

Development of Real-time Delivery Tracking & Racking System for Smart Warehouse Logistics using Cost-Effective IoT

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Abstract

In this era of Industrial Revolution 4.0, adaptation to the IoT is becoming a must to maintain competitiveness in logistic operation. SMEs in Malaysia must deal with problems in logistic operations, such as the inability to track the location of delivery accurately and monitor racking status. These cause logistical problems that include excessively expensive costs from inefficiencies in task management and workflow processes, overstocking, and frequent disruptions in the supply chain due to delayed or misplaced items. Therefore, to design a user-friendly, secure, and cost-effective IoT system focused on delivery monitoring and racking that could provide SMEs with in-transit real-time visibility and control of their logistic operations. The provided solution was developed through the exploitation of Google's suite of web-based software for its development: Google Sheets to host the database, Google AppSheet to provide the functionality for a mobile application, and Looker Studio as a business intelligence tool for visualization and display of tracking and monitoring data. After implementation in several SME warehouses in Malaysia, it proved to be successful in fully utilizing the This integration provides SMEs with in-transit visibility and control over their logistics. The rack percentage that was missing in the factory before the implementation of the system was very alarming, standing at 35%. This percentage later dropped dramatically to just 3% after the implementation of the

system. Following a series of successful deployments in various Malaysian SME warehouses, the system proved to optimize operations and reduce the complete chain of waste in the warehouse.

Keywords

Delivery Tracking & Racking system; web-based software; Looker Studio; Google Appsheet; IoT warehouse.

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Biographies

Mohd Hazri bin Mohd Rusli is currently a Senior Lecturer at Universiti Teknologi MARA with more than ten years of industry experience in automotive and manufacturing. Previously, he had worked for UMW Toyota Motor, managing Supplier Kaizen and Lean Operations, and as a Principal Project Manager at Honeywell. His expertise spans from mechanical engineering to lean manufacturing and project management. Dr. Hazri received his Ph.D. and Master's in Mechanical Engineering from UiTM. He is committed to promoting engineering education and operational efficiency.

Suzilawati binti Muhamud @Kayat is a well-established RF antenna design expert with broad experience in electrical engineering and academia. She is holder of an Associate Degree from Gunma National College of Technology in Japan, Bachelor's, Master's, and Ph.D. degrees in Electrical Engineering from Universiti Teknologi MARA (UiTM). Currently a Senior Lecturer at UiTM, Dr. Suzilawati has held various research and teaching positions, including at UNITEN R&D and MAHSA University. With more than a decade serving Sharp Electronics Malaysia as a Senior Engineer, she contributed to consumer research and product development covering ASEAN. Dr. Suzilawati continues to dedicate herself to the betterment and enhancement of engineering education and research in Malaysia.

Mohamad Khairi Bin Hassan has nearly 11 years of experience in managing manufacturing operations for manufacturing efficiency improvement and is a vastly experienced Senior Manufacturing Manager at Sugihara Grand Industries Sdn. Bhd., Selangor, Malaysia. He is an experienced leader in the industry. He attained a Bachelor of Science in Electrical and Electronics Engineering from Universiti Teknologi Malaysia in 2001. Being among the leading names of manufacturing, Mohamad Khairi believes in never-ending improvement.

Joshua Goh Wen Hann is an eminent professional who possesses a well-grounded academic background in both management and accounting. He holds a Master of Science (MSc) in Management from the University of Warwick where he graduated as part of the top 10% of his cohort, and a First-Class Honors degree in Applied Accounting from Oxford Brookes University. With relevant experience in business development, risk assurance, and corporate finance, Joshua has achieved successful capacities in optimizing procurement processes, getting customers internationalized, and establishing ISO-certified systems. His undying dedication makes him a perfectly shining achiever in his field.

Wan Aiman Aqil bin Wan Kefli is currently pursuing a Bachelor's degree in Mechanical Engineering at Universiti Teknologi MARA, Shah Alam. He was previously awarded a Diploma in Mechanical Engineering from UiTM Pasir Gudang, where he achieved a firm grounding in the principles of engineering. His academic sojourn reflects a certain love for novelty and an avid interest in the furtherance of his learning in mechanical engineering.

Afif Aiman bin Hasnul Basri is currently pursuing his studies at Universiti Teknologi MARA Shah Alam, majoring in Mechanical Engineering at the Bachelor's degree level. He has completed his Diploma in Mechanical Engineering at UiTM Permatang Pauh. His educational background reveals that he is solidly equipped with the foundation knowledge of engineering and eager to be continuously developed in his expertise for a brighter future in the profession.