



**APPLICATION OF IOT TECHNOLOGY IN AGRICULTURE INDUSTRY:
SUCCESS FACTORS**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

I hereby acknowledge that this project paper has been accepted as part of fulfilment for the degree of Bachelor of Supply Chain Management and Logistics.



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**APPLICATION OF IOT TECHNOLOGY IN AGRICULTURE INDUSTRY:
SUCCESS FACTORS**

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This thesis is submitted in partial fulfilment of the requirements for the award of Bachelor of Technology Management (Supply Chain Management and Logistics) with



29.01.2023

DECLARATION OF ORIGINAL WORK

I hereby declare that all the work of this thesis entitled “Application of IoT Technology in Agriculture Industry: Success Factor” is original done by myself and no portion of the work encompassed in this research project proposal has been submitted in support of any application for any other degree or qualification of this or any other institute or university of learning.

	
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DEDICATION

I would like to appreciate the dedication of my beloved family members who educated me and motivate me to learn until degree level. And also, I express a deep sense of gratitude to my lecturer whom also my supervisor for my final year project, Dr Nurhayati Binti Kamaruddin and my fellow friends. They have provided me fully support and advice throughout this research. Without their blessing and encouragement, this research is impossible to complete within short period of time.



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ABSTRACT

This article propose application of IoT technology in agriculture industry including the devices, application in various category as well as the success factor. The increasing demand for food in terms of both quantity and quality due to the rise of population and the environmental issue such as unpredictable climate change as well as land limited for agriculture activity has simultaneously increase the requirement for intensification in the agriculture industry to develop smart agriculture. In such circumstances, IoT technology which is a highly promising technology plays a crucial role in offering innovative solutions to cope the current scenario in order to maximize the high quality productivity. With the help of introducing sensors, all information needed could be collected in a real time manner with the collaboration of Internet. This research highlights the various IoT-based sensing technologies and their application in monitoring various aspects in the agriculture field such as RFID and its monitoring management. In short, the aim of this research is to determine explore the success factor and the most significant and also to determine the relationship between the application of IoT technology and the success factor of IoT technology in agriculture industry. The research used quantitative method in designing questionnaire, data is collected from 196 respondents selected randomly and being analyzed using SPSS software including Descriptive Analysis, Pearson's Correlation Analysis and Multiple Regression Analysis. The outcome shows operational efficiency is highly agreed by the respondents to be the success factor of applying IoT technology. Apart from that, the product maximization and accurate data analysis also shows significant relationship towards the application of IoT but not the cost reduction and wastage. Hence, IoT technology is successfully and constantly evolving to be applied in agriculture field bring out with numerous advantages and contribution towards government, agriculture industry and knowledge in order to fulfil food demand with resolving issue in the agriculture field.

Keywords: IoT technology, agriculture industry, food demand, concern, quality, application, RFID, sensors, productivity, success factor, operational efficiency

ABSTRAK

Artikel ini mencadangkan aplikasi teknologi IoT dalam industri pertanian termasuk peranti, aplikasi dalam pelbagai kategori serta faktor kejayaan. Permintaan makanan yang semakin meningkat dari segi kuantiti dan kualiti akibat pertambahan penduduk dan isu alam sekitar seperti perubahan iklim yang tidak menentu serta tanah yang terhad untuk aktiviti pertanian secara serentak meningkatkan keperluan untuk intensifikasi dalam industri pertanian untuk membangunkan pertanian pintar. Dalam keadaan sedemikian, teknologi IoT yang merupakan teknologi yang sangat menjanjikan memainkan peranan penting dalam menawarkan penyelesaian inovatif untuk menghadapi senario semasa bagi memaksimumkan produktiviti berkualiti tinggi. Dengan bantuan pengenalan penderia, semua maklumat yang diperlukan boleh dikumpulkan dalam cara masa nyata dengan kerjasama Internet. Penyelidikan ini menetengahkan pelbagai teknologi penderiaan berasaskan IoT dan aplikasinya dalam memantau pelbagai aspek dalam bidang pertanian, seperti RFID dan pengurusan pemantauannya. Secara ringkasnya, tujuan penyelidikan ini adalah untuk menentukan penerokaan faktor kejayaan dan yang paling signifikan dan juga untuk menentukan hubungan antara aplikasi teknologi IoT dan faktor kejayaan teknologi IoT dalam industri pertanian. Penyelidikan menggunakan kaedah kuantitatif dalam mereka bentuk soal selidik, data dikumpul daripada 196 responden yang dipilih secara rawak dan dianalisis menggunakan perisian SPSS termasuk Analisis Deskriptif, Analisis Korelasi Pearson dan Analisis Regresi Berganda. Hasil kajian menunjukkan kecekapan operasi amat dipersetujui oleh responden untuk menjadi faktor kejayaan mengaplikasikan teknologi IoT. Selain itu, pemaksimuman produk dan analisis data yang tepat juga menunjukkan hubungan yang signifikan terhadap aplikasi IoT tetapi bukan pengurangan kos dan pembaziran. Oleh itu, teknologi IoT berjaya dan sentiasa berkembang untuk diaplikasikan dalam bidang pertanian membawa pelbagai kelebihan dan sumbangan kepada kerajaan, industri pertanian dan pengetahuan bagi memenuhi permintaan makanan dengan menyelesaikan isu dalam bidang pertanian.

Kata kunci: teknologi IoT, industri pertanian, permintaan makanan, isu, kualiti, aplikasi,

RFID, sensor, produktiviti, factor kejayaan kecekapan operasi



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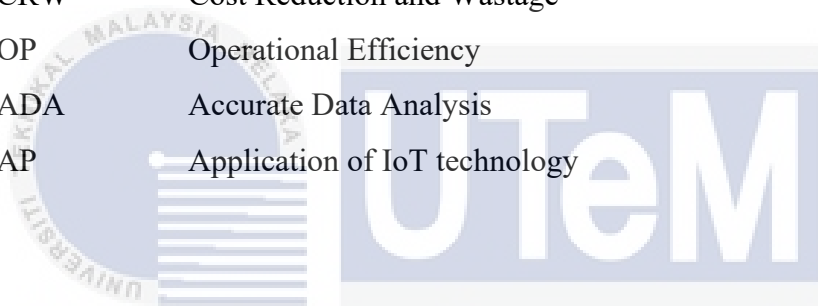


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LIST OF ABBREVIATIONS

UTeM	Universiti Teknikal Malaysia Melaka
IoT	Internet-of-Things
RFID	Radio Frequency Identification
SPSS	Statistical Package for Social Science
PM	Product Maximization
CRW	Cost Reduction and Wastage
OP	Operational Efficiency
ADA	Accurate Data Analysis
AP	Application of IoT technology



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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Agriculture industry symbolizes the growth of economy for a country. The process of food production carried out in this sector comprises irrigation, organic farming, fertilizers, harvesting and others. The current scenarios shows various problems found in the agriculture sector especially the sophisticated techniques applied are inefficient, lack of manpower and less appropriate time estimated for farm irrigation or fertilizer disperse to yield (Saurav Verma, 2018). Therefore, the agricultural experts are revolving to IoT in order to achieve advancement in the field. Technological advancements are literally essential for better sustainability on the whole in agriculture industry which focuses on the quality and the volume of the production upon the current age of high market competition and risk. Consequently, Internet of Things (IoT) is the advance technology as the smart farming solutions or a system such as precision farming, smart greenhouse, data analytics and others which is capable in enhancing the production efficiency and resolving the issues perceived, by monitoring the crop field and automating in irrigation system with the help of sensors (Parvez et al, 2020).

1.2 BACKGROUND OF STUDY

The application of IoT is consist in diverse areas including marketing, supply chain management, transportation as well as smart agriculture. It is undeniable that today's agriculture industry is growing rapidly with IoT technology which is defined as network

connecting physical object that are mostly embedded with sensors for the purpose of real time information collect and data transmission. The rapid emergence of IoT technology shows great potential in redesigning agriculture industry from existing traditional agriculture methods in order to build smarter, more digital and intelligent farm (Ayaz et al, 2019). The interconnectedness of IoT technology has enhanced the farming practices such as gathering information about the temperature, environmental sensing, receives sunshine, soil moisture and other parameters in order to improve farmers' competitiveness.

Agricultural production is reflected the competitiveness of the farm as a whole for sustaining or enhancing human life. Increasing in agricultural production plays a crucial role in feeding a growing world population and simultaneously conserving resources in the future. Nevertheless, the challenges likely the uncontrivable environmental and climate concerns, water sustainability and others faced by the agriculture industry has yield the output of the sector. As a result, the application IoT technologies is came in hand to enable real-time data automation collection so as to strengthen the efficiency and productivity in agriculture field.

IoT technology emphasizes the ability of network equipment for data collection transmission across all around the world to be processed for automation. As information generated by IoT technologies allows farmers for farm operation tracking and performance, it thus develops better informed decisions for the sake in improving productivity and responsiveness of farm with less consumption of time and money (Lakhwani et al, 2018). Nevertheless, the IoT technology would definitely bring agriculture industry towards success with unimaginable advantages once these smart farming technologies is applied or processed initiating with suitable actions.

1.3 PROBLEM STATEMENT

According to Dewi (2019), who stated that the total world population is projected to increase approximately 2.0 billion from 7.0 billion towards 9.0 billion within this 40 years. This growth of global resident would arises a world-scale problem of food shortage due to the inefficiency of traditional agriculture operation to continuously keep pace with the demand for food. Apart from that, the unpredictable environment concerns like the climate change and

natural disaster have posed multiple effects towards agriculture industry such as the damage and losses to production and in addition with the degradation of land, water and other natural resources in farming, thus declining the rates of growth in productivity. (Calicioglu et al, 2019).

The limitation of agriculture land is considered a daunting challenge in agriculture industry in order to maximize food production to accommodate the demand for food due to growth in population. In spite of the fact that agriculture fill up almost 40% of the earth's surface, only 12% of the world's land is restricted to be used for farming, expanding agricultural land would lead to loss of biodiversity, deforestation and gradually causes unpredictable climate change owing to 70% of global water are used for agricultural crops irrigation and contribute to a projected 11% of the emissions of greenhouse gas (GHG). (Jonathan, 2019).

As a result, the study explored the success factor on the application of IoT technology in agriculture industry. Since the food productivity, process agility, quality are crucial to feed the demand for food despite the difficulties faced, IoT plays the key role in providing the farmers precious insight on the performance of their field by developing smart agriculture with the addition of automation, sensing and analytics technology so as to enhance maximization productivity within cost management and waste reduction.

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1.4 RESEARCH QUESTION

- What are the success factor of applying IoT in agriculture industry?
- Which is the most significant success factor of applying IoT in agriculture industry?
- What is the relationship between the application of IoT technology and the success factor in agriculture industry?

1.5 RESEARCH OBJECTIVES

- i. To explore the success factor of IoT technology application in developing smart agriculture farming.
- ii. To determine the most significant success factor of applying IoT in agriculture industry.
- iii. To investigate the relationship between the success factor of IoT technology application and the application of IoT technology in agriculture industry.

1.6 SCOPE AND LIMITATION OF THE STUDY

The study mainly emphasizes the application and the success factor of IoT technology which perform in the development in smart agriculture. It is focus in the agriculture industry in Sarawak state. The research paper is conducted through quantitative method, collecting responds from respondents randomly through questionnaires. The outcomes are based on statistical performance from larger population samples The respondents are chosen from the management department of agriculture industry.

The limitation of applying the quantitative research methodology is the improper identification of the selected population that can make it difficult for the researcher to accomplish their desired goals. The less accurate calculation on probability distribution of observed data obtained may lead to falsity in proposition. Also, the questionnaire with close ended questions that provides respondents with limited selections of responses made causes limited outcomes outlined in the research proposal.

1.7 SIGNIFICANT OF STUDY

This study focus on developing smarter agriculture field through the application of IoT technology. The finding of the research helps to gain insight of the success factor of applying IoT technology in the agriculture industry. In addition, the researcher hope that the agriculture industry is benefited in transforming their traditional agriculture operation to smart agriculture

with the adoption of IoT technology in order to maximize the production. In this, the study would be capable in providing empirical literature resources to future researchers who take the similar topic within agriculture industry.

Key words: IoT technology, agriculture industry, success factor

1.8 SUMMARY (THESIS OUTLINE)

In this research paper, 5 chapters is included and each chapter consists of various contents regarding to the topic of this research which is Application of IoT technology in Agriculture Industry: Success Factor. Chapter 1 include the introduction of the complete research, the background of study, problem statement, research questions, research objectives, scope and limitation of the study, significant of study will be discussed in this chapter. Chapter 2 will illustrate the literature review and applicable theoretical model. The proposed research framework is provided at the end of this chapter which tends to describe the theory and develop the hypothesis. Chapter 3 will discuss and explain deeply based on the research methods that were conducted in this particular research. Chapter 4 indicates the findings and discussion intended to include further dialogue and interpretation of the topics under consideration. Lastly in Chapter 5, the discussion on the findings had already been discussed in the foregoing chapter and will be concluded in this chapter.