DIGITAL TWIN CONCEPT FOR INDONESIA DIGITAL GOVERNMENT INFORMATION TECHNOLOGY GOVERNANCE

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ABSTRACT

This paper explores the possibility of digital twin concept implementation framework in Indonesia Digital Government Systems (IDGS) using Information Technology (IT) Governance indicators states in Indonesian Government regulation. The concept of Indonesia Digital Government regulated by Indonesia Presidential Regulation no. 95 year 2018 that define digital government as a governance that adapting to advances of technology information and communication and utilize optimally so it can provide service to citizen in most efficient and effective way. Indonesia government implement IT Governance using regulation publish by the Minister of State Apparatus and Bureaucracy Reform No. 59 year 2020 about monitoring and evaluation of Indonesia Digital Government System. In the regulation, the governance consists of monitoring, which is a systematic assessment process through verification of information on the results of the Self-Assessment to measure the maturity level of implementation and the evaluation, is a process of self-assessment systematically through verification and clarification of information which can be continued with information validation to the results of the Self-Assessment to measure maturity level of digital government system implementation. The concept of exploiting digital twin concept to Governed IT Management is a framework introduce by Geert Poels, Henderik A. Proper and Dominik Bork in 2021. The Digital Twin concept itself already utilize to do such as monitoring data, data analysis, conduct simulation, and enhances performance of assets. The framework will be use as a technology infrastructure reference model that facilitate Digital Twin in conceptual aspect where process of IT governance, organizational IT assets management and IT management processes, connected.

Keywords: Digital Twin,Indonesia, Digital Government, IT Governance.

1.   INTRODUCTION

The era of digital technology serves as foundation trigger for a government to operates its bureaucracy that create changes in process of its public services and give positive transformation experience for the citizen [1,2]. The technologies have also been used as perspective reason for a revolutionary progress, such as known also by the term of disruptive innovation in area of public service availability, creating radical changes to existing business and its service models, and ultimately, the services and who delivered them are also shift its course more extreme in positives way [1,2,3].

Indonesia Digital Government goals for being implemented found in Presidential Regulation number 95 year 2018, in the consideration section, consist two goals that the regulation aims, the first was to realize a good governance that are free of fraud, effective in operation, transparent to public access, and accountable for every action and decision it's made, resulting a high quality and professional public services deliver, a digital government system is required; and second was to improve cohesiveness and efficiency of digital government system, a good governance and management required [4].

The development of digital government systems in Indonesia has not yet achieve satisfied result such as for one of the goals of better public services delivered and its governance [5]. This claim easily seen by using various parameter indexes for measuring government system maturity, it gives Indonesia low level for global competitiveness and accessibility in doing business, the government effectiveness variable also in a low level, with high levels for corruption variable. Indonesia government need to tackle and overcome this situation and strategies needed when doing digital transformation and creating a good digital government system. Variables that can be explored and may be create opportunity to develop digital government system are a. in aspect of regulations and policy, b. in choosing and implement the digital system, c. reforming the bureaucratic for governance, d. developing apparatuses human resource, the culture and it's leadership, and the last but not least is e. Information Communication and Technology Infrastructure aspects [5,6].

When discussing the reasons why Indonesia Digital Government Systems are not performed either its implementation nor the utilization, there are few that could be mention, such as the National ICT

infrastructure that yet to achieve optimum coverage. Satellite technology, internet networks and electricity networks are essential for the development of Digital Government Systems across Nation [5,7].

The next to mention would be issues of leadership factor at every level bureaucracy. This condition creates situation such as mismatch and miscommunication policy between the central government and the local government's policies, resulting poor regulations, spending budget not efficient and no system standardization. All the situation mention before can be avoided with the commitment of the leaders and officials to working together realizing the digital government systems. Cases of how commitment and working harmonized give satisfactory and success result of implementing the systems in the regions are found [6,7].

The last factor that needs to mention are culture. Indonesia local government are familiar with technology and can easily access such technology, and local leaders are eager to develop public services using digital government system. Unfortunately, sometime local leader vision for digital government systems implementation meet solid wall called working cultural factors of its apparatus. This factor gives results of limited awareness and missing appreciation for importance of the systems. Another reason for the resistance of the apparatus to adopt and adapt the systems is the thought of threatening their job and position. An example for this kind of thinking is the integration process of state agencies, departmental and non-departmental agencies are always constrained because their ego won't allowed, they are afraid to share data and information for whatever reasons that might be [5,6,7].

Reflecting from all the reasons mention above that explained the need of Indonesia Digital Government System and why it still not yet achieves satisfactory results, there's should be a formulation of strategies to achieve such results [5,6]. Strategies that can be taken are: develop legal aspects and policies to guide Indonesia digital government system implementation; optimizing infrastructure for digital system, such as data centre, this could resulting of more integrated and seamless of intra-government network and its applications; reforming bureaucratic and restructuring it; develop human resource in bureaucracy and gain ICT competences; introduce technology literation for work culture to change and encourages apparatus to adopt and adapt technology; creating and nurturing leadership to have digital vision, they in time will enhance process sector collaboration, resulting better provision of ICT infrastructure coverage [7,8].

2.   LITERATURE REVIEW

According to Indonesia Presidential Regulation no. 95 year 2018 digital government define as a governance that adapting to advances of technology information and communication and utilize optimally so it can provide service to citizen in most efficient and effective way [4]. Detailed processes of IT Governance conduct for Indonesia Digital Government Indonesia government implement IT Governance using regulation publish by the Minister of use of state apparatus and bureaucracy reform of the Republic of Indonesia No. 59 year 2020 about monitoring and evaluation of Indonesia Digital Government System. In the regulation, the governance consists of monitoring, which is a systematic assessment process through verification of information on the results of the Self-Assessment to measure the maturity level of implementation and the evaluation, is a process of self-assessment systematically through verification and clarification of information which can be continued with information validation to the results of the Self-Assessment to measure maturity level of digital government system implementation. [9].

Further explained in the regulation [9], in section 2, item (1), The Ministerial Regulation is intended to provide guide for Central Agencies and Local Government in: a. understand the objectives of monitoring and evaluation and determination of the scope of application assessment Indonesia Digital Government System; b. understand the assessment method Monitoring and Indonesia Digital Government System evaluation; c. understand the work steps that must be carried out in the Monitoring and Evaluation process Indonesia Digital Government System; and d. ensure the quality of implementation Monitoring and Evaluation of Indonesia Digital Government System in Central and Government Agencies Area. Item (2), Indonesia Digital Government System Monitoring and Evaluation aims to: a. measuring the progress of Indonesia Digital Government System implementation in Central Government Agencies and Local Governments; b. improving quality of Indonesia Digital Government System implementation in Central Government Agencies and Local Governments; and c. improving quality of public services in Central Government Agency and Local Government [9].

IDGS Maturity Level Assessment Structure, the structure for assessing the maturity level of IDGS implementation consists of: a. domain, is the area of IDGS application being assessed; b. aspects, are areas of IDGS implementation that spesifically assessed; and c. indicators, are information from aspects of IDGS implementation that spesifically assessed, where a domain consists of one or more aspects, and an aspect consists of several indicators [9].
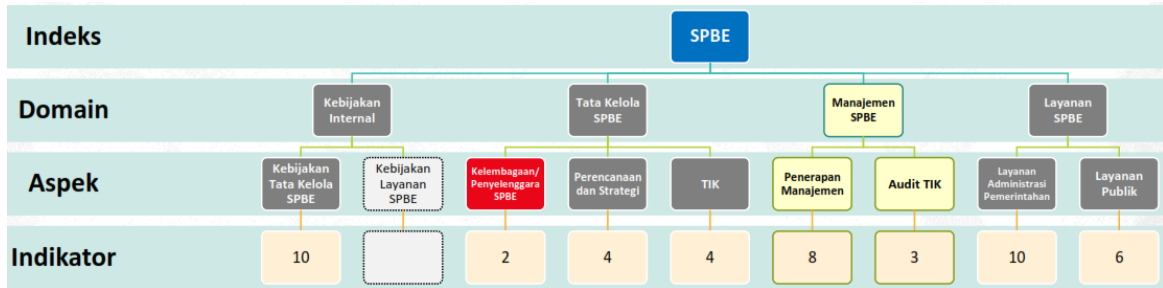
Figure 1 Maturity Level Assessment Structure [9].

Table 1. List of Indicators in SPBE Policy Domain

Aspect/ Indicator	SPBE Policy Domain Indicator Name
Aspect 1 - Internal Policy for SPBE Governance	
Indicator 1	SPBE architecture internal policy maturity level Central/Local Government Agencies
Indicator 2	maturity level of internal policy plan map SPBE for Central/Local Government Agencies
3 indicator	data management internal policy maturity level
4 . indicator	maturity level of development internal policies SPBE app
5 . indicator	Service Center internal policy maturity level Data
6 . indicator	network service internal policy maturity level intra Central/Local Government Agencies
7 . indicator	maturity level of internal policy of use Central/Government Agency service liaison system Area
8 . indicator	management internal policy maturity level information security
9 indicator	technology audit internal policy maturity level information and communication
10 indicator	coordination team internal policy maturity level SPBE for Central/Local Government Agencies

The structure of the maturity level assessment can be seen in Figure 1 in the form of a hierarchy and list of domains, aspects, and complete indicators can be seen in Table 1-4 [9].

Table 2. List of Indicators inSPBE Governance Domain

Aspect/ Indicator	SPBE Governance Domain Indicator Name
Aspect 2 - SPBE Strategic Planning	
11 indicator	Institutional SPBE Architectural Maturity Level Central/Local Government
12 indicator	Maturity Level of Agency SPBE Plan Map Central/Local Government
13 indicator	Maturity Level of Plan and Budget Integration SPBE
14 Indicator	Maturity Level of SPBE Business Process Innovation
Aspect 3 - Information and Communication Technology	
15 Indicator	Maturity Level of SPBE Application Development
16 Indicator	Data Center Service Maturity Level
17 . indicator	intra-Agency network service maturity level Central/Local Government
18 indicator	Maturity level of use of liaison system Central/Local Government Agency services
Aspect 4 - SPBE Operator	
19 . indicator	Maturity level of SPBE coordination team implementation Central/Local Government Agencies
20 Indicator	maturity level of SPBE implementation collaboration

Table 3. List of Indicators in SPBE Management Domain

Aspect/ Indicator	SPBE Management Domain Indicator Name
Aspect 5 - Implementation of SPBE Management	
21 Indicator	Maturity Level of SPBE Risk Management Implementation
22 . indicator	Maturity Level of Security Management Implementation Information
23 Indicator	Maturity Level of Data Management Implementation
24 Indicator	Maturity Level of ICT Asset Management Application
25 . indicator	Maturity Level of Application of Competency Source Human Power
26 Indicator	Maturity Level of Knowledge Management Application
27 Indicator	Maturity Level of Change Management Implementation
28 . indicator	Maturity Level of Service Management Implementation SPBE
Aspect 6 - Implementation of ICT Audit	
29 . indicator	Maturity Level of Infrastructure Audit Implementation SPBE
30 Indicator	Maturity Level of SPBE Application Audit Implementation
31 Indicator	Maturity Level of SPBE Security Audit Implementation

Digital Twin can be defined as connection or joint coordination between three aspects, which is a virtual entity, a physical entity, and data connections between both entity. The digital situation of the physical entity that contains all properties, data, information, and same condition as physical entity are called virtual entity. Computational techniques will be used to take advantage and enhancing the process, this in turn make virtual entity be used to monitoring and improving physical entity performance [10,11].

Digital twin functions are mirroring and virtual processing. Mirroring defined as data connection between entities (virtual and physical). The physical entity using metrology and realization approach that are implemented, using terms of actuators and sensors [10,11].

Table 4. List of Indicators on SPBE Service Domains

Aspect/ Indicator	SPBE Service Domain Indicator Name
Aspect 7 - Electronic-Based Government Administration Services	
Indicator 32	Maturity Level of Planning Services
Indicator 33	Maturity Level of Budgeting Services
Indicator 34	Maturity Level of Financial Services
Indicator 35	Maturity Level of Procurement Services and Service
Indicator 36	Maturity Level of Personnel Services
Indicator 37	Maturity Level of Dynamic Archive Service
Indicator 38	Maturity Level of Property Management Services Country/Region
Indicator 39	Maturity Level of Internal Monitoring Service Government
Indicator 40	Maturity Level of Performance Accountability Services Organization
Indicator 41	Maturity Level of Employee Performance Service
Aspect 8 - Electronic Based Public Service	
Indicator 42	Maturity Level of Service Complaint Service Public
Indicator 43	Maturity Level of Open Data Services
Indicator 44	Maturity Level of Documentation Network and Legal Information (JDIH)
Indicator 45	Maturity Level of Public Service Sector 1
Indicator 46	Maturity Level of Public Service Sector 2
Indicator 47	Maturity Level of Public Service Sector 3

Virtual process defined by algorithms implement and run on the virtual entity, the process includes but not limited to optimizing model, analyzing model, or physical entity simulation. Closed loop system needed for virtual processing effecting the physical entity and also only if the virtual entity connected to the physical entity [11,12].

The reference framework use different components for their infrastructures and define each of them in terms of their function, relationships with the system's environment or the rest of components and it's purpose. Mirroring function when digital twin virtual entity represent the organizational IT assets, governance processes and it's management. An organisation-specific ontology for IT governance as it's core, use framework for reference architecture which domain ontology provided. The domain ontology regulates all governance system such as governance processes, associated management processes, and system of organizational IT assets, also covers evolution change within the organization over time. In this scenario, COBIT 2019 framework will be use within GITM Domain Ontology, but COBIT 2019 framework can be expanded or replaced by other IT governance domain knowledge such as stated in Minister of use of state apparatus and bureaucracy reform of the Republic of Indonesia regulation No. 59 year 2020 about monitoring and evaluation of Indonesia Digital Government System [13,14].

Knowledge graphs in figure 2, can uniformly integrate and give representation of heterogeneous data. GITM Knowledge Graph fuction as a reference to how creating an uniformly comprehensive and visualize all relevant and needed data to be use in IT governance, including but not limited to create data streams from COBIT Management Processes, Organizational IT Assets and COBIT Governance Processes, and can be expanded and connected to other data [14,15].
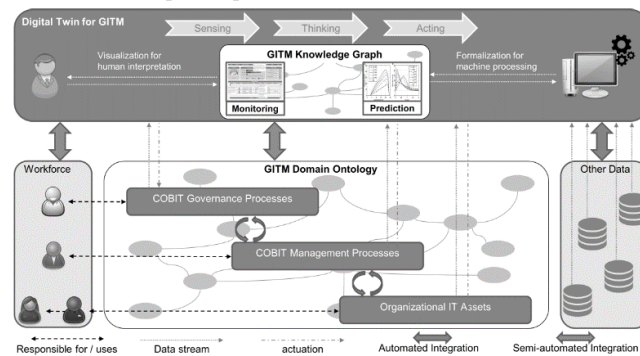

Figure 2. The Digital Twin for Governed IT Management Framework. [10]

Virtual processing main function are twinning infrastructure to synchronizes modeled organizational IT assets, organization-specific ontology and it's governance processes and management [11,12]. This function process follows Control Theory, the Sense-Think-Act paradigm, it's requires apart from simulation and analytical capabilities to predict and monitor, also to enhances visualization capabilities in easing interpretation of data [16]. To realize these capabilities, knowledge graph technologies adopting capabilities of the digital twin parameters of machine processing formalization and other data from internal and external [16].

3. METHODOLOGY

Study literature to search and compile knowledge about digital government, IT Governance and Twin Digital. Combining Digital Twin for Governed IT Management framework introduce by Geert Poels, Henderik A. Proper and Dominik Bork [10] and ITGS indicators that states in Minister of use of state apparatus and bureaucracy reform of the Republic of Indonesia regulation No. 59 year 2020 about monitoring and evaluation of Indonesia Digital Government System [9].

4. RESULT AND DISCUSSION

Based on framework model of Digital Twin for Governed IT Management explained above, the COBIT framework in GIMT Domain Ontology in figure 3 are replaced with Indonesia Digital Government System IT Governance Indicators in figure 4. We propose by replacing COBIT with IDGS IT Governance Indicators, the Digital Twin for Governed IT Management framework could be adopted and utilise by Indonesian Government according to regulation.

Indonesia Digital Government System IT Governance Indicators for maturity assessment are created to produce acceleration of the development of the state apparatus is carried out through the bureaucratic reform as stipulated in the Indonesia Presidential Regulation No.81 year 2010 about Grand Design of Bureaucratic Reform 20l0–2025 in order to achieve a world-class bureaucracy where governance more

effective, efficient, transparent, and accountable government and The quality of public services is getting easier, faster, and affordable. With the development of technology 4.0, the bureaucratic reform program is encouraged through the application of IDGS, so that government apparatus may utilizes ICT to provide services to entity such government agencies, business agencies, and the public in general [5,9].
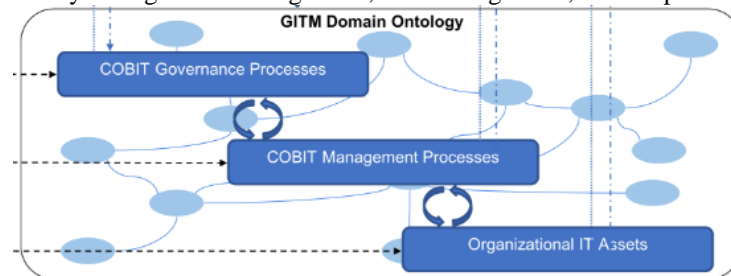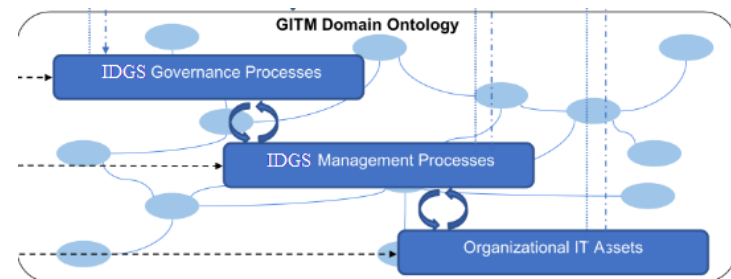

Figure 3. GIMT Domain Ontology with COBIT [10]

Figure 4. GITM Domain Ontology with IDGS IT Governance Indicators

In general, IDGS supports all areas of change as an comprehensive and fundamental effort to develop state apparatus and accelerate the achievement of world-class bureaucracy. In addition, by IDGS specifically are placed in areas of management change where: implementation of systems, processes, and work procedures that are transparent, effective, efficient, and measurable supported by the implementation of IDGS. To measure the achievement of the bureaucratic reform program, the Ministry of Empowerment of the State Apparatus and Bureaucratic Reform conduct assessment implementation of the bureaucratic reform program in the agency government. Bureaucratic Reform Index as a result of the assessment implementation of the bureaucratic reform program is a composite index that compiled on several indexes of assessment results in areas of reform change bureaucracy, including an assessment of the implementation of IDGS as part of implementation of the assessment of bureaucratic reform and the mandate of the Presidential Regulation Number 95 of 2018 concerning IDGS. IDGS Monitoring and Evaluation carried out to assess the extent to which the implementation of IDGS in Agencies Central and Local Governments can contribute to reform progress bureaucracy. IDGS monitoring and evaluation is carried out by measuring Maturity level of IDGS implementation in Central Agencies and Local Governments which are represented in the form of index values IDGS [9].

In order for IDGS Monitoring and Evaluation activities to be carried out efficiently, effectively, and objectively, it is necessary to develop Monitoring and Evaluation guidelines for IDGS evaluation that can be understood by all parties in the Central Agency and Local government [9]. The IDGS Monitoring and Evaluation Guideline regulate assessment methods and preparation, implementation, and reporting processes implementation of IDGS Monitoring and Evaluation at Central Agencies and Local government [9].

The virtual entity in terms of the concepts in the domain are concerned with relationships and properties, as well as all possible constraints, are defining within GITM Domain Ontology [10]. Within Applied Ontology, a domain ontology explained the given domain and specifically enable process to define what should exist within. With these reasons, GITM Domain Ontology defines not only data that need to be gathered, but also what the virtual entity of the IT governance digital twin should be concerned with in order to track the evolution of the organizational IT assets, to monitor the status and performance, governance processes and its management [10].

Domain ontology as a conceptual foundation to develop organization-specific ontologies for IT governance, facilitate within framework [10]. For specific organization that need develop IT governance digital twin for itself, they could use a generic domain ontology that matching the situation of their own [18]. Accurately represented in the organization-specific ontology, a design process that facilitate within GITM Domain Ontology could ensures relevant IT governance concepts, and their properties, constraints and

relationships be identified and be included. This design process can identify digital twin parameters that are relevant, matching organization specific IT governance concerns [19, 20]. The generic ontology designed using GITM domain ontology design process could help reducing organization's effort for designing ontology for itself.

The framework used COBIT 2019 by default, as a reference architecture for developing IT governance digital twins, a GITM Domain Ontology [14, 21]. The conceptual model of framework designed to be utilized as it is for simulation, so it is by default GITM Domain Ontology developed based on COBIT 2019 as in figure 3 [14,21]. In figure 4, the COBIT framework replaced by Indonesia Digital Government System IT Governance Indicators for maturity assessment and as stated within Regulation Minister of use of state apparatus and bureaucracy reform of the Republic of Indonesia No. 59 year 2020 about monitoring and evaluation of Indonesia Digital Government System, this indicators could serves as the organization-specific ontology that consists of relevant IT governance concepts for IDGS implementation and evaluation, its properties, its relationships and each constraints [9,10].

5. CONCLUSION

This paper discusses about exploration of Digital Twin concept that can be used to develop smart and data-driven IT governance systems. The utilization of knowledge graphs and related technologies within framework serve to create uniformly integrated heterogeneous data representation streams. The framework facilitates as reference to create a system for IT governance, evolving itself to be adopted and be use for Indonesia Digital Government Systems IT Governance.

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