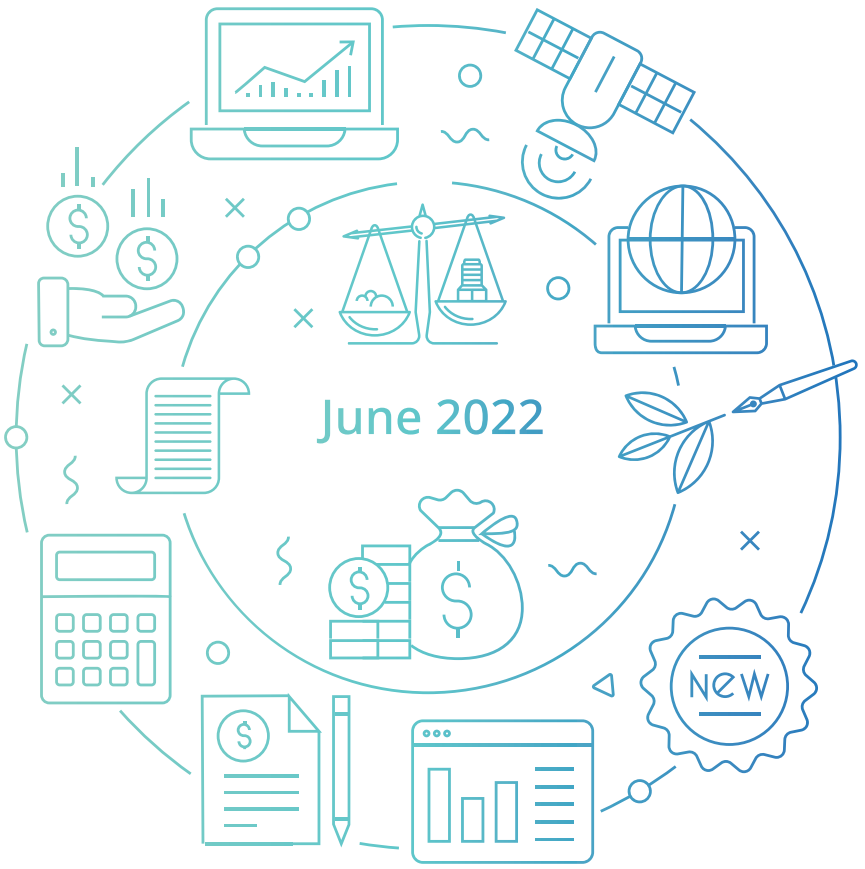
PEMNA
Public Expenditure Management Network in Asia

2021 PEMNA Budget CoP Advisory Services Program

Improvement for Indonesia's ICT Budgeting Process



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DISCLAIMER

This advisory report was prepared by the Team of Advisors (authors) as an output for the 2021 PEMNA Budget CoP Advisory Services Program. The contents including recommendations and opinions in this report are advisory in nature and have been given to the best of the authors' abilities and knowledge from information and data collected during the project period. The views in this report do not necessarily state or reflect the views of the Public Expenditure Management Network in Asia (PEMNA).

Executive Summary

1. Request Background

To survive and prosper in the global trend of the 4th Industrial Revolution or Digital Transformation, the Indonesian government has a national strategy and an aligned policy framework on Information, Communications and Technology (ICT). In order to bring about their strategic goals, the government also needs to have a systematic ICT budgeting process aligned with their ICT strategy. Budgeting starts with a systematic classification of programs, projects and cost estimations, which should be based on a commonly shared guideline. Indonesia's government has no guidelines for identifying and classifying ICT projects, hence no guidelines for ICT project costing. The lack of classification of ICT projects creates problems in allocating, monitoring, and managing ICT-related budgets, which in turn causes issues in evaluating the performance of ICT projects. The main objective of this project was to help improve budgeting for ICT expenditures in Indonesia by providing recommendations for efficient ICT spending. Gathering data was necessary to understand the current situation in Indonesia, and the advisory team introduced Korea's methods on how the performance management system, guidelines for each step of the budgetary process including software project cost calculation, financial information system etc. are necessary for effective ICT budgeting. This report focuses on recommendations to improve ICT budgeting for the Indonesian government.

2. Current Status and Issues

The ICT has changed the way we live and work. Summarized as the 4th Industrial Revolution and Digital Transformation, these global trends have accelerated, widened, and deepened with the COVID-19 pandemic across the world. ICT has become an essential element for survival for individual citizens and businesses, as well as for efficient government operations. Social digitalization and e-government require effective coordination and cooperation between sectors and among central and local governments.

Fast-moving technologies and global trends give us opportunities and challenges. Citizens and businesses should play a role in taking advantage of emerging opportunities in various areas of life, such as education, business creation, and business operation. Government should provide

relevant infrastructure, legal and regulatory systems, human resource development, cyber security, and digitalized government operations. Indonesia needs to improve their budgeting process to optimize the allocation and management of ICT projects and budgets under fiscal constraints. ICT budgeting has become an issue of national budgeting, with ICT budgets increasing in size and scope. An ICT budget is managed from a planning stage to a monitoring stage and through an evaluation stage in some countries.

Indonesia's government does not have a clear system for identifying and classifying the ICT budget. Commonly shared criteria and guidelines for classifying ICT budget need to be unified in the general budgeting system. Common ICT budget guidelines could help improve the management process over the cycle of planning, executing, monitoring, managing, and evaluating performance. Indonesia also needs systemic ICT integration and coordination between ministries, sectors, and among central and local government to avoid redundant and overlapping spending.

Some governments provide common guidelines and templates for their ministries and agencies, so that they can do their planning and budgeting in compliance with the provided guidelines and templates. These guidelines are applied through the whole cycle of an ICT project. The United States federal government requires agencies to establish a comprehensive approach to information technology (IT) planning, IT budgeting, and IT investment management processes, based on common guidelines. Information on ICT projects and budgets is made public via the IT dashboard. The United Kingdom and Australia review certain projects, including ICT projects, based on a gateway approach that puts project plans to experts to get a professional opinion. The gateway approach puts more emphasis on an ex-ante assessment prior to decision making.

Budgeting guidelines in Korea involve major sectors, which includes a separate ICT sector. The Ministry of Economy and Finance (MoEF) has ultimate budgetary authority in government. The Ministry of Science and ICT (MSIT), as a lead ministry of ICT policy, plays a key role in reviewing and giving its opinion to the MoEF on ICT plans submitted by the ministries. At the end of the review, all project information is registered on the Government Enterprise Architecture Portal (GEAP). This information is shared by the ministries and agencies in order to check and avoid redundant overlapping when planning ICT projects. Review by the ICT lead ministry and GEAP play a similar role as the gateway of the UK and Australia. Throughout the whole cycle and process, the dedicated expert organizations continuously cooperate with the MoEF and the MSIT.

3. Recommendations for Improvement

In order to achieve the digitalization of public service and the digital transformation, Indonesia needs to improve the ICT budgeting system to support their national strategy and system reform. Recommendations for key improvement areas in the ICT budgeting can be summarized as follows.

1) Governance for ICT policy and budget: For effective coordination and management of ICT investments, the lead ICT ministry or committee for ICT should be clearly designated to make decisions and execute policy, based on legal and political support. The lead ministry or the committee should have the legal authority and political power strong enough to coordinate and manage the ICT investments over the entire cycle. Dedicated expert agencies should cooperate with the lead ministry in their respective areas, such as new technology and security. There needs to be a dedicated expert organization for coordination and harmonization between central and local government in areas of technology and local issues.

2) Categorization of national ICT project: The government organizations need to manage strategic ICT programs and projects with expertise and authority regarding governmental sectors and reforms. We suggest that the Indonesian government consider clearly classifying the ICT program and the related ICT budget into a sectoral ministry or a committee for ICT through a government reform. For a balanced decision on the ICT budget, the systematic categorization of national ICT projects will help the government prioritize proposed projects and avoid redundancy when planning ICT projects.

3) Guidelines for ICT budgeting: To formulate and review ICT projects, all the concerned parties should use common standard guidelines. We recommend that the Indonesian government provide guidelines for ICT budgeting as well as criteria for classification for the ICT budget. To classify and categorize the ICT budget, the Indonesian government can consider having the Ministry of Finance (MoF) draw up guidelines for ICT budgeting to provide to other ministries and agencies. The guidelines must cover the scope of ICT products, services, and projects.

4) Specific guidelines and formulas for ICT project costing: These must be clearly provided and shared by all the ministries and agencies. These ministries and agencies should formulate their ICT plans and review and manage their projects based on the guidelines and formulas. All cost calculation for software development must be made based on the common guidelines and formulas by the project type. All ministries and agencies should be mandated to comply with the guidelines and costing formulas. Therefore, budget proposals, review, adjustment, approval decisions, accountability are based on the common guidelines and formulas. The Korean guidelines for ICT budgeting and costing can serve as an example when the Indonesian government prepares its guidelines.

5) ICT project management system and ICT budget information system: The project management system (PMS) and the ICT budget information system can improve the budgetary process of large ICT projects. The data on ICT projects will assist line ministries manage their projects effectively from planning to implementation. The data also can help ministries select projects, avoid duplications and estimate the costs. This project management and budget information system can increase the efficiency and effectiveness of ICT budgeting when used together with an Enterprise Architecture Management System (EAMS) and a Financial Management Information System (FMIS). If the Indonesian government decides to operate a national project information system, an ICT program management system could

be incorporated into the system. To upgrade or enhance their SPAN financial management system, the Indonesian government can refer to the d-Brain, which is the FMIS of the Korean government.

6) Preliminary Feasibility Study (PFS): Any project, which requires significant investment or is strategically critical calls for a thorough examination prior to the investment decision. In addition to general guidelines for PFS, ICT sector-specific guidelines should be provided. The PFS examines the efficiency and appropriateness of a project by reviewing its economic and policy feasibility, as well as investment priorities, optimal investment timing and other factors. A lead ministry for ICT policy should preview the ICT project and give its expert opinion to guide the MoF in making a good decision for the main PFS.

Table of Contents

2021 PEMNA Budget CoP Advisory Services Program: Improvement for Indonesia's ICT Budgeting Process

Introduction

I

Introduction

Governments must have a comprehensive set of processes and procedures for budgeting. Budgeting in any organization has many dimensions—political, economic and financial. A budgeting system is meant to encourage the development of organizational goals, and the strategies and plans to achieve these goals, as well as the effective allocation of resources consistent with the goals, policies, and plans. There should also be a process dealing with performance management. Budgeting should have a long-term perspective, more than annual balancing revenues and expenditures. This long-term perspective is particularly critical in ICT budgeting where techno-socio-economic elements change and evolve all the time. Effective ICT budgeting has an evolving nature, and hence should serve as an agile framework and architecture to reflect constant changes and evolutions.

The budget processes enable governments to achieve policy goals through budget allocations to specific programs and services. For effective budget allocation, a systematic budget process should be well-established, well-integrated, and well-shared from planning all the way to implementation to performance evaluation.

This report examines and assesses ICT budgeting in the Indonesian government and then makes recommendations to the Ministry of Finance. Recommendations will be made with reference to practical cases of other countries, mainly Korea. Before going over the budgeting issues, this chapter begins with an introduction of the trends and implications of the 4th Industrial Revolution and Digital Transformation.

1. The 4th Industrial Revolution and Digital Transformation

It is certain that technological change will fundamentally change the way we live, work, and relate to one another.[1] In a hyper-connected society, the creation of new value is enabled by utilizing extensive data generated from online and offline connections, as well as the interaction among everything, including people, things and spaces. Although the concept of a service that combines

1 World Economic Forum, 2015

online and offline capabilities is not new, this model is gaining momentum due to the expansion of digital devices and the COVID-19 pandemic.

The COVID-19 pandemic has exposed the vulnerability in our society to unexpected events. Sudden change can occur anytime and anywhere. Events, such as the disruption of global supply chain, diplomatic conflict, and climate changes, pose potential threats to any region and any country.

There is no denying that ICT is an indispensable element of economic activity and the lives of citizens around the world. As an essential element of the digital economy, an ICT industry has become a crucial sector of most of the advanced economies. As digitalization accelerates, widens, and deepens, most industries will find it hard to survive without the use of ICT. ICT acts as a driver of economic growth in most of the countries and also, as an enabler for economic and social transformation. The deep change driven by new technologies—mainly by ICT—is often called "The 4th industrial Revolution" (IR).

Just as the 4th Industrial Revolution, driven by the new technology, is remaking industries and economies, a massive and deep change of a society in general—a digital transformation—is already underway, although it is not proceeding at the same pace everywhere. Digital Transformation (DX) is the use of new, fast-changing digital technology to solve problems, often utilizing cloud computing, which reduces reliance on user-owned hardware, but increases reliance on subscription-based cloud services. Some of these digital solutions enhance the capabilities of traditional software, while others are entirely cloud-based.[2] Digital transformation has been used mainly in the industrial context to refer to the capability to solve social problems by utilizing existing technology or new technology. The concept of Digital Government was derived from the process of governments' adapting to digital innovation. Today, an ecosystem of interdependent digital technologies underpins the digital transformation and will evolve to drive future economic and societal changes (OECD, 2019).

As a result of the COVID-19 pandemic, the 4th Industrial Revolution and DX will accelerate and expand going forward. The 4th industrial revolution and the digital transformation will lead to reforms and transformations at every corner of our society. Both revolution and transformation, however, will not proceed smoothly without careful and intensive effort. These trends can be both opportunities and challenges at the same time for all of us. Indonesia is no exception.

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2 International Telecommunication Union & National Information Society Agency (2020). *Digital Transformation and Digital Government.*
Digital Transformation. (2022). In *Wikipedia.* https://en.wikipedia.org/wiki/Digital_transformation
OECD (2019). *Going Digital: Shaping Policies, Improving Lives.* OECD Publishing, Paris. https://doi.org/10.1787/9789264312012-en.

2. Opportunities and Challenges

Digitalization, with the increasing pervasiveness of ICT, will create both opportunities and challenges to countries, businesses, and citizens. Over the course of the deployment of ICT, many conflicts will emerge between the existing laws and regulations and the emerging reality, between the traditional business models and new digital enterprises. Governments must deal with these emerging conflicts and with any legal and institutional incompatibilities arising from new technologies and business models. Telemedicine, online education and many contactless services are key examples of innovations created by new technologies that experienced massive growth during the COVID-19 pandemic. Governments, businesses and citizens must get ready to seize the digital opportunities and cope with challenges ahead.

In the era of the 4th Industrial Revolution and Digital Transformation, the gap between those who are digital-ready and others will accelerate globally and domestically. The digital divide should be dealt with as an issue of an inclusive society, especially since the digital divide is closely related to and caused by the income and education divide.[3]

Without appropriate infrastructure and institutional setting, a national economy cannot move forward in a fast-moving world, and instead becomes highly likely to result in social and economic stagnation. Governments and the public sectors, at the least, should keep pace with the changes, and preferably should lead the way to provide favorable conditions for change. To this end, every citizen, government and business must continuously innovate to adapt to a fast-changing environment.

3. Background Rationale and Scope of the Advisory Services Program

The underlying assumption of neoclassical growth theory is a diminishing return to capital in production. The economic growth in this neoclassical model is determined by exogenous variables. Endogenous growth theory challenges the neoclassical growth theory with an explicit mechanism, through which the rate of technological progress, and hence the long-run rate of economic growth, can be influenced by economic factors. Summing up, the economic growth can be determined by intentional decision and activities that are endogenous to an economic system.

In the digital age characterized by the 4th IR and DX, governments need to transform themselves towards digital government—a digital transformation of government. Indonesia is the world's largest island country, which consists of over 17,000 islands. And it is the fourth most populous

3 Park S. R., Choi D. Y., Hong P. (2015). Club convergence and factors of digital divide across countries. *Technological Forecasting & Social Change 96,* 92-100. https://doi.org/10.1016/j.techfore.2015.02.011

country in the world with about 27 million people. Indonesia has rich natural, cultural, and human resources to mobilize and utilize for the future. In order to leverage the potential from its rich resources, we recommend that Indonesia create a national strategy and put into place an aligned policy framework for infrastructures and resources, especially for ICT-related ones. In particular, in order to build cooperation between the central government and local governments to provide public services, it is necessary to expand the communication network.

Countries should align their national strategy with a systematic budgeting process that reinforces their goals. This process begins with a systematic classification of national resources, so that key resources and budgets will be allocated in alignment with the national strategy. A national strategy and budgeting for ICT in Indonesia is no exception.

The main focus of this report is on examining the ICT budgeting in the Indonesian government and recommending improvements. Specifically, recommendations will be focused on how to improve the ICT budgeting process. In order to make recommendations that are relevant and realistic for the Indonesian government, the best practices in ICT budgeting of other countries will be examined, mainly those used by the Republic of Korea (ROK).

The specific areas of recommendations will be as the following:

(1) Governance for ICT Policy and ICT Budgeting,
(2) Categorization of National ICT Planning: Internal and Sectoral,
(3) Guidelines for ICT Budgeting (Criteria for Classification of ICT Budget),
(4) ICT Project Management Systems,
(5) ICT Budget Information Systems,
(6) Preliminary Feasibility Study (PFS).

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II

ICT Budgeting in Indonesia

II

ICT Budgeting in Indonesia

1. ICT Budget Management System

1.1. Budget Preparation (Formulation and Proposals)

The ICT budget formulation shares the same process that Indonesia currently is using with its general budget—a unified and comprehensive budget.

These are four milestones in the process:

- Evaluasi Kinerja (Performance Review)
  There are two reviews, which are conducted by the Ministry of National Development Planning (BAPPENAS—Evaluasi Kinerja Pembangunan) and the Ministry of Finance (Evaluasi Kinerja Anggaran). Both ministries work together to define the theme and direction of up-coming development. The theme will be used to guide the work plan (RKP) and the fiscal plan (KEM-PPKF). The theme, equipped with fiscal capacity, is sent to the President for approval. Once the President approves it, the MoF will estimate the fiscal ceiling range and specified resource envelope to be submitted to BAPPENAS for synchronization with ministries' baseline.

- Pagu Indikatif (Indicative Ceiling)
  The results of the synchronization by the BAPPENAS and the MoF will be established as the indicative ceiling (Pagu Indikatif) in a joint circular (Surat Edaran Bersama). The budget circular provides guidelines on the preparation of the ministry-specific work plans (Renja-KL) and includes the indicative budget ceilings for each ministry, broken down by programs and expenditure types.

- Pagu Anggaran (Budget Ceiling)
  Simultaneously with the Pagu Indicative process, line ministries prepare their baseline to be adjusted with the indicative ceiling. Each line ministry then finalizes its Renja-KL on the basis of the indicative budget ceilings and submit them to BAPPENAS and the MoF. Each line ministry meets with BAPPENAS and the Ministry of Finance in a Trilateral Meeting to adjust the budget. The adjustment is made based on inputs from preliminary discussions with Parliament and from cabinet meetings. Once the adjustment is finalized, the budget ceiling is submitted to the President as Pagu Anggaran. The Pagu Anggaran is already equipped with RKAKL (the detailed

proposed budget).

- Alokasi Anggaran (Budget Allocation)
  After the President approves the proposed budget, the range budget of program levels is submitted to Parliament. The detailed budget is not submitted. Parliament can adjust the budget as long as the whole range remains the same. Once Parliament approves, it will be established as Alokasi Anggaran (budget allocation). Since the level approved by Parliament is a program level range, the line ministries need to make adjustment to their RKAKL based on the Alokasi Anggaran. After that is done, the budget will be issued as the Presidential Regulation of Budget Implementation (Perpres Pelaksanaan Anggaran).

1.2. Budget Authorization (Approval)

The programs are divided into thousands of activities. The breakdown into smaller division is based on following structure:

- Programs level (hundreds)
- Activities level (thousands)
- Classification of Outputs (Klasifikasi Rincian Output: KRO) level (tens of thousands)
- Outputs (Rincian Output: RO) level (hundreds of thousands)

Most of the ICT spending is not located at the programs level, but at the outputs/RO level; however, ICT is a supportive element for the programs and activities. The Ministry of Communication and Informatics defines whether or not a particular output is an ICT-related output. The **first problem** with this process occurs when a line-ministry does not ask for clearance from the Ministry of Communication and Infomatics because the ministry thinks that the output is not related to ICT.

Meetings to scrutinize hundreds of thousands of outputs are conducted in a very limited amount of time. This creates the **second problem.** The approval often proceeds poorly because they have to meet the deadline.

The Ministry of Finance approves ICT-related proposals in terms of budget. On the other hand, the Ministry of Communication and Informatics gives causal approval of ICT-related proposals. Parliament only approves the budget at the general program level, but does not deal with specific ICT proposals.

Following agreement with Parliament, the Ministry of Finance issues a revised budget circular that includes a preliminary budget ceiling for ministries' programs. The overall budget ceiling rarely changes, but its composition does. The composition does not particularly state ICT expenditures, since ICT classification is not well defined in the line ministries budget structure. This is the **third problem**.

1.3. Budget Execution (Spending-Monitoring-Reporting)

Since there is no clear classification regarding an ICT-related budget, monitoring and reporting is difficult. Currently, the MoF needs to scrutinize the output detail (RO) to discover if a budget item is ICT-related or not.

1.4. Budget Accountability (Reporting, Audit, and Evaluation)

Related to these problems, accountability with the ICT budget is not easy to report, audit and evaluate because it is not well classified in the budget structure. This unclear classification of the ICT budget systematically affects the other processes of the budgeting cycle.

2. Structure of Cost Estimation for ICT projects

2.1. Breaking Down Costs for ICT Projects, the ICT System, and ICT Activities

There are no common guidelines on how to break down costs for system development, ICT operation and maintenance. Each ministry adjusts the base using its own approach, because of the lack of common guidelines. Recommendations for common guidelines are provided in chapter 8.3.3 and Appendix A.

2.2. Estimating Costs (Common Guidelines or Formulas)

Similarly, there are no common guidelines for estimating costs in the ICT-related budget. Each ministry does the cost estimates based on its own understanding.

3. Budget Review and Closing in Government with Parliament

3.1. Relationship Between Central Government and Local Government

The Ministry of Home Affairs, representing the central government, provides annual guidelines to all local governments for their budget preparation. These are mainly administrative and procedural provisions. Sub-national governments also submit their financial report to the Ministry of Finance, as an input in constructing the consolidated financial report. However, in terms of performance reporting, sub-national governments report to the Ministry of Home Affairs. While this ministry is closely connected to the Ministry of Finance, there is limited coordination between the Ministry of Finance and Ministry of Home Affairs in setting financial management regulations for local governments. The Ministry of Home Affairs also is the designated ministry that is tasked with the monitoring and evaluation of the special allocation fund.

3.2. Dependency/Independence and Cooperation/Coordination

Parliament interacts extensively with the government throughout the budget process:

- Approval of overall fiscal policy orientation and preliminary budget policy (KEM PPKF).
- Formal discussions between ministries, agencies and their respective sectoral commissions on the contents of budget proposals.
- Approval of the government's formal budget proposal.

- Approval of aggregate levels (program levels) of the budget.

4. Budget Spending Monitoring and Management System

4.1 Monitoring to Ensure the Budget is Spent Effectively

The MoF uses a system named SPAN (State Treasury and Budget System) to provide fast, accurate, detailed, and integrated information services regarding budget spending. The Directorate General of Treasury has developed a web-based application called the Online Monitoring SPAN (OM-SPAN Application).

4.2. Real-time Monitoring System

The functions of the OM-SPAN Application, based on each available module include:

1. Budgeting Module
2. Commitment Module
3. Payment Module
4. Admission Module
5. Bank Module

5. Performance Management System (Monitoring and Evaluation)

5.1. Monitoring Budget Performance

State ministries and agencies conduct the monitoring and evaluation of budget performance independently. Their results are then entered into a system that runs as a service by the MoF Directorate General of Budget. The system is named SMART (Sistem Monitoring dan evAluasi kineRja Terpadu).

5.2. Performance Evaluation System / Performance Management System

5.2.1. Performance Management System (General Budget)

Using the SMART system, line ministries are required to input their data on a monthly basis, so that the MoF can do following assessments on their budget performance:

- Preparation
- Data collection
- Measurement and Assessment
- Analysis
- Recommendations and Reporting

5.2.2. Performance Management System (ICT Budget)

Performance management system for the ICT budget is no different than the system used for the general budget.

6. Description of Government Accounting System

6.1. Brief History

The Indonesian government's accounting system uses a standardized code called a Standard Chart of Accounts. It is a list of codifications and classifications related to financial transactions, which are compiled and used systematically as a guide in planning, budgeting, budget execution, and government financial reporting.

6.2. Simple Structure of Government Accounting System

The structure of the Chart of Accounts is embedded in the budget structure, located in the lowest level as follows:

1. Programs
2. Activities
3. Output Classification (KRO)
4. Output (RO)
5. Components
6. Sub-components
7. Account (based on Chart of Accounts)

The software that uses this data is an integrated system owned by several directorates in the MoF.

6.3. Eligibility of Access

The government accounting system is accessible only by the MoF and each of the line ministries, which own the data. Parliament is not allowed to see it because account detail is considered part of the executive's role.

6.4. How ICT Budget is Managed

The ICT budget is handled the same way as the general budget.

7. Description of Government Procurement System

7.1. Brief History

The implementation of e-procurement in Indonesia is assigned to the Government Goods/ Services Procurement Policy Agency (Lembaga Kebijakan dan Pengadaan Barang/Jasa Pemerintah: LKPP, http://www.lkpp.go.id/).

7.2. Eligibility

All government agencies that already have established an electronic procurement services (Layanan Pengadaan Secara Elektronik: LPSE) office in their organization structure are eligible to use the system. All vendors who have passed the administrative requirement also are eligible.

7.3. ICT-Related Procurement Item Lists

The ICT-related procurement item lists are based on the Regulation of the Government Goods/ Services Procurement Policy Agency (LKPP) Number 11 of 2018 concerning Electronic Catalogs (e-Katalog).

8. Major Problems and Areas for Improvement

This chapter contains descriptions of the major problems in the ICT-budgeting process and recommendations for improvements. Of special note is sub-chapter 8.3 (Framework, Criteria and Guidelines), on what has been recognized as the root cause.

8.1 Legal and Regulatory

The major problem in the regulatory area is that there is no national ICT master plan for external service. The need for this regulation is critical because it will be used for guidance on high-profile

budget proposals. However, the draft of this national architecture is in an ongoing process.

8.2 Governance and Institutional

During the budget formulation process, there are intense communication and coordination activities. In terms of the ICT budget, there needs to be improved coordination in the acquisition of endorsement letters (ICT-classification clearance) between the line ministries and the Ministry of Communication and Informatics, which has the causal authority. The Ministry of Communication and Informatics would benefit from advice from expert organizations to help with the assessments for their clearance review.

8.3 Need for Framework, Criteria, Guidelines for ICT-related Budget and Projects

The recent Advisory Services workshop revealed that the most significant problem in the ICT budget is that there is no ICT classification, which means no guidelines and consequently, no framework. Therefore, ICT classification is the root cause of ICT budgetary problems. In order to build the classification, we need to analyze the budget structure to locate where the classification tags can be embedded, because the budget is organized across multiple dimensions.

For example, a ministry has a budget for a non-ICT program, but it requires ICT function to support the program. Meanwhile, different ministries have different programs but require the same ICT support. This situation may result in each ministry procuring the identical ICT function. Another potential problem is that a ministry might fund an ICT solution by using a non-ICT budget. For example, a ministry might purchase an ICT function for human resource development, using funds from their non-ICT budget.

The lack of an ICT classification leaves leaders unable to see clearly the value of ICT expenditures and the budget performance trade-offs that are necessary to optimize budget spending. In order to align ICT with finance and business units, a multi-dimensional classification is needed to describe costs, sources, technologies, ICT functions, and services

8.3.1 Framework

The necessary framework consists of a thoughtful **multi-dimensional classification** and a **platform**, which helps users to use classifications throughout the whole process. A platform plays a pivotal role in the success of an ICT-tagged budget implementation. The following are some key considerations for the platform to have.

1. Browse, Search and Approval of ICT Budget
   It should be easy for a user to view the overall structure of the general budget and find out what is included and what is excluded. That is, a user should be able to view a term in the context of its parent-child relationships, synonyms, and its scope definition. In addition to browsing and navigation, the user should be able to make an automated approval of an

ICT-tagged budget among lead ministries.

2. Automate Tagging
   The value of an ICT-tagged-budget comes from the accurate tagging of information. To tag accurately, users need to remember the complete classification and be willing to make additional manual efforts for tagging. And even if they are willing, the results will be not consistent because of the subjective context of terms. The platform should have machine-learning algorithms with an additional layer of human curation to drive the best results.

3. Dashboard
   The ICT-tagged-budget evolves by adding new tags, deleting obsolete ones, merging redundant tags or splitting confusing ones. The platform should be designed for the efficient monitoring of these actions.

4. Reporting
   The software should make it easy to generate reports, which are essential to maintain a healthy ICT- tagged budget.

5. Downloads
   The number of ICT-tagged-budgets increases over time. Also, the relationships between tags become complex. It is, therefore, difficult to have a consistent and complete view of the complete ICT-tagged budget. The platform should have an option to download it.

6. User Support and Assistance
   The platform should allow users to report errors, request changes, and make queries. The user interface of the platform should be such that these options are easily accessible to the users.

8.3.2 Criteria

As has already been mentioned earlier, the budget is multi-dimensional. Therefore, a multi-dimensional classification system is required. It consists of multiple classifications (taxonomy), whereby the top-level node of each represents a different type of criteria, attribute, or context.

Three perspectives are imparted by the four layers: **Finance, ICT** and **Business.** These perspectives would enable meaningful information for decision makers. For example, the Ministry of Finance could see the budget that makes sense to them in financial terms (i.e., those that link to BAS), while the Ministry of Communication and Informatics will see ICT terms when they scrutinize the same budget. This approach enables line ministries and lead ministries to bucket infrastructure, applications, services, and projects into standard categories and enables discussion of these buckets in terms that make sense and matter to all parties.

Thoughtful classifications help users easily navigate to the part of budget that is relevant to ICT. They should allow for accurate and consistent tagging of budget, with terms that are easy

to understand. One of the success factors for any information system is how well its users can comprehend the underlying meaning of a tag in the classification.

Each tag in the classification should represent a single concept (or unit of thought). Therefore, two tags should not have an overlap in their scope definitions. Tags with overlapping meanings cause confusion. Because of this confusion, users may tag similar information inconsistently, and the end users could get confused about which tag to select when looking up the themes related to supported programs. If users get incomplete information or do not get the information that they expect, then they will stop trusting the entire information system.

A complete list of finance, ICT function, ICT service, and business layers of the multi-dimensional classification recommendations can be found in Appendix B.

ICT budget classifications are broad and multi-dimensional, and thus no single document could comprehensively cover the subject. This section explains classifications as a predefined starting point that can be used to model better classifications in the future.

Irrespective of how carefully we develop the initial classifications, they will evolve as the information they describe, users, and their use-cases evolve over time. New terms are introduced by industry analysts; new concepts emerge; and terminology and usage changes. Some terms go out of fashion or become obsolete as marketing spins new words.

The following are some common maintenance tasks that are needed to always keep the classification relevant.

- Addition of new terms (tags)
- Deletion of redundant and obsolete terms
- Splitting terms
- Merging different terms
- Review process

8.3.3 Guidelines

These guidelines are an adaptation from the same guidelines that are used by the United States government's Office of Management and Budget (OMB). The guidelines consist of four layers, but the detail of each layer can be adjusted later in the maintenance process, which was explained earlier.

- **Finance:** The finance layer begins with the BAS (chart of accounts) as the financial source of truth. This provides for a standard set of cost pools: hardware, software, internal labor, external labor, outside services, facilities and power, telecommunications, internal services and others. The MoF will need to change or update the BAS to fit with the classification criteria.

- **ICT Function:** The middle layer includes a standard set of ICT functions and sub-functions, such as servers, storage, voice and data networks, application development, and support. These are common among nearly all ministries and can be viewed as resources or basic building blocks of services.

- **ICT Services:** Also at the ICT view for most firms are ICT services, often delivered in the form of technical services, such as infrastructure services and platform services.

- **Business:** This classification provides a standard, but generic set of solution categories, along with higher-layer business units, business architecture, customers and partners. It is at this layer of the model where we have created industry-specific elements, extending this standard classification, following the same general principles present. This allows for more meaningful reporting and comparisons within the covered industries, without losing the cross-industry comparisons that are possible at the other layers, via common apps, services, and capabilities.

The complete recommended guidelines can be found in Appendix A. It is not immediately intuitive for the users to operate in a multi-dimensional world based on multi-dimensional classifications, where the information is tagged from multiple perspectives.

Therefore, it is important for the MoF to develop a measure of the current situation that it believes will change after the ICT-classified budget implementation. One commonly used measure is the time spent on finding the ICT related budget and tagging it.

8.4 Capacity and Competency Issues

It is difficult for any user (both line ministries and lead ministries) to tag all these dimensions manually when working with budgets. It is tiring to think about information through multiple dimensions, especially when stakeholders have different perspectives. For example, the MoF uses a financial perspective, while BAPPENAS uses a planning perspective, the Ministry of Communication and Infomatics uses an ICT perspective and line ministries use a business perspective.

Therefore, regardless of education and training, users will not be able to tag all the possible dimensions of the classifications. Furthermore, when there are no predefined and logically defined dimensions for the tags, the user experience is frustrating.

Once the initial classifications have been given, the next step is to create exercises mapping the budget with ICT classifications. It will require real data for the tags, so that users can train the machine-learning software to assist with this work. Inviting universities or research institutes to join the training can be a good time to start a collaboration initiative with the expert organizations.

8.5 Central and Local Government Fiscal Balance Relationship

As explained in chapter 3.1 (Relationship between central government and local government), the role of the Ministry of Home Affairs and the Ministry of Finance are involved in the preparation

of the local budget (Anggaran Pendapatan dan Belanja Daerah: APBD). There is not yet optimal coordination between the two ministries in drafting regulations related to regional finance. In addition, the implementation of the APBD still is not in line with the programs or priorities of the central government.

In this regard, law no 1 year 2022 concerning Central and Local Governments Financial Relations (Hubungan Keuangan antara Pemerintah Pusat dan Pemerintah Daerah: HKPD) was established to improve the quality of coordination at the central and local government levels in the preparation of the APBD.

There are four pillars that can be found in the HKPD law: increase local taxing power, decrease the vertical and horizontal fiscal gap, improve spending, and align central and local governments programs. We suggest planning and the spending budget are key areas for improvement. Better spending begins with better planning, followed by improvements in spending, which can be achieved by having better control. This section elaborates our better planning and spending recommendations.

8.5.1 Strengthening local government budget planning

The HKPD law strongly regulates efforts regarding national fiscal synergy, with the aim of making central and regional actions more harmonious, so that national development targets and high economic growth can be more easily achieved, in an efficient and effective manner.

- Alignment between local and central programs:
  In order to align central and local government programs, there should be an **integrated framework** for planning. All parties (the MoF, the MoHA and the BAPPEDA—the local government planning agency) with all their local agencies—need the means to work efficiently with both the local government budget proposal and the central government work plan. The recommended framework is an e-Government platform with cloud technology to gain centralized data. For example, the BAPPENAS uses KRISNA to manage the special allocation fund (DAK) for local government budgets. The KRISNA platform is used by the MoF, the BAPPENAS and all local governments. The MoF needs to run a similar service together with the MoHA to manage the general allocation fund (DAU).

- Budget proposal improvement:
  Implementing a common platform alone is not sufficient to improve budget proposals because it requires a **standard of data (chart of accounts, programs) and procedure** to make the process more efficient. The standard will need guidelines to use it. In terms of ICT, the same classifications that we proposed in chapter 8.3.3 should be used to maintain the single framework.

8.5.2 Strengthening local government budget spending

The DAU and the DAK aim to provide equality of public services in each region, while the revenue

sharing fund (DBH) aims to reduce inequality between the central and regional governments.

- Mandatory spending, such as education and health:
  Local governments have a minimum-requirement budget for their mandatory spending. The DAU is given to meet this need, if the local government has insufficient funds from locally-generated revenue (PAD) combined with their share of the DBH. Often local government use the DAU fund for non-mandatory spending. This practice should be monitored to enforce mandatory spending. If the DAU is managed with the **same standard, guideline,** and **common platform,** then it will make it easier to perform spending control. Our recommendation is to use the same framework described in chapter 8.3.1 to strengthen the control.

- Human resources improvement:
  Training and certification plays an important role in human resources improvement. Learn from the success story of way the Government Goods and Service Procurement Policy Agency (LKPP) conducts its training for its e-Procurement service users. It is worth to considering doing similar training to improve human resources. The LKPP training and certification is conducted on-site in the LKPP's location regularly, not seasonally. The MoF could do training online on a regular basis. An online training curriculum could utilize the integrated framework that we recommend in chapter 8.3.1. Only certified users would be eligible to use the system.

All these recommendations will need further research to have a model or prototype of how it works. Our suggestion is to work with a research agency to develop the model.

Key issues and areas of improvement in ICT budgeting can be summarized as follows: effective governance for ICT policy and budget, the systematic categorization of national ICT projects, guidelines and a manual for ICT budgeting and costing, an ICT project management system, an ICT budget information system, and preliminary feasibility studies of key ICT projects. Specific recommendations over these areas will be made in Chapter IV based on the case of the Korean government.

2021 PEMNA Budget CoP Advisory Services Program: Improvement for Indonesia's ICT Budgeting Process

III

Case Studies: UK, US, Australia, and Korea

III

Case Studies: UK, US, Australia, and Korea

Each country has its own political system and socio-economic circumstances, most of which have been shaped over a unique historical and cultural background. Each government also has a national ICT strategy and budget allocation process, a monitoring and evaluation process, and applied systems, including performance measurement in the ICT area. In this section, we will go over outlines of the budgeting process of four countries in the context of ICT policy, through the life cycle of ICT budgeting, from planning through evaluation. Given that legal and political structures are hard to change in reality, this section does not review those structures. It concentrates on practically implementable areas. This section, in particular, sheds more light on the level of processes and managerial discretion in ICT budgeting.

Key implications can be summarized as follows: 1) In the gateway approach in UK, much of the focus is on the preview process of an ICT project to avoid risk and sunk costs. 2) Monitoring systems are in place like the IT dashboard in the United States. 3) A ministry of finance cooperates with a lead ministry of ICT and dedicated expert organizations. 4) Guidelines, templates, and cost-calculating formulas for ICT projects are shared from the planning stage.

It is commonly found that vertical and horizontal communication and cooperation among ministries play a critical role in helping the efficient allocation of a budget. Effective cooperation and coordination should be made between a government and a parliament, a planning ministry and a finance ministry, among ministries, and among sub-governments. Organizational structure, budgeting process, and managerial flexibility should also be in place so that all the players agree on and share strategic goals and priorities.

1. UK, US, and Australia

The Gateway Review process is a project assurance methodology, developed in the UK, to improve the delivery of major projects.[4] It involves short, sharp and confidential reviews, conducted by reviewers, who are not associated with the project, at six key stages of the project life cycle, also known as Gates. A Gateway Review is a checkpoint that is reached at the end of each phase of

4 GOV.UK. (2022, January). https://www.gov.uk/government/publications/ogc-gateway-review-0-strategic-assessment-guidance-and-templates

the planning life cycle. The information shared at a Gateway Review provides assurance that the business case is viable or will remain viable before progressing to the next stage. The UK puts more emphasis on an ex-ante assessment of the project to mitigate the risks involved, and hence to prioritize competing alternatives. Over the course of passing through the gateway, solid business planning and result-oriented projects are likely to be selected and funded. This system is very effective as long as the experienced experts and professionals deeply review and analyze the projects over the course of the gateway.

OMB circulars and bulletins in the United States are major tools used by the Executive Office of the President to exercise managerial and policy direction over federal agencies. The circulars and bulletins generally promote government effectiveness by providing uniform guidance to agencies. Circular No. A–130, requires agencies to establish a comprehensive approach to the acquisition and management of information resources. That approach should include effective IT planning, IT budgeting, and IT investment management processes.[5] Agencies must submit information generated by those processes to the OMB as part of their budget development. That information will be made public via the IT dashboard, with exceptions made for sensitive procurement information and data related to national security systems. The IT dashboard is a website enabling federal agencies, industry, the general public, and other stakeholders to view details of federal information technology investment. Agency CIOs are responsible for evaluating and updating select data on a regular basis, which is accomplished through interfaces provided by the IT dashboard.[6]

A Gateway review used by the Australian government, similar to the UK's process, is designed to support the effective development, planning, management and delivery of the government's major projects and programs.[7] The review gives an independent perspective, challenges plans and processes, and identifies issues and risks. The government has set main principles for ICT investment and managed accordingly.[8]

2. Korea

Budget requests must stay within the spending ceilings, and reflect the results of self-assessment based on a checklist, and in-depth evaluations of fiscal projects. In the past, when Korea tried to manage programs, in particular in the ICT budget, according to predetermined costs and

5 Office of Management and Budget. (2021). Circular No. A-11. https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf
Office of Management and Budget. (2016). Circular No. A-130. https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A130/a130revised.pdf

6 U.S. General Services Administration, Federal IT Dashboard. (2022, January). https://itdashboard.gov/

7 Australian Government, Department of Finance. (2022, January). Gateway Reviews Process. https://www.finance.gov.au/government/assurance-reviews-and-risk-assessment/gateway-reviews-process

8 Australian Government, Department of Industry, Science, Energy and Resources. (2022, January). https://www.industry.gov.au/data-and-publications/

schedule, at times those programs yielded poor quality results. Korea addressed these challenges by moving to a medium-to-long-term budget plan of at least five years. It also implemented systematic performance management. [9]

Table 1 Performance Management System

The system sets goals and performance indicators for fiscal projects and reflects indicator-based evaluation results onto the fiscal management. The system was introduced in 2003 to convert traditional input-oriented fiscal management into fiscal management focused on performance and responsibility. It is a 3-step system comprised of the performance goal management, self-assessment of fiscal projects, and an in-depth fiscal project evaluation system.

Performance Goal Management System (Y-1~) (1st Step, Monitoring)	Self-assessment of Fiscal Projects (Y+1~) (2nd Step, Review)	In-depth Fiscal Project Evaluation System (Y+2~) (3rd Stage, Evaluation)
Management of performance goals and indicators of fiscal projects of all government agencies	Annual evaluation of one third of major fiscal projects	Annual in-depth evaluation of about 10 projects and systemic reform

Korea's performance management system enabled better decisions about large-scale investment projects, a preliminary feasibility study (PFS) and total project cost management system. The Korean government has been using a Digital Budget and Accounting System (dBrain) to manage the national budget over the whole cycle of budgeting.

It is worthwhile to note here that Korea government promotes the digitalization of its internal government under the name of e-Gov., which is aligned with its national ICT strategy. The Korean government set the common national ICT strategy, a part of which includes an e-Government strategy. The e-Gov. strategy covers the cross-governmental ICT policy and projects, which can share some resources or duplicate each other. The e-Gov. strategy also includes local governments, of which Ministry of Interior and Safety (MoIS) is in charge.

The Ministry of Science and ICT (MSIT) is a lead ministry for Korea's national ICT strategy. The MSIT delegates part of its authority on e-Gov. planning and execution. It also delegates to the MoIS part of the budget for e-Gov., which covers cross-governmental ICT projects that are used by multiple

9 Tina George Karippacheril et al. (2016). *Bringing Government into the 21 Century: The Korean Digital Governance Experience,* World Bank Group. https://openknowledge.worldbank.org/handle/10986/24579

ministries and involve duplicating activities or shareable resources. The MoIS has authority to coordinate and allocate the budget, delegated from the MSIT on some of the cross-ministry ICT projects.

ICT also operates within the scope of the budget system. The basis of project management is the management code, and the management code has the following system:

Table 2 Code Structure

Organization- Accounting - Accounts - Field - Sector - Program - Unit Business – Detailed Business

Based on the general experience of Korea, developing countries should set their first priority as follows: infra-structure for e-Government, Enterprise Architecture (EA), a comprehensive government data center, and Public Key Infrastructure (PKI). The EA is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the governmental operating model. It helps minimize compatibility problems that arise when integrating or connecting each e-Government system.

2021 PEMNA Budget CoP Advisory Services Program: Improvement for Indonesia's ICT Budgeting Process

IV

Recommendations for Improvements

IV

Recommendations for Improvements

In general, a good budgeting system contains several important features and elements. It should have a long-term perspective in place and a systematic link to and focus on to specified goals and results. A good budgeting system and process should also incorporate the engagement and involvement of stakeholders over the course of the entire budgetary life cycle. In order to have a good ICT budgeting process, the government must make sure that it has a national ICT strategy; an effective governance for ICT strategy; budgeting, relevant principles and guidelines for ICT budgeting; an ICT management system; and an ICT budget information system.

This report examines and focuses on the issues regarding ICT budgeting of the Indonesian government. Based on the review of ICT budgeting in Indonesia in this chapter, we will try to make relevant recommendations, paying due regard to realities and practices of the Indonesian government.

Key recommendations will be made for practical measures for innovating and improving the governance for ICT policy, the categorization of national ICT planning, guidelines for ICT budgeting, ICT project management systems, ICT budget information systems, and a preliminary feasibility study (PFS).

1. Governance for ICT Policy and ICT Budgeting

One type of governance for ICT policy does not fit all. ICT policy should be different from country to country, by political systems, and techno-economic circumstances. Over the past three decades, Korea tried various types of governance for ICT policy. For example, in early phase of digitalization, the Korean government established the National Digital Committee, which consisted of all the ministers.[10] The head of the committee was the Prime Minister, the vice head was the Minister of Finance and Economy, and the assistant administrator was the Director of Office for the Government Policy Coordination under the Prime Minister. The members of the committee were appointed by the head of the committee from among the Secretary General of the National

10 This committee changed from the Informatization Promotion Committee, the Special Committee, the e-Government Strategy Committee, etc. For the sake for general description and recommendations, all the committees will be integrated into one equivalent to the National Digital Committee.

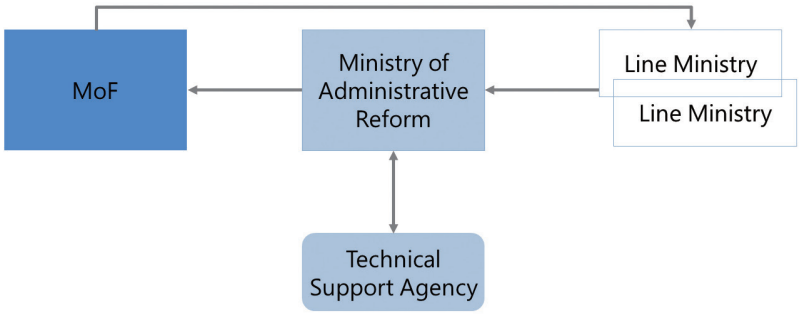
Assembly, Court Administrator, and the chiefs of the relevant agencies.

The Committee deliberated the annual ICT plan, coordinated policies and projects, and determined the National ICT Master Plan. The Committee, despite being the highest organization for digitalization, didn't have enough political and budgetary authority to fully back up the master ICT plan and faced challenges in coordinating among the various ministries. A new Special Committee was established to resolve and mitigate these problems. The important roles of the Special Committee are to secure technical support and to effectively coordinate among the ministries. For technical support such as standardization, the Special Committee needs a dedicated expert organization. For effective coordination, the Special Committee needs high-level engagement, powerful enough to coordinate ministries. Political support and technical expertise are two of the minimum elements for securing financial resources, improving laws and regulations, and dealing with technological issues. The Special Committee can select the key strategic, high priority ICT projects and support financing the projects. Financial resources put severe constraints on most ambitious projects in any government. The strong leadership and the corresponding governance made possible an extremely rare approach, "Investment first and Settlement later" in the general account of the digitalization fund. For the efficient ICT planning and budgeting, it is worthwhile to consider the approach from the early stage of digitalization of Korea, which was made possible by strongly centralized governance. Under the strong political and symbolic leadership of the National Digital Committee, the lead ministry of ICT policy, the Ministry of ICT, supported and executed the strategy and plans.

Government must prioritize strategic programs and projects in key areas and see that they are planned and implemented by a government-wide ICT organization. The organization must have legal and political power to coordinate and manage the critical issues among ministries. (e.g., the National Digital Committee). It would be best if the president or the vice president leads and manages this organization, backed up by political and budgetary support. In this context, we recommend that government of Indonesia consider establishing a dedicated expert ICT organization, like the National Information Society Agency (NIA) or the National IT Industry Promotion Agency (NIPA) in Korea.

For effective ICT budgeting in government, we recommend that the Indonesian government consider designating a lead ministry for ICT policy and ICT budgeting. The lead ministry should be given authority to collate all the government's ICT policies and projects. It should be empowered to pre-review the ICT programs. The lead ministry also should be delegated to pre-review the ICT budget, and then advise the MoF. Dedicated expert ICT organizations can support the lead ICT ministry and the MoF with respect to ICT policies and ICT budgeting.

Figure 1 ICT Budgeting Structure Going Forward



In preparation for fast-moving ICT trends and the ICT needs of social contingencies, the government must have strategic and budgetary discretion and flexibility. We recommend that Indonesia consider setting up a dedicated fund for national ICT development and national digitalization.

2. Categorization of National ICT Projects

As explained earlier, the lead ministry should prepare and share a national-level ICT master plan. Based on this plan, each line ministry should prepare its own ministerial master plan, and then present the ICT business and project plan to the National Digital Committee, indicating its clear relationship to the annual action plan.

An ICT budget should be divided into ICT expenditures to be used by ministries for their internal administrative processing and ICT budget investments to promote sectors or industries supported by the ministries (for example, energy, and transportation). Therefore, it is important to distinguish the characteristics of the ICT budgets of ministries. We recommend that the national ICT governance of Indonesia take some of the characteristics of ICT budgeting into account by categorizing national ICT projects. To make the categorized ICT projects a reality, governance should be in place for both the internal ICT and sectoral ICT.

It is necessary for the technology-oriented ministries to check any overlap between technology trends and inter-ministerial projects, to secure interoperability, and to identify priorities and joint investment items. In other words, the technology management department needs to play the role of an intermediary, so that the ICT budget can be allocated efficiently by advising the budget authority from a technological perspective.

Our recommended procedure is as follows. First, after a national ICT master plan is confirmed by the National Digital Committee, the line ministry of the administration establishes an ICT

master plan that matches the mission and work of the ministry, and presents the results to the National Digital Committee for approval. The ministry prepares an annual action plan based on the approved master plan and provides it to the ministries and related public agencies. Each organization plans a project based on the action plan, and prepares a budget stating the rationale. Each ministry submits ICT plans to the Ministry of ICT. Internal ICT plans are delegated to the Ministry of Administrative Reform. In Korea, the ICT plans of local governments are submitted to the Ministry of Interior, which plays a similar role of the Ministry of Administrative Reform in Indonesia.

We suggest that the Ministry of Administrative Reform also review the feasibility of the project in terms of technological feasibility, inter-ministerial interoperability, redundancy, and security. The reviewed results and opinions are submitted to the MoF, which compiles the budget with reference to the results reported by the Ministry of ICT and the Ministry of Administrative Reform.

The budget prepared by the MoF is finalized through the resolution of the National Assembly. After each business department executes the plan, a settlement report is prepared and submitted. The results of a performance evaluation in achieving the goals that were submitted in the planning stage are attached to the settlement report and submitted. The performance of the submitted financial statements should be evaluated and their outcome reflected in the budget for the next year.

Government must make sure that strategic programs and projects are managed by the organizations with expertise and authority regarding sectors and governmental reforms. We recommend that the Indonesian government clearly classify the ICT program and the related ICT budget into a sectoral ICT and internal government reform.

3. Guidelines for ICT Budgeting (Criteria for Classification of ICT Budget)

Of all of the functional areas of government finance, clearly stated guidance for budgeting is the most practical document for any ministry and agency. In any organization, the ICT budget is generally defined as the sum of total allocation of IT spending over a fiscal year (usually 12 months). ICT budget should show all the ICT costs that incur inside and outside an organization, relating to its activities. At the early stage of digitization, the ICT budget used to be delegated to the ICT department. Now the ICT budget is not limited to the ICT department, with the pervasive diffusion of ICT into most business processes. Across most organizations, ICT costs rise heavily with the increasing digitalization of functions and businesses. In general, the ICT budget includes at a minimum: hardware, software, personnel, insourcing and outsourcing, backup, disaster recovery, and occupancy costs associated with operating and supporting ICT for the organization. Contingency reserve funds should be secured in case of service disruption and emergencies. In real business circumstances, various taxes, license fees and maintenance and operation (M&O) costs should be clearly and explicitly included in the planning stage and in the cost-estimating phase. The cost items can vary from country to country because the business and accounting

practices are different.

The Organisation for Economic Co-operation and Development (OECD) defines and collects data on government ICT spending as follows;[11]

Governments look to the use of ICT as a lever for more efficient internal operations, greater public service quality, and better and more open policy making. The expectations to deliver policy-relevant results are also high because spending on ICTs is considerable. The OECD data criteria offer a broad scope and definition the ICT project and services. A central government ICT spending is the share of total central government budgets dedicated to ICTs (e.g., investments in hardware and software, running costs of IT infrastructures, salaries for ICT specialists and training). Important context factors need to be considered, although their role is not yet entirely clear. The countries where central governments spend more than 1.5% of their budget on ICT include both highly centralized countries (New Zealand, Finland) and federal countries (the United States, Canada, Switzerland), as well as both large and small countries measured by population. The absolute size of the public administration can also influence spending patterns. Some countries have used dedicated ICT spending reviews to better understand spending patterns, consider domestic context factors and improve returns on government ICT use. More detailed information on ICT spending, including comparisons of disaggregated data, could help improve ICT expenditure decisions. Analysis of such data could illustrate how individual ICT spending categories develop over time, for example, public employment costs compared to outsourcing; how central government ICT spending interacts with spending at local levels where most public services are delivered; or how the use of technology supports the attainment of policy objectives in areas like health care, education or justice.

We recommend that the Indonesian government clearly identify and classify the ICT program and the related ICT budget, separately from other programs and projects. To classify and categorize the ICT budget, the government of Indonesia must consider drawing up guidelines for ICT budgeting to be used by all, from the MoF to line ministries to agencies. The guidelines must provide the scope of ICT products, services, and projects. It also should provide as detailed a definition and classification of ICT projects and budget as possible.

The investments on the ICT projects usually require a substantial upfront investment and have continuous operation and maintenance costs to keep the ICT system functional and operational as planned over the lifespan of the ICT system. Because most ICT investments are capital expenditures, the ICT budget should be spread over the standard lifespan commonly applied to the projects. The standard lifespan of the ICT system should be set so that all the ministries commonly apply it in their planning and budgeting.

The Korean government sets a standard guideline that is applied to key tasks over the life cycle of an ICT project (planning, budgeting, implementation, and performance evaluation). We

11 OECD (2013), *Government at a Glance 2013*, OECD Publishing. http://dx.doi.org/10.1787/gov_glance-2013-en

recommend creating key guidelines for each task. The main guidelines and systems for the entire life cycle of ICT projects (planning, budget, development, and performance evaluation) used in Korea are depicted in Figure 2.

Figure 2 Guidelines for Each Phase

Phase	Related Guidelines
① Planning & Budget Mgt.	- National Informatization Framework Act - National finance law - Preliminary Feasibility Study Operation Guideline - ISP establishment common guide - Guidelines for National Fiscal Management Plan - Medium-term Project Plan - Detailed guidelines for budget drafting and fund management plan drafting - Guidelines for Preliminary Feasibility Study
② Program Mgt. ② Progran Implementation ②-2 Operation & Msintenance ②-3 Performace Mgt. ②-4 IRM	- Information system establishment and operation guidelines - Administrative Institutional Informatization Promotion Manual - Informatization business step-by-step inspection guide - Informatization Business Duplicate Linkage Review Guide - E-gov performance management Guide
③ Settlement	- Settlement report with performance evaluation results

The categorization of the ICT project at the policy level requires budgetary process reengineering, which is likely to require legislative activities. Further study on the Indonesian situation is called for in this regard. If the government categorizes and classifies the ICT project based on common guidelines, the line ministry can propose a separate ICT budget in compliance with the guidelines. In reality, the layers of costing and evaluating an ICT project are wide, ranging from a policy-level categorization of budget to an implementation-level breakdown of the cost. A detailed methodology for ICT costing and evaluation has practical value for the first-line workers. Under the presumption that the Indonesian government separately categorizes and classifies ICT projects, this report provides a guideline for ICT budgeting and a guideline for ICT cost calculation in Appendices C and D. All the concerned ministries and agencies can refer to the common

guidelines from the planning stage through the accountability stage. This report introduces the table of contents out of 400-plus page *Guideline for Software Project Cost Calculation,* (2021), which the Indonesian government likely will find useful.

4. ICT Project Management Systems

If the Indonesian government decides to operate a national ICT projects system, we recommend that they also incorporate an ICT program management into the system.

This management system should cover the entire budget process: budget formulation, submission, spending, and settlement. It should follow projects from selection, procurement and contract-runs, much like an ICT project management routine.

Budget-related tasks mainly involve planning, implementation, and evaluation. Planning consists of project design, budget planning, and performance planning. In the planning stage, the ICT project should be examined to see if the project is aligned with the national ICT master plan. The mid-term ICT plan and the annual ICT plan should be used in this stage.

Data from past ICT projects can help with the effective management of ICT projects, from planning to implementation. It helps planners make good decisions on project selection, avoid duplications, and estimate costs for the project. The data from past projects also can provide a useful guide when assessing the risks involved in new ICT projects. A project management system can increase the efficiency and effectiveness of ICT budgeting, especially when combined with an Enterprise Architecture Management System (EAMS) and a Financial Management Information System (FMIS).

A project management system can improve the budgetary process of major ICT projects, which require large amounts of money and time. When the ICT project exceeds a certain predetermined threshold of the budget, this project should be subject to a pre-Preliminary Feasibility Study (pre-PFS). The lead ministry for ICT should be in charge of the pre-PFS. The ICT ministry should focus on the technological aspects, along with the economic benefits, and consult with the MoF on the feasibility of the proposed project. After consulting with the ICT ministry, the MoF can them make a decision as to whether to put the project into the official PFS process. The PFS is conducted by the Public and Private Infrastructure Investment Management (PIMAC), which is explained later.

5. ICT Budget Information Systems[12]

FMIS refers to a computerized infrastructure that supports the automation and integration of

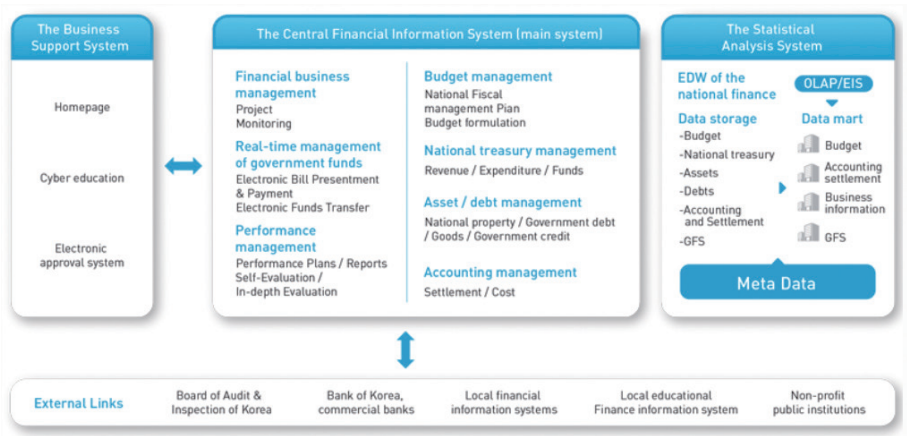
12 Korea Fiscal Information Service. *Features of the System.* https://www.fis.kr//en/main_biz/oper_of_dbrain_systems/features_of_the_system

financial tasks from budgeting to the settlement of accounts. The main functions of the FMIS are budget and treasury management. Budget-related functions include public investment management, budget allocation and preparation, and other finance-related functions, such as budget authority management, fund execution management, income and expenditure management, and cash management.

Korea built the Digital Budget and Accounting System (DBAS, known as dBrain), a financial information system in 2007. The next-generation system was enhanced in 2021 to strengthen information linkage and analysis functions with other systems in Korea.

The Digital Budget Accounting System consists of several unit-task systems (such as project management, budgeting, settlement of accounts, and statistical analysis) and an external connection system. The system is accessible by the central and local officials and some public institution users through a fiscal portal. It enables users to manage tasks on line. Thus, the system also provides an integrated financial information management to the public via the website.

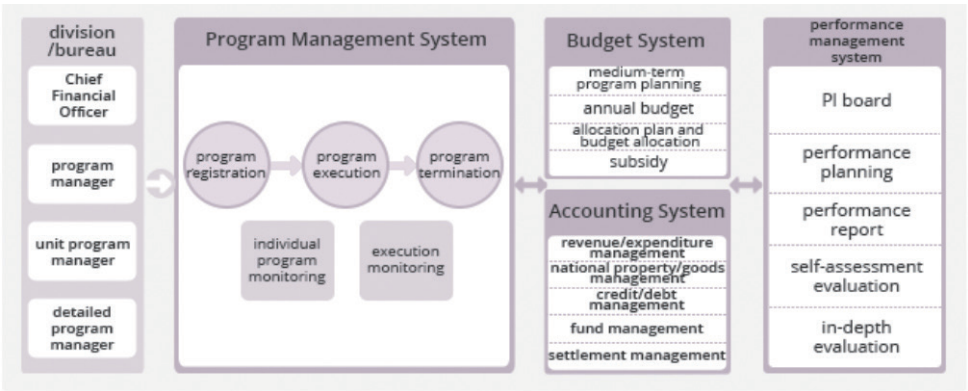
Figure 3 Overview of Korea's Financial Management System



Source: Korea Fiscal Information Service. *Features of the System.* https://www.fis.kr//en/main_biz/oper_of_dbrain_systems/features_of_the_system

The Program (Business) Management System manages the entire process of all fiscal activities and transactions from beginning to end, and it enables a view of business status and progress on a real-time basis.

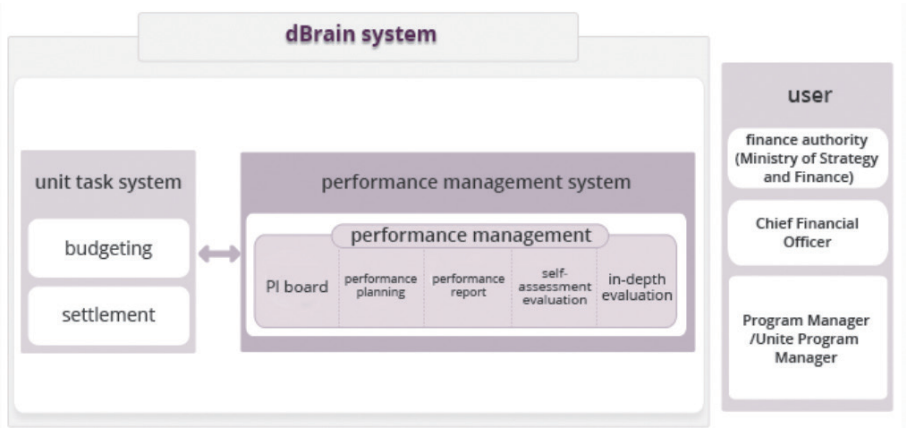
Figure 4 Component of Korea's Financial Management System



Source: Korea Fiscal Information Service. *Features of the System.* https://www.fis.kr//en/main_biz/oper_of_dbrain_systems/features_of_the_system

The Performance Management System also promotes a performance-driven business module. Through the system, project selection, annual goal setting, performance reports, and performance evaluation are linked. Thus, the system connects performance with the budgeting process.

Figure 5 Performance Management in the Financial Management System

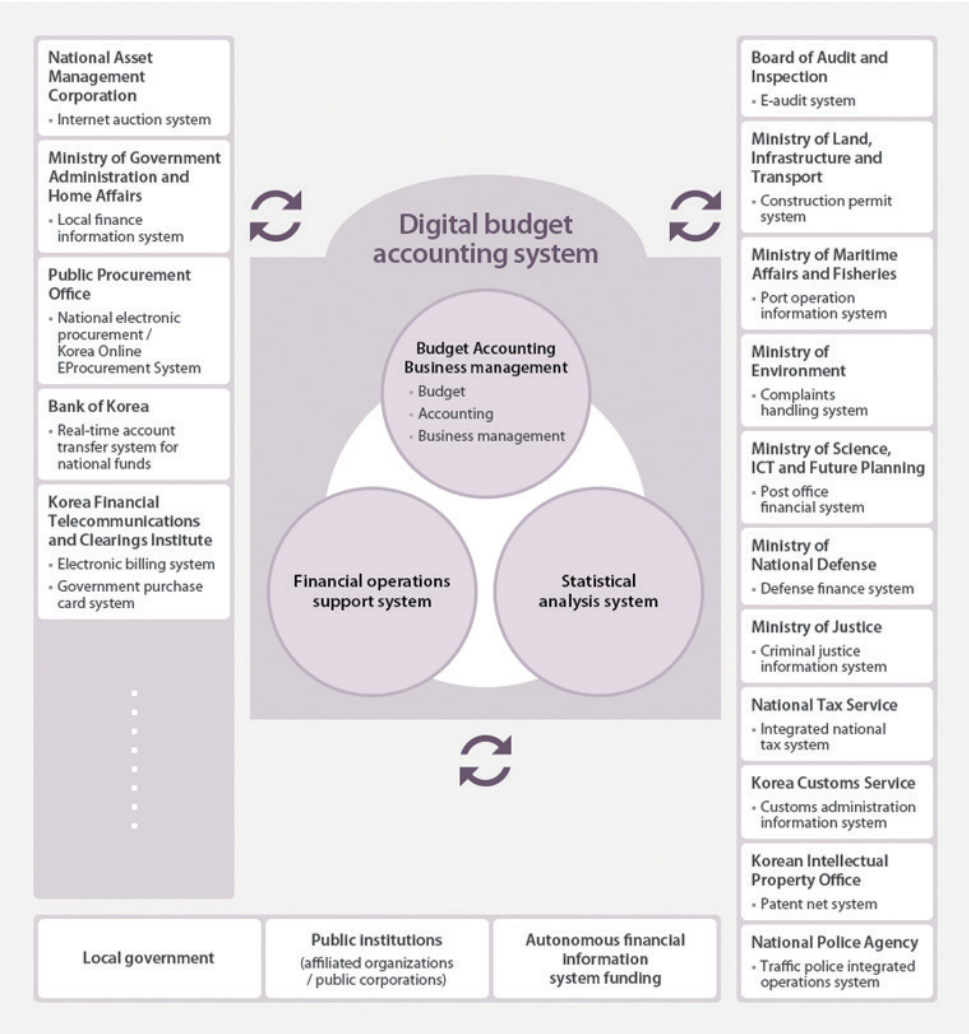


Source: Korea Fiscal Information Service. *Features of the System.* https://www.fis.kr//en/main_biz/oper_of_dbrain_systems/features_of_the_system

The Ministry of Economy and Finance (MoEF) can transparently manage financial information of the entire public sector, including central departments, local governments, affiliated organizations,

and public companies. The MoEF can comprehend government finances clearly and manage them all together.

Figure 6 Related Information Systems

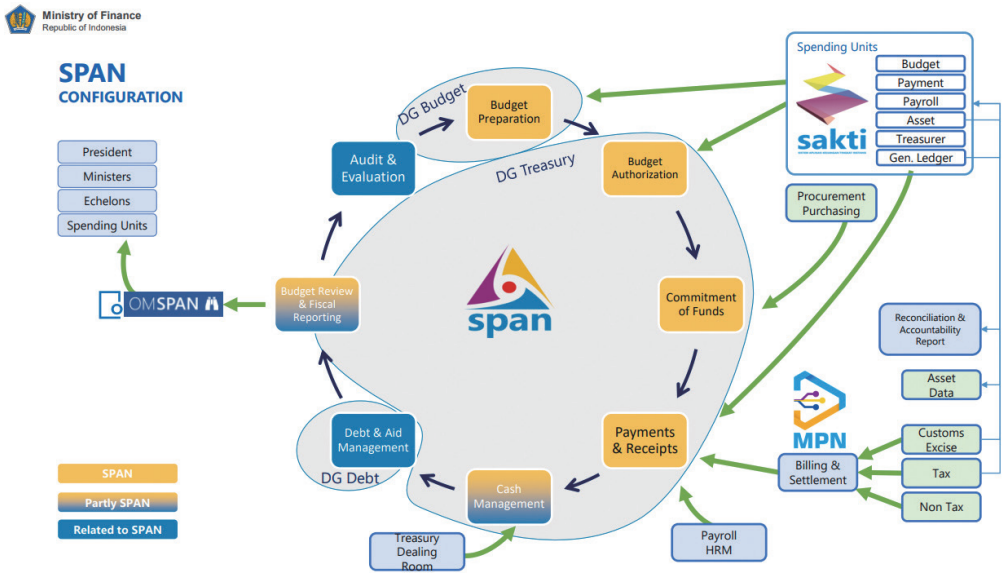


Source: Korea Fiscal Information Service. *Features of the System.* https://www.fis.kr//en/main_biz/oper_of_dbrain_systems/features_of_the_system

The name of Indonesia's financial information system is SPAN, an abbreviation of Sistem Perbendaharaan dan Anggaran Negara, which means "National Financial Budgeting System." The World Bank participated in its development. SPAN meets the functions and scope of a financial

information system as defined by the World Bank through its automating operations, including the budget and treasury sectors. It includes personnel management, payroll and income management, procurement, asset management, debt management, expenditure management, and auditing.

Figure 7 Scope of Indonesia's SPAN



Source: Indonesia Ministry of Finance, *IFMIS Implementation Case of Indonesia,* 2020, p. 17 (Provided by Indonesia MoF on October 1, 2020)

However, the SPAN system is limited by the lengthy time needed to process information. This is caused by processing excessively large amounts of financial reporting data, as well as data and resource consumption from the creation of duplicate reports, when users' requests for the same data are large. It is necessary to update the current operating system version (Oracle 11g, etc.), manage infrastructure, and improve capacity and performance. In addition, there is a high cost of maintaining an Oracle license and operating technology support. Another problem is the lack of a comprehensive national financial information system. The MoF uses SPAN, while line ministries use SAKTI, a financial information system for ministries and local governments that handle financial information in a variety of ways, including manual work. These fragmentary systems should be operated in an integrated manner.

In response, the Indonesia's Ministry of Finance is planning to digitize services, using new technologies such as cloud, big data, mobile, and machine learning. In particular, the MoF has a blueprint to expand SPAN's solution into a single solution for budget planning and

execution. Because the Indonesian government already has the SPAN financial information system, it is not urgently necessary to develop a new system or upgrade SPAN.

If the MoF chooses to enhance the SPAN system, we recommend that Indonesia refers to the Korea's dBrain and make the following changes.

- In-house development to introduce a flexible information system for budgeting processes and budgetary rules.
- Expansion of the external linkages with the financial information system.
- Secure interoperability between systems in terms of business and technical protocols.
- Improvement of the data warehouse function to analyze and utilize information accumulated through the financial information system (use of artificial intelligence, machine learning and big data platform).

We strongly recommend that the FMIS has systematic linkage with a performance management system, such as the IT dashboard in the United States. This will allow the government of Indonesia to understand the value of IT portfolios, manage IT investments, and make better IT planning decisions. Project selection, annual goal setting, performance reports, and performance evaluations would be linked throughout the system. Thus, such a system connects performance with the budgeting process. It is worthwhile to incorporate, at least, the integrated linkages of an ICT plan and the budget.

6. Preliminary Feasibility Study (PFS)

In reality, the established protocol or standard operating procedure cannot effectively cover all contingencies. A project requiring major investment or a strategically critical project calls for a thorough examination prior to serious decision making. The PIMAC serves as a gatekeeper for public investment procurement by enhancing the efficiency and transparency of public and private investment management. It also provides various consulting services and research to improve related policies and analytical tools.[13]

The PFS was introduced in 1999 to encourage a cautious approach to new large-scale projects by enhancing the efficiency of fiscal investments through verifying the feasibility of projects. The government uses PFS to conduct general research on various aspects of large-scale development projects, such as economic feasibility, policy analysis, investment priority, proper timing and financing methods.

While a feasibility study focuses mainly on technical viability, a PFS largely reviews economic and policy adequacy. A feasibility study is carried out by competent authorities; however, the Ministry

13 Public and Private Infrastructure Investment Management Center. Retrieved January 18, 2022, from https://www.kdi.re.kr/kdi_eng/kdicenter/pimac_cp-or.jsp

of Economy and Finance conducts a PFS.

In Korea, the National Finance Act, Article 38 is the sound legal ground for preliminary feasibility studies. It stipulates that a project that requires both the approval of the Ministry of Economy and Finance and the decision of the National Assembly must undergo inspection and verification in order to corroborate the results of a PFS. It also states that guidelines should be created to establish the criteria by which:

(1) a project will be selected;
(2) an appropriate agency will be set up to conduct a PFS; and
(3) the method and procedures upon which the study will be based.

The Management of Total Project Cost (TPCM), on the other hand, is based on Article 50 of the National Finance Act. The size, total project cost or period of a large-scale project set by the Presidential Decree must be agreed upon with the Minister of Economy and Finance. A revision of the size, total cost or period of an already agreed-upon project requires the same procedure.

The purpose of a TPCM is to enhance the productivity of fiscal spending and the quality of facility construction by rationally adjusting and managing the total project cost of construction work that is funded by the government throughout the project implementation stages. By managing project costs and changes in the size of a project throughout all the project stages, ranging from basic planning for a public investment project through construction work, the TPCM system aims at overseeing the expansion of the project size by a competent ministry or agency. Types of TPCMs include Reassessment Study of Feasibility, Reassessment of Project Plan, Reassessment of Demand Forecast, and Assessment of Design Modification.

PIMAC is in charge of conducting the entire process of Preliminary Feasibility Study in accordance to the General Guideline for Preliminary Feasibility Study and sector-specific standard guidelines which are developed and revised by PIMAC. It examines the efficiency and appropriateness of a project by reviewing its economic and policy feasibility, investment priorities, and optimal investment timing, among other considerations. The role of PIMAC in the area of conventional procurements also includes the development and revision of policies and methodologies.

An ICT project, if subject to the PFS, is thoroughly examined using the guidelines for a preliminary feasibility study for an ICT project. The cost of an ICT project is a primary criterion for the PFS of the project. This gateway approach basically functions in the similar way as the UK's and Australian gateway approach, in that an ex-ante close examination is emphasized prior to investment.

We recommend the introduction of the Preliminary Feasibility Study for ICT projects. To conduct the PFS, a dedicated expert organization is needed, like Korea's NIA to assist with a pre-PFS and PIMAC.

V

Concluding Remarks

V

Concluding Remarks

As digitalization accelerates, widens, and deepens across the society at the global level due to the COVID-19 pandemic, countries must proactively respond to the ICT-related trends and needs. Pervasive digitalization requires policy, financial resources, political support, technical capability, and good governance. Accelerating digitalization means that the government will receive more demands on its budget and pressure from the increasing number and size of the ICT-related policy.

Regarding ICT budgeting, the government should have an effective budgetary system and process to allocate resources under fiscal and budget constraints. It is important to understand the nature and component of the ICT budget. In many cases, the ICT expenditure is a sunk cost if it fails. Moreover, success depends in many cases on the various variables outside the project per se, such as user-friendliness and access. Education and training should be considered in the planning stage, which means an additional cost to the ICT deliverable.

The constant changes of business and government rules will necessitate changes to the ICT deliverable, which will drive up the cost of the maintenance and enhancement after the ICT project is closed. Therefore, expenses for maintenance and management should be considered as much as those for development of the ICT system.

There is no completion in digitalization and e-Government; digitalization and e-Government are a journey towards the uncertain future. For example, cloud computing is not suitable for information system budget allocation in the construction phase, so this needs to be reflected in the ICT plan. This journey should be standardized and shared as a process and as standard operating procedure. As a society and technologies constantly change, digitalization should keep pace with those trends and socio-economic needs. The ICT budgeting also must change to reflect those changes.

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2021 PEMNA Budget CoP Advisory Services Program: Improvement for Indonesia's ICT Budgeting Process

Appendix

Appendix A

These are the proposed guidelines to classify ICT in budget proposal. These guidelines are an adaptation from the same guidelines that are used by the United States federal government's Office of Management and Budget.

1. Business Layer

1.1. Business Unit

1.1.1. Revenue Generating

Units that are responsible for generating revenue for the agency and therefore maintain their own income statement or profit-and-loss (P&L) report. Often consume services from non-revenue generating business units, such as corporate.

1.1.2 Non-Revenue Generating

Units that do not directly generate revenue for the agency or maintain their own income statement. Often provide services to revenue-generating business units.

1.2. Business Architecture

1.2.1. Business Process

Represents how the agency drives business outcomes. Often defined and documented by business analysts or business-process owners, who may leverage third-party artefacts. Often specifies roles and responsibilities and the flow of work.

1.2.3. Business Capabilities

Represents what the agency does to drive business outcomes, but not how. Often defined and documented by Enterprise Architects.

1.3. Partners

1.3.1. Product Lines

The groupings of products and services provided by the agencies to citizens and or through partners (e.g., private companies). Often refer to technology-based products and services that are built directly on top of solutions, but may also represent the solution-related resources needed to deliver products and services that are not technology-based. (Non-technology-based products and services often are represented by revenue-generating business units.)

1.3.2. Digital Platforms

The system or combination of systems that are used to directly engage and serve customers and partners of the agency. May include mobile app-based platforms used to promote and sell physical products or to socially engage customers and prospective customers or other external users.

2. ICT Solution Layer

2.1. Workplace

2.1.1. Client Computing

Provides physical and virtual devices, associated software and connectivity that enable users to interact with the agency's technology systems and third- party systems.

2.1.2. Communication and Collaboration

Allow end users to communicate with other people via email or chat, to collaborate through shared workspaces, and to create and print content such as documents, presentations, videos, and other forms.

2.1.3. Connectivity

Provides users with access to the agency's technology systems. This includes wired and wireless access, while on premise, and remote access while away from the agency.

2.2. Business

2.2.1. Product Management

Enables product design and development, including innovation management, computer-aided

design, simulation, visualization, agency feedback, social product feedback and crowd-sourcing.

2.2.2. Sales and Marketing

Enable business-to-consumer (B2C) commerce platforms, business-to-business (B2B) commerce platforms, product configurations, point of sale (POS) platforms and payments. Enables marketing automation, online marketing, mobile marketing, and advertising technologies.

2.2.3. Manufacturing and Delivery

Enable prototyping, production scheduling, fabrication and manufacturing of tangible products, equipment maintenance, software development of digital products, and quality testing. Also, enable the logistics and delivery of physical products, including supply-demand matching, fleet and transportation management, tracking systems and GIS/routing optimization.

2.2.4. Customer Service

Enables multi-channel customer communication—automatic call distributor (ACD), computer telephony integration (CTI), interactive voice response (IVR), speech recognition, predictive dialing, email response, changes and co-browsing. Also, includes knowledge management, customer service workforce automation, and field service.

2.3. Shared and Corporate

2.3.1. Finance

Enables the financial management of the agency.

2.3.2. Workforce

Enables management of the employees and contractors of the business or organization. In the broadest terms, it includes the activities to select, recruit, develop, reward, retain, counsel, and retire employees. Includes the management of employee information, including workforce analytics.

2.3.3. Vendor and Procurement

Enable the procurement of goods and services required for a business to engage in its activity, including the development of sourcing strategies, vendor selection, contract negotiations, ordering of materials and services and ongoing vendor and contract management.

2.3.4. Health, Safety, Security and Environmental

Enable management to provide a safe environment for the organization, environment and local residents including policy, oversight, healthcare, occupational safety, and threat assessment.

2.3.5. Risk, Audit and Compliance

Enable management to proactively measure and mitigate the risk to the business and ensure adherence to regulatory requirements.

2.3.6. Legal

Enables legal counsel to support the organization's governance and operations, including discovery, litigation, contract reviews and intellectual property protection.

2.3.7. Property and Facility

Enable management to provide the facilities for the organization, including development and space planning, physical security, workplace services, fleet management (non-logistics), food services, and the maintenance of facilities and equipment.

2.3.8. Corporate Communication

Enables management to direct internal and external communications aimed at creating a favorable view among stakeholders, including public relations, stakeholder relations, government relations, external relations, and community outreach.

2.4. Delivery

2.4.1. Strategy and Planning

Enable the CIO and IT leadership team to efficiently plan and manage the agency's technology environment. Supported activities include planning, architecture, consulting, innovation, research and development (R&D), project and agile management, and vendor management. Many of the IT service management (ITSM) strategy services are included in this category.

2.4.2. Development

Plans, designs, builds, tests and releases new solutions.

2.4.3. Support

Assists the end-user community with training, application support, service desk and central print services.

2.4.4. Operations

Monitor, support, manage, and run the agency technology systems for the agency. Typically provided behind the scenes and not directly user-facing.

2.4.5. Security and Compliance

Ensure the integrity, protection and proper use of the agencies technology systems and data.

2.5. Platform

2.5.1. Application

Provide a range of application-based services that run on top of the computer platform to enable specific business applications.

2.5.2. Data

Provide a variety of data-related services that capture and retrieve transactional activities in a database, store the data in a centralized data warehouse, provide analytical and visualization tools to explore the data and caching technology to distribute information to the edge, to improve performance and response times.

2.6. Infrastructure

2.6.1. Data Center

Provides a secure and controlled environment for housing server, storage, network, and other technology equipment.

2.6.2. Network

Provides the voice and data network and supporting services, such as load balancing, domain services, virtual private network, and the internet to enable communications within and outside the agency.

2.6.3. Computing

Provides the physical and virtual computing systems that run business applications, software tools and system services. Can be dedicated or on-demand and may be provided on-premises or through external managed services or public cloud offerings.

2.6.4. Storage

Provides information storage for data, files, and other object types, ranging from real-time, high-performance data storage to long-term archive storage. Different offerings also provide recovery-point objectives to meet the business needs of an application, based on a business impact assessment.

3. ICT Function Layer

3.1. End User

3.1.1. Workspace

Client computers as physical desktops, portable laptops, thin client machines, peripherals (including monitors, pointer devices and attached personal printers) used by individuals to perform work. Includes Workspace as a Service, delivered via public cloud, third-party providers.

3.1.2. Mobile Devices

Client computer tablets, smart phones (iOS, Android, Windows Mobile) and apps used by individuals to perform work.

3.1.3. End-User Software

Client-related software used to author, create, collaborate and share documents and other contents. Examples include email, communications, messaging, word processing, spreadsheets, presentations, desktop publishing, graphics and others. Optional Level 3 categories include Productivity, Communications, and Collaboration.

3.1.4. Network Printers

Printers located on or near users' desktops. Examples include network-connected personal printers, ink-jet printers, laser printers, departmental or copy-room printers. Only include network connected printers. Do not include printers connected to an end-user computer.

3.1.5. Conferencing and Audio & Video

Audio and video conferencing equipment, typically used in conference rooms and dedicated telepresence rooms to enable workforce communications.

3.1.6. IT Help Desk

Centralized Tier 1 help desk resources to handle user requests, answer questions and resolve issues.

3.1.7. Desk-side Support

Local support resources that provide on-site support for moves, additions, changes and hands-on issue resolution.

3.2. Application

3.2.1. Application Development

Resources involved with the analysis, design, development, coding, testing and release, and packaging services associated with application development projects. Optional Level 3 categories include Development, and Questions and Answers.

3.2.2. Application Support and Operations

Operations, support, repair, and minor enhancements associated with existing applications.

3.2.3. Business Software

Software expenditures, including licensing, maintenance and support related to off-the-shelf software purchases. Business software delivered as a service (SaaS).

3.3. Delivery

3.3.1. IT Service Management

Resources involved in management activities handling incidents, problems and changes, as part of the IT Service Management process, excludes the Tier 1 help desk.

3.3.2. Operations Center

Centralized IT operations center resources, including monitoring and intervention. Examples include network operations center (NOC), and global operations center (GOC). Also included operations and support services delivered in connection with other infrastructure as a service (IaaS) and platform as a service (PaaS).

3.3.3. Program, Product, Project Management

Resources involved with managing and supporting IT-related projects and continuous product development (e.g., Agile) across business and IT-driven initiatives.

3.3.4. Client Management

Resources or account managers aligned with the lines of business to understand business needs, communicate about IT products, services and the status of IT projects.

3.4. Security and Compliance

3.4.1. Security

IT Security resources, including setting policy, establishing process and means, measuring compliance and responding to security breaches. Provides real-time operational security, such as vulnerability scanning, managing firewalls, intrusion prevention systems, and security information and event management (SIEM). Optional Level 3 categories include Cyber Security. The implementation actions defined by security policies (for example, mitigating security breaches by applying patches) are not included in the Security section and are part of the respective functional sections where the actions take place (for example, Computing, Storage and Network). This category includes security services delivered in connection with other IaaS and PaaS services.

3.4.2. Compliance

ICT-compliance resources include setting policy, establishing controls and measuring compliance to relevant legal and other compliance requirements. Optional Level 3 categories include Data Privacy. The implementation actions defined by Compliance policy (e.g., implementing controls like multi-factor authentication) are not included in the Compliance section and are part of the respective areas where the actions take place (for example, Computing, Storage, Network, Application, End User).

3.4.3. Disaster Recovery

ICT disaster recovery (DR) resources, setting DR policy, establishing process and means, dedicated failover facilities, performing DR testing. DR-designated equipment is included directly in its own sub-section (for example, extra servers for DR are included in the Computing section.) The implementation actions defined by disaster recovery policy (e.g., building DR servers) are not included in the disaster and recovery sub-section, but are part of the respective sections where the actions take place (for example, Computing, Storage, Network). DR recovery also includes infrastructure as a service to enable disaster recovery capabilities.

3.5. ICT Management

3.5.1. IT Management and Strategic Planning

IT management and administration resources typically are the CIO, senior IT leaders and administrative support, including centralized IT strategy and planning.

3.5.2. Enterprise Architecture

Enterprise architecture services, including business, information, application and technical architecture to drive standardization, integration and efficiency among business technology solutions.

3.5.3. ICT Finance

Resources involved in the planning, budgeting, spend management, and chargeback of ICT expenditures and the costing of ICT products and services.

3.5.4. ICT Vendor Management

Resources involved in the selection, contract management, oversight, performance management and general delivery of services by third party vendors and external service providers.

3.6. Data Center

3.6.1. Enterprise Data Center

Purpose-built data center facilities that house and protect critical IT equipment, including the space, power, environment controls, racks, cabling and "smart hand" support.

3.6.2.Other Facilities

Computer rooms and main distribution frame (MDF) and independent distribution frame (IDF) telecommunication closets that house IT equipment in corporate headquarters, call centers or other general purpose office buildings.

3.7.Network

3.7.1. LAN

Physical and wireless local area network connecting equipment within the core data centers and connecting end users in office working areas to the organization's broader networks.

3.7.2. WAN

Wide area network equipment, labor and support services directly connecting data centers, offices and third parties (excludes telecommunications and communication services). Network services delivered in connection with other IaaS and PaaS services.

3.7.3. Transport

Data network circuits and associated access facilities and services, includes dedicated and virtual data networks and internet access. Includes usage associated with mobility and other data transit, based on usage billing. Voice network circuits and associated access facilities and services. Also, includes usage associated with standard telephone calls. Both voice and data transport may include terrestrial and non-terrestrial (satellite) technologies. Optional Level 3 categories include data, voice, and network services delivered in connection with other IaaS and PaaS services. Voice resources that enable or distribute voice services through on-premise equipment including Private Branch Exchange (PBX), voice over Internet Protocol (VoIP), voicemail and handsets (excludes telecommunication and communication services).

3.8. Computing

3.8.1. Servers

Physical and virtual servers running a version of Microsoft's Windows server or Linux operating system, includes hardware, software, labor and support services. Optional Level 3 categories include Windows, Linux, and Public Cloud computing, computer as a service delivered via public cloud and third party providers.

3.8.2. Unix

Servers running vendor-specific, proprietary Unix operating systems (e.g., IBM AIX, Sun Solaris, HP UX), including hardware, software, labor and support services.

3.8.3. Midrange

Servers running IBM AS/400 platform including hardware, software, labor and support services.

3.8.4. Converged Infrastructure

Purpose-built appliances that provide computer, storage and network capabilities in one box.

3.8.5. Mainframe

Traditional mainframe computers and operations running legacy operating systems.

3.8.6. High Performance Computing

High-performance computing (HPC) is used for solving complex computational problems through massive concurrent use of computing resources and parallel processing techniques. HPC technology is applied in areas such as scientific and industrial research, product engineering and development, complex business modeling, simulation, and analysis. HPC hardware and software technologies are specialized and optimized for massively parallel computing and processing vast amounts of data.

3.9. Storage

3.9.1. Online Storage

Central storage such as storage-area networks (SAN), network-attached storage (NAS) and similar technologies for distributed computer infrastructure, including the equipment, software and labor to run and operate. Optional Level 3 categories include on-premise and public cloud storage, and online storage as a service, delivered via public cloud and third party providers.

3.9.2. Offline Storage

Offline storage resources used for archive, backup and recovery to support data loss, data corruption, disaster recovery and compliance requirements of distributed storage. Archive storage as a service delivered via public cloud and third party providers.

3.10. Platform

3.10.1. Database

Distributed database services, focused on the physical database (versus a logical design model), including database administrators, database management systems (DBMS), tools and operational support, database as a Service delivered via public cloud and third party providers.

3.10.2. Middleware

Distributed platform, application and system integration resources that enable cross-application development, communications and information sharing. Also, includes platform as a service delivered via public cloud and third party providers.

3.10.3. Container Orchestration

Tools and resources for managing the life cycles of containers. Includes the control and automation of tasks, such as provisioning and deployment of containers, maintaining availability, scaling up or removing containers to manage application loads, relocating containers, allocating resources for containers, and monitoring container and host health.

3.10.4. Big Data

Systems and resources for integrating, managing and analyzing high volumes of low-density, unstructured data that is received at high rates of velocity.

3.11. Output

3.11.1. Central Print

Central print services, often provided to support customer billing or support processes for customer documentation. Unit of measure: page.

4. Finance Layer

4.1. Internal Labor

4.1.1. Expense

Employee wages, benefits, expenses and occupancy.

4.2. External Labor

4.2.1. Expense

External contractor fees, travel and expenses.

4.3. Outside Services

4.3.1. Consulting

External consulting project-based services.

4.3.2. Managed Service Provider

External managed service providers.

4.3.3. Cloud Service Provider

External public cloud service providers including IaaS, PaaS and SaaS.

4.4. Hardware

4.4.1. Expense

Hardware expense of non-capitalized purchases (e.g., spare parts, consumables or equipment below capitalization threshold).

4.4.2. Lease

Hardware lease expenditures (for example, hardware purchased through a supplier or financial services leasing arrangement).

4.4.3. Maintenance and Support

Hardware maintenance and support expenditures.

4.4.4. Depreciation and Amortization

Hardware depreciation of capitalized purchases.

4.5. Software

4.5.1. Expense

Software expense of non-capitalized software purchases.

4.5.2. Licensing

Software license, support and maintenance expenditures for the use of non-SaaS-provided software. SaaS subscriptions belong under Outside Services > Cloud Service Providers.

4.5.3. Maintenance and Support

Software maintenance and support expenditures.

4.5.4. Depreciation and Amortization

Software depreciation of capitalized software license purchases and software development efforts.

4.6. Facilities and Power

4.61.1. Expense

Data-center space, power, security and other operating expenses (for example, co-location facility services, electricity and water).

4.6.2. Lease

Data center lease expenditures.

4.6.3. Maintenance and Support

Data center maintenance and support expenditures.

4.6.4. Depreciation and Amortization

Depreciation of data center facility building and leasehold improvements (e.g., raised floor investments, power, power distribution unit, infrastructure, and rack build-out).

4.7. Telecommunications

4.7.1. Expense

Expenses for voice and data network connectivity, including circuit and usage expenditures.

4.7.2. Lease

Expenditures for telecommunication leases.

4.7.3. Maintenance and Support

Expenditures for telecommunication maintenance and support.

4.7.4. Depreciation and Amortization

Depreciation and amortization of any capitalized telecommunication expenditures. Typically, this will show up under Hardware or Facilities depreciation and amortization.

4.8. Other

4.8.1. Other

Miscellaneous or non-standard expenses.

4.9. Internal Service

4.9.1. By Shared Serviced

Miscellaneous charges received from other internal-shared services groups (for example, HR service fees from the HR department). Real estate management fees for space and power should be included in the Facilities and Power cost pool.

Appendix B

This is multi-dimensional classification followed by proposed tag names in a #BlueColoredTag text. The classification consists of 4 layers: finance, ICT function, ICT service, and business layers.

1. Business Layer

1.1 Business Unit

1.1.1. Revenue Generating #RevenueGenerating

1.1.2. Non-Revenue Generating #NonRevenueGenerating

1.2. Business Architecture

1.2.1. Business Process #BusinessProcess

1.2.1. Business Capabilities #BusinessCapabilities

1.3. Partners

1.3.1. Product Lines #ProductLines

1.3.2. Digital Platforms #DigitalPlatforms

2. ICT Service Layer

2.1. Workplace

2.1.1. Client Computing #ClientComputing

2.1.2. Communication and Collaboration #CommunicationCollaboration

2.1.3. Connectivity #Connectivity

2.2. Business

2.2.1. Product Management #ProductManagement

2.2.2. Sales and Marketing #SalesMarketing

2.2.3. Manufacturing and Delivery #ManufacturingDelivery

2.2.4. Customer Service #CustomerService

2.3. Shared and Corporate

2.3.1. Finance #Finance

2.3.2. Workforce #Workforce

2.3.3. Vendor and Procurement #VendorProcurement

2.3.4. Health, Safety, Security and Environmental #HealthSafetySecurityEnvironmental

2.3.5. Risk, Audit and Compliance #RiskAuditCompliance

2.3.6. Legal #Legal

2.3.7. Property and Facility #PropertyFacility

2.3.8. Corporate Communication #CorporateCommunication

2.4. Delivery

2.4.1. Strategy and Planning #StrategyPlanning

2.4.2. Development #Development

2.4.3. Support #Support

2.4.4. Operations #Operations

2.4.5. Security and Compliance #SecurityCompliance

2.5. Platform

2.5.1. Application #Application

2.5.2. Data #Data

2.6. Infrastructure

2.6.1. Data Center #DataCenter

2.6.2. Network #Network

2.6.3. Computing #Compute

2.6.4. Storage #Storage

3. ICT Function Layer

3.1. End User

3.1.1. Workspace #Workspace

3.1.2. Mobile Devices #MobileDevices

3.1.3. End User Software #EndUserSoftware

3.1.4. Network Printers #NetworkPrinters

3.1.5. Conferencing and AV #ConferencingAV

3.1.6. IT Help desk #ITHelpdesk

3.1.7. Desk-side Support #DesksideSupport

3.2. Application

3.2.1. Application Development #ApplicationDevelopment

3.2.2. Application Support and Operations #ApplicationSupportOperations

3.2.3. Business Software #BusinessSoftware

3.3. Delivery

3.3.1. IT Service Management #ITServiceManagement

3.3.2. Operations Center #OperationsCenter

3.3.3. Program, Product, Project Management #ProgramProductProjectManagement

3.3.4. Client Management #ClientManagement

3.4. Security and Compliance

3.4.1. Security #Security

3.4.2. Compliance #Compliance

3.4.3. Disaster Recovery #DisasterRecovery

3.5. ICT Management

3.5.1. IT Management and Strategic Planning #ITManagementStrategicPlanning

3.5.2. Enterprise Architecture #EnterpriseArchitecture

3.5.3. IT Finance #ITFinance

3.5.4. IT Vendor Management #ITVendorManagement

3.6. Data Center

3.6.1. Enterprise Data Center #EnterpriseDataCenter

3.6.2. Other Facilities #OtherFacilities

3.7. Network

3.7.1. LAN #LAN

3.7.2. WAN #WAN

3.7.3. Transport #Transport

3.8. Computing

3.8.1. Servers #Servers

3.8.2. Unix #Unix

3.8.3. Midrange #Midrange

3.8.4. Converged Infrastructure #ConvergedInfrastructure

3.8.5. Mainframe #Mainframe

3.8.6. High Performance Computing #HighPerformanceComputing

3.9. Storage

3.9.1. Online Storage #OnlineStorage

3.9.2. Offline Storage #OfflineStorage

3.10. Platform

3.10.1. Database #Database

3.10.2. Middleware #Middleware

3.10.3. Container Orchestration #ContainerOrchestration

3.10.4. Big Data #BigData

3.11. Output

3.11.1. Central Print #CentralPrint

4. Finance Layer

4.1. Internal Labor

4.1.1. Expense #InternalLaborExpense

4.2. External Labor

4.2.1. Expense #ExternalLaborExpense

4.3. Outside Services

4.3.1. Consulting #Consulting

4.3.2. Managed Service Provider #ManagedServiceProvider

4.3.3. Cloud Service Provider #CloudServiceProvider

4.4. Hardware

4.4.1. Expense #HardwareExpense

4.4.2. Lease #HardwareLease

4.4.3. Maintenance and Support #HardwareMaintenanceSupport

4.4.4. Depreciation and Amortization #HardwareDepreciationAmortization

4.5. Software

4.5.1. Expense #SoftwareExpense

4.5.2. Licensing #SoftwareLicensing

4.5.3. Maintenance and Support #SoftwareMaintenanceSupport

4.5.4. Depreciation and Amortization #SoftwareDepreciationAmortization

4.6. Facilities and Power

4.6.1. Expense #FacilitiesPowerExpense

4.6.2. Lease #FacilitiesPowerLease

4.6.3. Maintenance and Support #FacilitiesPowerMaintenanceSupport

4.6.4. Depreciation and Amortization #FacilitiesPowerDepreciationAmortization

4.7. Telecommunications

4.7.1. Expense #TelecomExpense

4.7.2. Lease #TelecomLease

4.7.3. Maintenance and Support #TelecomMaintenanceSupport

4.7.4. Depreciation and Amortization #TelecomDepreciationAmortization

4.8. Other

4.8.1. Other #Other

4.9. Internal Service

4.9.1. By Shared Serviced #BySharedServiced

These proposed tags are taken from the Technology Business Management (TBM) Council. The TBM Council is a non-profit professional organization dedicated to advancing the discipline of technology and business management. More explanation about TBM can be found in the Case Study's chapter: United States: Federal Gov. IT investment management system.

Appendix C

Summary of Detailed Guidelines for Budget Formulation and Fund Management Plan Drafting: *The Ministry of Economy and Finance (MoEF) Regulation,* 2021.[14]

1. The guidelines have clearly defined the scope of ICT budget as a specific theme under the title of Business Type #7. Informatization (ICT) Business.

- It consists of:
  - hardware and software purchases and rental fees,
  - information system (IS) development and consulting expenses,
  - IS operation and maintenance expenses.
- IT-related standardization, technology development, training, network construction.
- ICT industry foundation promotion, projects to bridge the digital divide, security, and similar items.

2. The key role of the Ministry of Science and ICT (MSIT) in budget requests:

- ICT projects can produce results at the central government level or in multi-ministerial linkage, rather than individual ministries.
- ICT projects are reflected in the national ICT implementation plan, submitted to the MSIT. For new projects, a review opinion from the MSIT is submitted, together with the budget request.
- The MoEF may take into consideration the opinion of the Ministry of Science and ICT on conformity with the ICT policy direction.

14 Summarized and presented by Hari Purnomo, Senior Public Financial Management Specialist, World Bank, at the 2021 1st PEMNA Budget CoP Advisory Services Program Final Workshop on January 27, 2022.

*Appropriate amount of compensation for proposals for software work is calculated by applying "the operating regulations on compensation standards for proposals for software business, etc." (MSIT)

3. ICT Budget Plan must be prepared and discussed in multi-years:

- ICT projects require a budget including relevant information, so that the detailed investment requirements (total cost*) for each year and item can be identified, as well as the budget for the next year.

  *Total cost is defined as all expenses for system construction and operation. It consists of equipment purchase cost, rental fees, software development costs, operation and maintenance costs and additional construction costs for five years after completion of construction, and cloud computing service usage fee.

- New business: the total cost of the project is discussed in parallel when the annual budget is requested.

- Continuing business: includes all invested costs from the year of business start-up (including information strategy planning—ISP) to the current year and investment required to the next five years.

4. Requirement for conducting Preliminary Feasibility Study prior to ICT budget request:

- In principle, IS establishment can request budget after completion of the business process reengineering (BPR) and establishment of the information strategy planning (ISP).

  *Limited to cases where the budget was confirmed by the National Assembly or the budget was allocated after consultation with the Minister of Strategy and Finance in advance.

- The head of each central government agency requests the Ministry of Strategy and Finance to review the final product of the ISP prior to requesting the budget to establish an information system in accordance with the ISP establishment common guide.

- The MoEF may take into account the opinions of specialized organizations, such as the Korea National Information Society Agency among others, for the review of the ISP output.

- For new projects with a total project cost of 50 billion won (about USD 42 million) or more and a national financial support of 30 billion won (about USD 25 million) or more, a budget is requested only when the feasibility of project promotion is recognized as a result of a preliminary feasibility study.

5. The role of the National Information Resources Service (NIRS) to integrate ICT:

- The hardware and system software purchase budget must be included in the budget for replacing old equipment, new construction, and the expansion and upgrading of the existing information system for the information system to be transferred to the National Information Resources Service. The NIRS consults with the central government about budget requests, because the scope and amount of business should come from the central government. After consultation, the government should put these items in the budget plan.

- When the relevant central government requests a budget, the National Information Resources Management Agency must comprehensively consider:

  - (i) the possibility of using the existing equipment of the National Information Resources Management Agency,

  - (ii) the possibility of preferential application of cloud technology and,

  - (iii) the equipment expansion requirements, according to the new establishment of information systems in each central government office.

- The National Information Resources Service is the world's first pan-governmental integrated data center established in 2005:

  - NIRS is committed to achieve its vision of an Intelligent Cloud Computing Center and provide high-quality ICT services while it offers safe and convenient digital government services to citizens anytime, anywhere.

  - NIRS will endeavor to raise the status of Korean digital government to a higher level by continuously pursuing innovation, based on new technologies of the Fourth Industrial Age represented by AI, big data, cloud, and the Internet of things (IoT).

6. Establishment of government EA portal (GEAP):

- The central government must register the information system being built and operated on the pan-government Enterprise Architecture (EA) portal. Prior to submission of the ICT budget, line ministries, departments, and agencies are mandated to do a self-check to see if there is overlap or redundancy based on EA. The ministry in charge of the ICT budget also reviews the submitted plan and the EA data to see if there is overlap or redundancy. The government **can request a budget only if there is no overlap.**

- The government submits related data such as operation and maintenance of computerized equipment and information system registered on the pan-governmental EA portal (www.

geap.go.kr) upon request for a budget.

- GEAP has improved resource integration, sharing, and the EA management system to maximize the effects of the integration. The GEAP is also interconnected with the National Consolidated Data Center's National Total Operating Platforms (nTOPS), which has full IT resource information, including legacy systems.

7. Coordination with other agencies:

Request that a budget must be made after prior consulting with the department in charge of each area, about the size of the project, the implementation period, and the linkage and utilization methods between the projects and other areas needed to coordinate among agencies.

Appendix D

Table of Contents of the Guideline for Software Project Cost Calculation (revised in 2021) provided by the Korea Software Industry Association. Chapter and page numbers are provided for reference of specific part. ·

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