Designing the Smart Health Function towards Puskesmas (Citizen Health Centre) based on Smart City Concept

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Abstract. According to Regional Regulation No.23 of 2014 Article 386 until 390 which requires all institutions to adopt architectural designs to bring up architectural innovations. A smart city is a concept of the application, development, and implementation of technology that is applied to a region (especially urban area) as a complex interaction between the various systems in it. One important development area to be developed is the health sector. In Indonesian constitution of article 28 H and 28 I that the state must guarantee the lives of all its citizens, include by providing appropriate services such as health services. This study aims to design an enterprise architecture in health functions within Citizen Health Centre management system based on the Smart City based on the TOGAF ADM framework, so that it is expected to help the city government work program in realizing smart city and business activities that currently run can be supported by information systems so as to increase satisfaction Bandung City communities. Based on the results of research on public health functions at the Bandung City Health Office obtained a design or blueprint that focuses on the preliminary phase, architecture vision, business architecture, system architecture, information technology, opportunities and solutions, and migration planning.

Keywords: enterprise architecture, TOGAF, information system, health function, migration planning

1. Introduction

There is an instruction from the president that requires all institutions to adopt architectural design with Presidential Regulation No. 85 2018 to bring up innovations in the delivery of architecture [1]. Local Government through innovation in Law No. 23 of 2014 concerning Regional Government. In Chapter XXI titled Regional Innovation. From Article 386 to Article 390 of Law 23/2014, it explains that in the context of improving the performance of the implementation of Regional Government, the Regional Government can innovate. Innovations as referred to are all forms of renewal in the administration of Regional Government. In formulating an innovation policy, the Regional Government refers to the principle of increasing efficiency, improving effectiveness, improving service quality, there is no conflict of interest, oriented to the public interest, carried out openly, fulfill the values of propriety, and the results cannot be accounted for their own sake. Many concepts are designed to create innovation both in terms of policies or even the laws created and in terms of technology, along with the development of technology and communication science, the concept of smart city is now emerging, these concepts develop by basing the application of information and communication technology in managing cities.
In Indonesia there are also several cities that have implemented smart cities. For example, the Makassar smart city that manages e-Kelurahan to support services in Karampuang Kelurahan Panakkukang, which belongs to a smart society that promotes local wisdom. As well as Surabaya City, as the city that won the title of Smart City Awards 2011 by winning three categories from four categories namely smart governance, smart living and smart environment. Likewise, Manado City implements smart city in the field of Tourism through the introduction of tourism potential (nature, culture, culinary, history) throughout Indonesia and the world through internet networks [2]. In applying the concept of smart city, there are several elements that need to be developed. Among the various fields that want to be developed for smart cities, one of the important fields that will be developed is the health sector, starting from the integration between health practitioners so that it leads to better and more efficient health services to the community. For this reason, it is necessary to build an information system that can help create a fast and efficient service within the scope of public services in the health sector. Thus, the management of puskesmas can be described as an effort to manage puskesmas in a sustainable manner, which is carried out with an integrated system and strategy, so that it can achieve its goals and targets in accordance with the plans and stages set and ultimately will prosper the urban population. This study aims to design an enterprise architecture on health functions in the smart city-based management system.

The step and procedure of implementation from the enterprise architecture can be used by organizations through adopting specific method or framework within the enterprise architecture. So with the enterprise architecture method, it is expected to be able to manage complex systems and be able to harmonize the business and IT that will be invested. The meaning of enterprise architecture is described as the key element that forms an organization where it is intended to achieve harmony between business processes and objectives. In designing enterprise architecture, a framework is needed so that modeling can be structured and appropriate. There are several types of framework that are commonly used in modeling enterprise architecture, including the Zachman framework, TOGAF (The Open Group Architecture Framework), FEAF (Federal Enterprise Architecture Framework), TEAF (Treasury Enterprise Architecture Framework), and others. Table 1 is a comparison of the four frameworks [3]. The first step that needs to be considered when implementing the TOGAF ADM is defining the preparations, namely by identifying the architectural context to be developed, the second is defining the strategy of architecture and determining the architectural parts to be designed, starting from business architecture, information system architecture, technology architecture, and determine the capabilities of the architecture to be designed and developed [4].

| Criteria                     | Zachman | TOGAF | FEAF | Gartner |
|------------------------------|---------|-------|------|---------|
| Taxonomy complete            | 4       | 2     | 2    | 1       |
| Process completeness         | 1       | 4     | 2    | 3       |
| Reference model guidance     | 1       | 3     | 4    | 1       |
| Practice guidance            | 1       | 2     | 2    | 4       |
| Maturity model               | 1       | 1     | 3    | 2       |
| Business focus               | 1       | 2     | 1    | 4       |
| Governance guidance          | 1       | 2     | 3    | 3       |
| Partitioning guidance        | 1       | 2     | 4    | 3       |
| Prescriptive catalog         | 1       | 2     | 4    | 2       |
| Vendor neutrality            | 2       | 4     | 3    | 1       |
| Information availability     | 2       | 4     | 2    | 1       |
| Time to value                | 1       | 3     | 1    | 4       |

The access gap is a phenomenon that has three different aspects, including global disparities in the differences in information and communication technology between countries, social differences in the differences in access to information and communications technology between different sectors of the
country's society and democratic inequalities, which can also be understood in the name of the difference between those who use different digital means to engage in public life and those who do not [16]. The popular one is related to the digital Divide as a form and condition of the gap between people who have knowledge of digital technology with people who do not know at all. The factors causing the digital divide are the unequal provision of infrastructure, infrastructure in this case is the availability of access to roads, water, electricity, to the internet. Then, development has not been evenly distributed in each region. Meanwhile, the lack of cooperation between the government, the community, the private sector, academia and the lack of community awareness and differences in people's lifestyles are other implications. In addition, different regulations in each region can exacerbate the impact that occurs which leads to digital inequality in technical aspects, autonomy, skills and objectives.

![Smart City Dimensions](image)

**Figure 1.** Smart City Dimensions

Smart city is a concept of applying, developing and implementing technology applied to an area (especially urban areas) as a complex interaction between various systems in it [3]. The purpose is to overcome the various characteristics of ecosystem innovation by all smart city ideas including being a green city, interconnected and integrated for all layers and forms of the city. Smart city planning uses a reference model to determine the concept of smart city layout and character. Dimensions of the concept of smart city explain the 6 (six) dimensions in the concept of smart city as the basis for the implementation of smart city which is then used in calculating the index of smart city 70 cities in Europe, the six dimensions include Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment and Smart Living [5]. Smart cities that provide a large amount of data and information in different dimensions make the complex process of impact assessment and management of major projects possible. Management and control of large projects as costly, long-term and large-scale developments are essential to their success. In addition, they can facilitate data management in smart cities, where they generally use new and innovative technologies, and can provide integrated data [6]. It also can be seen as specific geographical boundaries that have ability to control, monitor and manages resources and capital independently to be sustainable in term of growth and profit to its environment and citizen by preventing harmful effect, integrating the service management and optimizing the benefits [10][11]. Digital technology has great potential for improving efficiency and service. This is where smart cities can be deployed in a realistic way. However, many institutional conditions must be created to unleash this possibility especially considering the technological aspect of procedural through seller-initiated
discourses on smart cities and at least at lower prices [12]. There are also many needs from the point of view of physical infrastructure, smart city, and digital technology that improve public services and better use of resources for the population, which reduces the impact on the environment [14]. Smart cities use ICT to smartly and efficiently use available resources while reducing costs and energy consumption, improving citizens' services and quality of life, and reducing their environmental footprint through develop innovation and a sustainable economy [15].

2. Methods
This study uses qualitative methods that are to give a clear picture and in accordance with facts in the field. The qualitative method is based more on the phenomenological nature of prioritizing appreciation. The purpose of this qualitative method is to look for the severity of a phenomenon or problem, develop the concept of sensitivity to the problem at hand. Data collection techniques that are often used are interviews where the researcher conducts a question and answer method with the Bandung City Health Office, regarding all actions relating to the public health function. In addition, researchers review the actions associated with the problematic issues raised. The results of these observations were directly recorded by the researcher and from the observation activities it can be seen the error or the process and the activity in the Bandung City Health Office.

3. Result and Discussion
In 1950 the Bandung City Health Service consisted of 10 Medical Centers and in 1972 it developed into 4 health centers consisting of: 1 Community Health Center, 18 Special Health Centers and then 18 Maternal and Child Health Centers and 6 maternity clinics. Based on Decree No. 50 of 1952 concerning implementation, namely the surrender as the Central Government on Health to regions in cities or cities. Personnel Management of the Health Service was gradually handed over to the local government of the Dati II Bandung Municipality and the status of the employees consisted of, Central Employees and Officers for Eradicating Smallpox and Eye Diseases. There are several problem identified such as There is often a delay in the process of receipt of a report by the Health Service which should be received every report in the month, inadequate communication information system becomes a hindering factor in the dissemination of health information and service quality improvement, Implementation of Standard Operational Procedure (SOP) has not been optimal resulting in low quality health services, the absence of health information service applications, to find out information about health such as room availability, ICU room availability and many more, the absence of mobile application to present relevant information and to create accessibility of interaction and lastly the service management is not optimal causing implementation programs that are less appropriate.

According to Presidential Regulation No. 95 of 2018 concerning Electronic-Based Government Systems (SPBE), which discussed SPBE components such as SPBE governance, SPBE management, SPBE services, and SPBE architecture. The SPBE principles that must be applied by government agencies based on Presidential Regulation No.95 of 2018 Article 2 are effectiveness, integration, continuity, efficiency, accountability, interoperability and security. The Health Information System road map is an indicative national health information system planning document for 2015-2019, which contains an overview of the current situation, direction and objectives to be achieved, implementation stage, targets of each stage, indicators of target achievement, financing, and organizing the implementation of the development and strengthening of the national health information system in the next five years in realizing an ideal health information system. Law No. 23 of 1992 concerning health, the President of the Republic of Indonesia has mandated health-oriented development through Healthy Indonesia 2010, which in essence undertakes development efforts need to put health policies in their implementation. In making efforts to develop and strengthen the central and regional governments, they have the authority to standardize, manage and develop national scale health information systems and facilitate the development of regional scale health information systems, then carry out management and development of provincial scale health information systems and management and development of health information systems within district or city scale.
**Figure 2.** Existing Business Process of Bandung

**Figure 3.** Solution Concept Diagram
Strategic issues that must be considered in efforts to develop, strengthen, and implement a health information system in the next five years include, among others, health information system policy and regulation, strengthening the coordination of health information systems, directed and measurable health information system planning, strengthening information system organizations health and standardization of health information systems. Meanwhile, the development of health information systems human resources, strengthening of ICT infrastructure in health care facilities, financing of health information systems requires insufficient funds and structuring transaction data in health care facilities to improve the quality and speed of service work processes and the availability and quality of data must also be serious attention. The government also needs to optimize data flow to increase availability, develop a health data bank and access to data sharing for the purpose of strengthening the use of information. Urban metabolism generally consists of product inputs and waste emissions with consistent negative externalities that exacerbate social and economic problems. Cities rely on many external resources, and the important fact is that you can always be a resource user. Promoting sustainability has been explained by encouraging natural capital stock. Other recent interpretations of urban sustainability are promoting a more centralized approach in which cities should respond to people's needs through sustainable solutions on social and economic dimensions [13].

4. Conclusions
Based on the results of the enterprise architecture design on the public health function, it can be concluded that the successful creation of smart city application in the enterprise architecture design is assessed from the smart city assessment indicator framework with CITYkeys namely integration, monitoring and evaluation and availability of government data. The results of the enterprise architecture design in this study produced a blueprint that can be used as a service reference for developing business services that are running. The results of the IT Roadmap design as a reference for smart cities in the development of information technology, namely the design of enterprise architecture in this study, use the TOGAF ADM method, with the main focus of research being the phase of business architecture, data architecture, application architecture, technology architecture, opportunities and solutions, and migration planning. Existing data, applications and technology available at the Bandung City Health Office are not yet fully in line with official requirements. So there needs to be improvement and development of data and applications in the Bandung City Health Office. Based on the analysis of technology architecture, the condition of the existing service technology does not meet several requirements, so it is necessary to develop and improve the target technology.

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