

Digital Business Planning for Waste Recycling using Service Oriented Architecture



Sri Hesti Mahanani, Sofia Alatas, Tuga Mauritsius

Abstract: Waste is one of the biggest problems in Indonesia. The number increases with increasing population and lead to the development of waste bank that are manage irregularly by the community. By implementing digital business using SOA, the entities in the waste management ecosystem will be integrated. An end to end processes will be centralized into one application and automation making this business can be controlled efficiently. The use of digital business promises to encourage Indonesian citizens to manage waste by selling garbage to waste banks and revolutionizing the way in organizations accelerate processes and competencies and take leverage of market opportunities. The proposed system is a functioning mobile and web-based application as an enabler of environmental ecosystems, especially waste management problem. Waste disposal from household, market, office, roadside, commercial areas and various location will be deposited to the nearest waste bank. Regarding to this issue, we created digital business planning based on Service Oriented Architecture (SOA) for waste management.

Keywords: Digital business, Waste Management, Service Oriented Architecture, SOA, Enabler

I. INTRODUCTION

Waste is one of the biggest problems in Indonesia. It cause flood and dirty living environment that affects poor health in society. This serious problem has been registered in Indonesian presidential decree PERPRES No 97 2017 which talks about how to reduce and manage waste [1]. The amount of waste increases with increasing population [10].

Lack of the public awareness in maintaining the environment makes waste management difficult to implement [3] there is also a false understanding of waste in the community, where waste is considered to have no economic value [4]. Waste bank is one of the ways to manage waste, it has a specific purpose for handling waste by buying back waste in terms of a deposit like banking system [5].

Indonesia has tried to apply waste banks in several regions

such as Malang, Makassar, and Jakarta. The local government was made the regulation to manage the waste starting from planning to the monitoring process [2]. In this case the effort in implementing waste bank are still not integrated, the absence of the integration system causing the process inefficient and ineffective. According to [17] the system that is integrated with each business process and IS system will be more consistent and operational activities will be more effective and efficient.

E-commerce sector plays a significant role both in developed and developing countries [14]. Digital transformation has resulted major changes in the processes, competencies, and business models. The organization able to accelerate and expand the deployment area by utilizing the digital technology assimilation [9]. According to [18] decision makers can quickly consider business needs it would be better to make a dashboard as an interactive and user-friendly decision support system.

SOA is described as a set of architectural concepts that form a blueprint for enterprise computing architecture [6]. SOA promises to revolutionize the way in which organizations compete, speeds up decision-making, and take leverage of market opportunities [7].

Based on the factors above, we create a concept of digital business based on Service Oriented Architecture (SOA) for managing the waste banks. In paper [20] through digitalization using simulation games are able to expose urban environmental problems in the form of exposure to proposed solutions that invite a municipality's awareness. Sama with paper [20] in this paper digital business approach able to courage Indonesian citizen to manage their waste by selling garbage to waste banks and developing a marketplace for recycle handicraft through mobile and web-based applications.

It will make the existing waste banks integrated with each other. The system optimized the 3R program (recycle, reduce and reuse). Base on paper [19] Citizen involvement has the potential to be directed to participate in mapping the development of urban problems. In the case of this paper is waste. We involve not only the waste banks but also citizens, companies, volunteers, banks, government, third party logistic and Geographic Information System (GIS). GIS offer the capability to store, retrieve, analyse, display data related to land use, land cover, urbanization, and environment [8].

In this way the system can support the waste bank's operational activities, transactions and managing customer savings also assisting a local government in registering waste bank in each region and controlling their activities.

Manuscript received on February 10, 2020.

Revised Manuscript received on February 20, 2020.

Manuscript published on March 30, 2020.

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The use of digital environment with service-oriented architecture is a suitable method to connecting the community. The entities with different roles can be integrate and operating their services. It helps the process more efficient and cost-effectively.

II. RELATED WORKS

In journal [1] that is written by Prof. S.A. Mahajan, Akshay Kokane, Apoorva Shewale, Mrunaya Shinde , Shivani Ingale, Smart Waste Management System using IoT was proposed. They tried to provide public dustbins with embedded monitoring devices. It was said that their proposed system would help in real time monitoring level of garbage in public garbage bins. By monitoring the level of garbage in public garbage bins, it would help to provide optimized routes for garbage collecting vans, which will reduce cost associated with fuel. Our concept is similar with this Smart Waste Management System, we do deploy smart bin but we offer something more. We try to integrate our system with GIS which make us possible to see and get the information about our environment. Our GIS integrated system will show us our surround environment condition, we will be able to see which spot that has high level of garbage. Our system will notify the users where the closest dirty spot is so it will help our volunteers to make a cleanliness event where ever the dirty spot is.

According to journal [16] digital transformation has the potential for business. the are six hypothesis of influencing factors such as "increased sales", "economic sharing", "personalized offerings", and "social media" which have a positive impact on the tourism industry. In journal [2] waste bank management model is also said not only beneficial in making cleaner environment, but also has an impact on local economy. Despite of the benefits, the community is still expecting more support from government to make the waste banks operate better by helping them determine pricing model for the waste. In Our concept, the pricing model of the waste is better defined. We involve companies and industries which will be the one of recycled waste consumers to define the pricing model. We will adjust the waste prices with the numbers of requests, so it will be dynamic pricing model.

For SOA implementation, journal [3] stated that there are some benefits of it. This make our concept which is using SOA will surely get that benefits too, here are the benefits of implementing SOA that are stated in [3]; SOA will reduce the integration cost, improve business agility and flexibility, improve asset reuse and the most important implementation of SOA will return on investment. We believe that by implementing our concept of waste management in mobile application will give so many advantages, from environmental to individual positive impacts.

III. METHODOLOGY

In this study, the authors conducted a study of the concepts that had been devised previously developed related to digital business and the implementation of SOA. The method is chosen from a case perspective and registers several questions. The mixed-methods approach to survey & interviews specific question with a closed-ended answer would

be followed by an open-ended answer elaborating upon the same question.

The research process including study collected background information on service and environmental development practices from various literature. Then produced a list of cases to be identified. And this list is then used as the basis for qualitative analysis. The reliability of qualitative data analysis is used to collect and categorize data where the author can describe the existing situations and problems.

IV. RESULT AND DISCUSSION

A. Profile of Application Iagiarism

The proposed system is a mobile and web-based application which functioning as an enabler (Enabler is anything that can help) environmental ecosystems, especially waste. Waste located in the household environment, market, office, road, commercial area or other locations will be collected and deposited to the nearest waste bank. Waste bank also becomes a tool for bringing together stakeholders: local government, public (communities), private sectors and mass media. Communities are the main actors in waste management [10]. The collected waste that have been sorted will be distributed to the factory/users of waste to be recycled. The waste bank is also connected to a banking and logistics system managed by an organization based on the regulation of the sanitation and environmental services in Indonesian government.

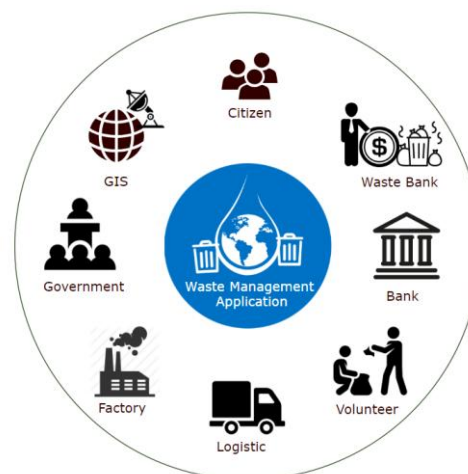


Fig. 1. Application Rich Picture (Retno.Dyah, et al., 2015)

B. Business Process Identification

The business model canvas describes ecosystem including the process of exchanging garbage by citizens to be able to produce either money or goods. The process of ordering waste both by the company and individual. Below is the explanation:

1) Ecosystem

This waste management system consists of 4 main entities, citizen, waste bank and government:

- Citizen : Increase community participation through application that connects customers with the nearest waste bank. Mobile Application (IOS and Android based).

- Company/Individual : As a waste buyer to produce a recycling waste.
- Waste Bank : Connecting waste banks all over Indonesia and the application can be accessed via Mobile APPS and desktop application.
- Government : Collaborating with the government as a regulator for waste management in the area. Web based application (Desktop Application based)

2) Business Model Canvas

Below is the Business model canvas that we propose:

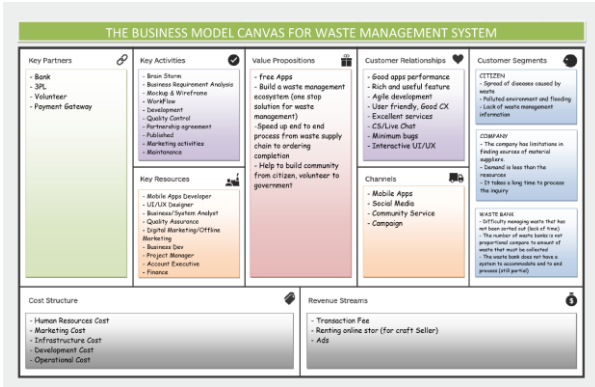


Fig. 2. Business Model Canvas

3) Application Feature

a. Feature in Citizen Application



Fig. 3. Citizen User Interface

- Waste Bank Location Checking and Waste Pickup
The application connects citizens to a waste bank. The application has an ability to check the nearest waste banks location and request for garbage pickups. In this case we used Geographic Information System (GIS) that enable to store, retrieve, analyse and display data related to location coordinate [8]
- Waste Deposit & Balance
The application provides the information about waste bank and what kind & price of an-organic trash that can be sold to the waste Bank. The electronic balance from the deposit / exchange of waste can be used as a non-cash payment instrument. E-money offers advantages that give the ease, speed, and efficiency [11]. Balances can be withdrawn into a personal account or transact easily and safely without cash.

The balance can also be used for transactions at the Garbage Craft Online Store.

- Waste Request

We realize that Citizens also need certain types of waste, so we make a request waste feature that can request small scale waste on the application.

- Forum & Event

The forum & event feature is all about trash event, community, education, how to dispose of garbage, tips and tricks for processing waste, and waste utilization.

- Become Volunteer

This become volunteer feature allows us to register to participate in becoming a volunteer for cleaning area from waste.

b. Feature in company/personal application



Fig. 4. Company User Interface

- Waste List

In the waste list feature the company can review the product details, prices and availability of waste in real time.

- Trash Order

In this Order feature, the company can buy garbage directly to the waste bank list available in the application. This order can be done by companies or individuals.

- Bidding Formula

Formula bidding is one of the special features for company. Company can do the bidding for the price of the garbage they need.

- Online Garbage Craft Shop

As we all know, internet and e-commerce are entirely committed towards every developed country. But we think it can be accomplished and can make a remarkable benefit to developing countries also if an ideal business purpose can be made. Ohidujja man et.al clearly discussed that E-commerce is a revolution & turning point in online business practices and can make a huge contribution to the economy [12].

c. Feature in waste bank application

- Waste banks admin can manage customer and customer transaction.

- Waste bank will connect to bank and for the successful data transactions will be auto deduct from waste bank account to customer account.

- The waste bank data incorporated has been integrated nationally, thus facilitating the process of monitoring waste management & planning for the development of Waste Banks nationally.

d. Feature in government application

- Mapping and manage the waste banks all over the region. Waste bank registration and validation then looking at the details of the activities and transactions of each Waste Bank activity management

- The system help government to manage waste, categorize and collect from the public place with the trash system alert adopt from the sensor and that will send the notification [15].

- Report and transaction history can assist the governments in monitoring the transaction of each Waste bank in each region. This aims to maintain the transparency and integrity of the management of the waste bank, as well as to determine the next steps taken by the government to address waste in certain areas. Recording of transactions and balance calculations is carried out by the system, thereby increasing transparency and efficiency of the resources needed.

4) Proposed SOA Architecture

With the application, the entities will be integrated with each other in the waste management ecosystem. Complete distribution coverage of garbage to the smallest level. Automation of end to end processes that are centralized to 1 application will make the business more efficient and controlled. Proposed SOA architecture described in the picture below. SOA interoperability framework that are services exposed by other systems. In order to promote the dynamic reuse of systems and components, the interfaces must be described with contextual information to allow correct understanding and integration into higher-level systems [8]. The implementation of web services is to manage and persistent storage of information objects, one of the assets is to avoid duplicate function and tools. This may happen by embedded functions or by calling the services through an API [11].

The databases are stored and maintain in a cloud server. Mainly, started as an infrastructure as a service form, where the user had access to superior hardware, the cloud providers further developed solutions for offering access to the customer of preinstalled software architectures (platform as a service) or for service access (software as a service) [13].

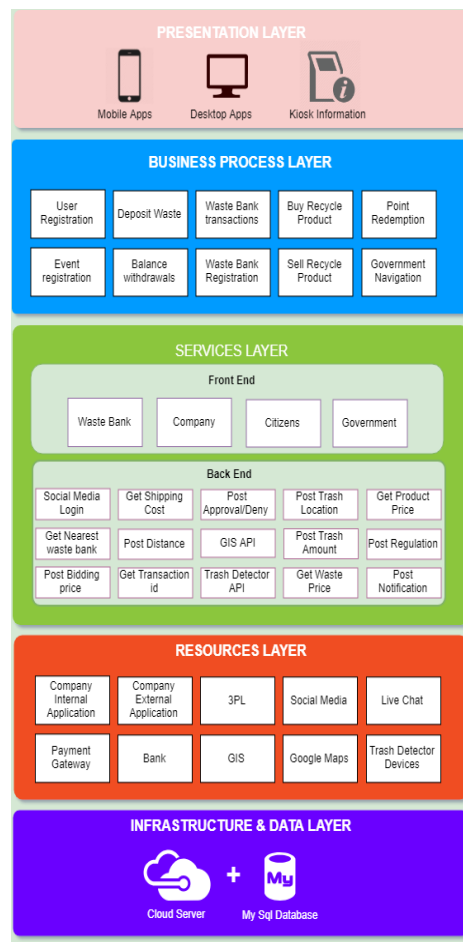


Fig. 5.SOA layer

V. CONCLUSION

From the previous research, we discover waste management using IOT with monitoring devices has an absence of direct interaction between the entities. Regarding to this issue, we create a plan of waste management with a digital business based on Service Oriented Architecture (SOA) to connect the devices and the community as an integrated system using one stop solution application.

The digital business approach has an ability to change the community behaviour of littering into managing a valuable waste. Such as, recycle waste into handcraft souvenir, selling sorted waste to waste bank and make a purchase using e-Money (waste balance).

In this paper we proposed how waste management using digital business based on SOA can be implemented. In our system, we would involve and integrate not only the waste banks but also citizen, company, volunteers, banks, government and third party logistic. The services based make them interacted more effectively, efficiency of space, energy, and time to manage the waste.

From the government's side, we can contribute to our society to comply the regulations by reducing the amount of garbage, the dustbins will be organized, a cleaner city, better infrastructure and increased hygiene.

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