Universiti Teknologi MARA
Cawangan Perak

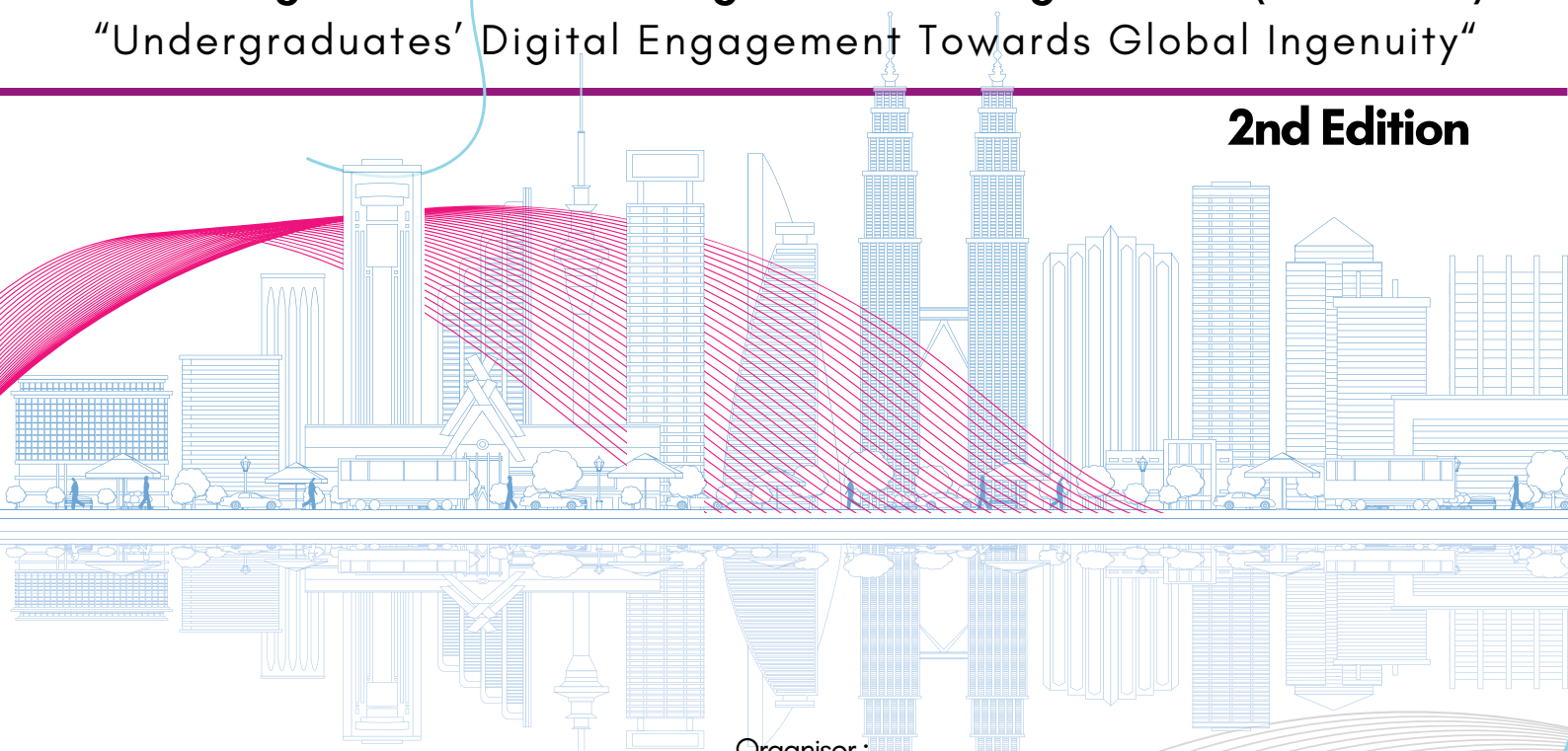
e - Proceedings

IUGeT

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

2nd Edition



Organiser :

Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch

Co-organiser :

INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch

Bauchemic (Malaysia) Sdn Bhd

Universitas Sebelas Maret

Universitas Tridinanti (UNANTI)

Publication date :

November 2024

e - Proceedings

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

Organiser :

Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch

Co-organiser :

INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch

Bauchemic (Malaysia) Sdn Bhd

Universitas Sebelas Maret

Universitas Tridinanti (UNANTI)

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN: 978-967-2776-42-0

Cover Design: Muhammad Anas Othman
Typesetting : Arial

e-ISBN: 978-967-2776-42-0

iVUTI 2024 Committee

Project Leader
Ts Muhammad Naim Mahyuddin

Assistant Project Leader 1
Dr Ezzat Fahmi Ahmad

Assistant Project Leader 2
En Mohd Fadzli Mustaffa

Secretariat 1
Syahmimi Ayuni Ramli

Secretariat 2
Nur Afiqah Anuar

Treasurer
Dr Izrahayu Che Hashim

Registration Team
Dr Asmaa' Che Kassim
Dr Fatin Syazwina Abdul Shukor
Dr Suwaibatul Islamiah Abdullah Sani

Certification Team
Ts Nurul Huda Abdul Hadi
Ir Raja Nurulhaiza Raja Nhari
Dr Siti Jamiah Tun Jamil

Graphic Team
Mohammad Fitry Md Wadzir
Jannatun Naemah Ismam,
Nor Azizah Talkis
Wan Nur Hanani Wan Abdullah

Promotion Team
Nurulanis Ahmad@Mohamed
Najma Azman
Ts Sr Dr Asmat Ismail

Evaluation Team
Dr Suzanah Abdullah
Haslina Hashim
Azlizan Adila Mohamad
Noorsazwan Ahmad Pugi
Gs Dr Munirah Radin Mohd Mohktar
Mohd Najib Husain

Publication Team
Nur'Ain Ismail (Head)
Siti Nurhayati Hussin (Chief)
Dr Nuramira Anuar (Sub-chief)
Dr Paul Gnanaselvam A/L Pakirnathan
Noorlinda Alang
Norasyikin Abdul Malik
Halimatussaadiah Iksan
Nurdiyana Mohamad Yusof
Syaza Kamarudin
Dr Wan Nordiana Wan Ali
Dr Ida Nianti Mohd Zin
Dr Nurul Sahida Fauzi
Dr Noor Rizallinda Mohd Ishak
Dr Lizawati Abdullah
Iza Faradiba Mohd Patel
Nurfatima Wahida Nasir
Nazirul Mubin Mohd Noor

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)
Undergraduates' Digital Engagement Towards Global Ingenuity
e-ISBN: 978-967-2776-42-0

PROTECTIX: SMART MOBILE APP FOR SAFETY AND HEALTH MONITORING IN IBS CONSTRUCTION

Scholastica Sekam[1], Mohd Najib Abd Rashid[2] and Mohamed Rizal Mohamed[3]*

[1, 2] Department of Built Environment Studies and Technology, College of Built Environment, Universiti Teknologi MARA Perak Branch, Seri Iskandar Campus.
[3] College of Built Environment, Unversiti Teknologi MARA, Shah Alam.

*mohamedrizal@uitm.edu.my

Abstract
This innovation project report introduces "ProtecTix," a smart mobile application aimed at enhancing labor safety and health monitoring in Industrialized Building System (IBS) construction. The introduction highlights the critical need for improved safety measures in the construction industry. The problem statement identifies the limitations of current safety management techniques, which often rely on manual processes prone to human error and lack real-time monitoring and predictive capabilities. The primary objectives of ProtecTix include integrating real-time data collection, predictive analytics, and wearable sensor compatibility to address these challenges. The methodology follows a design thinking framework, which involves empathizing with construction workers, defining key safety problems, ideating innovative solutions, prototyping, and analyzing the application's impact. The project utilized documentation review, desk study, and prototype development methods to create a user-friendly and advanced application. The findings demonstrate that ProtecTix can significantly improve safety, efficiency, and worker well-being in high-risk IBS construction environments. The conclusion emphasizes the application's potential for commercialization, offering a valuable tool for the construction industry to enhance overall safety standards and operational efficiency.

Keywords: *IBS Construction, Innovative Technologies, Predictive Analytics, Real-time Data, Safety & Health Monitoring*

1. INTRODUCTION

The development of ProtecTix, a smart mobile application intended to improve worker safety and health monitoring in the context of Industrialized Building System (IBS) construction, is examined in this study. The study's scope includes identifying cutting-edge technologies to enhance safety monitoring, designing and simulating the application, and suggesting a business plan to ensure the application's commercial viability. To reduce accidents and boost productivity in high-risk construction situations, the main goal is to develop software that combines wearable device compatibility, predictive analytics, and real-time data collecting. In the context of literature review, existing research identifies issues in construction safety management, such as the reliance on manual methods and the necessity for real-time hazard detection. The literature also covers IoT's role in improving safety and the limitations of current mobile application solutions in high-rise buildings.The study follows a design thinking methodology that includes empathizing with construction workers, describing the problem, brainstorming ideas, and testing and analyzing prototypes. The procedures include a thorough documentation examination, a desk study, and the use of software tools for prototyping. ProtecTix is a comprehensive app that includes real-time communication, GPS tracking, safety modules, incident reporting, health monitoring, and data analysis.

e-ISBN: 978-967-2776-42-0

It beats other apps by providing a more comprehensive and user-friendly approach to safety management. The results show that ProtecTix has the potential to greatly increase safety and operational efficiency in IBS building projects.

2. LITERATURE REVIEW

Monitoring systems quickly send alerts to supervisors or emergency services during emergencies, reducing injury severity and response time. They also analyze data to identify safety patterns, improving ongoing safety measures (Wang & Ke, 2024). This proactive approach helps prevent accidents, minimize operational interruptions, and enhance productivity (Almaskati et al., 2024). Construction sites use IoT-enabled solutions with intelligent sensors to collect and communicate real-time data. These sensors detect hazardous behaviors or conditions, preventing accidents. They can be worn by workers or integrated into safety equipment like hard hats and safety boots (todd, 2021). Real-time systems provide immediate notifications, automated regulation compliance, increased risk awareness, improved incident response, and proactive maintenance. They are used in various sectors to monitor activities and identify risks. Mobile apps can offer detailed incident reports, aiding investigations and corrective actions. They also support predictive maintenance to prevent equipment failures and reduce downtime (Omitaomu, et al., 2019). Mobile apps for safety monitoring may face issues like delayed alerts, inaccurate location-based safety checks, incomplete incident reports, and unreliable predictive maintenance. These challenges can hinder safety monitoring. Effective collaboration among contractors, safety managers, and government organizations is essential for successful implementation (Adlina, 2024).

3. METHODOLOGY

This chapter gives a detailed description of the materials and method used to develop the innovation project. The innovation framework, the materials and method are described in detail so that the innovation project can be replicated. A framework for innovation is a methodical and deliberate approach that provides guidance to organizations in their systematic pursuit of innovation. Framework offers a methodical and replicable approach to promoting innovation by creating ideas, executing and expanding these ideas to provide tangible business solutions (Roy, 2023). The type of innovation framework chosen for this case study is the design thinking framework. Design thinking is a technique that prioritizes the needs and experiences of people, focusing on understanding their perspectives, identifying and addressing problems, and developing innovative ideas. The process involves understanding customer requirements, generating solutions, creating prototypes, and refining them through iterative cycles, incorporating user feedback (Roy, 2023).

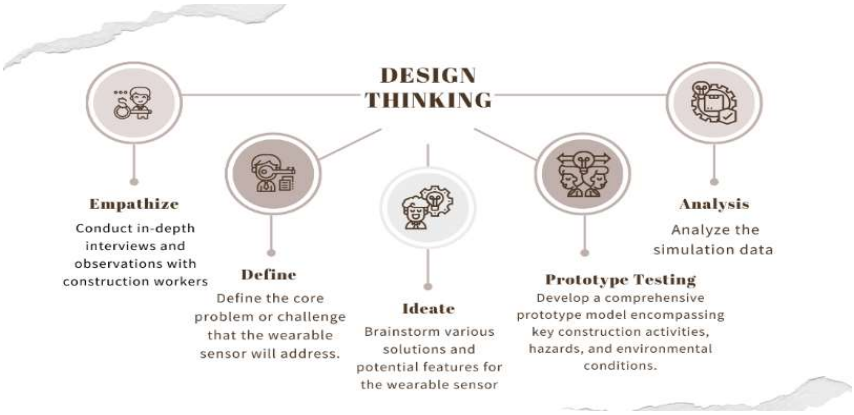


Figure 1: Design Thinking Framework for Innovations of Wearable Sensing Device

e-ISBN: 978-967-2776-42-0

The document review approach is used to fulfil the initial goal of creating advanced technology for a wearable sensing device. This method entails a methodical analysis of diverse written sources to provide information and direction for the design and development process. This approach includes the following fundamental components such as literature review, patent analysis, technical documentation, market research and case studies.

Then, a Prototype method can enhance the development of advanced safety and health monitoring mobile applications for IBS Construction. Using specialized software tools like Figma, you can create interactive mockups to model, simulate, and analyze the app's functionality, including its response to safety situations and environmental factors. CapCut can create realistic presentations to demonstrate the app's interactions in construction scenarios. These tools allow for precise modeling and testing of the app's performance in a controlled virtual environment, ensuring its effectiveness and reliability before producing physical prototypes.

4. RESULT AND DISCUSSION

ProtecTix addresses the limitations of traditional safety monitoring systems by providing a digital platform for real-time monitoring and data management. It incorporates IoT, wearable devices, and advanced data analytics to identify potential hazards and improve response times. ProtecTix features a user-friendly interface, real-time communication, GPS tracking, safety and training modules, incident reporting, health monitoring, and integration with various devices. It also offers data analytics to detect safety trends and improve standards. The application includes a profile dashboard, quick voice communication, project overviews, GPS tracking, safety and training modules, incident reporting, health monitoring, and paired devices functionality. ProtecTix is marketable due to increasing demand for safety solutions in construction, driven by stricter regulations and corporate responsibility. It uses advanced technologies like IoT and wearable devices, offering real-time monitoring and hazard detection. The app's user-friendly interface and integration with existing tools make it easy to adapt and scalable. Additionally, it offers potential cost savings through reduced insurance premiums and legal liabilities. Overall, ProtecTix's marketability is enhanced by its relevance, technological sophistication, and cost-efficiency benefits.

5. CONCLUSION

ProtecTix is a significant advancement in construction technology and safety management, offering real-time monitoring of labor safety and health in IBS construction. By utilizing IoT, wearable devices, and data analytics, it surpasses traditional safety methods, providing predictive analytics and user-friendly interfaces. The app supports sustainable development goals (SDG 9 and SDG 12) by promoting industry innovation and responsible production. Its features, such as real-time hazard detection and proactive data analysis, set a new standard for safety management in construction. ProtecTix can enhance safety, reduce disruptions, and improve productivity in IBS projects. As the industry grows, ProtecTix and similar solutions will be crucial for worker well-being and sustainable construction practices. Future efforts should address the app's limitations and expand its use across more projects and industries.

6. ACKNOWLEDGMENT

I am deeply grateful to God for His mercy and wisdom throughout this process. This achievement would not have been possible without His grace. I sincerely thank my lecturer, Sr. Ts. Dr. Asmat Ismail, and my supervisor, for their invaluable mentorship and guidance. I also express my gratitude to Ts. Dr. Mohd. Najib Bin Abd Rashid for his exceptional support.

e-ISBN: 978-967-2776-42-0

I wish to acknowledge Universiti Teknologi MARA Perak Branch for providing the essential innovation facilities and supervision that were crucial to this project. Their support and resources significantly contributed to the success of this work.

7. REFERENCES

Adlina. (2024, 4 12). *Sektor Pembinaan Hong Kong Menggunakan Pemantauan Keselamatan Berasaskan App | CIDB HQ*. Retrieved from CIDB HQ: https://www.cidb.gov.my/eng/hong-kong-construction-sector-embraces-app-based-safety-monitoring-amid-rising-industrial-accidents/

Chen, H., Mao, Y., Xu, Y., & Wang, R. (2023). The Impact of Wearable Devices on the Construction Safety of Building Workers: A Systematic Review. *Sustainability*, 1.

Fern, N. W., & Masirin, M. M. (2021). A Review on the Implementation of Construction Safety Management System in ASEAN Development Projects. *IJSCET*, 4.

L. X., Z. Y., & L. Y. (2016). Evaluating the impacts of high-temperature outdoor working environments on construction labor productivity in China: A case study of rebar workers. *Building and Environment*, 6.

Omitaomu, O., Ozmen, O., Olama, M., Pullum, L., Kuruganti, T., Nutaro, J., Nebeker, J. (2019). Real-Time Automated Hazard Detection Framework for Health Information Technology Systems.

Roy, R. (2023, 6 27). *Innovation Framework*. Retrieved from IdeaScale: https://ideascale.com/blog/what-is-innovation-framework/#toc_What_is_an_Innovation_Framework

Todd. (2021, 10 20). *6 Ways IoT Improves Construction Safety | GoCodes*. Retrieved from Tool Tracking Software: https://gocodes.com/iot-improving-construction-safety/

Todd. (2021, 11 11). *Types of Wearable Technology in Construction | GoCodes*. Retrieved from Tool Tracking Software: https://gocodes.com/wearable-technology-in-construction/

Villegas, F. (2021, 11 24). *Desk Research: What it is, Tips & Examples | QuestionPro*. Retrieved from QuestionPro: https://www.questionpro.com/blog/desk-research/

Wang, G., & Ke, J. (2024). Literature Review on the Structural Health Monitoring (SHM) of Sustainable Civil Infrastructure: An Analysis of Influencing Factors in the Implementation. *Buildings*.

UNIVERSITI TEKNOLOGI MARA
Cawangan Perak

e - Proceedings

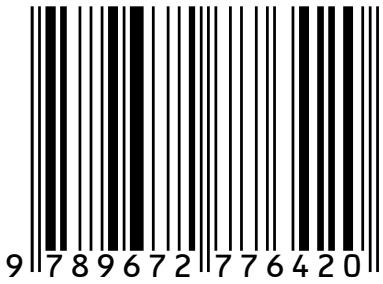
IUGeT

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

e-Proceeding IUGeT 2024 2nd Edition

e ISBN 978-967-2776-42-0



Unit Penerbitan UiTM Perak

(online)