



## Application of Artificial Intelligence in Smart City Development

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### **Keywords**

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### **Abstract**

Artificial Intelligence is a technology that has been widely adopted in this 4.0 industrial era. Artificial Intelligence is capable of connecting every device, so that someone can automate all devices without having to be on location. More than that, nowadays there are many machines that can interpret certain conditions or events with the help of Artificial Intelligence. In writing the problems reviewed by this author, the aim is to describe the problem of how to apply Artificial Intelligence in the development of smart cities. The method used in this study is a qualitative approach and literature review in analyzing the application of the Society 5.0 concept to the smart social component. The results produced in the writing of this journal are about several explanations of the application of Artificial Intelligence in the development of smart cities.

## **1 Introduction**

In urban areas, the latest challenge is the development of the population of the community which has increased. For BPS information, in 2020 the percentage of people in urban areas is close to 56.7% and increases until reaching 63.4% by 2030 must have access to education, health care, transportation, justice, social services, benefits and others. The building sector accounts for nearly 40% of total non-renewable energy consumption, 40% of greenhouse gas emissions, and 70% of electricity use in industrialized countries (Minoli et al., 2017).

One solution that can solve some of the problems associated with urban areas is the application of smart city design. Smart city is a design that mixes the role of the community or citizens and data technology in the ability to use the available energy base. The form of smart cities that were raised (Giffinger, 2007) to measure smart cities in European cities has 6 parts, namely Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living and Smart Management. The application of smart city design requires metrology analysis and early introduction or the situation of reviewing the city in the development process.

Smart cities deliver modern intelligent control systems for energy management and comfort in smart buildings. They consider various aspects, such as the control system, intelligent calculation methods, and convenient settings (Shaikh et al., 2014). Smart cities create huge, real-time data and various or what big data says. From this information, it starts from the movement of people and materials in terms of the movement of provisions regarding the physical and social form of the city. Cities can be said to be intelligent if there is an intelligence use that is able to combine and synthesize this enormous information into some objectives and recognize methods of improving the capabilities, equality, sustainability and quality of life in the city (Batty et al., 2012).

The Expert System is one of the important scopes in artificial intelligence. Here the computer is used as a tool to put the insights of experts. That way the computer wants to have the ability to solve cases by plagiarizing the capabilities possessed by experts. The types of smart people and smart governance in this matter are related to citizens, the State Civil Apparatus (ASN) and public services (Wulandari, n.d.). On the other hand, the desire of citizens for the services of the public is very meaningful. Residents are often hesitant if they want to get the necessary public services even if they only seek information first.

Followed by the initial industrial revolution established in the aspects of mechanization and steam engines, the second factory revolution was based on the intensive use of electric power and mass creation, and the third factory revolution was made in the IT area and the expansion of the digitization area [5]. Sourced from the explanation above to the purpose of this research is to describe how the application of Artificial Intelligence in the development of Smart Cities. In this study, researchers will explain how the application of Artificial Intelligence in the development of Smart Cities in Indonesia.

## 2 Materials and Methods

This research uses a qualitative approach and literature review in analyzing the application of the Concept of Society 5.0 in the smart social section. A smart city is not an item or technology, but a way of mixing various parts together with innovative methods. For Arlington County. Research methods In the early stages of writing this journal, a collection of research articles related to the topics presented in the journal was then carried out a review of these articles written in this journal by relating existing writings (Saluky, 2018). This research center puts that methodology into practice in 2 steps. The first step is to carry out literature research in terms of research related to artificial intelligence research that has been applied to a city or to special research. The result of this level is the state of the art research on the application of the intellect of creation in smart cities sourced from research first. The result of this level is a form of artificial intelligence that can be used to facilitate city analysis using artificial intelligence.

## 3 Results and Discussions

### Artificial Intellegency

Humans are intelligent (good at solving problems) because people have insight and experience. Insights are gained from practicing. Continuing to be a lot of insights that belong to you will definitely be able to solve cases more. But the provision of insight alone is not not bad, people are also given the idea of carrying out reasoning, citing conclusions sourced from insights and experiences possessed.

Without having the skills to reason well, people with a wealth of experience and knowledge do not want to be able to solve problems well. Likewise, with very good reasoning skills, but without sufficient knowledge and experience, people also do not want to be able to solve problems properly.

Likewise, so that machines can be smart ( play a kind of role as well as people) so that they must be given the provision of insight, as a result of having the skills to reason. To create an intellect application there are 2 important parts that are very necessary:

1. Knowledge *base* , is fact- fact, philosophy, views and ties accompanying one another.
2. Inference *engine motors*, the expertise of drawing conclusions is based on insights and experiences.

In the 1950s, Alan Turing, a pioneer of *Artificial Intelligence* as well as a British mathematician carried out experiments. Turing (*turing test*) is a pc through its terminal placed at a distance. At the end of one there is a stop with an *Artificial Intelligence* application and at the other end there is a stop with someone operator. That operator does not recognize if at the end of another stop an *Artificial Intelligence* application is installed.

They spoke where the stop at the end shared a reaction to a series of issues raised by the operator. the operator assumed that he was talking to another operator located at another stop. Turing thinks that if a machine can make a person believe that he is able to talk to others, to the point that it can be said that the machine is smart (kind of like a person).

### **Smart City**

There are various different definitions of *Smart City*, but the general definition of *Smart City* is the use of *Smart Computing* technology in creating infrastructure components and services from the city. These components and services include administration, education, health, public safety and transportation. The term *Smart City* itself has appeared over the past few years. This concept is a new paradigm in urbanization, especially the era after the internet.

Some definitions of smart cities are: Cities that perform well in economic, human, governmental, mobility, environmental and *livability* indicators, are built on a mix of intelligent and autonomous citizens and have a high level of awareness (Giffinger et al., 2007). A city that monitors and integrates the condition of all its critical infrastructure, including roads, bridges, tunnels, railways, airports, ports, communications, water, electricity, and even large buildings, optimizes its resources. Can create, plan preventive activities, repair and monitor security aspects while providing optimal services to its citizens (Nam & Pardo, 2011). A city that combines physical infrastructure, IT infrastructure, social infrastructure, and business infrastructure to leverage the collective intelligence of the city (Harrison et al., 2010). Using intelligent computing technology to make key components and services of city infrastructure – including city management, education, public health and safety, real estate, transportation, and utilities – smarter, integrated and efficient (Washburn et al., 2009). Develop a unified framework to explain the relationships and influences between factors in smart city initiatives. Each of these factors should be considered when assessing the level of smart cities and studying smart city initiatives. These factors form the basis for comparing how cities envision their smart initiatives, the implementation of shared services, and the challenges associated with them. This combination of factors is also presented as a tool to understand the relative success of different smart city initiatives applied in different contexts and for different purposes. Similarly, this framework can help illustrate the true impact of variable types (organizational, technological and contextual) on the success of smart city initiatives (Chourabi et al., 2012).

In its application, *Smart City* is closely related to Big Data and *the Internet of Things* (IoT). Big data is a term that reflects large data, both organized and unorganized. The data contained thereafter were analyzed to predict the state of the city. While IoT is a system where the internet is connected to the real world through various sensors in sharing devices. The target of 100 *Smart Cities* in Indonesia has a very good reason related to the existing potential. The potential of *Smart City* as a catalyst in solving problems in various urban areas in Indonesia is certainly very large considering the technological opportunities, government support and *Smart City* models that can be adapted to the existing culture and problems faced (Rachmawati et al., 2018).

### **Artificial Intelligence Implementation**

*Artificial Intelligence* is a technology that has been widely adopted in this industrial 4.0 period. *Artificial Intelligence* is able to relate each feature, until one can automate all features without having to be in a position. More than that, nowadays there are already many machines that can interpret a certain situation or event with the encouragement of *Artificial Intelligence*.

One of them is a smart camera that detects the density of loading power of transportation equipment on the highway using *Deep Learning Neural Network* technology, which has been implemented in some District and City Regional Rulers in supporting the *Smart City* program (Lubis, 2021).

In the industrial zone, many have also automated the creation and manufacturing machines using human machines and *Artificial Intelligence*, as a result of Industry 4.0 increasing competitive energy through smart features. Every entity that is able to understand this technology, until it has a *competitive advantage*. But in the midst of the advancement of industry 4.0 which is quite dense the rulers must go fast in adopting this program, otherwise they will reduce the ability of the business field to maintain the stability of the audience service.

Therefore, it takes the right knowledge and understanding for the rulers in experiencing the Industrial 4.0 period. 0, where the *Chief Information Of Icer* (CIO) can cite a meaningful contribution in sharing support based on their knowledge in the style of industry technology 4.0, specifically *Artificial Intelligence* which has been widely adopted in various zones.

In order for a computer to behave like a human being as a human being, it must be equipped with knowledge and thinking ability. For this reason, artificial intelligence will try to equip computers in many ways to provide both components so that computers become smart devices (Mathur & Modani, 2016).

### System Design and Development Phase

There are three (3) meaningful factors from the development of the expert system, namely the presence of experts, *users* (users) and the system. An expert is a person who has a special experience of something about a problem. In the system, the experience is placed as the basis of insight and the basis of provisions. On the contrary, *the user* is a person who is willing to ask questions with experts through the system. The system itself provides various means to connect experts and users. The parts of the expert system are:

1. Knowledge acquisition. This tool is a way to calculate insightful data to be a problem from an expert. The basis of knowledge is used as a selection to be studied, processed and organized in an organized way to become the basis of knowledge.
2. Knowledge base and rule base. After the method of obtaining knowledge ends, it is tried, until the knowledge must be represented as the basis of knowledge and the basis of the next provision is combined, coded, organized and interpreted in the form of other concepts into a systematic form.
3. Inference mechanism. It is part of an expert system that carries out reasoning by using the contents of provision notes sourced from queues and special patterns. Throughout the way the discussion is accompanied by the system as well as *the user (user)*, the inference method tries the provisions one for one until the situation of the provisions is correct.
4. Program explanation facilities. sharing a description of how the program is carried out, what must be presented to the *user (user)* about a problem, sharing suggestions with the user (user), accommodating user errors and narrating how a problem is intertwined.
5. User *interface*. The important provision of creating a user interface is a waiver in implementing the system. All difficulties in making something must be kept secret, all that is shown is an interactive, communicative form and lightness of use.

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The following are 4 techniques for solving artificial intelligence:

- *Search* (search technique) is a problem-solving technique that presents a problem in the state space and systematically evaluates the state from the initial state until the destination state is found.
- Reasoning (inference style) is a problem-solving technique that presents problems in logic (a mathematical tool used to present and manipulate facts and rules).
- Scheduling is a method of solving problems by breaking down problems into smaller sub-issues, solving problems one by one, and then combining solutions from the smallest units to create a composite.

Learning automatically applies rules that are usually expected to apply to data we didn't know before (Hollands, 2008).

### 4 Conclusion

Smart city is a design that mixes the role of communities or citizens and data technology in the ability to use the available energy base. The form of smart cities that were raised ( Giffinger, 2007) to measure smart cities in European cities has 6 parts are Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living and Smart Management. Smart cities introduce modern smart surveillance systems for power management and comfort in smart buildings. Artificial Intelligence is a technology that has been widely adopted in the factory period 4. 0 this. Artificial Intelligence is able to relate each feature, until one can automate all features without having to be in a position. One of them is a smart camera that detects the density of loading power of transportation equipment on the highway using Deep Learning Neural Network technology, which has been implemented in some District and City Governments in supporting the Smart City program. There are three (3) meaningful factors of expert system development, namely the presence of experts, users and systems. The parts of the expert system are: (1) Knowledge acquisition, (2) Knowledge base and rule base, (3) Inference mechanism, (4) Program explanation facility, (5) User interface.

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