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Waste Management Based on Smart City Management by Using Internet of Things (IoT) and Artificial Intelligence (AI) Technology

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ABSTRACT

The purpose of this Community Service activity is to assist the waste bank to record data in making daily reports of incoming and outgoing waste data, making reports and financial records of transaction results. Assist UPTD, TPA Management, and the Environment Agency, in receiving and managing incoming waste. Knowing the traffic of trucks entering the landfill, providing information about the status of the landfill and providing automatic records for the landfill manager. The method used in this community service activity is the lecture, discussion and direct simulation method. The results of this community service activity make it easy for waste bank officers to record and make daily reports of incoming and outgoing waste data, make reports and financial records of transaction results. Assist UPTD, TPA Management, and the Environment Agency, in receiving and managing incoming waste. Knowing the traffic of trucks entering the landfill, as well as knowing about an integrated system based on smart city management, by applying internet of things (IoT) and artificial intelligence (AI) technology. The smooth implementation of this community service activity cannot be separated from the use of complete communication media, the material delivered is appropriate to the needs of the participants, with this Community Service program, it can be a reference and example for partners who have not collaborated. Besides, this Community Service activity can change the community's negative paradigm towards waste. Based on this activity, the environmental service has the basis to provide policies, budgets and supervision regarding waste management. Besides that, with this community service activity, it changes the paradigm about the importance of waste management

Key Words: Garbage, Waste management, Smart city

INTRODUCTION

Situation Analysis

Talking about waste is never ending, because every day humans always interact with garbage. Garbage is a consequence of human activities that produce waste (Dwiyatmo, 2007). Garbage is an inseparable part of people's lives, especially in urban areas.

Every day the waste is increasing along with the increase in population. E. Kurniawan (Grahanida, 2012: 2) stated that, the increase in population resulted in the amount of waste increasing as well. The increase in the amount of waste is often not matched by a good waste management system. This increasing amount of waste will not be managed properly if the handling is still using the old paradigm (collect-transport-dispose). According to estimates from the Central Statistics Agency (PBS) the amount of waste in 2020 in 384 cities in Indonesia will reach 80,235.87 tons per day. Of the waste generated, it is estimated that 4.2% will be transported to the Final Disposal Site (TPA), 37.6% of which are burned, 4.9% are disposed of into rivers and 53.3% are not handled. Of the approximately 53.3% of untreated waste, it is disposed of in an unsanitary manner and according to the 2003 National Urban Development Strategy (NUDS) estimate, the average volume of waste generated per person is around 0.5 – 0.6 kg/day (Sukir, 2010).

The current waste problem is not something that can be taken lightly, the waste problem has become a serious problem. Many disasters that have occurred are related to waste. Garbage if it is not handled properly and correctly from the source of the waste, it will cause health, social,

economic and beauty problems (Nugroho, 2009). One of the most surprising and unexpected events occurred, sixteen years ago, on Monday, February 21, 2005, a major disaster occurred at the Leuwigajah Final Disposal Site (TPA) in Cimahi City, namely a loud explosion followed by a landslide of existing garbage. The avalanche of garbage immediately swept away two settlements, namely Kampung Cilimus and Kampung Pojok. Two settlements, which are about 1 km from the Leuwigajah TPA, were completely destroyed by the garbage and killed. 157 people died. https://humas.bandung.go.id/berita/tragedi-leuwigajah-isah-kelam-bandung-lautan-sampah. This incident should be enough to make the public and the government aware of how dangerous it is if waste management is not improved. We don't want this incident to happen again. Taking lessons from the incident, the handling of the problem must immediately receive more attention than before from all parties. As a result of the waste problem that is not handled properly it can cause various other problems, such as air pollution, potential flooding and reduce the degree of beauty of the city of Bandung.

The city of Bandung as one of the cities that is trying to implement a smart city. A city that is successfully referred to as a smart city is a city that already has a new breakthrough to solve various problems that exist in the city so that it can improve city performance (Hasibuan, 2019). Smart city is a concept regarding the layout of a city in optimizing information and digital technology to improve people's welfare and happiness, as well as improving government services so as to reduce and reduce costs, time, and energy. This is in line with various notions of smart city which emphasize that smart city is an effort to make its citizens happy (Eniyati, 2017). One of the efforts in implementing this smart city is related to cleanliness, especially regarding waste.

Partner Problems

The problems faced by partners today are that it is difficult to raise public awareness to sort and choose waste, organic and inorganic, people think that waste is something dirty so they are ashamed to deal with waste. In addition to that, there is also a lack of garbage transport equipment, so far they do not have a qualified garbage transporter. There is no technology capable of knowing the volume of waste and the capacity of the waste bank, TPS and TPA, so that waste often accumulates, especially if the waste transport vehicle is damaged. Lack of young workers as the next generation in waste management.

The purpose of this Community Service activity is to assist the waste bank to record data in making daily reports of incoming and outgoing waste data, making reports and financial records of transaction results. Assist UPTD, TPA Management, and the Environment Agency, in receiving and managing incoming waste. Knowing the traffic of trucks entering the landfill, providing information about the status of the landfill and providing automatic records for the landfill manager.

RESEARCH METHODS

This community service activity is carried out using lecture, discussion and direct simulation methods. In the implementation of this service activity, it is carried out through three stages, namely the preparation stage, implementation and evaluation stage.

In this preparation stage, the following activities are carried out:

1. Partner search
2. Conduct a field survey to the RW 05 Antapani Wetan Office as the place for the activity. During this survey, interviews and discussions were held with village officials to identify problems in using computers.
3. Identification of problems that exist in partners, this stage is the first step in formulating what will be the material for system design and training materials in this service activity.

The next stage after the preparation stage is the implementation stage. At this stage, training activities as well as direct simulations are carried out with training participants related to an integrated system based on smart city management, by applying Internet of Things (IoT) and Artificial Intelligence (AI) technology.

The last stage in this activity is the evaluation stage. The activities carried out at this stage are in the form of an assessment or evaluation of the results achieved by the training participants and simulations. The results achieved by the participants were obtained by collecting data through

interviews with several training participants and simulations regarding the understanding of the training materials and simulations that had been received. Based on the results of the interview, it was concluded that there was an increase in information and understanding of an integrated system based on smart city management, by applying Internet of Things (IoT) and Artificial Intelligence (AI) technology. In addition, it also increases motivation in waste management by waste bank officers. This community service activity is carried out through training and simulations which are participated by various parties, namely:

a. Implementation of Unikom PKM
b. Garbage Bank Officers
c. UPTD/TPS officers
d. TPA officers

DISCUSSION AND RESULTS

Discussion

Community service activities carried out through training and simulations have been carried out smoothly. The implementation of community service activities was carried out on RW 05 Antapani Wetan waste bank officers, the Environmental Service, UPTD/TPS officers and TPA officers. This activity is carried out through face-to-face training activities with lecture methods and direct simulations in the use of Internet of Things (IoT) and Artificial Intelligence (AI) technology for waste management. During the process of this training activity, all participants were enthusiastic and enthusiastic about listening and listening to the material presented.

The pattern of waste management is also still partial, so it is necessary to have an integrated system that is able to monitor and analyze the sources of waste generation, types of waste, volume of waste, and be integrated with related units/services. For this reason, it is necessary to have appropriate and adaptive government policies to handle waste by involving public (community) participation in this case by empowering waste banks that are able to turn waste into rupiah which in turn has an impact on the community's economy.

Obstacles

a. It is difficult to raise public awareness to sort and choose waste, organic and inorganic, people think that garbage is something dirty so they are ashamed to deal with waste.
b. Lack of means of transporting waste, so far they do not have adequate means of transporting waste.
c. There is no technology capable of knowing the volume of waste and the capacity of the waste bank, TPS and TPA, so that waste often accumulates, especially if the waste transport vehicle is damaged.
d. Most of the participants are over 50 years old, so it cannot be done just once for a simulation of Internet of Things (IoT) and Artificial Intelligence (AI) technology.

Follow-up

Following up on the obstacles that occurred, the following efforts were made:

a. Conduct socialization about the importance of managing waste and how to sort waste.
b. Provide assistance in the form of equipment used in waste management.
c. Provide training related to effective waste management methods according to the type of waste through the use of an effective system. Build an integrated system based on smart city management, by applying Internet of Things (IoT) and Artificial Intelligence (AI) technology.

Research result

The results of this service activity make it easy for waste bank officers to record and make daily reports of incoming and outgoing waste data, make reports and financial records of transaction results. Assist UPTD, TPA Management, and the Environment Agency, in receiving and managing incoming waste. Knowing the traffic of trucks entering the landfill, as well as knowing about an integrated system based on smart city management, by applying Internet of Things (IoT) and Artificial Intelligence (AI) technology.

CONCLUSION

The problem of waste in Indonesia so far has become a serious problem that has not been properly resolved by the district/city government. The problem is caused by limited funding for the provision of infrastructure as well as the low level of waste service to the community in almost all landfills. The final landfill can no longer accommodate the waste produced by the community, so that garbage accumulates and causes unpleasant odors which can cause various problems in urban areas such as disease, flooding, etc.

Community service activities begin with finding partners and identifying problems, then continuing with the counseling process and direct simulation with the participants. The transfer of knowledge is going well so that it is expected to be able to reduce the waste problems faced by the people of Bandung City.

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APPENDIX

Figure 1. Signing of Cooperation

Figure 2. Message from the Chief Executive of PKM and the Coordinator of DLH

Figure 3. DLH participants

Figure 4. Coordination Meeting

Figure 5. Submission of material by resource persons

Figure 6. Delivery of assistance to partners