Why is the Application Programming Interface the backbone of a Smart City?

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Abstrak. Improved communication technology, causing smart city initiatives have developed in major cities in the world since the last decade. Smart cities aim to create sustainable urban development. Through the Ministry of Communication and Information of the Republic of Indonesia implemented the “100 cities to smart city” program, which began in 2017. The purpose of this article is to analyze the Application Programming Interface (API) as the Smart City backbone in Samarinda as a buffer city for the capital of the Republic of Indonesia in 2024. This study uses a qualitative approach with data collection techniques through in-depth interviews, FGD, observation and emphasizes on document analysis. This study provides the following conclusions. First, Samarinda City Government has carried out various transformations and innovations so that the city of Samarinda is competitive and ready to become a buffer city for the Republic of Indonesia’s capital in 2024. Second, infrastructure development is necessary as a means of supporting smart cities. To facilitate the implementation of API in Samarinda City. Recommendations from this research for the successful implementation of API in Samarinda City as a buffer for the nation’s capital in 2024 are as follows. First, there needs to be a more comprehensive strengthening of policies and regulations because there are regional apparatus of the Samarinda City Government that have an information system that is not integrated with the API. Second, there needs to be an increase in human resources, especially the State Civil Apparatus and / or Civil Servants, directly related to API. This study proves that there are no consolidated standards or best practices for smart governance because each city can implement different governance frameworks and models in achieving smart cities according to their local wisdom and city resources.

Keywords: smart city, application programming interface, public policy, good governance, competitiveness

1. Introduction

In the past decade, there has been a debate about the meaning of the city of the future. This debate is related to the existence of discourse about the purpose of the smart city. The smart city is an innovative city management concept based on information and communication technology that enables accessibility between the government, the private sector, and the community.[1].

The hallmark of Smart City is the increased use of integrated knowledge networks and electronic services to improve people’s quality of life. This increased use of integrated knowledge networks and electronic services occurs through better distribution of goods and services, increased creative and professional relations between local governments and their inhabitants, thus enabling them to contribute to each other in producing strategic policies. All stakeholders in the city, become the main actors to participate in the global competition in enriching the city and empowering its people. Thus, the smart
city concept’s application encourages local government officials to develop smarter policies according to the needs of their communities in facing sustainable ecological, social, cultural, and economic challenges.[2].

There are three essential things in governance in smart cities [3]. First, the features that determine smart cities consist of smart technology, smart people, and smart collaboration. Second, a transformative or incremental perspective on changes in city governance. Third, a more open process or better outcome as a claim of legitimacy for the smart city government. This smart city governance can form a new collaboration model between communities through the use of ICTs to get more open governance and better results. The definition of a smart city is related to the creation of smart computing technology, vital infrastructure components, and city services. City services include city administration, education, health, public safety, real estate, transportation, and utilities. Thus, a city becomes smarter, connected, and efficient [4]. With a narrow perspective approach, smart cities refer to districts with many companies in IT or other new technologies [5] [6]—the use of ICTs by utilizing new ICTs to strengthen urban systems [7], [8].

On the other hand, smart cities also include the role of ICT as the main characteristic of smart cities, without ignoring the literature in their social problems [9] [10] [11]. Other experts and researchers highlight and recognize the importance of urban development related to business, the social inclusion agenda, the creative role of industry in urban growth, the importance of social capital in urban development and urban sustainability. The central aspect of this smart city approach is that technology forms the starting point to be the initial foundation for all other problems [7] [8].

In the planning process, smart cities involve many stakeholders [12]. A city needs to learn suitable models in complex networks to ensure the successful implementation of smart cities [13]. Smart City makes it easier if it is designed and implemented in cities that already have smart characteristics. Because building a smart city requires high infrastructure complexity [14]. Although in the end, several studies have shown no consolidated standards or best practices for smart governance. Each city can apply different governance frameworks and models to achieve smart cities [15].

The concept of Smart City in Indonesia has become one of the parts of "Nawa Cita" or the nine priority agenda of the President of the Republic of Indonesia Joko Widodo. The smart city concept becomes manifest in its direction through the jargon "making government absent by building a clean and effective government for the welfare of the people" and "encouraging local governments in Indonesia to maximize ICTs to improve public services." In its implementation, various local governments in Indonesia still have differences in the implementation of Smart Government practices. However, various regions in Indonesia have the same common thread, which is "the convenience of public services." All local governments are competing to create information systems, but do not see the sustainability of the system itself. For this reason, interoperability in information system integration is needed. The use of Application Programming Interface (API) makes all regional development organizations one and share data, such as population data and civil records, community data that requires health social security, taxpayer data, and other data that is different from developers [16].

The Government of the Republic of Indonesia established East Kalimantan Province as the location of Indonesia's new capital city in 2024 - namely Kutai Kartanegara Regency and Penajam Paser Utara Regency. This choice will affect the socio-economic conditions of the City of Samarinda. Samarinda City, as a research location, is the capital of the buffer province, which is located closest to the location of the Capital of the Republic of Indonesia in 2024 [17]. This article aims to analyze the API, as a means of a smart city for Samarinda City.

2. Methodology

The study methodology is qualitative with in-depth interviews, FGD, observation, and emphasis on analysis [18]–[20]. Analysis of documents to get the meaning of a document [21]. This study begins with searching for the underlying meanings, themes, and forms of various documents through four stages of the process [22]—first, the collection of initial documents following the relevance of the research objectives. Second, "open coding" provides codes that identify data based on research topics. Third,
"theoretical coding" collects data into themes and concepts. Fourth, build coherent stories or narratives that can link various themes that emerge from the data and literature. The next step, a literature review is to explore meaning, understand, and develop empirical knowledge. Literature review material contains manuscripts or writings and drawings without intervention. This material comes from books, journals, online news, press releases, and expert analysis to explore and understand people's behavior or group of people as an explanation of human problems or social problems [18], [23]–[25].

3. Result and Discussion

The election of Samarinda City is a place of research for three crucial reasons. First, Samarinda City is the only city government on Kalimantan Island and 23 other regencies/cities in Indonesia, which were first selected by the Ministry of Communication and Information of the Republic of Indonesia to take part in the "100 Cities Towards Smart Cities" program. To be selected in the program, a rigorous and comprehensive assessment carried out on 514 districts/cities throughout Indonesia. The selection process carried out through an assessment process by measuring the readiness of the vision, regulations, Human Resources that will support smart city policies, potential in each region, aspects of equitable and territorial development, aspects of leading sector development, and nawacita by various expert teams representing the government sector, the private sector, and universities [26]. Second, Samarinda City is one of the largest cities in East Kalimantan Province with the highest growth and population levels and increasing economic potential [27]. Third, Samarinda City Government has an interest in making smart cities because it will increase the role of cities in providing services to the community [17]. The best way can be achieved by mobilizing all the city's resources and coordinating its actors using new technologies and joint policies that are forward-looking. To that end, Samarinda City Government has strengthened good and smart governance through a smart city strategy since 2017 [28]. Efforts made by the Samarinda City Government to develop and implement smart city policies since 2017, two years later, received recognition from the Central Government. The Ministry of Research, Technology, and Higher Education of the Republic of Indonesia awarded the 201 IT Itech Award and Telco from the Supreme Leader of the Local Government for the 2019 Smart City Implementation and Top E-Government Implementation in 2019 Public Services [29].

Samarinda City has built more than forty information systems spread across 47 local government organizations. This information system certainly needs to be maintained so that it can continue to be used and appropriately utilized because investment information systems are precious [30]. In order to get smart city recognition, there are 6 (Six) Smart City Pillars - namely: (1) Smart Economy, (2) Smart Environment, (3) Smart Government, (4) Smart Life, (5) Smart Mobility, and (6) Smart People. The focus is not only on ICTs but also as part of smart cities besides meeting the basic needs of other communities. The Smart City program in Samarinda City divided into 3 phases. First, the Quick Win Phase conducted in 2017 - 2018. Smart Win Quick Win Samarinda established in 4 technical guidance mandated by the Ministry of Communication and Information of the Republic of Indonesia and disseminated to Samarinda City policymakers. From the input received, it decided that Samarinda Smartcity's quick win was the integration of public services (API) and the revitalization of the Citra Niaga area. Rearrangement This area will use a smart city pillar approach/framework. The design of Smart Citra Niaga is structured so that other regions in Samarinda City can be replicated. Second, the development phase 2018-2021 is the continuation phase of Quick Win. This phase is the sharpening of the program in the RPJMD as a form of implementation of the six pillars of Samarinda Smart City so that development problems can be resolved and medium-term development goals can be achieved with smart city urban management. Third, this phase has been in the target stage to improve the quality of human resources in Samarinda City Government, increase economic growth, and improve environmental quality. Referring to the Samarinda Mayor Regulation in 2018 regarding the Samarinda Smart Cities Masterplan, the Samarinda City Government API will be the backbone for all city government programs. API Pemerintah Kota Samarinda is consistent with the explanation that Smart City (which is synonymous with the use of ICTs and data) is a solution to overcome the City's economic, social, and environmental challenges [31].
In recent years, many empirical studies carried out on the role of documentation for software systems, programming frameworks, and APIs. Literature review about design and documentation about API in ten years has increased and developed rapidly along with technological developments. The design and documentation of the API are, of course, a new insight to facilitate the development of the existing API system and significant attention for Samarinda in building the API as a basis for developing smart cities. Learning the API involves understanding the functionality and learning about API elements and coordinating them to provide the functionality needed [32].

Any program implemented to achieve smart cities will not succeed if there is no support from OPD, stakeholders and also the community in implementing this API, not only symbolically support but more importantly how they can understand the objectives of activities in-depth and support the smooth running of activities from existing program policies. In this perspective, the public needs to give an understanding and literacy about smart city programs and their implementation through API.

Gradually, the implementation of API in Samarinda began with infrastructure development in the form of data centers, network operation controls, the provision of centralized fiber optics, and the availability of command centers as control and information centers of various existing systems. The Samarinda City Communication and Information Office built and designed the entire infrastructure as a center for integrating all existing information systems in each regional apparatus. Reliable and qualified infrastructure and supported by technical personnel from the Samarinda City Communication and Information Office. Implementation of API in Samarinda leads to 4 (four) core activities, which include: (1) creating legal and institutional legality, (2) developing infrastructure and human resources, (3) developing application and supporting software, and (4) strengthening literacy digital. The digital literacy movement is an effort to persuade people to be open to smart city programs through socialization and awareness-raising, both through print and electronic media, the city government's official social media, and various digital community forums to increase knowledge. The Office of Communication and Information of Samarinda City, as the policy implementer in Samarinda City, has established cooperation and synergy with various stakeholders to make the literacy process easier.

Data Center is the "home" or data storage media of all connected data. Data Center is the essential thing in implementing API. With the development of technology, there will be even more challenges in managing data centers, especially about security issues that needs continuously monitored for 24 hours. In reality, the API's implementation has not been optimal due to the limited technical personnel available. The limitations of human resources also have implications for Network Operation Control and other infrastructure. Therefore the implementation of this API is closely related to the availability of resources [33].

The implementation of the API is also related to application and software development. Referring to several literature reviews, application development through developers is more profitable because it saves more time and can accommodate user needs. Samarinda City Government develops applications to facilitate data integration and sharing activities through software developers with maintenance support from Samarinda City's Office of Communication and Information. The involvement of Samarinda City Communication and Information Office is because it takes a long time to build a system independently. Not to mention, this system must be able to minimize the occurrence of program errors (bugs). Therefore, the software or application must go through due diligence and quality control following the Government of the Republic of Indonesia's standards.

Through a two-way approach like this, the system runs better. Besides, the transfer of knowledge from the developer or software developer to technical staff. Technical problems can be resolved quickly. Thus, all system development will be connected to the API of the Samarinda City Government. All data is stored in the data center. Furthermore, all information is visible in real-time through the Samarinda Command Center.

The API's implementation stems from the preparation of regulations and planning documents about software interoperability between internal applications. Furthermore, Samarinda City Government takes steps to manage one data and one map and regulations regarding public information disclosure. The
Mayor Regulation becomes a strategic tool to ensure consistency between planning and implementation. Besides, for policy development, a master plan and blueprint support are needed. With various legal bases in implementing API, various regional government organizations can share data such as population data, community data that applies to permits, work data, and other data that contains personal data.

From the institutional side to support the implementation of API, the Government of Samarinda City needs to take two steps. First, the establishment of the Samarinda Smart City Board, which has the primary duties and functions in directing the planning, implementation, monitoring, and evaluation of API. Second, forming an implementation team with the main tasks and functions as a technical team implements the API.

After running for more than two years since 2017, it turns out that Samarinda City Government still needs the integration of various information systems in other regions. In an interview with the Head of Application Field explained that:

"After API has been running for more than two years, it is only connected to two Regional Apparatus Organizations in Samarinda City, namely the Population and Civil Registry Office and the Health Office. While other Regional Apparatus Organizations will be implemented in stages next year according to their resources and political will of priorities determined by each Head of the Regional Apparatus Organization in the City Government of Samarinda."

In line with the results of the integration of various information systems in other regions, the assessment results of the Ministry of Communication and Information of the Republic of Indonesia in Samarinda using 6 (Six) Smart City Pillars with three elements of smart city readiness show that the readiness of Samarinda City is generally quite good in governance management (see appendix 1) [34]. The results showed that the implementation of a smart city in general in Samarinda City had been going well. While API implementation is still not optimal because it is not integrated with all Local Government Agencies with API, for this reason, there is a need for the Mayor of Samarinda's regulation to provide rewards and punishments to regional government organizations that are willing to integrate their data with the API.

4. Conclusion

The smart city is an alternative solution for Samarinda City in preparation for the City of the Buffer City of the new nation in 2024. The utilization of API as a first step towards the smart city's process is following the existing vision and mission. This smart city program was adopted to provide more effective and efficient public services to all levels of society and refer to the vision of Samarinda City as an inclusive city. The results of research on the implementation of API to build smart cities in Samarinda City show.

First, Samarinda City Government needs to carry out various transformations and innovations so that Samarinda City is competitive and ready to become a buffer city for the capital of the Republic of Indonesia in 2024. Various transformations and innovations can be seen from the mayor of Samarinda's political decision in making regulations as a basis for implementing policies to develop Samarinda City towards smart cities - long before the announcement of the Province of East Kalimantan as a potential new capital city in 2024. Second, infrastructure development is necessary to support smart cities to facilitate the implementation of API in Samarinda City. This support can be seen from: (1) the concept of the smart city in the RPJP document and Samarinda City RPJM, (2) synchronization of patterns and structures in support of the smart city concept is in the Smart City Council Decree and SK Technical Team; (3) organizational structure and work procedures of regional apparatuses; and (4) the master plan for ICT development in Samarinda City.

This study provides recommendations for the successful implementation of API in Samarinda City as a potential capital city of 2024. First, it is necessary to strengthen policies and regulations that are more comprehensive because they have not been integrated into various information systems and
agencies in the 47 Regional Organizations of Samarinda City Government. Second, it is necessary to increase human resources, especially the ASN directly related to API development. Third, it is necessary to build a system of rewards and punishments through regulations to avoid moral hazards and inconsistencies in implementing API policies. Fourth, it is necessary to have policies related to ICTs, correctly build interoperability in the API system, and local regulations that support sustainable public information disclosure.

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References
[1] N. Khansari, A. Mostashari, and M. Mansouri, “Impacting Sustainable Behavior and Planning in Smart City,” *Int. J. Sustain. L. Use Urban Plan.*, vol. 1, no. 2, pp. 46–61, 2013, doi: 10.24102/ijslup.v1i2.365.
[2] L. Broccardo, F. Culasso, and S. G. Mauro, “Smart city governance: exploring the institutional work of multiple actors towards collaboration,” *Int. J. Public Sect. Manag.*, 2019.
[3] A. Meijer and M. P. R. Bolivar, “Governing the smart city: a review of the literature on smart urban governance,” *Int. Rev. Adm. Sci.*, vol. 82, no. 2, pp. 392–408, 2016.
[4] D. Washburn and U. Sindhhu, “Helping CIOs Understand ‘Smart City’ Initiatives,” *Growth*, p. 17, 2009.
[5] P. Fusco Girad, L.; Lombardi, P. and Nijkamp, “Creative urban design and development. International Journal of Services Technology and Management,” 2009.
[6] P. Caragliu, A., Del Bo, C., and Nijkamp, “Smart Cities in Europe. In 3rd Central European conference in regional science,” CERS 2009, 7-9 Oct. Kosice, Slovak Republic., pp. 45–59, 2009.
[7] N. Walravens, “Mobile business and the smart city: Developing a business model framework to include public design parameters for mobile city services,” *J. Theor. Appl. Electron. Commer. Res.*, vol. 7, no. 3, pp. 121–135, 2012, doi: 10.4067/S0718-18762012000300011.
[8] J. H. Lee, R. Phaal, and S. H. Lee, “An integrated service-device-technology roadmap for smart city development,” *Technol. Forecast. Soc. Change*, vol. 80, no. 2, pp. 286–306, 2013, doi: 10.1016/j.techfore.2012.09.020.
[9] N. Komninos, “Intelligent cities: towards interactive and global innovation environments,” *Int. J. Innov. Reg. Dev.*, vol. 1, no. 4, p. 337, 2009, doi: 10.1504/IJR.2009.022726.
[10] R. G. Hollands, “Will the real smart city please stand up? Intelligent, progressive or entrepreneurial?,” *City*, vol. 12, no. 3, pp. 303–320, 2008.
[11] A. Caragliu, C. Del Bo, and P. Nijkamp, “Smart Cities in Europe,” *J. Urban Technol.*, vol. 18, no. 2, pp. 65–82, Apr. 2011, doi: 10.1080/10630732.2011.601117.
[12] K. Axelsson and M. Granath, “Stakeholders’ stake and relation to smartness in smart city development: Insights from a Swedish city planning project,” *Gov. Inf. Q.*, vol. 35, no. 4, pp. 693–702, 2018.
[13] A. Palomo-Navarro and J. Navío-Marco, “Smart city networks’ governance: The Spanish smart city network case study,” *Telecomm. Policy*, vol. 42, no. 10, pp. 872–880, 2018.
[14] A. Caragliu and C. F. Del Bo, “Do smart cities invest in smarter policies? Learning from the past, planning for the future,” *Soc. Sci. Comput. Rev.*, vol. 34, no. 6, pp. 657–672, 2016.
[15] R. P. Dameri and C. Benevolo, “Governing smart cities: an empirical analysis,” *Soc. Sci. Comput. Rev.*, vol. 34, no. 6, pp. 693–707, 2016.
[16] “https://smartcity.jakarta.go.id/blog/345/penerapan-api-jakarta-oleh-aplikasi-hospitaloka.”
[17] “News/feature/2012/03/20/who-needs-smart-cities-for-sustainable-development, https://worldbank.org/en/.”
[18] J. W. Creswell, *Penelitian Kualitatif & Desain Riset*. Yogyakarta: Pustaka Pelajar, 2015.
[19] S. B. Stainback and W. C. Stainback, *Understanding & conducting qualitative research*. Reston, VA; Dubuque, Iowa: Council for Exceptional Children ; Kendall/Hunt Pub. Co., 1988.
[20] J. W. Creswell and V. L. Plano Clark, *Designing and conducting mixed methods research*. 2018.
[21] G. A. Bowen, “Document Analysis as a Qualitative Research Method,” *Qual. Res. J.*, vol. 9, no. 2, pp. 27–40, 2009.
[22] L. M. Wood, B. Sebar, and N. Vecchio, “Application of Rigour and Credibility in Qualitative Document
Analysis: Lessons Learnt from a Case Study,” *Qual. Rep.*, vol. 25, no. 2, pp. 456–470, 2020.

[23] N. K. Denzin, *The research act : a theoretical introduction to sociological methods*. 2017.

[24] Y. S. Lincoln, “Naturalistic inquiry,” *Blackwell Encycl. Sociol.*, 1985.

[25] N. K. Denzin and Y. S. Lincoln, *The Sage handbook of qualitative research*. 2018.

[26] “https://kominfo.go.id/content/detail/11656/langkah-menuju-100-smart-city/0/sorotan_media.”

[27] “https://cargonesia.com/melihat-perkembangan-kota-samarinda/.”

[28] “https://www.neraca.co.id/article/93533/langkah-menuju-100-smart-city.”

[29] “https://samarinda.prokal.co/read/news/16182-raih-dua-penghargaan-top-it-dan-telco-2019.html.”

[30] “Read/2011/05/08/17295933/Teknologi.Mahal.tapi.Tak.Dimanaatkan, Https://nasional.kompas.com/.”

[31] C. Manville, G. Cochrane, and J. Cave, “Ipol-Itre_Et(2014)507480_EN,” 2014.

[32] B. A. Stylos, J., & Myers, “Mica: A web-search tool for finding API components and examples,” pp. 195–202, 2006.

[33] S. M. Grindle, *Politics and Policy Implementation in the Third World*, Third. Princeton University Press, 2017.

[34] C. C. for S. Nation, *Citiasia Smart Nation*. 2015.

[35] R. Mahesa, G. Yudoko, and Y. Anggoro, “Dataset on the sustainable smart city development in Indonesia,” *Data Br.*, vol. 25, p. 104098, 2019, doi: 10.1016/j.dib.2019.104098.

Appendix 1. Results of smart city program evaluation results in Samarinda City

Source: Ministry of Communication and Information of the Republic of Indonesia, processed by the author 2020