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Artificial Intelligence in Realizing Smart City through City Operation Center

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ABSTRACT
The presence of technology in life provides the convenience of information for the community. The tendency to integrate data in life brings forth a smart city concept which is a big issue globally. In theory, a smart city develops and manages a city by leveraging information technology to more effectively and efficiently connect, monitor, and regulate existing resources inside the city to maximize services to its residents and support sustainable growth. Artificial Intelligence (AI) can be a solution in public services to realize bureaucratic reform to be more effective, active, and efficient. The Jambi Municipal Government is among the pioneers in implementing smart cities and AI in public services. AI-related findings related to public services are 15 applications and websites integrated with the Jambi City Operation Center (JCOC) as a control room to monitor activities in Jambi City for 24 hours. Thus Jambi Municipal Government is able to respond to community needs more quickly, with SIKESAL as a complaint application. The SIKOJA application provides various services such as correspondence, hospital locations, and traffic CCTV. Regarding smart mobility, Jambi City applies an integrated Area Traffic Control System (ATCS) to conduct Electronic Traffic Law Enforcement (E-TLE. This study employed descriptive qualitative, in which the data were obtained from websites, government service applications, mayor's social media, report documents, and journalism related to the research topic. The obtained data were then analyzed using the Nvivo 12 plus data processing application.

Keywords: *Smart City, Artificial Intelligence, City Operation Center, Government.*

1. INTRODUCTION

Social media opens up interactions in cyberspace, demanding that the government take service providers [1]. In realizing bureaucratic reform with IT-based public service innovation, service innovation carried out by the government is also required to be collaborative [2]. It requires leadership in the public sector with an innovative, collaborative, and agile approach in government [3].

The urbanization process significantly affects socio-economic development at the city and country levels worldwide, including in Indonesia [4]. The city is emerging as the critical social experimentation problem of the 21st century, the center of solutions to the issues at hand [5]. To deal with increasing urban matters, companies, non-profit organizations, local governments, and citizens are adopting smart city ideas that implement more ICT [6].

In simple terms, smart cities use information and communication technology to monitor, measure, and manage cities in order to improve residents' quality of life as local government initiatives and to support sustainable development, with an approach that is linked to the process of technology diffusion from top to bottom [7]. The goal of Smart City is to turn rural and urban areas into places of democratic innovation, with an ecosystem of collective intelligence innovation and co-creation capabilities of citizens as an effort to design innovative lives and jobs [8].

ICT plays an essential role in policy design, decisions, implementation, and critical productive services in the smart city concept [9]. Artificial Intelligence (AI), particularly machine learning (ML), significantly advances Smart city applications. Due to having wireless sensor networks independently collecting and analyzing, and communicating structural data, known as "intelligence monitors," AI algorithms make it possible to process large amounts of data and detect patterns [10].

The smart city network design is being revolutionized by the convergence of AI and Blockchain technologies to create a sustainable ecosystem [11], relating to city infrastructure, public safety, security, and providing optimal solutions [12]. Digital technology innovation and AI are significant for developing improvements in public administration, mobility, environment, economy, and quality of life in cities must be integrated [13].

Smart City Operation Center (SCOC) or smart city command and control center [14] is a platform for coordinating centers of various urban services. The system receives requests from different locations in the city to serve tasks and arrange routes for other service provider units to manage traffic implemented through the Area Traffic Control System (ATCS) [15]. Similarly, the Integrated Centralized Command and Control Center (ICCC) will handle and manage different city service activities, including real-time monitoring and improving service delivery efficiency. AI provides intelligence to formulate better policies and plans [16].

Jambi City, one of Indonesia's major cities, notably in the Sumatra region, is leading the way in adopting smart cities, with a control room called the Jambi City Operation Center (JCOC) for monitoring services in the city [17]. Jambi. Until recently, no one has considered how AI may be used to create a smart city through the JCOC. As a result, this study was carried out.

2. METHOD

This study employed a qualitative approach to explain the phenomena that occur in order to appreciate their importance [18]. This study was conducted in Jambi City, Jambi Province, Sumatra, Indonesia, which serves as the provincial capital as well as the province's administrative, social, economic, and cultural hub. Jambi City, with a population of 611,353, is the province's most densely populated area, accounting for 17% of the province's total population. It also affects mobilization, resulting in traffic congestion.

This study obtained the data from online sources such as websites and social media, which was then supported by a literature evaluation on the application of artificial intelligence in the creation of a smart city via a city control room. The Nvivo 12 Plus application was used for qualitative data analysis since it is simple to use and can analyze words as well as investigate word frequencies, qualities, and cases from large datasets [19]. On the other hand, this application greatly helps qualitative research by providing valuable data, saving time, and offering better flexibility [20].

3. BASIC THEORY

3.1 Artificial Intelligence

Artificial Intelligence, according to Russell and Norvig, is a term used to describe systems that mimic cognitive capabilities such as learning, speaking, and problem-solving [21]. Artificial Intelligence (AI) is also applied to the public sector by the government for public service management [22]. On the other hand, the government and society using or web-based AI have gaps and pose challenges [23]. Such as AI applications, "AI Process Automation," "Predictive Analytics," "Identity Analytics," "Virtual Agents," and "Cognitive Robotics," which are highly influential and of great benefit to the public sector. AI applications automate processes, reduce waiting time, other administrative expenses [24].

3.2 Smart City

Simply put, smart city management systems automatically and notifies urban problems that will arise or are happening, are informed by sensors, and then propose automatic actions [25]. IBM's approach to understanding a smart city is based on three pillars: planning and management services, infrastructure services, and community services [26]. A smart city has essential components consisting of 4 dimensions, technology, data, government, community, physical environment, and the support of excellent and collaborative governance [27]. The six pillars of a Smart city are smart government, smart economy, smart society, smart mobility, smart environment, and smart quality of life. Municipalities can apply only a few pillars according to urgency [28]. Among the forms of smart mobility application, regulating traffic with the Area Traffic Control System (ATCS) allows motorists to monitor city streets in taking the fastest route, and the government in an emergency can control traffic [29].

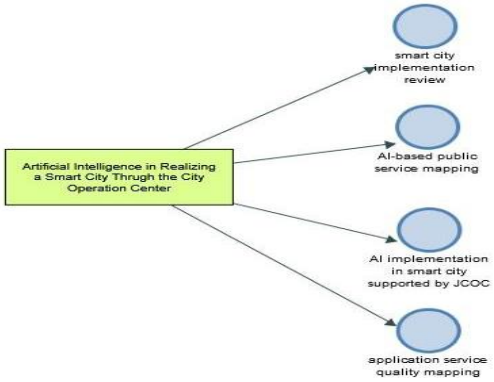
3.3. Smart City Control Room

The ICCC integrated command and control center, while in Jambi City, called the Jambi City Operation Center (JCOC), connects and integrates and analyzes information streamed by digital instruments installed throughout the city.[30]. ICCC as a database to anticipate data flood and change knowledge [31] and municipal governance with a more sophisticated understanding in real-time [32]. The development of command and control centers highlights innovation, collects and integrates big data, thereby helping urban planning processes like India [33].

3.4. Analysis Framework

Research related to the use of AI in realizing a smart city through the Jambi City JCOC applies several sub-sections; review of Smart city implementation; AI-based public service mapping; performance of AI in smart cities supported by JCOC; application service quality mapping; and sustainability.

Figure 1 Analysis framework.



4. FINDINGS AND DISCUSSION

4.1 Artificial Intelligence in Realizing Smart City Through JCOC

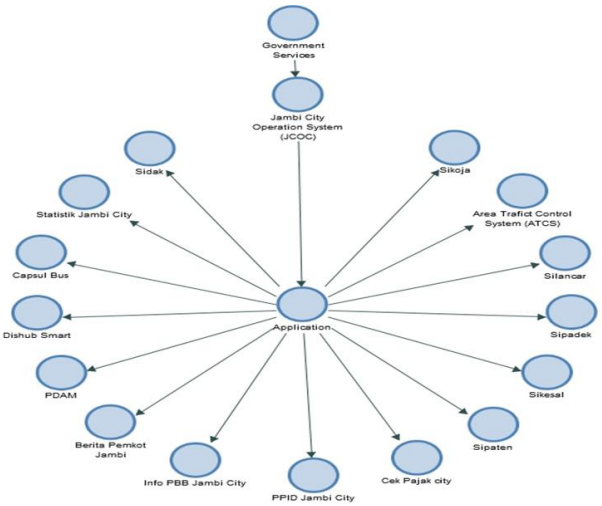
Jambi City is part of the 100 smart cities movement from 2017 to 2019, projected by a joint initiative of the Ministry of Communication and Information, the Ministry of Home Affairs, the Ministry of Public Works and Public Housing, National Development Planning Agency, and the Presidential Staff. The movement aims to guide districts/cities to develop a smart city master plan to maximize technology and public services. In realizing a smart city, Jambi City uses five steps: regulatory development, infrastructure development, application development, ICT HR development, and the development of inter-institutional cooperation.

The first step in realizing a smart city, the development of regulations, has been mentioned in the first vision and mission of the Jambi City RPJMD 2018-2023 and Jambi City Regional Regulation Number 1 of 2019 concerning the Implementation of Smart City. It is supporting the bureaucracy and improving information technology-based public services. Network management components such as network availability, backup system/redundancy system, disaster recovery system, network security, and network dependability must all match the Service Level Agreement (SLA) for smart city infrastructure.

Smart city infrastructure includes software, namely applications or websites, hardware such as sensors or CCTV, internet networks, and command center data. The Jambi Municipal Government is

required to improve and develop infrastructure such as CCTV, continue application integration, web, internet development, and video conference installation. The result of public service applications in Jambi City has 15 applications that utilize AI in realizing a smart city connected to the Jambi City Operation center (JCOC).

Figure 2. Application-Based Jambi City Service Map.



Source: coding analysis via Nvivo 12 plus software

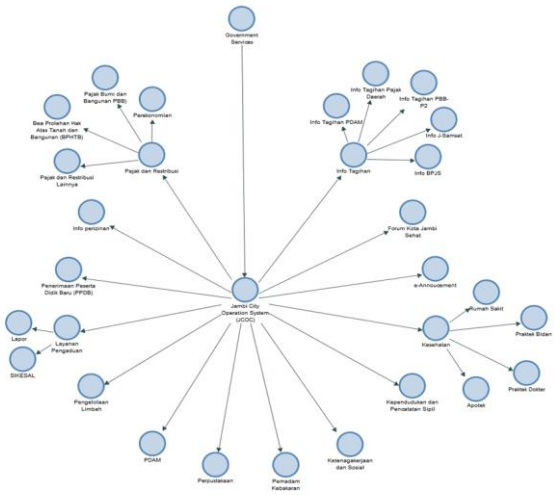
This study found that the mapping of Jambi city public service applications that there are 15 applications integrated with JCOC; Sikoja Jambi city information, services that can be accessed, namely, Website, public services consisting of information; complaints, emergency numbers, education, health, CCTV, licensing and billing info. Meanwhile, there are internal services, Sisummaker, Civil Service Archives, Simoeg, E-Planning, Si raja koja, e-Yantur, Main Jambi city, E-Kinerja. In addition, Sikoja can see location exploration, education, gas stations, culinary, tourism, free wifi, ATMs, shopping, health, hotels, offices, houses of worship, police stations, trash cans, to garbage trucks.

The Silancar application is a one-stop licensing service managed by the Jambi City Investment and One-Stop Integrated Service Office. Smooth service, licensing registration, individual license lists, professional license lists, and company license lists; Sipadek is a correspondence information system interconnected between local government organizations (OPD) sub-districts to urban villages; Sikesal is an online community complaint information system, providing access to create new complaints reports, reports are responded to, and descriptions are completed; Sipaten is an integrated administrative service system for Jambi City sub-districts and urban villages, accessible services, micro, and small business licenses, certificates, marriage dispensation letters, personal hygiene certificates (SKBD), certificates of incapacity, student research permits;

Jambi City PPID (Information and Documentation Management Officer) provides Government news and documentation, information, profiles, public information, information services, news, reports, and our contacts; Information on Land and Building tax of Jambi City to find out the amount of PBB bill (land and building tax); The Jambi Municipal Government News application provides the latest information on the City of Jambi in terms of economy, development, social, tourism and so on; PDAM (Regional Drinking Water Company) application to check bills; Dishub is a smart service of the Jambi Municipal Government, to oversee personnel and services for public complaints such as congestion and indiscriminate parking, and is integrated with capsule buses as an online public transportation mode.

Jambi City Statistics provides information services. The last is the Sidak application (the Jambi City DPRD Information System) which aims to facilitate the performance of the council secretary in maximizing the services of council members; Besides having a public service application, it also has an official website controlled through the Jambi City Operation Center.

Figure 3. Website-based service map for Jambi City



Source: coding analysis via Nvivo 12 Plus

This study found that the Jambi City public service coding project on the Website https://jambikota.go.id/new provides 14 services, controlled by the JCOC and forwarded to their respective agencies. Fourteen public services that can be accessed include; Billing info consists of PDAM billing info, PBB-P2 billing info, Regional Tax billing info, J-Samsat info, and BPJS info; Healthy Jambi City Forum; e-Announcement; There are Health, Hospital, Midwife Practice, Doctor Practice, Pharmacy; Citizenship and Civil Registration; Labor and Social Affairs; Firefighters; Library; PDAM; Waste Management; Complaint Services consist of, Report, and SIKESAL; New Student Admission (PPDB); Licensing information; There are taxes and levies, Economic Land and Building Tax (PBB), Customs for Land and Building Rights (BPHTB) Taxes and Other Retributions.

Development of ICT HR In realizing a smart city, the Jambi Municipal Government continues to improve ICT HR by cooperating with the Ministry of Communication and Information. Considering that in the E-Government measurement carried out by the United Nations, Indonesia is ranked 88th out of 193 countries with a score of 0.6612 in the High E-Government Development Index (EGDI) group. In assessing the Electronic-Based Government System, Jambi City received a good predicate with an SPBE index of 2.85.

It supports cooperation between institutions in realizing the smart city of Jambi City. Jambi Municipal Government also collaborates with the private sector, PT Multi Inti Digital Transport for developing Capsule Bus Online, PT Altera Electronic payment system (E-Payment), PT Rimba Palma providing subsidized 5 kg gas customer cards. Cooperation with government institutions such as the Jambi City Communication and Information Office with the BSSN (National Cyber and Crypto Agency). Jambi City Police Chief collaborates with the Bungo Regency Government regarding the duplication of the Sikesal Application, in the use of JCOC ICT for law enforcement of traffic violations electronically (E-TLE). Jambi also has a cross-country cooperation with Singapore, Singapore Cooperation Program (SCP) in improving human resources, and Sri Lanka in waste management.

4.2 Effectiveness of Applications and JCOC as Smart Governance

Jambi City Operation Center (JCOC) is a control room with a large screen for monitoring, a database of several applications, and the Jambi Municipal Government website. JCOC's contribution to realizing a smart city is application and website management. The JCOC has carried out the Deputy Mayor of Jambi, such as a sudden online inspection (Sidak) of the State Civil Apparatus (ASN) after leaving with the Eid al-Fitr holiday.

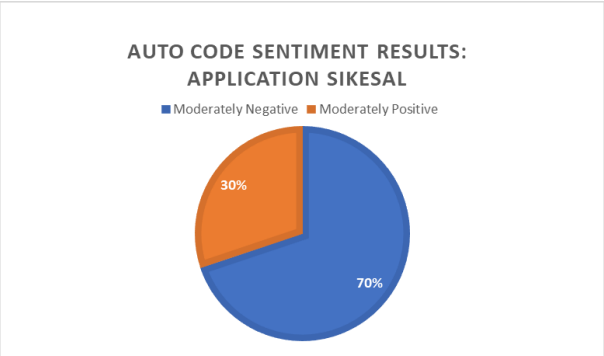
To support JCOC, almost every intersection is installed with CCTV and ATCS to take Electronic Traffic Law Environment (ETLE) actions and monitor and control traffic to prevent and overcome congestion related to the smart mobility pillar. The server post for the Regional Traffic Management Center (RTMC) operator, CCTV monitoring, and ETLE action is located at the JCOC of the Jambi Mayor's Office. There were 888 violations, but only about 300 were given a ticket [34].

In realizing one of the pillars of a smart city, namely smart government or E-Government, the Jambi Municipal Government launched the Sikesal and Sikoja applications.

The Jambi municipal government launched the Sikesal and Sikoja applications to realize one of the foundations of a smart city, namely smart government or E-Government.

Through the JCOC control room, Sikoja displays city information and monitors public complaints. Community complaints are continued to the relevant technical agencies for follow-up. Seeing the effectiveness of using Sikesal to code sentiment is as follows.

Figure 4. Sikesal Application User Response

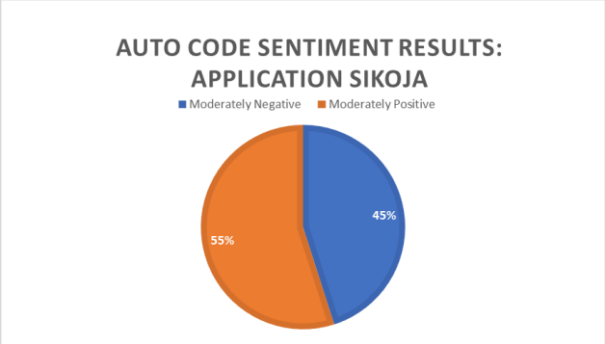


Source: Nvivo 12 Plus Sikesal app sentiment analysis

The Sikesal application was released on April 8, 2019, with a rating of 2.0 out of 5 with ±1,000 downloads. Based on the results of sentiment analysis, the user response is quite positive, 30%. In contrast, the negative reaction is quite large, 70%.

Regarding the reaction to Sikesal problems, problems often occur when registering or running. Some features cannot be accessed, and the old reporting process gets a response. Application users emphasize development and improvement, recommended functionality, benefits, and continuous updating. Sikoja is the Jambi City Information System. The main application contains various public services to bring together multiple websites and applications from multiple OPDs, making it easier for the public and apparatus to obtain information and integrate with JCOC.

Figure 5. Sikoja Application User Response



Source: Nvivo 12 Plus Sikesal app sentiment analysis

The Sikoja application was released July 22, 2019, and downloaded ±10,000 with a rating of 4.4. Sentiment analysis results show a positive response from 55% of users, while a negative response of 45%. The people of Jambi City appreciate that Sikoja is considered very helpful and easy. On the other hand, the demands for developing and improving registration problems and some inaccessible features such as CCTV, inaccurate Maps, and incomplete features such as health-only emergency numbers.

5. CONCLUSION

The city of Jambi, in realizing a smart city adopts five development steps to prove its success. The application of AI in applications and websites allows services on one hand through the SIKOJA application. The presence of JCOC provides a more organized management of application systems and websites to be forwarded to their respective agencies, and the stored information can be the basis for the subsequent policymaking. The low utilization and use of ICT are because government and community human resources are not ready to transform and are not used. Some forms of application-based services are only a display for implementing the smart city program but are not utilized. The necessity to improve the quality of human resources, infrastructure, and application development in order to address operational issues. As well as application integration of several systems and agencies, as well as data sustainability, to support future policies.

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