

**REFERENCE ARCHITECTURE ANALYSIS & DESIGN FOR INVENTORY
PROCESSES DIGITALIZATION & AI OPTIMIZATION IN SMART
ELECTRIFICATION FACTORIES**

By

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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ABSTRACT

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Effective inventory control is essential for ensuring operational efficiency, cost management, and financial accuracy in manufacturing organizations. Stock taking, as a core process of inventory verification, plays a critical role in maintaining data integrity and supporting production continuity; however, traditional manual methods remain labor-intensive, time-consuming, and prone to error, thereby limiting real-time visibility and decision-making effectiveness. This study examines the stock-taking process in a Smart Infrastructure Electrification Automation Factory and proposes the design of a reference architecture to digitalize & optimize processes inventory management. It emphasizes the integration of digital technologies such as automation and artificial intelligence for process optimization. Using a qualitative case study approach, this research aims to develop a reference architecture that supports the modernization and digitalization of traditional inventory and warehouse management processes by integrating digital technologies and evaluating potential Artificial Intelligence (AI) applications to improve inventory accuracy, operational efficiency, and overall organizational performance.

Keywords: Artificial Intelligence (AI), Stock Taking, Inventory Management, Digital Transformation, Process Automation.

DEDICATION

I dedicate this thesis to my beloved family, whose unwavering love, encouragement, patience, and continuous support have been my greatest source of strength throughout this academic journey. Their belief in me has inspired me to persevere through every challenge and achieve this important milestone.

I would also like to dedicate this work to our Chief Executive Officer, whose vision, trust, and leadership have provided me with the opportunity to contribute to the company's digital transformation initiatives. The challenges and responsibilities entrusted to me have significantly enriched my professional experience and inspired the research presented in this thesis.

Furthermore, I sincerely appreciate our Chief Executive Officer for supporting my personal and professional development by providing the opportunity to pursue higher education while continuing my professional responsibilities. This encouragement reflects a strong commitment to continuous learning and talent development, making the completion of this master's degree possible.

To everyone who has contributed, directly or indirectly, to this journey, I offer my deepest gratitude. This achievement is as much yours as it is mine.

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