# i-SPiKE 2023

INTERNATIONAL EXHIBITION & SYMPOSIUM ON PRODUCTIVITY, INNOVATION, KNOWLEDGE & EDUCATION

"Optimizing Innovation in Knowledge, Education and Design"

# EXTENDED ABSTRACT

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Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality . I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

*Professor Dr. Roshima Haji Said*
RECTOR
UiTM KEDAH BRANCH

**WELCOME MESSAGE (i-SPiKE 2023 CHAIR)**

We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPiKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPiKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail
Chair
3rdInternational Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023)

# SMART WASTE MANAGEMENT SYSTEM WITH IOT MONITORING

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**ABSTRACT**

The Smart Waste Management System (SWMS) with IoT monitoring is a cutting-edge solution that utilizes Internet of Things technologies to optimize waste management processes. By deploying smart waste bins with sensors and IoT devices, the system continuously monitors bin fill-levels, temperature, and other parameters, transmitting real-time data to a central monitoring platform. Through advanced data analytics and machine learning algorithms, the platform predicts waste accumulation patterns, optimizes collection routes, schedules pickups based on fill-level data, and detects any abnormal conditions. This IoT-based system ensures efficient waste collection, prevents overflows, reduces operational costs, promotes sustainability through waste segregation and recycling, and contributes toa cleaner and more sustainable environment.

## INTRODUCTION

Malaysia is fast rising economically and socially. It's typical to observe waste or recycling bins overflowing in public locations, particularly in cities, due to increased waste disposal. This is due to densely populated residential and industrial locations. The obsolete traditional approach to trash management has resulted to an unstable and expensive waste collecting technique. Weekly waste collection is unsuccessful because not all areas require daily collection, while some need regular collection to prevent overflow.

## PROBLEM STATEMENT

Inefficient Cost management: Traditional waste collection routes are often based on fixed schedules, leading to inefficient pickups. Waste bins may be emptied even if they are not full, resulting in unnecessary fuel consumption and increased operational costs.

Overflowing waste bins: Without real-time monitoring, waste bins can become overfilled, leading to overflowing waste and unsightly conditions in public spaces. Overflowing bins attract pests, pose health hazards, and degrade the overall cleanliness of the environment.

Lack of data-driven insights: Traditional waste management systems often rely on manual processes and lack access to real-time data.

Environmental impact: Overflowing waste bins contribute to environmental pollution andpose risks to human and animal health.

## OBJECTIVE

Optimized waste collection: IoT smart waste management systems enable optimized waste collection routes based on real-time data on fill levels.

Cost savings: By optimizing collection routes and reducing unnecessary pickups, can significantly reduce operational costs, including labor, fuel, and vehicle maintenance expenses.

Sustainability and environmental impact: IoT smart waste management systems efficient waste management practices help minimize environmental pollution and promote proper waste disposal and recycling.

Real-time monitoring and alerts: IoT sensors provide real-time data on various parameters, such as fill levels and type of wastage. This enables waste management teams to monitor the status of bins remotely and receive alerts in cases of issues such as fire, vandalism, or malfunctioning equipment.

Citizen engagement and education: IoT smart waste management systems can facilitate better citizen engagement. This helps educate and involve residents in sustainable waste management practices, leading to increased compliance and improved waste diversion rates.

## METHODOLOGY

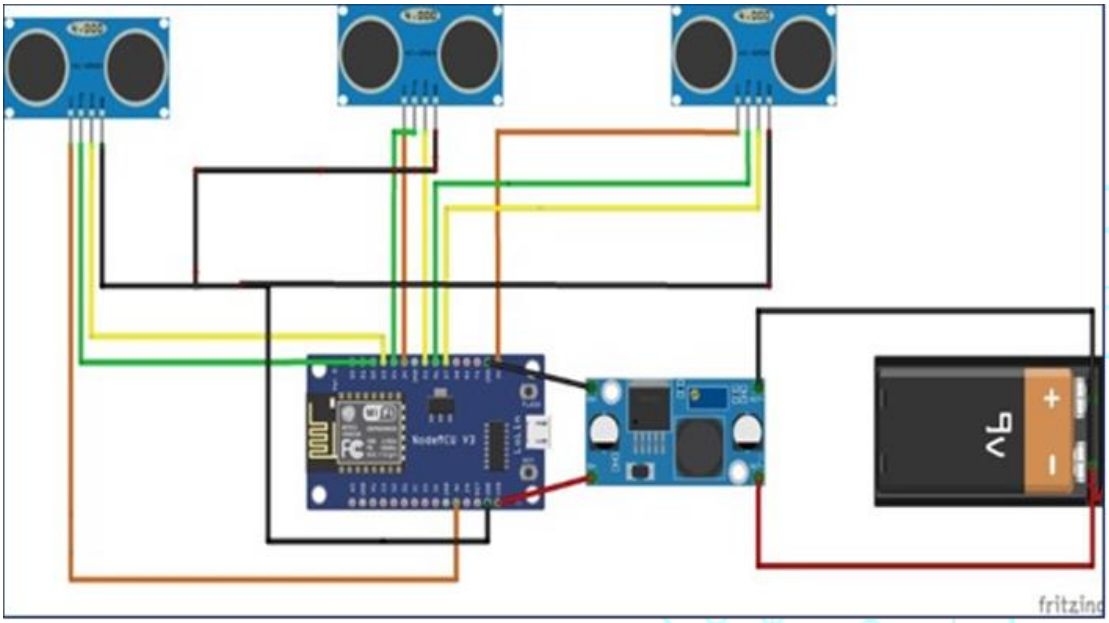


**Figure 1.** Component and Schematic of this project


**Figure 1.0** IOT Diagram of this project

The hardware comprises a NodeMCU ESP8266, ultrasonic sensors HC-SR04, and voltage regulators LM2596. Ultrasonic sensors measure the distance between the sensors and the garbage inside the bin and transmit this information directly to the cloud service via a microcontroller and wireless network. We utilized the Blynk IOT app to centralize data and also as a user interface for monitoring the entire waste management system.

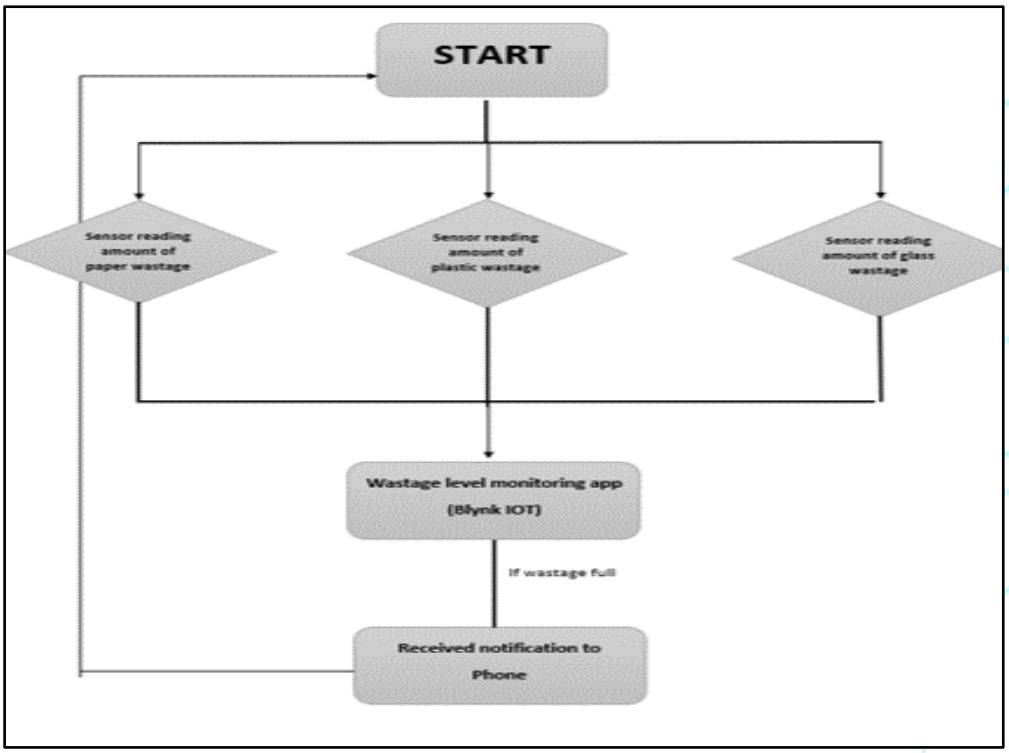


**Figure 1.1** Flowchart of this project

**How it works?**
IoT sensors are installed in waste bins to measure fill levels.
The sensors transmit data wirelessly to a central management system.
The central management system analyses the data using advanced analytics and machinelearning algorithms.
Real-time fill level data is used to optimize waste collection routes.


## CONCLUSION

IoT smart waste management systems offer significant commercial value by improving operational efficiency, reducing costs, and enhancing service quality in waste management processes. We proposed this innovation to our Majlis Bandaran. Furthermore, IoT smart waste management systems contribute to the achievement of Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities. SDG 11 aims to make cities inclusive, safe, resilient, and sustainable. IoT smart waste management directly aligns with this goal by improving waste management practices, promoting cleanliness, reducing environmental pollution, and fostering sustainable urban development. Efficient waste collection and proper disposal have a positive impact on public health, quality of life, and the overall sustainability of cities and communities.

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