CHAPTER ONE

GENERAL INTRODUCTION

1. BACKROUND TO THE STUDY

One of the principle worries with our environment has been waste administration which impacts the wellbeing and condition of our general public. The detection, monitoring and management of wastes are one of the essential issues of the current time. The conventional method of manually checking the wastes in waste canister is a difficult process and takes more human exertion, time and cost which can easily be dodged with this current technology. This is the solution, a technique where waste management is automated. Generation of waste is everyday by households and also by local factories, artisans and traders, as the way of life increments because of development and technological advancement (Frances, 2020).

Rahman, *et al.*, (2022) claimed that, the unprecedented growth of urbanization and population in recent decades has led to a significant surge in municipal waste production, challenging traditional waste management systems. Inefficient waste collection, overflowing bins, and delayed issue resolution have become commonplace, contributing to environmental pollution and public health concerns.

To address these challenges, there is a pressing need for innovative technologies that can revolutionize waste management processes. The advent of the Internet of Things (IoT) and smart city initiatives has opened up new possibilities for integrating advanced technologies into urban infrastructure. Smart waste management systems have emerged as a promising solution to enhance the efficiency of waste collection and disposal (Rahman, *et al.*, 2022).

The integration of sensor technologies, data analytics, and real-time communication offers the potential to transform traditional waste bins into intelligent, proactive entities.

The conventional waste bins, often static and passive, lack the ability to adapt to changing waste volumes and compositions. This limitation results in inefficient use of bin capacity, frequent overflows, and increased operational costs for waste management authorities. Additionally, the lack of real-time monitoring and timely issue detection hampers the ability to respond promptly to maintenance needs or address potential system malfunctions. Effective solid waste management is one of the requirements in achieving the status of a developed nation. In the coming decade, foreign investment attraction to a nation will largely be influenced by healthy and clean environment, more so, a large percentage of the world's population will be residing in the cities. These aids development

of smart cities perceptions geared towards decent urban living utilizing innovative know-hows. Management of solid waste is a vital process in any nation, it cut across every facets of the country for example standard of living, economy, healthcare, education, and pattern of living (Afolalu, *et al.,*2021).

The current global technological advancement, industrial revolution, and urbanization call for sustainable development policies and plans. Huge investment has been made by several nations of the world towards the establishment of smart cities. The present waste management schemes are not sufficing to control the significant increasing waste level. Smart waste management system is to keep our homes and communities clean from unwanted mess up. Smart garbage monitoring system gives a real time indicator of the garbage level in a bin and mobile application. The waste disposal can be managed more properly and efficiently by constantly monitoring the bin status and the garbage level. In addition, the municipality can be alerted when the bin is full or almost full, thus promoting dynamic scheduling and routing of the garbage collection (Cheema, *et al.,* 2022).

The proposed smart waste bin with shuffle refuse and alarm notification aims to bridge these gaps by introducing dynamic features that address both the capacity utilization and real-time monitoring aspects of waste management. The mechanism ensures optimal use of available space within the bin, preventing overflow and reducing the frequency of collections. Simultaneously, the Alarm Notification system provides immediate alerts to relevant stakeholders in the event of critical situations, allowing for swift response and issue resolution. This study seeks to evaluate the effectiveness of the smart waste bin in real-world urban environments, considering factors such as user acceptance, operational efficiency, and environmental impact. By combining technological innovation with practical waste management needs, this research endeavors to contribute valuable insights to the ongoing discourse on smart city development and sustainable urban living. The findings from this study are expected to inform future advancements in smart waste management solutions, paving the way for more resilient and responsive urban infrastructure.

1.2STATEMENT OF THE PROBLEM

Waste disposal are a part of our everyday life and mostly its condition are improper managed due to improper waste dumping, collection and management, which leads in foul smell and unhygienic condition, thus inherently results in pollution of the environment. The conventional waste management systems are grappling with the escalating challenges posed by burgeoning urban populations. Overflowing bins, inefficient waste collection, and

delayed issue resolution not only contribute to environmental degradation but also strain municipal resources. The absence of adaptive features in traditional bins exacerbates these issues. This study addresses these shortcomings by investigating the potential of the smart waste bin with shuffle refuse and alarm notification in mitigating challenges associated with waste management.

1. AIM AND OBJECTIVES OF THE STUDY

The aim of this project is to design a smart waste bin using alarm notification system. The objectives are to:

i. Automate lid operation for hygienic use.
ii. Monitor waste levels to optimize collection schedules
iii. Enhance user interaction and feedback.

1.4SIGNIFICANCE OF THE STUDY

This study holds substantial significance in the realm of urban infrastructure and waste management. The implementation of the smart waste bin has the potential to revolutionize how cities handle waste, promoting sustainability, reducing environmental impact, and enhancing the overall efficiency of waste management systems. The findings will inform policymakers, waste management authorities, and urban planners, contributing to the development of smarter and more adaptive urban environments.

1.5 SCOPE OF THE STUDY

The study will primarily focus on the evaluation of the smart waste bin with Shuffle Refuse and Alarm Notification in a selected urban setting. User feedback, operational data, and environmental impact will be assessed to provide insights into the effectiveness of the technology. However, the study acknowledges that variations in urban infrastructure and waste management practices may exist, and generalization to all contexts may require additional research. The scope will extend to assessing the feasibility of scaling this technology to diverse urban environments, taking into consideration factors such as cultural, economic, and infrastructural differences.

1.6ORGANIZATION OF THE REPORT

This is the overall organizational structure of the work as presented in this project. Chapter one of this project deals with the general introduction to the work in the project. It also entails the aim and objectives of the project, significance of the study, the scope and organization of the project. Chapter two deals with the literature review and discussion of

related aspect of the project topic. Chapter three covers the methodology, the analysis of the existing system, description of the current procedure, problems of existing system (procedure) itemized, description of the proposed system and the basic advantages of the proposed smart waste bin using SMS notification. Chapter four entails design, implementation and documentation of the system. The design involves the system design, output design form, input design form, database structure and the procedure of the system. The implementation involves the implementation techniques used in details, choice of programming language used and the hardware and software support. The documentation of the system involves the operation of the system and the maintenance of the system. Chapter five deals with summary, conclusion and recommendation.

1. **Definition of Technical Terms**

Actuator: A device that converts electrical signals into physical action, such as a motor that moves the lid of a smart dustbin.

Arduino: An open-source microcontroller platform used for building digital devices and interactive projects.

Cloud Platform: A network of servers hosted on the internet to store, manage, and process data remotely, often used in IoT applications.

DC Motor: An electric motor powered by direct current (DC), commonly used to control moving parts like a smart dustbin lid.

ESP8266/ESP32: Microcontrollers with built-in Wi-Fi and Bluetooth capabilities, widely used for IoT devices.

Firmware: Software programmed into hardware devices to control their operations, like the code running on a smart dustbin's microcontroller.

Infrared (IR) Sensor: A sensor that uses infrared light to detect objects or measure distances.