	0.7686
Iraq	High EGDI	M3	143	0.436	0.3353	0.537	0.4358

**Sumber: (United Nations 2020)**

Indonesia's EGDI position is ranked 88th with an Online Service Index of 0.6612 (highest: Denmark, 0.9758), Indonesia still has to continue to improve the availability of digital public services. This OSI indicator is in line with the acceleration of e-government implementation in all countries, including Indonesia. As e-government is translated by the UN as the use of ICT to provide government services more effectively and efficiently to citizens and businesses. E-government is also about reforming public administration, management and day-to-day activities.

The second indicator is government effectiveness which is taken from the *Government Effectiveness Index Report*. This indicator shows the perception of the quality of public services, the quality of civil servants and their level of independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to the policy. Effective government, in theory, will be better able to deliver change in the delivery of public services.



**Figure 10. Indonesian Government Effectiveness Index 2014-2018**  
**Sumber: (World Bank n.d.)**

Bureaucratic reform to realize world class government and improve the quality of public services. Based on international assessments, Indonesia's Government Effectiveness Index (GEI) has increased (scale between - 0.25 – 0.25). This index measures the quality of service settings publik, the

quality of the bureaucracy, the competence of human resources and public service human resource level of independence from political pressure. This index describes the government's ability to make effective policies and provide public services. The government will improve the convenience and efficiency of public services through the Public Service Mall. The government must be fast and responsive in responding to the needs of the community by implementing an electronic-based government system such as e-procurement, one data, one map. ASN professionalism government with computer-based recruitment and consistent implementation of the ASN Law.

Furthermore, the indicator Importance of IT to the Government's Vision for the Future summarizes the question of 'to what extent does the government have a clear implementation plan to utilize ICTs to increase your country's overall competitiveness?', from the WEF Executive Opinion Survey. It also acts as a *proxy* for the level of innovation in government, and the desire to use new technologies as part of a vision for the future.

**Table 5. Results of Indonesian Government Usage Sub-indicators**

	<b>Importance of ICTs to government vision of the future</b>	<b>Government Online Service Index</b>	<b>Government success in ICT promotion</b>	<b>Avarage on Government Usage</b>
<b>Score</b>	4.4/7	0,36/1	4,3/7	3,9
<b>Ranking</b>	43/148	88/147	51/148	65

**Sumber: (Baller, Dutta, and Lanvin 2016)**

The table above is an interpretation of the data on the pillar 8 at WEF Networked Readiness Forum 2016. Pilar 8 is just the Government Usage consisting of three sub indikator namely Importance of ICTs to government vision of the future, Government Online Service Index, Government success in ICT promotion. To find out how important the use of IT in the government's view of the future, it can be seen on the table that the value of Indonesia on indikator first of 4.4 out of 7 and was ranked 43 of 148 countries. Digital and innovation competitiveness in Indonesia is still lacking and needs a lot of improvement. This had an effect on the decline in Indonesia's ICT Adoption index on the GCI in 2019. The variable "supporting environment" decreased by 6 points and placed Indonesia in rank 72 out of 141 countries in the field of ICT adoption.

After knowing the readiness of the AI environment in Indonesia as above, it is necessary to incorporate capabilities into the control structure of existing government organizations. This is done to cope with other challenges such as ethical issues and the use of trust. Managing this artificial intelligence is more complex than procuring the latest hardware and software. Managing AI operationally means focusing more on answering questions like "How to make AI do what you want it to do?" and "What do we want AI to do for us?". Citing past studies on AI and the importance of regulating ecosystems, there is much debate

in managing AI due to the gap between the way organizations deal with operational risk by focusing on low probability, high risk issues, and the way AI users think about these issues by focusing on high probability issues. and low risk (CSIS 2018) . If it is associated with the concept of bureaucratic reform in Indonesia, the use of AI in government must be taken into account properly. Stakeholders need to coordinate various approaches to address the operational spectrum in its implementation. The analysis that we used for this study using indikator AI of CSIS operational management focusing on three things: Management Level, Management Level Strategic AI, and management of AI at Operational and Tactical Levels.

1. Management Level

To be able to manage AI, it is necessary to have systematic management at the strategic, operational and tactical levels. The mapping can be seen in Figure 11 below. The availability of AI will play an important role in policy information moving from the tactical level to the strategic level through the operational level. While the policy mandate informs the changes that occur as AI practices move from the strategic level to the tactical level through the operational level.



**Figure 11. Focus Areas in Managing AI**  
 (Sumber: CSIS 2018)

To be able to achieve bureaucratic acceleration through AI, it is necessary to mobilize national research and innovation resources to the fullest. Based on Strana KA, the strategy was built using a *Quadruple-helix* approach between government, industry, academia, and the community which was later referred to as the Artificial Intelligence Industry Research and Innovation Collaboration (KORI-KA). The roles of each actor are mapped as follows.



**Figure 12 KORI-KA. Quad ruple- helix Approach**  
 (Sumber: Badan Pengkajian dan Penerapan Teknologi 2020)

KORI-KA itself has 3 functions at once, namely the function of direction and the function of implementing concurrently with the *Program Management Office*. Based on the Agency for the Assessment and Application of Technology (2020) these functions are mapped as follows.

**Table 6. KORI-KA Functions**

Briefing Function	Execution Function and PMO
Determination of priority research and industry innovation initiatives	Planning
Determination of research and innovation centers of excellence per industry sector	Preparation of implementation program
Coordination of research and innovation policy support for the Artificial Intelligence industry	Budgeting and financing
Supervision of the implementation of industrial research and innovation initiatives	Alignment and Consolidation Continuous evaluation, control and improvement

(Sumber: Badan Pengkajian dan Penerapan Teknologi 2020)

The *quadruple-helix* approach in KORI-KA is considered very important to ensure that all research and innovation programs that support AI and bureaucratic reform can run well and follow the existing roadmap so that they can have a broad impact on the community in order to improve public services.

2. AI Management at the Strategic Level

At the strategic level, the AI management is done by the Policy Approach, Responsibility, and Accountability. The use of AI requires a regulatory approach to establishing standards and guidelines. Free at the strategic level plays an important role in the implementation of risk-related AI penyalahunaan privacy and information sensitive. AI management at this strategic level does not have to start from scratch but can use existing software, security information, and policies in network risk management as a standard for

starting an AI system that is integrated with guaranteed national security. In Indonesia, in terms of policy, it has been facilitated with several supporting regulations. This regulation ensures the existence of a legal institution with well-mapped coordination. The existing laws that support the AI National Strategy in Indonesia are as follows:

- a. Law Number 19 of 2016 concerning Amendments to Law of the Republic of Indonesia Number 11 of 2008 concerning Information and Electronic Transactions (ITE).
- b. Government Regulation Number 82 of 2012 concerning the Implementation of Electronic Systems and Transactions (PP PSTE).
- c. Presidential Regulation Number 95 of 2018 concerning Electronic-Based Government Systems.
- d. Presidential Regulation Number 133 of 2017 concerning Amendments to Presidential Regulation Number 53 of 2017 concerning the National Cyber and Crypto Agency (BSSN), contains BSSN's direct responsibility to the President and is included in the National SPBE Coordination Team with other Ministries/Institutions/Agencies.

In addition to strengthening internal institutions, Indonesia also carries out cooperative relations at the international level which are listed in the United Nations Institute for Disarmament Research (2020) , namely:

- a. Represented at the Group of Governmental Experts on Developments in the Field of Information and Telecommunications in the Context of International Security pada periode 2012/2013, 2016/2017, dan 2019/2021.
- b. Trilateral Meeting on Security, Indonesia-Malaysia- Philippines in 2017.
- c. Australia-Indonesia Cyber Policy Dialogue (First) in 201.
- d. Indonesia-Russia Cyber Bilateral Dialogue in 2017.
- e. Memorandum of Understanding, India-Indonesia in 2017.
- f. Cybersecurity Alliance for Mutual Progress - CAMP Initiative, as a member in 2016.

### 3. AI Management at the Operational and Tactical Level

If at the strategic level set of conditions, needs, and priorities of the operational level and the tactical will grama h focus on data security and the security of cyber namely about how the AI will be able to build an environment of data-based firm that is able to answer the challenges of a more realistic and operational. This can be done by building a cloud computing -based architecture , reducing data bottlenecks, providing realistic and accurate training data, and building cross-functional teams that combine subject matter expertise with data science expertise.

Security wheel Siber to the data used in AI is something that is very important because the data used are not aggregate data, but micro data that has been anonymized. Cybersecurity will include infrastructure security, and applications that must always be considered. Protection of Personal Data as stated in the regulation of the Minister of Communication and Information Number 20 of 2016 concerning Protection of Personal Data in Electronic Systems is a precondition for storing, processing, and analyzing data used in AI training. Personal data is stored using the Personal Data Protection method,

namely by using anonymous data or data synthesis so that the data can still be used for research and development but cannot be used to identify the owner of personal data. The Government Regulation stipulates that every electronic system operator must register its electronic system with the Ministry of Communication and Information. Derivative regulations regarding the obligations and requirements for electronic system registration have been made, namely the Minister of Communication and Information Regulation Number 36 of 2014 concerning Procedures for Registration of Electronic System Operators, the Minister of Communication and Information Technology Number 10 of 2015 concerning Procedures for Registration of Electronic Systems of State Organizing Agencies and the Minister of Communication and Information Technology Regulation No. 7 of 2019 concerning Integrated Business Licensing Services in the Information and Communication Sector. Electronic system registration is done online through the Online Single Submission (OSS) and is an obligation.

## **E. CONCLUSION**

The government has used AI through SPBE to realize clean, effective, transparent, and accountable governance as well as quality and trusted public services since 2018. This has brought changes to the online-based public service sector in Indonesia. Indonesia's EGDI ranking in 2018 based on the UN's assessment of e-government services was ranked 107, while in 2020 it rose 19 places to 88th position. However, based on the Government Effectiveness Index (GEI) assessment in 2019, Indonesia did not experience an increase from the previous year. Indonesia still needs the incorporation of capabilities into the control structure of existing government organizations.

Indonesia needs to manage artificial intelligence more complex than procuring the latest *hardware* and *software*, and manage AI operationally that is more focused on knowing what we want AI to do for us, and how to make AI do what we want. Stakeholders need to coordinate various approaches to address the operational spectrum in its implementation. The quadruple-helix approach in KORI-KA is considered very important to ensure that all research and innovation programs that support AI and bureaucratic reform can run well and follow the existing roadmap so that they can have a broad impact on the community in order to improve public services. At the strategic level, AI management is carried out with a policy, accountability and accountability approach. At the operational level, cybersecurity of data which includes infrastructure and application security is stored using personal data protection methods using *anonymous* data or data synthesis so that data can still be used for research and development but cannot be used to identify the owner of personal data.

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