

IMPROVE INDONESIA NATIONAL E-PROCUREMENT FAIRNESS WITH VENDOR DATA-DRIVEN CAPABILITY ASSESSMENT AND TOGAF ADM

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ABSTRACT

The implementation of a distributed national e-procurement system creates problems with the low quality of vendors data. This paper aims to improve vendor data quality by making it single source of truth that various applications can share in LKPP. Data acquisition using ethnographic immersion techniques in order to get deeper and meaningful research data. The analysis process uses the TOGAF ADM framework. The result is a blueprint and a roadmap for the work package implementation process to centralized vendor data. Therefore, it can be concluded that by using a good roadmap, the goal of improving the quality of data providers and the fair principle in national procurement with minimum downtime can be achieved.

Keywords: *Enterprise Architecture, Improvement Data-Driven, Capability Assessment, e-Procurement Government Agency, TOGAF ADM*

1. INTRODUCTION

Government Procurement Policy Institute (Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah, LKPP) is an institution established in 2007 to be responsible for and manage policies related to procurement [1]. The choice of national e-procurement (Sistem Pengadaan Secara Elektronik, SPSE) deployment using the distributed model was due to the past poor of the national internet network [2]. To date, 620 Electronic Procurement Agencies (Lembaga Pengadaan Secara Elektronik, LPSE) have their SPSE or are affiliated with other agencies. Each government agency has the authority to conduct electronic procurement in its environment by using the applicable policies and services provided by LKPP.

To date, there are 2 million registered vendors data spread across SPSE in Indonesia.

However, only about 400 thousand have been successfully consolidated. The rest resulted in low-quality data, such as data loss that was not successfully correlated with each other. In addition, many duplications are not easy to consolidate. The missing and duplications of vendor working experiences lead to breaking the fairness principle.

The chart report below is pulled from LKPP Smart Report, which shows progress consolidating data from various SPSE nationwide. The trend of the last three years (2018-2020) shows zero growth, which means there is something problem during data collection. It might also happen a long time since 2008. The total number of vendors is also far below the reported number. The consolidation process that is run manually requires intervention from the provider itself making the process even slower.

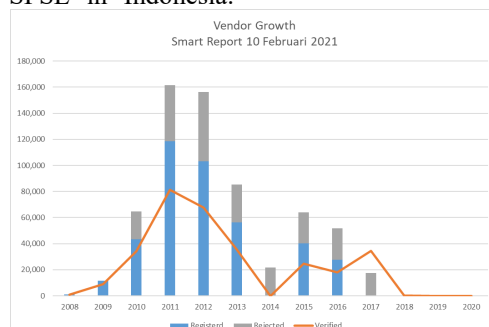


Figure 1: Consolidated Registered Vendor Data [3]

On the other hand, of the 400 thousand vendors data, only a few were successfully verified. As a result, only a few providers have the qualifications to participate in quick type tenders that require the vendor participant to be verified. This situation, of course, violates the principle of fairness in the national electronic procurement system. From the government's side, of course, it also causes losses. The opportunity to get a wide and best choice of providers has the potential not to be achieved. The brief description above is an example of how a procurement situation fails to comply with the principles of national electronic procurement [4].

Based on this problem, an enterprise data-driven approach and utilizing an enterprise architect framework using TOGAF ADM is made. The goal is to make a roadmap on achieving a single truth of vendor data sources. The single truth of vendor data make data more reliable and trusted is important to very large operation [5] such as national e-procurement.

2. LITERATURE REVIEW

2.1 National E-Procurement Principles

There are several principles to do national electronic procurement based on the existing regulation. Among the principles are [4]: effective efficient, transparent, open, competitive, fair, and accountable.

In addition to openness, the principle of fairness is one of the important pillars that drive the other principles. For example, among the principles correlated with the principle of fairness are competitive, effective, efficient, and accountable.

The fairness principle relates to the equal treatment of every party in the public space [6]. It should be reflected on every policy, practice and, standard procedure [6]. Among 2 million, only 300 thousand verified vendors that are potentially eligible to participate in the quick tender process. Such situations are contradicted fairness and competitive principle. On the other hand, government agencies potentially lost to get the best vendor available to their system during the quick tender process.

The role of vendor in national e-procurement plays a very important role. The availability of vendors in providing goods and services needed by the government is an economic driver and supports the government's running. If the absence of a provider occurs, then the wheels of government will be disrupted.

The expectation for the widest possible vendor participation is the realization of SPSE's goal to create a procurement market.

2.2 Distributed Data

Distributed data can be local within a single or geographically across data centers where each application can work autonomously between systems [7]. Thus, distributed data is different from distributed processing or distributed systems, where networked computers are also carried out remotely [7]. The distributed data that occurs here is not controlled by centralized control but runs independently and is federated, even though the application is the same but has different instances and does not relate to one agency with another.

For several reasons, problems arise from maintaining database integrity and specifying synchronization between data to avoid duplication of data being lost during the synchronization process. First, the duplication of data poses direct contamination of the data information. The second problem is the addition error due to duplication of data and the impact on misleading decision-making. [8]. Finally, this bad decision-making can also have fatal consequences [9]. For example, there are lawsuits from vendors to agencies or even LKPP.

Such a situation happened when planning a tender. Frequently tender tend to fail since there is no such vendor that has accepted criteria. Therefore, it is not good for tender performance in such agencies. Since the decision of generating tender requirements is based on unreliable vendor data.

Data duplication [10] on the vendor's working experience during the consolidation process gives the vendor more experience than its reality. On the other hand, a vendor who has experienced missing the experience data may lose the total experience that may impact meeting the criteria of tender requirement. This situation may break the fairness principle.

The distributed system was chosen due to the government's autonomy principle, especially fiscal decentralization policy [11]. However, each local government has their privileges. Therefore, the work needs to be carefully chosen not to break the autonomy principle, especially the ownership and manageability of vendor data.

2.3 Data-Driven Organization

Generally, companies that work based on data enjoy the advantage of having more targeted and measurable information so that the company's work is more effective and efficient, for example,

selecting vendors in procurement. Data-driven enterprise is required synergies between strategies and structures that affect enterprise architecture. Data-driven organizations need to think about how various kinds of data can be managed and accessed widely. To maintain the existence of the data, it is not only stored on the central server but needs to be stored for replication in a remote data center or cloud. Data is not only helpful in informing senior decision-makers, but anyone in the organization who can make decisions can also benefit from data [12].

The data-driven solution approach is expected to obtain a set of provider data with good quality [13]. Good data quality will certainly improve the quality of the national electronic procurement process. With the passage of this national electronic procurement process, all procurement principles that have been established can be implemented. Of course, both the provider and the government will benefit greatly from the results of this process.

2.4 TOGAF ADM

TOGAF contains Enterprise Architecture (EA) specifications, implementations, and methodologies. This study will examine, more specifically, the TOGAF ADM determined by the Open Group [14]. The reason for choosing TOGAF as an enterprise architecture framework and methodology is that it is considered a proven framework adopted by many leading organizations to improve business productivity and align IT with business significantly. In addition, EA TOGAF is one of the popular standards [15] that ensures standardized standards, methods, and communication [16] between EA experts. TOGAF also helps in utilizing resources to be more effective and efficient [17] so that, in the end, it can increase return on investment.

As mentioned earlier, the goal of TOGAF ADM is to help organizations develop a company-specific enterprise architecture [18] that embraces organizational strategy and incorporates this strategy into all aspects of the organization, namely vision, business, information systems, and technology architecture [15].

Each phase contains business components, architectures, and IT capabilities that interrelate with other phases to complete the solution. The ADM process is the core of each stage of TOGAF implementation in building the architectural framework. Thus, ADM can assist organizations in making the transition from the current architecture (as-is) to the enterprise architecture that is expected

(to-be) in the future [16]. A brief explanation of the first five phases is as follows [15]:

- *Preliminary Phase*
This phase is an initiation phase, in which there are preparations needed to meet business requirements and needs, including determining the principles of the organizational architecture framework. The central aspect is detailing the architecture, framework, architectural requirements and principles, and framework management linkages.
- *Architecture Vision*
Define the initial phase of the ADM, including the outline of scope, list of defined stakeholders, approval matrix, and architecture vision.
- *Business Architecture*
It represents a holistic view of the business, developed to support an agreed architectural vision.
- *Information System Architecture*
The definition of IS architecture in the project architecture is consists of Application and Data architecture. Application architecture is a directory of crucial application systems expected to process data and support business. Data architecture describes the asset structure of the organization's data logically and physically and data management resources.
- *Technology Architecture*
It describes the infrastructure required to support applications, services, operations, and reporting and analysis requirements. Technology Architecture Development is used for more typical architect projects.

The first phase of TOGAF ADM contains the design, plan, and definition of the EA (as and will be). From the gap between this as-is and will be, it can be obtained what is missing, what to remove and what needs to be improved. These results are a key important element of the roadmap that needs to be implemented to achieve the best outcome of improved vendor data quality.

2.5 Immersion Ethnography Data Acquisition

Ethnography is qualitative research that involves researchers in an organization or community to observe behavior and interactions closely. Ethnography explores phenomena from the subjective point of view of the researcher [19]. Ethnography is also often referred to as a participant-observer in which the researcher is also involved with the object being studied [20] in a certain role even though it is marginal [21].

This ethnographic approach will help researchers get more meaningful data, or more popularly referred to as thick data [22]. It is hoped that with this research approach, more comprehensive data will be obtained and provide more meaning for the data to be processed and used as the basis for this research. The purpose of ethnography is to get an emic view [23], not to find generalization findings [24], but to find contextual data relevant to the existing situation. In ethnography, the researcher takes data that exists, what ought to be, what people do, what is said, and how they work [25].

Researchers conducted ethnographic immersion interviews together with authorized officials at the directorate responsible for developing the national electronic procurement system. The choice of immersion is because researchers are also partly involved in this development process, even though their role is marginal. It is hoped that with this immersion, researchers will get more comprehensive data which will later be used in building architectural designs using the TOGAF ADM framework.

3. METHODOLOGY

In this study, there is a research framework that covers the entire research process. This research starts with the observation and interview stages to related companies and analyzes each data obtained. The focus of the research is on the initial architecture of TOGAF, which can be shown below figure:

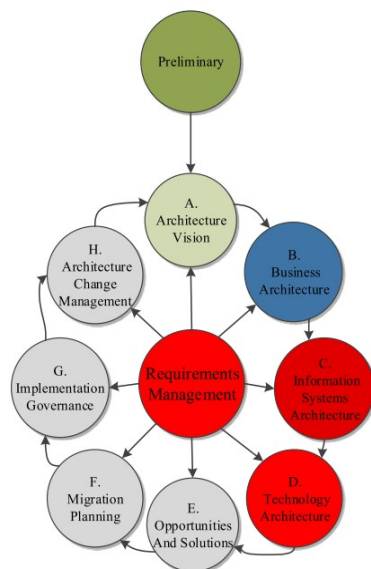


Figure 2: Adapted TOGAF ADM Model [12]

The research steps will consist of:

- *Preliminary Phase*
Preparation and initiation activities are needed to meet business objectives, enterprise architecture and explain the architectural framework and the definition of principles.
- *Phase A: Architectural Vision*
The initial steps of the architectural vision development process include information on setting spatial boundaries, the stakeholders, creating the architectural vision, and acquiring approval.
- *Phase B: Business Architecture*
Business architecture development aims to strengthen the architectural vision that has been previously defined.
- *Phase C: Information System Architecture*
Information system architecture aims to develop data and application architecture.
- *Phase D: Technology Architecture*
Architectural technology aims to develop a technological architecture that describes the composition and synergy of principles services further logical and physical technology components.

4. RESULTS

4.1 Preliminary Phase

The initial stage for designing the Enterprise Architecture aims to produce architectural principles and convince stakeholders involved in the decision-making process. The aim of this phase is done for the success of the Information Technology architecture in the organization. This phase describes the preparation phase of the initial planning and activities by defining 4W1H (where, what, why, who, and how) to design to meet the enterprise architecture's business objectives. In this phase, produce a catalog artifact, namely the EA design principles. The EA design principles catalog can be shown in table 1.

The impacted organizational unit varies from internal organizations, including the support unit and planning department. The external organization involved in the architecture is the vendor itself, the finance and tax department, and the homeland department. The core impacts are shown in the SPSE Agency as part of the central idea of the national procurement system, blacklist vendor system, legal, e-Procurement planning, and vendor. The soft impact comes from the supported area, data warehouse, and shared service center like

a call center, which helps handle trouble tickets. The whole picture can be shown in figure 3.

The e-Procurement planning system is involved since when choosing the tender type, the planner has to be making sure that the tender process would be running successfully since the qualified vendor is available. On the other hand, if the qualified is not available, the requirement needs to be adjusted, which leads to schedule problems, or the tender has to be dropped. The Blacklist system was involved to exclude the blacklist vendor from being invited in quick tender processes. If something goes wrong, then a lawsuit might be filed to dispute the tender process. Vendors have the most significant interest here when their data fails to be consolidated, meaning that their chances, not qualifying, are high, thus failing to be invited to participate in the quick tender process.

The current and targeted maturity assessment result can be shown in figure 4.

Resolution approach or mitigation strategy to fill the gap between current and target maturity levels are shown table 2.

The following section describes the critical roles for enterprise architecture capability management shown below table 3.

Table 2: Architecture Capabilities Maturity Gap.

Capability	Current Maturity Level	Target Maturity Level	Gap	Resolution Approach
Strategic Planning	40	90	50	Enable agility in an extended enterprise
Architecture Planning	40	70	30	Establishment of the planning process
Funding & Resources	45	70	25	Make funding available through the intensive workshop with stakeholder
Architecture Process and Method	65	90	25	Define the interactions with the existing framework
EA Governance	40	80	40	Documented governance framework
Organization Structure & Skills	50	70	20	Approach functional-based resources to be able to perform excellent operations
Stakeholder Management	30	75	45	Identification of stakeholders and establishment of communication plan

Table 1: EA Design Principle Catalog.

Principle	Purpose
Business Architecture	The architecture developed must support the business processes and the existing vision and mission of the organization.
Application Architecture	The architecture developed must be secure and information well protected.
	The application speeds up business processes
	The application developed is easy to use and understand
Data Architecture	Access to data can be done more securely and easily
Technology Architecture	Applications must be integrated with other applications that meet common industrial standards

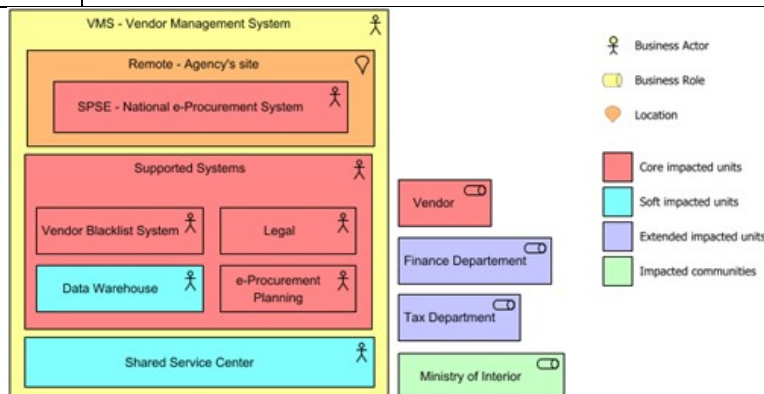


Figure 3: Impacted Organization Unit

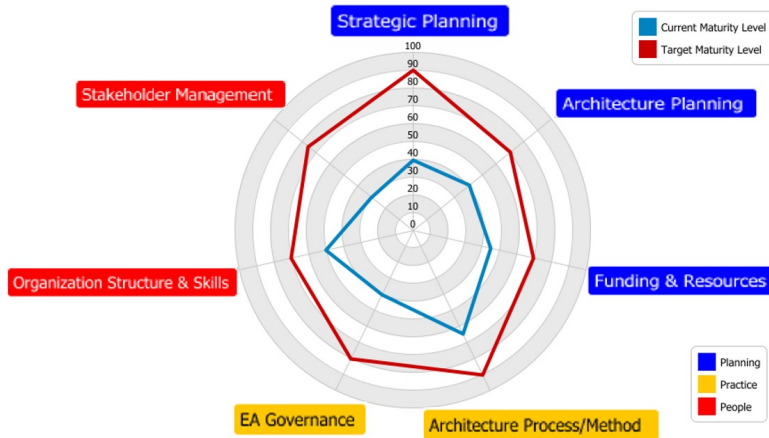


Figure 4: Architecture Maturity Assessment

Table 3: Roles and Responsibilities.

Role	Responsibilities
Director	<ul style="list-style-type: none"> Provide advice and assistance on IT acquisition and management and facilitate the implementation
Enterprise Architect	<ul style="list-style-type: none"> Produce architectural design, documentation of design decisions, and strategic plan base on the articulation of technical vision Communicate relevant information to all stakeholders Build formula of solution context and identify any alternate solution
Chief Architect	<ul style="list-style-type: none"> Ensure that business strategy is conveyed implicitly in enterprise processes Provide guidelines to enterprise architects on the development activities of the architecture.
Program Management Office	<ul style="list-style-type: none"> Define standards for how to execute architecture projects Ensure assent with project management procedures, standards, and policies Collect project data and present information needed for management review Expedite portfolio management process
Service Management	Responsible for managing, executing, and monitoring deployment solutions

Base on the roles above, the RACI (Responsible, Accountable, Consulted, Informed) assessment matrix produces the RACI matrix of the

involvement roles into major architecture activities shown in figure 5.

	Enterprise A...	Architecture ...	Impact Asse...	Capability A...	Architecture ...	Design Ass...	Architecture ...	Performanc...
Director	I	I	I	I	I	I	I	I
Enterprise Archit...	R	R	R	R	RI	C	RA	R
Chief Architect	RA	RA	RA	RA	RA	AC	RA	RA
Program Manag...	C	C	I	I	I	I	I	I
Service Manage...							R	C

Figure 5: RACI Matrix

The architecture organization illustrated in figure 6 highlights major structural elements required for the architecture governance initiative. The director plays a crucial role in the success of enterprise architecture projects. Enterprise Architects keep with domain architects, which commonly are application owners in each unit.

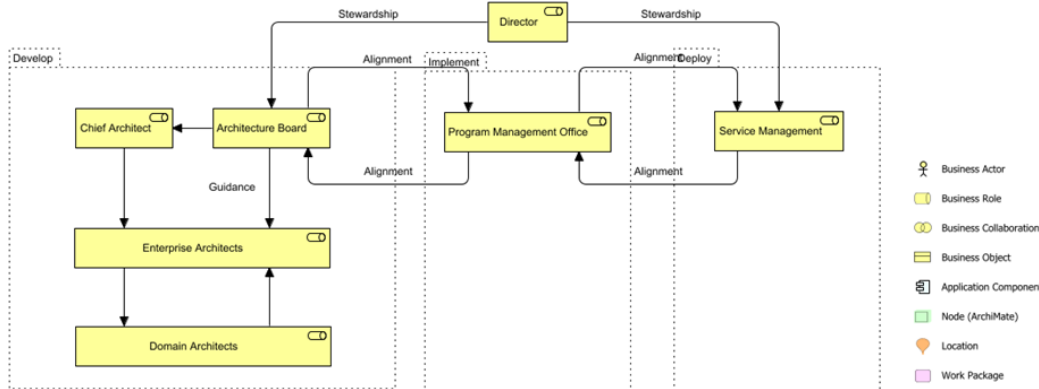


Figure 6: Governance Structure

The following section restates the business objectives, goals, and drivers illustrated in table 4.

Table 4: Drivers/Goals/Objectives Catalog

Drivers	
1	Mandatory requirement of the regulation that each e-procurement process should be accountable
2	Improve public satisfaction in the fairness of the e-procurement process
Goals	
1	Improve Vendor Data Quality in terms of integration and consolidation
2	Vendors can to self-manage their data
3	Maintain data availability by paying attention to data integrity and security
Objectives	
1	Increase vendor data integration and consolidation success rate by more than 80% by the end of this year

4.2 Phase A: Architectural Vision

The scope of this phase includes the vision, mission, and business objectives:

- The vision and mission of LKPP are:
The realization of the Government's Goods/Services Procurement Policy Institute as the main driver in the Government's Procurement of Goods/Services to Realize an Advanced, Sovereign, Independent, and Personalized Indonesia based on Mutual Cooperation.
- The business objectives of LKPP are:

1. Implement a responsive procurement policy and encourage the nation's independence by technological advances
2. Develop electronic-based procurement business processes and adaptive procurement HR management
3. Improve the accountability of the Procurement of Goods and Services.

To achieve the business objectives of the three organizations, namely to increase accountability for the procurement of electronic goods and services, the need for vendor data management is vital. One element of accountability is the fairness principle [4], an essential key in this research activity. Vendors have the right to follow all business processes equally and from anywhere. In addition, all tender processes are open so that all parties can monitor together. The solution concept offered in this study can be seen in Figure 7, where fairness is one of the objectives of this research activity.

The e-Procurement department is the most central unit that is closely related to implementing objectives of LKPP. LPSE and vendor are most interested in this particular data consolidation to make a fair e-procurement process. The Board of Directors and Legal Department are groups of stakeholders that have influence and lower interest, but they might be impacted once the problem occurred. A support group that helps LPSE handle problems is a stakeholder group that needs to be closely monitored to keep their lower rate of escalated problems.

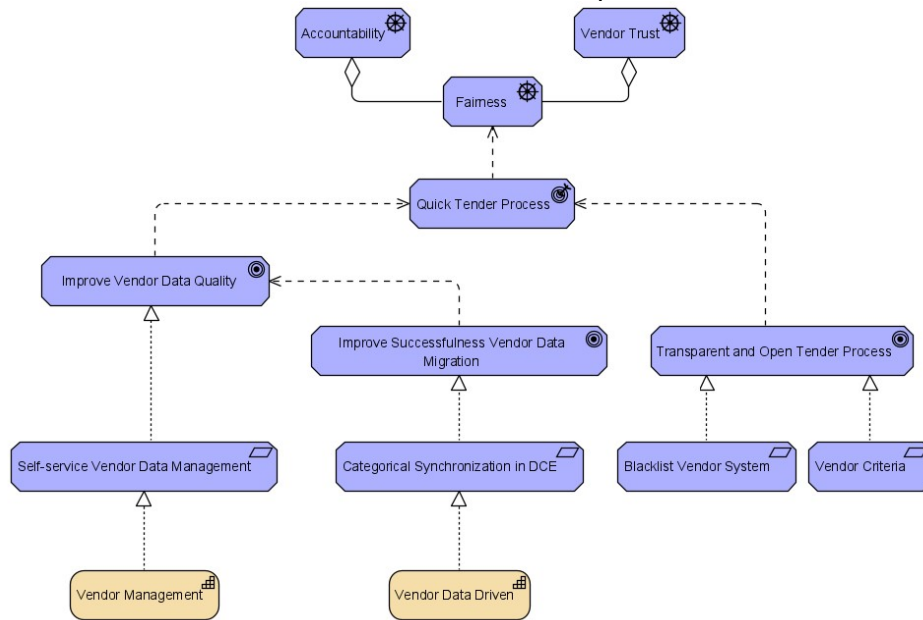


Figure 7: Solution Concept

In this phase, produce a stakeholder map matrix that can be shown in figure 8.

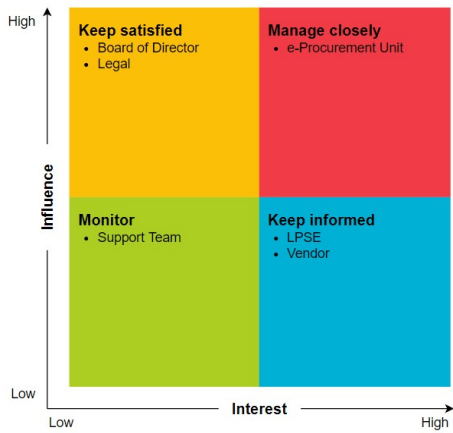


Figure 8: Stakeholder Map Matrix

The next stage is the assessment of business capabilities which can be seen in the following figure 9. It was found that the current obstacle to be faced is the lack of expert enterprise

architects. Therefore, it is necessary to conduct training or increase the number of experts. Furthermore, because the changes made are pretty significant, gradual, and require considerable employee durability, it is necessary to launch a program to motivate employees to always align with the design and implementation process later. The last one is related to policies and rules designed to help run business operations properly.

Next, carry out an IT Capability assessment which can be seen in figure 10. The gap that appears is related to implementation and testing. Therefore, it is necessary to redevelop the related application and carry out comprehensive testing of these changes to fill this gap. The changes made are changing the SIKAP application architecture from monolithic to microservice, changing the data collection mechanism in DCE, and implementing gateway management to manage published APIs.

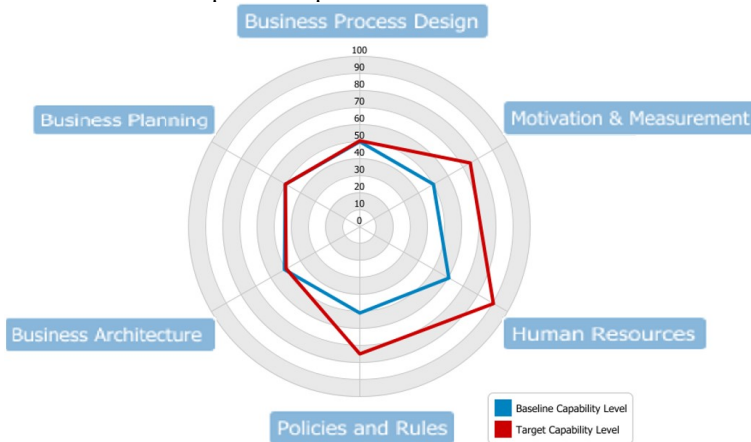


Figure 9 Business Capability Assessment

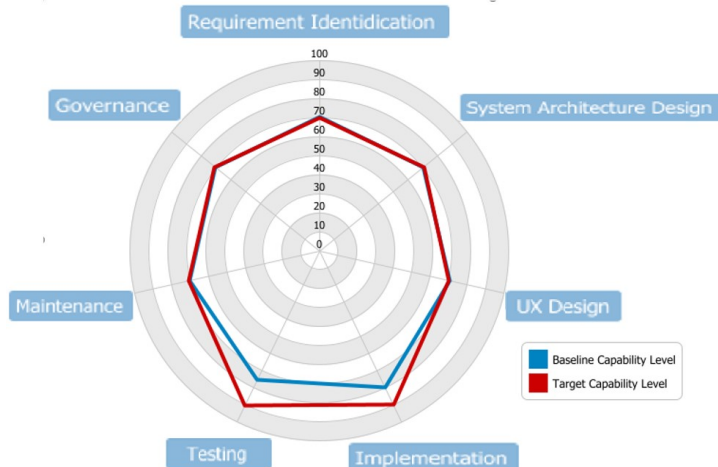


Figure 10: IT Capability Assessment

4.3 Phase B: Business Architecture

In this business architecture phase, at the initial stage, we need to define the baseline. The baseline of this business architecture can be seen in figure 11. The function of modifying vendor data can be done through two applications, namely SPSE and SIKAP. The SIKAP application serves various vendor data change functions, from self-registration, verification by officers, and shortlist searches for quick tenders and public searches.

The next step is to develop the target business, architecture model. This business architecture target is an illustration of the expected architectural design in the future. In the target business architecture, changes are required based

on drivers, goals, and objectives. The target of this business architecture can be seen in figure 12.

Next, do a gap analysis of changes from the baseline to the target. Briefly, the changes that occurred in the recording process and changes to the data provider can be seen in table 5.

The vendor management system (VMS) is the result decomposition of the SIKAP application and part of the primary process in national e-procurement. In the e-procurement department, the vendor management system is under the responsibility support unit.

There are some key business processes and subprocesses that can be found in Tables 6-8.

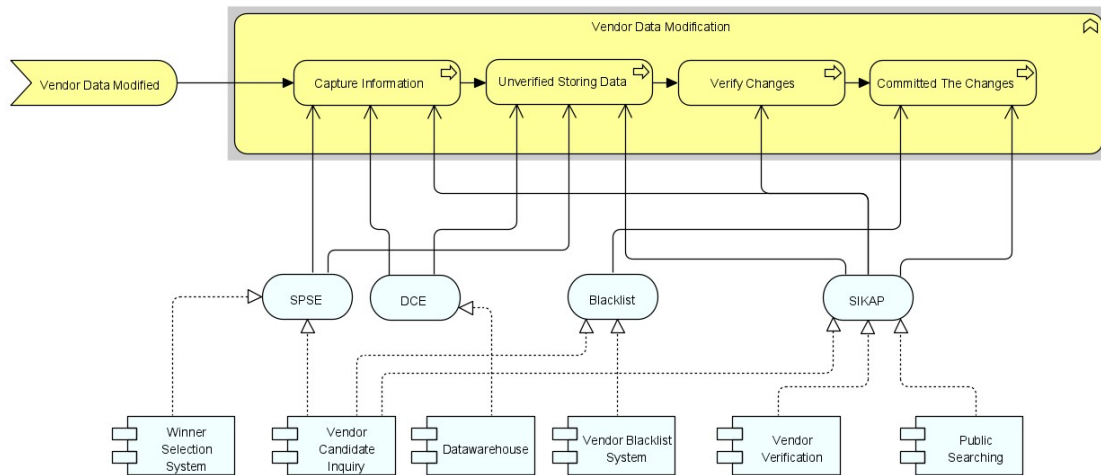


Figure 11: Baseline Business Architecture

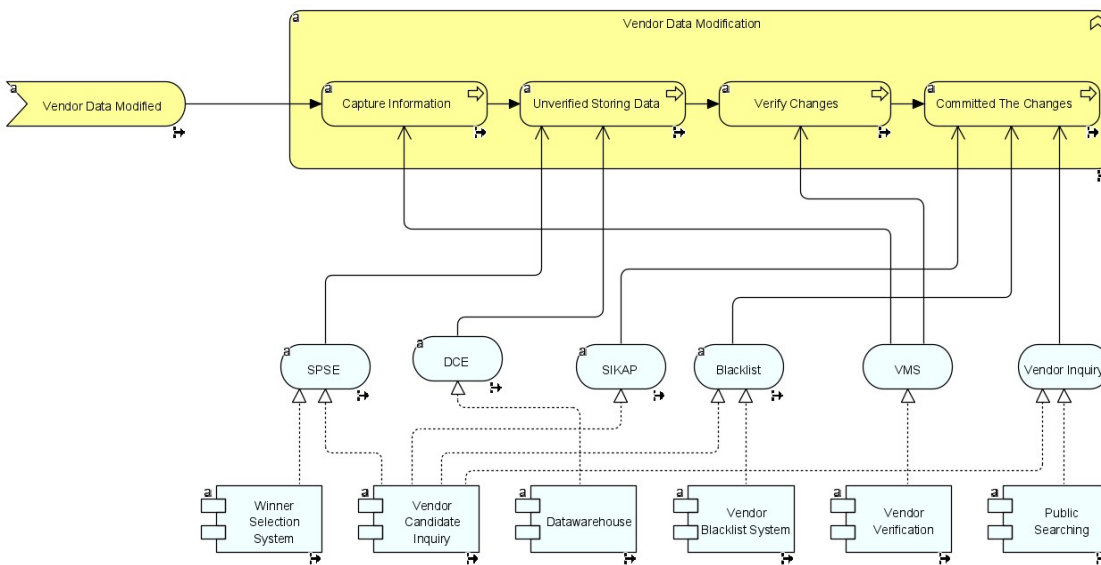


Figure 12: Target Business Architecture

Table 5: Gap Summary

People	Vendors can do self-service registration and managing their profiles instead of coming to the agency ask them to do it.
Process	Vendors register and manage their profiles via the VMS application. Therefore, registering Vendors via SPSE is no longer available. The only remain is a different experience once the vendor is selected as a winner of the tender.
Tools	Introduce new VMS
Information	N/A
Measurement	N/A
Financial	N/A
Facilities	N/A

Table 6: Process Architecture Account Registration

Sub Process	Activities
Registration LPSE Account	Create an Account in CENTRUM with an e-mail with a proof assignment letter from the superior of the related officer
	Verification e-mail account
	Account created but disabled until it approved by LKPP officer
Registration LKPP Account	Create an Account in CENTRUM with an e-mail with a proof assignment letter from the superior of the LKPP officer
	Verification e-mail account
	Disabled account created; approval needed from super administrator role with dispossessions letter from the direct superior

Table 7: Process Architecture Self Service

Sub Process	Activities
Registration (Could be done in SPSE which remote site or SIKAP as centralized application)	Create an Account with an e-mail
	Verification e-mail account
	Login with the new account created
	Input mandatory profile
	Input optional profile
	Input project/experience
	Input experts/employees
Change/Update Profile (Via SIKAP)	Login with a valid vendor account
	Update mandatory profile, and some fields need re-verification (e.g., NPWP, SIUP, field) or approval by the officer
	Some other data fields do not need to be verified (e.g., phone number)
Manage Portfolio (Via SIKAP)	Login with a valid vendor account
	Add/Delete/Modify project or working experience in corporate level within proof document attached
	Each modification or additional experience needs to be re-verification by the related officer
Manage experts/employee (Via SIKAP)	Login with a valid vendor account
	Add/Delete/Modify the list of employees with detail working experiences; the additional proof document is attached if required
	Each modification or additional employees and experiences need to be re-verification by the related officer

Table 8: Process Architecture Vendor Validation

Sub Process	Activities
Find Vendor by ID (NPWP or Company Name)	Login with a valid LPSE account
	Search Vendor by a specific parameter
	View Vendor profile with more detailed data
Document Verification	Login with a valid LPSE account that has valid roles
	Verify uploaded document
	Update verified field flag
Corporate Level Verification	Login with a valid LPSE account that has valid roles
	Verify the related field with the submitted proof document and other sources, such as the national tax system.
	Update verified field flag
Project/Experience Level Verification	Login with a valid LPSE account that has valid roles
	Verify the related project/experience
	Update verified field flag
Experts	Login with a valid LPSE account that has valid roles
	Verify the related project/experience field with proof reference document submitted and other human resources department required document
	Update verified field flag, and it can be done in employee detail records level or each experience records level

The below process is intended to be public on the front page of SIKAP, which is no need to be authenticated to utilize the application's functionality.

Table 9: Process Architecture Public Services

Sub Process	Activities
Find Vendor	Without login, public/guess can search with some searching parameter
	Public/guess can view limited approved information, like company name, addresses, but remain confidential data keep hidden.

4.4 Phase C: Information Architecture

At the beginning of this information architecture stage, focus on the data architecture. First, we need to create a baseline data architecture model, as shown in figure 13. The vendor registration process has a dualism process that can be done through SPSE or SIKAP depends on the officer's choice. Once vendor data is created, it can be managed through SIKAP, including the experts' data.

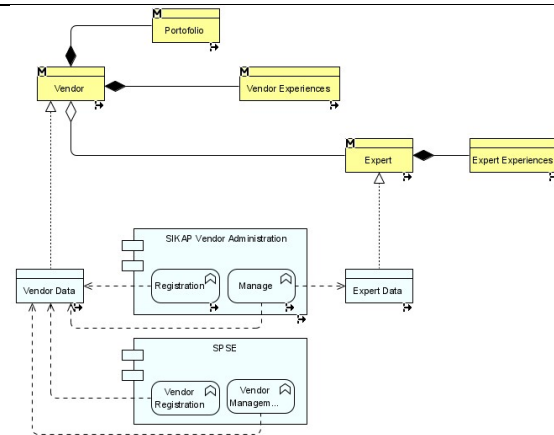


Figure 13: Baseline Data Architecture Model

The next step is to design the target data architecture model, as shown in figure 15. The next step is to design the target data architecture model, as shown in figure 14. Finally, the vendor registration and management functions in the SPSE application are removed. All these functions are only available through VMS, which is a functional decomposition of the SIKAP application. Synchronization of vendor data from VMS to SPSE for contingency purposes when an offline process occurs is carried out during the authentication process through the ADP service.

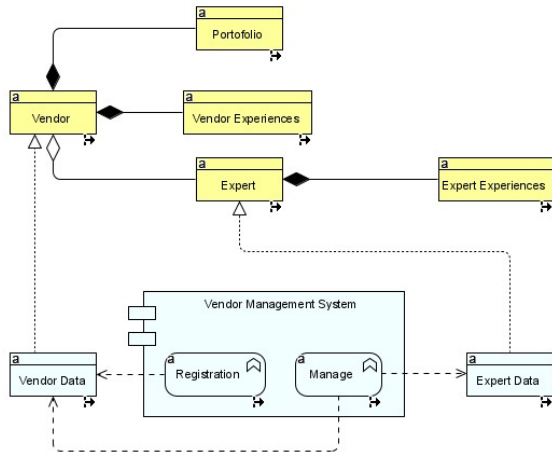


Figure 14: Target Data Architecture Model

In addition to the baseline and target data architecture model, it is necessary to create a

baseline application architecture model and design a target application architecture model. The baseline application architecture model can be seen in figure 15 and the target application architecture in figure 16.

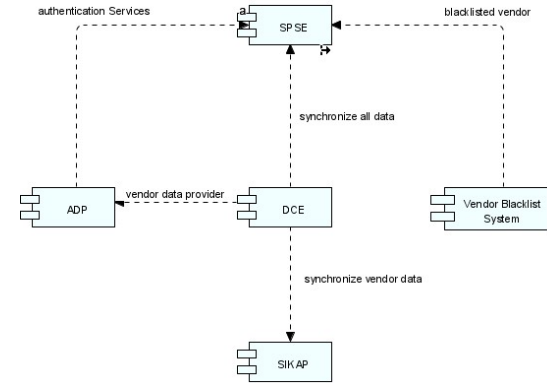


Figure 15: Baseline Application Architecture Model

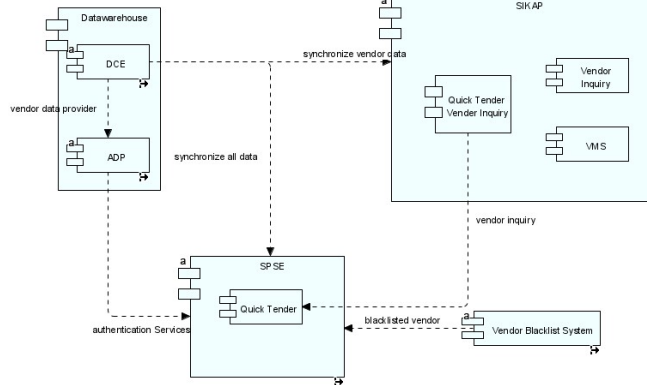


Figure 16: Target Application Architecture Model

The next step is the gap analysis of the data domain, which can be seen in figure 18. Conceptually there is no difference between baseline and target data domain. Both business and data objects appear with the same structure and concept model.

Here, a green label shows the new components in the target, namely in SIKAP, which includes: VMS, Quick Tender Inquiry, Vendor Inquiry, and Public Searching; then, those in the SPSE are Quick Tenders.

The table 10 summarizes the application proposals, along with a brief of the function of each application.

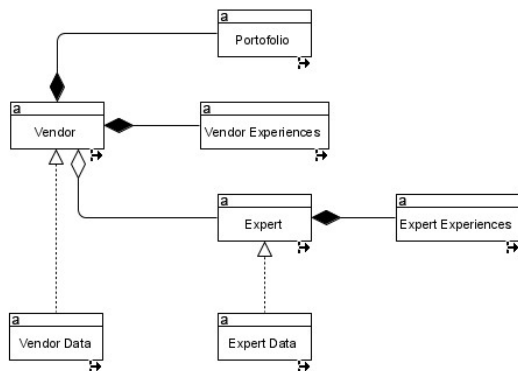


Figure 17: Gap Analysis Data Domain Model

The next step is the gap analysis of the application domain, which can be seen in figure 18.

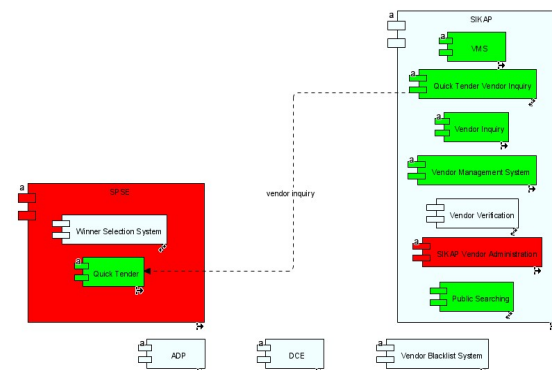


Figure 18: Gap Analysis Application Domain Model

Table 10: Proposed Information System

Application	Function
Messaging System	This messaging system is the central platform introduced to create asynchronous communication among applications and services. In addition, messaging systems can be used for back-end mechanisms synchronizing large databases that do not require real-time data.
Datawarehouse (DCE)	DCE already exists but has a severe synchronization load problem caused by its requirement to synchronize all schema databases in remote locations. In addition, the cost of synchronization is prohibitive. Therefore, this research suggests to divide the synchronization path, vendor profile data made a particular synchronization path, apart from other data such as tender data, for example
Vendor Management System (SIKAP)	SIKAP is an application that manages vendor data, from the registration process, profile changes, experience, company experts, and the verification and validation process carried out by LPSE. Currently, SIKAP is a monolithic application, so that it becomes hard to manage both development and operation. Therefore, it is necessary to transform the architecture into microservices so that the functions in the SIKAP application can be broken down into more minor services which are expected to be easy to manage.
Vendor Finder	It is a crucial feature in the vendor search process. SIKAP is transforming from monolithic into a microservices architecture. One of the services made is the search for vendors. This vendor search will be divided into several facets: public, which is where everyone can search for a specific vendor profile based on certain keywords or search criteria, and no less important is the electronic procurement facet, which provides vendor search services based on criteria that have been defined in the procurement planning process—the previous year.
CENTRUM (Centralized User Management)	This application manages government employee types of accounts that remain on LKPP or remote LPSE offices. CENTUM also provides OAuth 2.0 authentication services for related applications within LKPP.
Centralized Authentication Services for Vendor Account (ADP, Agregasi Data Penyedia)	SPSE hosted on remote LPSE or other related applications hosted in LKPP make OAuth 2.0 authentication via ADP for Vendor type accounts.
API Gateway	API Gateway is an application that functions to expose services or expose data using the service paradigm to other parties. These other parties can be applications or internal services or application/services from other parties, such as other government institutions through the Open API initiative. The use of this API Gateway makes the development of services more straightforward, and the security policies or rules can be maintained in different aspects of business-specific source code.

4.5 Phase D: Technology Architecture

This stage creates a baseline and target technology architecture, which is then made into a gap analysis. In Figure 19, it can be seen how the

results of the technology architecture gap analysis. The green color blocks indicate new functions that must or will be created, while the red blocks represent functions or applications that will be eliminated in the architectural target later.

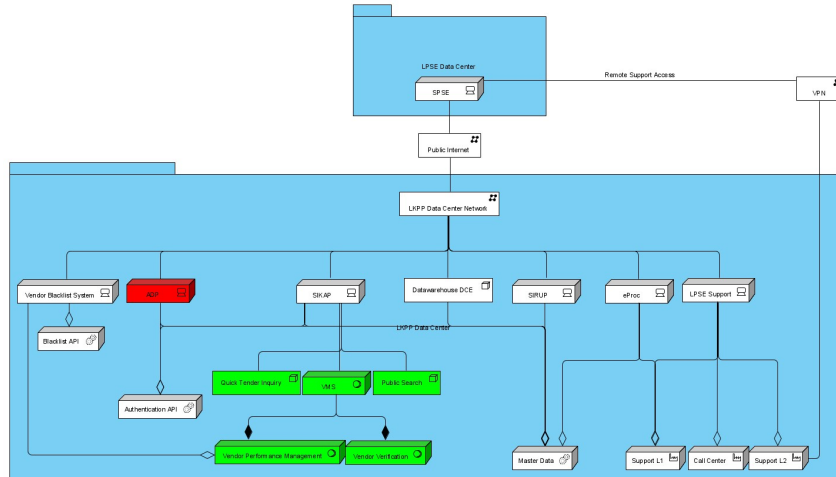


Figure 19: Gap Technology Architecture

The last stage of this roadmap is the creation of new functions in centrally managing vendor data. Vendor Management System (VMS) is the main function in the SIKAP application that serves the self-management of vendor data. In addition, SIKAP application is also used by authorized officials to verify vendor data and assess the performance of vendors who won tenders.

Another function of the addition of SIKAP is the need for a search for vendors by the public and a tool to build queries for quick tenders, which will later be used by SIRUP in the procurement planning stage and SPSE when the procurement is executed at a later date.

In the current state, the authentication process for vendors occurs in two models. The first is to use a local SPSE database. Local database authentication is the original version of the early SPSE as a logical consequence because the registration process is also in SPSE. The second authentication process is when the vendor has asked LKPP to consolidate its account to ADP, the vendors can log in to all SPSE throughout Indonesia with one username and password. All of the more than 600 SPSEs have implemented this

kind of authentication. However, not all vendors request to be consolidated in ADP.

The final result of this architecture is that because all provider data will be in SIKAP, the ADP function is no longer relevant. Because ADP only functions to consolidate when requested. Policy options for making this provider's data accessible nationally have been defined. This policy means changing the perspective from sectoral ownership to national management. Therefore, ADP will be omitted in the target architecture later.

In order to get to the destination architecture, it is necessary to make a transition process. The resulting transition process in this architectural design can be presented in Figure 20. There will be two workflows. First, upper branch flows are work packages related to consolidating provider data from more than 600 databases spread throughout Indonesia into one centralized database under the flagship application called SIKAP. The second flow below is the application transition process so that the risk of change does not impact the live production environment. This transition process introduces new technologies using API Gateway and messaging or event stream processors.

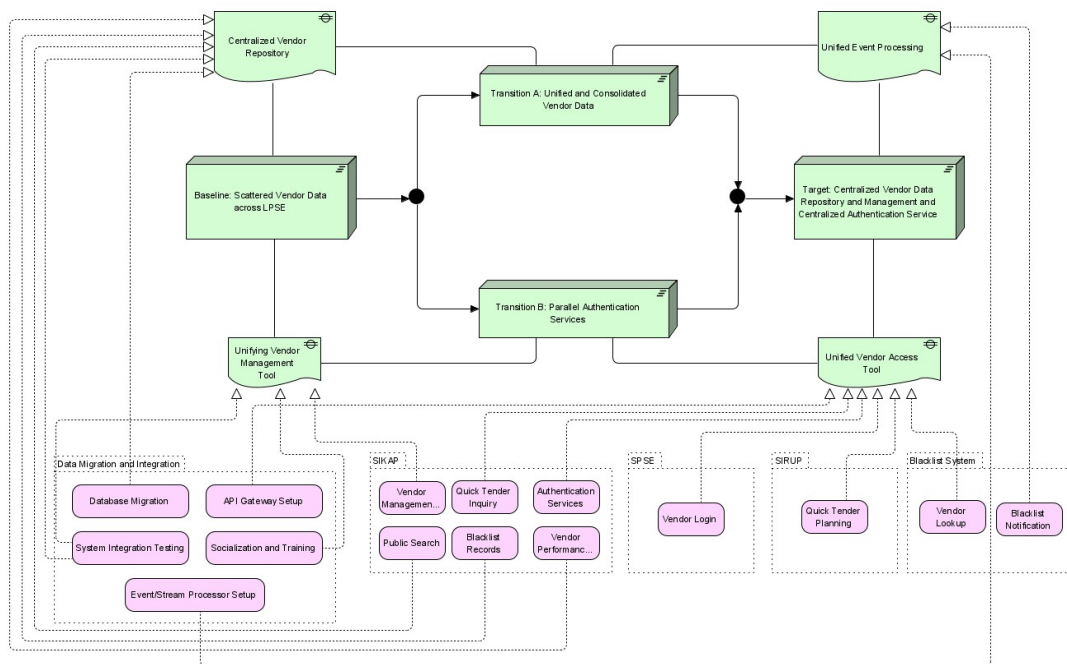


Figure 20: Transition Plan

The pink bottom block represents the work packages that will later be implemented to support the above transition process. Appointing the winner of each work package is part of the TOGAF ADM phase process, which is not included in this paper.

5. CONCLUSIONS

The conclusion obtained from the research results is that increasing fairness with an enterprise data-driven approach with the TOGAF ADM framework can be achieved with a suitable method and architecture. Therefore, enterprise architecture

prioritizes outlining architectural projects that will be executed to fulfill the business vision.

There are multiple staging scenarios as part of transition process to improve the data consolidation process of vendor data from each distributed SPSE database which can be described as follows:

- The existing synchronization process could be split based on the priority, priority created by urgency, and data sensitivity. In this case, vendor data is more critical to synchronized bi-directionally between SIKAP and related SPSE, so the synchronization agent should handle such a typical load. Therefore, the vendor synchronization process previously direct to DCE will be directed to SIKAP with calling API provided, and from SIKAP will be synchronized to DCE.
- The minor priority data type can be synchronized as a batch method using an asynchronous model thru messaging systems.
- New vendor registration processes are suggested done via SIKAP only.
- Vendors are urged to verify the consolidated account with SIKAP and do self-services updates or tracing missing information.
- SIKAP functionality will be divided into small functions and implemented using a microarchitecture approach. For the first stage, it would become authorized services and public service. Public service only searches vendor service by keyword and simple parameter. Authorized services are consisting a vendor management system (VMS) and vendor lookup for quick tender process type.
- All applications and data services will be hosted through the Open API Gateway to reduce complexity and make all service access uniform across the enterprise.

By improving the quality of vendor data and the successful consolidation of distributed data, there will be fairness in the tender process in national e-procurement and reduce problems that can potentially become lawsuits.

In future proceedings, it can be suggested that all vendor registration processes can be improved with a centralized process, either self-service or with the assistance of existing personnel, to avoid data loss or duplication in the past. In addition, future regulations must be followed so that vendors are required to update their profiles and experiences through SIKAP when participating in tenders through SPSE.

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