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CORN FARMERS INTENTION TOWARDS INTERNET OF THING (IOT) FOR AGRICULTURAL PRODUCTION IN PAHANG

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DECLARATION

I hereby declare that the work embodied in this report is the result of the original research

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Corn Farmers Intention towards Internet of Thing(IoT) for Agricultural Production in Pahang

ABSTRACT

This paper contributes to know intention of corn farmers' intention toward Internet of Things for agriculture production. Agriculture growth is needed to build and maintain cities, stock exchanges, banks, and universities. The Internet of Things (IoT) is emerging as a revolutionary technology in this new age. The research paper aims to determine the intention among farmer especially corn farmers towards IoT and to investigate the relationship between attitude, subjective norms, and perceived behavior control and the involvement of farmer in the IoT technology in Pahang. In this research, a survey was conducted, and the questionnaire was distributed using purposive sampling toward 50 farmers in Pahang. The data collected were then analyzed using four analyses: descriptive analysis, reliability analysis, chi-square analysis, and regression analysis. The study found that farmers' intention level and a significant relationship between subjective norms and perceived behavior towards involvement in IoT use for agriculture product in Pahang.

Keywords: Internet of Thing (IoT), Corn Farmers, Intention, Technology, Pahang

Hasrat Peladang Jagung Terhadap Internet of Thing(IoT) untuk Pengeluaran Pertanian di Pahang

ABSTRAK

Kertas kerja ini menyumbang untuk mengetahui hasrat petani jagung terhadap Internet Perkara untuk pengeluaran pertanian. Pertumbuhan pertanian diperlukan untuk membina dan mengekalkan bandar, bursa saham, bank dan universiti. Internet Perkara (IoT) muncul sebagai teknologi revolusioner pada zaman baharu ini. Kertas kajian ini bertujuan untuk menentukan niat dalam kalangan petani khususnya petani jagung terhadap IoT dan untuk menyiasat hubungan antara sikap, norma subjektif, dan kawalan tingkah laku yang ditanggapi dengan penglibatan petani dalam teknologi IoT di Pahang. Dalam penyelidikan ini, satu tinjauan telah dijalankan, dan soal selidik telah diedarkan menggunakan persampelan bertujuan kepada 50 petani di Pahang. Data yang dikumpul kemudiannya dianalisis menggunakan empat analisis: analisis deskriptif, analisis kebolehpercayaan, analisis khi kuasa dua, dan analisis regresi. Kajian mendapati tahap hasrat petani dan hubungan yang signifikan antara norma subjektif dan persepsi tingkah laku terhadap penglibatan dalam penggunaan IoT untuk produk pertanian di Pahang.

Kata Kunci: Internet of Thing (IoT), Peladang Jagung, Hasrat, Teknologi, Pahang

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LIST OF ABBREVIATION AND SYMBOLS

IoT	Internet of Thing
SPSS	Social Package for the Social Science
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
PLS-SEM	Partial Least Squares Structural Equation Modelling
KMO	Kaiser-Meyer-Olkin
SRMR	Standardized Root Mean Square Residual
TPB	Theory of Planned Behaviour
&	And
%	Percentage
r_s	Spearman Correlation Coefficient

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this research, chapter 1 consist of research background, problem statement, hypothesis, significance of study and objective of the proposal. This research focus on corn farmers' intention toward technology, especially on internet of thing (IoT) and their background in Pahang.

1.1 Research Background

Agriculture is about more than just growing crops, contrary to popular belief. Agriculture is the production of food and fibre from world's land and water. Agriculture is the most important aspect of humanity, and any prosperous economy needs it (Allan, 1999).

The Internet of Things (IoT) is emerging as a revolutionary technology in this new age. In IoT, the internet connects people and things. Furthermore, because of the advancement of groundbreaking applications, IoT is already widely considered. This latest paradigm has improved the quality of our lives. This has a huge impact on supply chain management, position tracking, agriculture, real-time financial reporting, energy conservation, remote control, maintenance, and management of business processes. IoT has piqued the interest of researchers and industry leaders all over the world. The advancements in IoT scenario allow us to save a lot of money on business upgrades while still improving our lives. While the success of IoT has attracted the attention of researchers, it still has a number of potential problems and challenges (Joshitta & Arockiam,2016).

In order to improve agriculture in modern society, IoT was needed. It is critical to cut costs, increase productivity, and achieve intelligence in agriculture. In recent years, IoT has made strides in data collection and transmission, and intelligent processing (Qu & Tao.2014).

Currently, crop output data collection is not as effective as it should be. Crop studies are often conducted in remote and dispersed areas, collecting data manually.

However, when data is obtained manually, the result would be very poor because it does not consider previous conditions. Farmers would be able to obtain precise data and increase farming performance with the aid of IoT technologies (Jayaraman, Yavari, Georgakopoulos, Morshed, & Zaslavsky, 2016).

One of the best examples of sustainable farming technology is organic farming. Sustainable farming technology is described as using traditional methods with the help of traditional farming knowledge while also incorporating modern technologies to increase variety in farming system (Razali, Noor, Ahmad, & Shahbodin, 2017).

The most determining factor in deciding to implement precision agriculture technology is the attitude to apply. While perceived ease of use and utility are important in shifting users' attitudes toward technology (Rezaei- Moghaddam & Salehi, 2010).

Social factors typically influence the level of acceptance of new technology. For example, a farmer who has never used a smart agriculture system would be more likely to apply as observing neighbours obtain benefits (Mohr, Harrison, Wilson, Baghurst, & Syrette, 2007).

In a nutshell, the major factors that influence the adoption of sustainable farming techniques are performance expectations and social influence. Farmers would embrace sustainable farming technology realizing can reduce task uncertainty in the farming operation and improve job efficiency (Razali et al., 2017).

1.1.1 Internet of Thing (IoT)

The Internet of Things (IoT) allows gadgets to attach to any object, at anytime, anywhere on the planet, causing a seismic shift in our lives. The Internet of Things development allows for diverse administrations in all areas, such as manufacturing, human services, and education. IoT advancements are essentially changing the way people collaborate and perceive creativity. The Internet of Things is still in its early stages of growth (Vos, 2015).

"The systems administration of physical questions using embedded sensors, actuators, and various gadgets that can gather or transmit data about the posts" is how the Internet of Things (IoT) is described (McKinsey, 2014). These articles may be something that can share data over the system, such as a person or a physical device. The Internet of Things (IoT) refers to the interconnections of the physical world of things with the virtual universe of the Internet and the stages of progress, regardless of the measures typically used to allow interconnection (Mazhelis et al., 2012).

The Internet of Things (IoT) refers to objects that can communicate through internet (Uckelmann et al.,2011). Having a lot of things connected will completely change us, and IoT advancements will change the world in the same way that internet did (Schlick et al., 2013). For example, IoT advancements used in smart refrigerators that self-regulate the use of food and drinks and re-arrange merchandise can benefit customers (Sundmaeker et al., 2010).

Smart farming practices are critical to fostering human growth and development and addressing issues such as hunger and food insecurity (Agrawal, Prieto, Ramos, &

Corchado, 2016). The cost of internet access is declining these days, and connections are readily accessible all over the world (Joshitta & Arockiam, 2016).

The internet of things (IoT) is a network of interconnected physical objects that can be accessed through the internet. It connects physical devices, cars, houses, and other items to electronics, software, and sensors, for example, allowing them to capture and share data. Smart farming refers to the Internet of Things (IoT) (Gupta, 2017).

1.1.2 Farming Before the Emerging of New Technologies in Agriculture

The Malaysian vegetable sector has had a low adoption rate of good horticultural practices. Furthermore, only a few agriculturists are believed to have obtained it (Tey et al. 2012). Malaysians are largely unaware of the importance of practical innovation cultivation (Darus, Norazlina Mohd, Ahmad Rozelan Yunus, 2017).

Agriculturists can recognise sustainable cultivating innovation, increasing profit and decreasing assignment risk in farming operations. Farmers would also accept it if the breakthrough allows to improve job execution (Darus, Norazlina Mohd, Ahmad Rozelan Yunus, 2017).

The decision to use inventions is based on farmer's intention of innovation (Chi & Yamada, 2002). Agriculturists can achieve innovation by innovation exchange. On the one side, learning 'generators, such as inquire about research centers and colleges to customers, such as ranchers, alludes to the general practice of transferring data and aptitudes from data or, on the other hand, learning 'generators, such as inquire about research centers and colleges to customers, such as ranchers (Valera et al. 1987).

1.1.3 Agriculture with Help of IoT

Our culture has recently begun to move toward a "always linked" structure. The rapid advancement of technology has resulted in changes in human lifestyles. IoT is one of the most recent developments. IoT connects a wide range of artefacts to the internet. IoT is described by the researcher and innovations team as “a dynamic global network infrastructure with self-configuring capabilities,” based on standard and interoperable communication protocols, where physical and virtual things have identities such as physical attributes (Vijayalakshmi & Arockiam, 2016).

Farmers are introduced to smart farming techniques by reduce costs, improve traceability, and increase security. Many smart farming technologies, aside from IoT, necessitate major investments (Agrawal et al., 2016).

IoT can be used in vegetable planting, and storage and delivery, directly enhancing traceability control from start to finish (Qu & Tao, 2014). Precision farming is a method of dealing with growers that uses of IoT and information and communication technology (ICT) innovations to increase returns and ensure asset security. Exact cultivation necessitates the continuous gathering of data on product, soil, and air conditions. This approach aims to ensure profit and sustainability while also protecting the environment (Malavade & Akulwar, n.d.). The need to increase the efficiency of water system types and reduce water shortages is growing. There is a growing awareness of the importance of preserving existing water resources by implementing maintainable and productive water system structures. To determine the exact requirements for water, an

IoT-based brilliant water device estimates various parameters such as moistness, soil dampness, temperature, and light force. This has been shown that such a system will contribute to greater water system proficiency (Rajakumar, Sankari, Shunmugapriya, & Maheswari, 2018).

1.2 Problem Statement

Smallholder farmers in northern Bangladesh have used various technologies and practises to better respond to the effects of climate change. However, these technologies and activities do not seem to have been thoroughly established in climate change and technology adoption literature. Climate-shock mitigation technologies in agriculture cover various activities involved in agricultural practises that must be analysed and prioritised (Farid, Tanny, & Sarma, 2015).

When rural farmers lack access to knowledge and information that would assist them in achieving full agricultural yield, farmers are forced to grope in the dark and migrate to urban centres in search of white-collar employment, which may be the~~ir~~ only means of survival. Because of the negative social and economic implications, the above dangerous condition should not be permitted or encouraged (D & Oliver, 2015).

The Internet of Things (IoT) allows us to gather real-time data on any physical activity. There are several variables to consider from the temperature of equipment to the efficiency of a fleet of wind turbines. IoT sensors have the potential to provide information in real time (Haight, 2015).

Many products can be used in agriculture, such as product sorting, crop planting, and environmental monitoring. In order to reduce costs, increase productivity, and achieve intelligent agriculture in modern society, the application of Internet of Things (IoT) is critical (Qu & Tao, 2014).

Prior to the Internet of Things, sustainable farming technology was implemented. Sustainable farming technology is described as using traditional methods with the help of traditional farming expertise while also incorporating selected modern technologies (Razali et al., 2017).

Farmers would adopt sustainable farming technology if allows to gain advantages and reduce job uncertainty, improve work success in their farming activities, and is considered a part of social norms. (Razali and colleagues, 2017).

1.3 Hypothesis

H_0: There is no significant value between the relationship of attitude, subjective norms and perceived behavior control of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.

H_1: There is a significant value between the relationship of attitude, subjective norms and perceived behavior control of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.

1.4 Research Question

1.4.1 Is there a connection between demographic factors and farmer behaviour intentions when it comes to IoT use?

1.4.2 Is there a connection between a farmer's intention to use IoT and their subjective norm, perceived ease of use, and perceived usefulness?

1.4.3 What is the most important element in deciding a farmer's willingness to use IoT technology in Pahang?

1.5 Objectives

In order to study the behavioral intention of corn farmer in Pahang to use the IoT technology, the objectives of this research are as follows:

1. To determine the corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.
2. To investigate the relationship of attitude, subjective norm and perceived behavior control of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.
3. To identify the most influential factor of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.

1.6 Limitation of Research

Several weaknesses have been discovered during this study. First, only corn farmers in the Pahang region were chosen as the population or respondents. As a result, despite this study being performed in four districts within the same state, the data obtained is limited to the same demographic groups. As a result, applying the results to a larger population around the country should be done with caution.

The second limitation is that this study was limited to farmers working in agriculture, while IoT applications are far broader. Those involved in the agriculture sector should be considered as respondents in future IoT studies.

Finally, respondents' bias responses will be anticipated, as respondents from various backgrounds can respond to the questions differently. Some respondents will take the sincerity of respondents in answering survey questions for granted, which could lead to bias in this study.

1.7 Scope of Study

This research focuses on corn farmers in Pahang's intentions regarding the use of IoT technology in their farming activities. This study was conducted in Pahang, and it primarily focuses on corn farmers who work in the agriculture sector. In addition, this study focuses on a new conceptual research paradigm that combines the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB).

1.8 Significance of Study

This study aims to develop a new conceptual research paradigm based on a combination of the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB) for evaluating corn farmers' acceptance of new technology in Pahang. Aside from determining the most important factors that affect farmer acceptance of new technologies, such as perceived utility, perceived ease of use, subjective norms, and IoT purpose. The new conceptual research structure developed as a result of this study can be used by other researchers to investigate the acceptance of new technology in a specific field. In addition, this study serves as an indirect exposure to our farmers to the Internet of Things (IoT), a modern technology in agriculture. This will pique their interest in learning more about the technology before it is widely implemented in Malaysia. For the government, this study will provide information about our farmers, including whether they are ready to adopt technology or not.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter aims to gain a better understanding of the latest emerging technology known as the Internet of Things, which is the future of agriculture. The analysis of studies and empirical results that are significant in the theoretical development and conceptual context to achieve the study's objectives are also discussed in this chapter

2.1 Theoretical Frameworks

2.1.1 Technology Acceptance Model (TAM)

Fred Davis first introduced TAM in 1986. TAM is a paradigm for modelling users' acceptance of knowledge or innovations that is adapted from the Theory of Rational Action (Lai, 2017). Venkatesh and Davis produced the final version of TAM in 1996, as shown in figure 2.1. After that, it was discovered that perceived usefulness and perceived ease of use had a direct impact on behavior purpose (Lai, 2017).

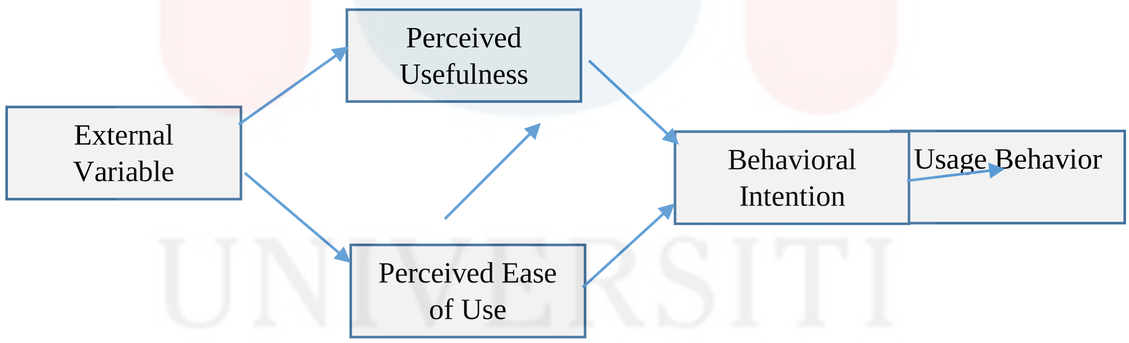

Figure 2.1: Adapted from Final version of Technology Acceptance Model (TAM) (Source: Venkatesh and Davis, 1996).

Perceived usefulness (PU) is described as a person's belief that using a particular framework would improve his or her activity execution (Davis, 1989). It is the degree to which a person believes that using the system can improve his or her performance. A system with a high level of perceived usefulness in the authoritative setting allows the client to have a good use-execution relationship (Yusliza et al, 2009).

Perceived usefulness is the point in which an individual uses an existing invention to complete, supervise, and illuminate an errand assigned by boss (Izzati, Redzuan, Razali, & Muslim, 2016). These lines often allude to the client's expectations of the experience's outcome.

Client evaluations of usability and learning convenience are measured by perceived ease of use. In this way, perceived ease of use manages client motivation, based on an assessment of the characteristic aspect of using the IT, such as its interface and the process involved with using it (David Gefen et al, 2000).

Behaviour is governed by his goal, which is in turn governed by one's attitude toward behaviour and emotional norm about the conduct (Lai, 2017).

2.1.12 Theory of Planned Behavior (TPB) on Corn Farmers Intention Towards Internet of Thing(IoT) for Agricultural Production

The theory of planned behaviour (TPB) is used to investigate farmer behaviour, as illustrated in Figure 2.2. TPB has been widely used to analyse behaviour in a variety of domains, including innovative mobility technologies (Gautama, 2016), water-saving irrigation strategies (Pino, 2017). The intention to utilise products or technologies as a result of one's behaviour can be used as a predictor of their adoption (Offermann-Van Heek, 2018).

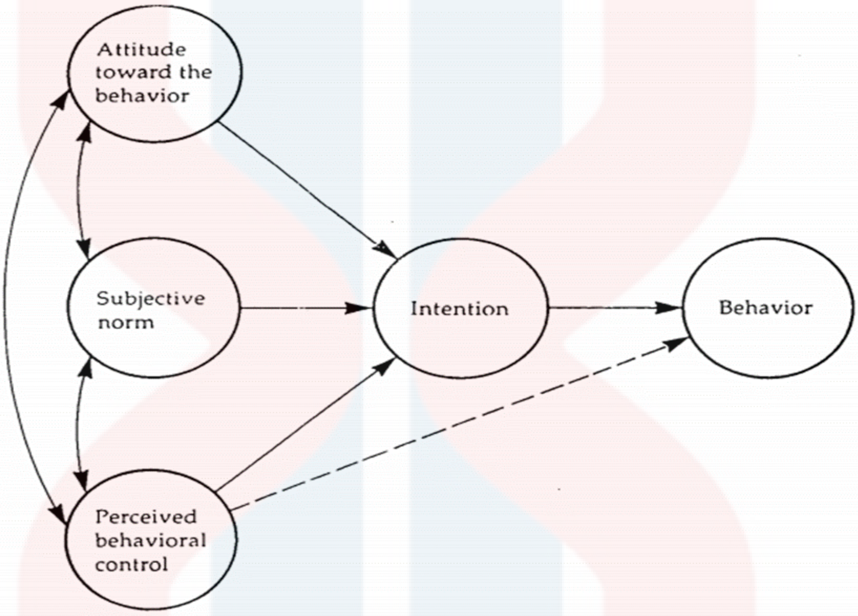

Figure 2.2: The Theory of Planned Behavior.

The TPB is a theory that was created to anticipate and explain activities that were not entirely voluntary. The motivating elements that drive conduct are considered to be captured by intentions. The degree to which a person has a favourable or unfavourable evaluation of the behaviour, subjective norm (perceived social pressure to perform or not perform the behaviour), and perceived behavioural control can all be used to predict intentions to perform behaviours (perceived ease or difficulty of carrying out the behavior, presence or absence of requisite resources and opportunities). The stronger the intention to accomplish the conduct under examination, the more favourable the attitude and subjective norm are, and the larger the perceived behavioural control. The person believes that the benefits of performing a certain action outweigh the disadvantages (Ajzen, 2011).

Domain-specific factors, in addition to the three predictors, are both useful and crucial for acquiring a thorough knowledge of any behaviour (Ajzen, 2011).

The causes of attitude and subjective standards are identical to those found in Theory of Reasonable Action. Although users' intentions of behaviour control can restrict their actions (Lai, 2017).

According to Mathieson (1991) and Yi, Jackson, Park, and Probst (2006), human and social factors could play a role in the reception of innovation using TPB display. In this way, the TAM could be contacted with TPB developments in order to consolidate the social factors that influence innovation adoption. In any case, the TPB in Chau and Hu (2002) found that the relationship between social standard and conduct expectation was negative, and that social standard did not influence conduct goal. Shih and Fang (2004) investigated the receipt of web money using TPB and Decomposed TPB methods and discovered that, similar to Venkatesh and Davis (2000)'s findings, subjective norm was likely to influence the behavioural target to use in a compulsory domain, while the effect could be immaterial in a deliberate situation. Since this investigation is purposeful, the Shih and Fang (2004) analysis will have no bearing on the novel single-stage E-instalment System innovation (PC Lai, 2017).

Subjective norms are a person's intention of the social pressure to perform or not perform objective behaviour (Ajzen, 1991; Francis et al., 2004). It can also be described as a person's intention of other people's viewpoints and considerations on the proposed behaviour. These insights can have a powerful effect on an individual, causing them to act in a certain way, such as returning to work. This means that an individual's subjective norms are based on his or her knowledge of important others' intentions of their behaviour (Brouwer et al., 2009; Vermeulen et al., 2011).

2.2 Acceptance of New Agriculture Technology by Farmers

Horticulture has undergone significant transformation in recent years. It has triumphed in terms of lowering food prices, feeding an expanding population, removing labor from the homestead, and providing an ever-increasing variety of sustenance to purchasers over time. Innovation has had a significant influence on these developments, and it is still addressing natural and social issues in an integrated manner today (OECD, 2001).

Traditionally, the agriculture sector has been exposed to a great deal of danger prior to the advent of IOT technologies. Rainfall predictions and insufficient irrigation are only a few of the causes, as are defective planting or harvesting techniques, and low soil quality, which has become a declination factor in overall productivity (Amin & Li, 2014).

Organic farming technology is one of the forerunners in sustainable farming technology. Organic farming technology is described as using traditional methods and unique cultivation knowledge while also incorporating selected modern technologies to add variety to the farming system (Bhatta et al., 2009). It can also be used as an alternative to traditional horticulture to help with horticultural advancement (Lankton et al., 2015; Khalil et al., 2011).

In the future, it will be critical to improving natural cultivating innovation or, on the other hand, natural generation structure (Garcia, 2014).Food production must increase by 60% by 2050 in order to feed the world's increasing population, which is projected to reach 9 billion by 2050. Crop production must be increased urgently (Jayaraman et al., 2016).

2.5 Chapter Summary

This chapter discussed by the previous researcher about corn farmers' intention towards Internet of Thing (IoT) for agricultural production in Pahang. The first section in this chapter shows the theoretical framework where it helps to analyse the result for this study. The second section was told about the TPB model used in this thesis. Attitude, subjective norm, and perceived behaviours control as factors that influence intention towards Internet of Thing (IoT) for agricultural production. Third section was the studies from the previous research about the level of corn farmers' intention towards Internet of Thing (IoT) for agricultural production. Next section was indicated the relationship of attitude, subjective norm and perceived behaviour control towards corn farmers' intention on Internet of Thing (IoT) for agricultural production. The last section shows about the most influential factor of corn farmers intention towards Internet of Thing (IoT) for agricultural production.

CHAPTER 3

METHODOLOGY

3 Introduction

In order to perform the research and achieve the aim of this study, many methods will be used, including a questionnaire, site selection, research sampling, research procedure, data collection, and sampling.

This chapter explains the approach that was used to achieve the research's goals. This chapter will be divided into four parts. The conceptual structure and model used will be described in the first section. The types of data and the questionnaire design will be discussed in the second and third pages, respectively. Finally, the methods of analysis used in this study are discussed in the final section.

3.1 Conceptual Framework

In this study, the TPB theory was utilised to assess the important elements and relationships between corn farmers' intentions and IoT for agricultural production in Pahang. The TPB model was related to and appropriate for the study's objectives, which were to investigate the relationship between attitude, subjective norm, and perceived behaviour control in relation to farmers' intention toward IoT in Pahang, to determine the level of farmers' intention, and to identify the most influential factor in farmers' intention toward IoT for agricultural production in Pahang. The independent conceptual variables of the modified TPB model were attitude, subjective norm, and perceived behaviour control (as given in Figure 3.1).

Corn farmers' intentions in Pahang are influenced by their attitude, which is an independent variable. The attitude was a behavioural belief that could predict and evaluate an individual's attitude. Experience, age, knowledge, emotion, skills, and information were other factors that influenced behavioural views.

The subjective norm was the pressure farmers felt when deciding whether or not to employ IoT technology. Individual perceptive behaviour, whether they should perform or not, was regulated by subjective norms, controlled by normative beliefs. The farmers' behaviour can then be controlled by community and culture, which includes family, friends, the government, and the subjective media. Furthermore, subjective norms were one of the elements that influenced corn farmers' intentions in Pahang.

Attitude and subjective norms have an impact on perceived behaviour control. It appears that the farmer is being controlled in his actions. Farmers' perceived behaviour control in Pahang is influenced by attitudes such as farmers' experiences and talents. Attitude, subjective norm, and perceived behaviour control were factors in determining the level of farmers' intention toward IoT in Pahang as independent variables, while the level of farmers' intention toward IoT in Pahang as a dependent variable, according to the TPB conceptual framework of this study (as given in Figure 3.1).

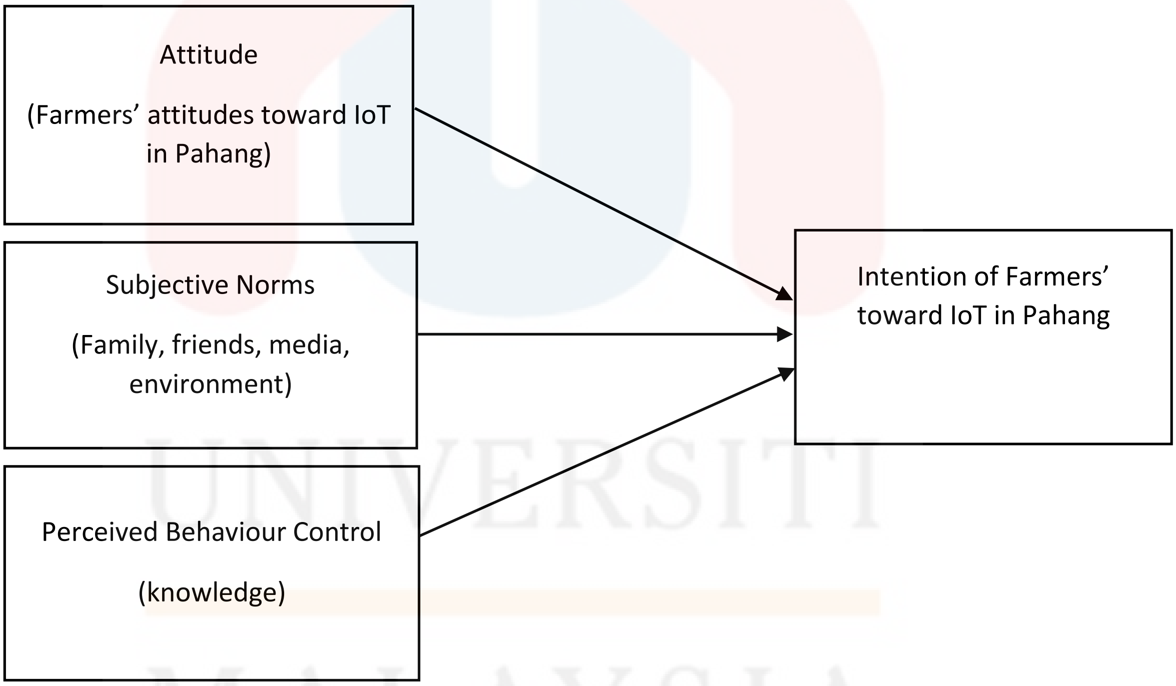

Figure 3.1: Diagram of research framework

3.2 Data Collection

3.2.12 Study Site Description

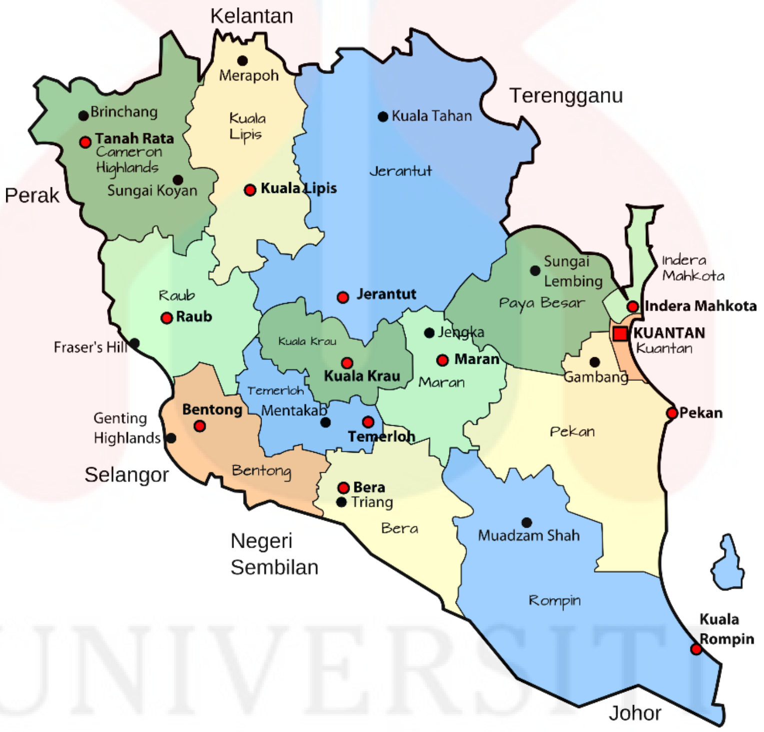

Figure 3.2: Map of Pahang state

Source: Tourism Pahang Official Portal of Tourism Pahang - Map of Pahang

Because of its agricultural activities and potential, Pahang (Figure 3.2) was chosen as a research site because of its agricultural activities and potential. The survey was carried out in Pahang's districts specifically.

3.2.13 Sampling Techniques

Convenience sampling can help with self-choice, authoritative choice, class time, the amount of long periods of presentation, and a variety of other contaminating effects. At times, the disparity between the two gatherings' synthesis is so pronounced that it casts doubt on the exploration's overall validity. However, several times these flaws go unnoticed by scientists or are brushed aside as if nothing unusual has happened (Farrokhi, 2012).

The data collection method for this analysis will be convenience sampling. Convenience sampling is a non-probability sampling method in which subjects are chosen for their ease of access and proximity to the researcher.

The respondents were selected because they are the easiest to recruit for the study, and the researcher did not consider selecting subjects that are representative of the entire population.

3.2.14 The Instrument

A survey using a standardised questionnaire was conducted for this report. The entire questionnaire is designed on a Likert scale. The respondents were given five pre-coded answers on a five-point likert scale. To begin, describe what your Likert scale will be measuring, as this will serve as an instruction to those who will build or produce the initial collection of candidate items for your scale. Following that, a list of possible scale items will be generated and rated. The items usually will be rating with a scale:

1. Strongly disagree
2. Disagree
3. Neither agree or disagree
4. Agree
5. Strongly agree

The next step is to choose the objects, compute the inter-correlations between all pairs of items, and finally, the respondents are ready to respond to the questionnaire using the Likert scale by rating the scale provided. The survey methods are being used because they will make collecting data from respondents based on their acceptance of IoT technologies easier.

I. The prepared questionnaire will include all of the parts mentioned below:
II. Section A: Demographic Information
III. Section B: Perceived Usefulness of IoT Towards Agriculture Sector in Pahang
IV. Section C: Perceived Ease of Use of IoT Towards Agriculture Sector in Pahang
V. Section D: Subjective Norms That Influence Farmer to Apply IoT Technology
VI. Section E: Behavioural Intention Towards IoT in Pahang Agriculture Sector

3.2.15 Pilot Study

In this study, a pilot study was conducted to ensure that questionnaire was accurate, relevant, and easy to fill out by respondents. To assess the survey questionnaire's overall feasibility, a sample size of respondents will be used.

The Statistical Package for Social Science (SPSS) was used to analyse this report's data in this report. The pilot study results and the Cronbach's Alpha of reliability statistic will be presented.

The Cronbach's Alpha value for the variables of perceived usefulness of IoT in the agriculture sector in Pahang and perceived ease of use of IoT in the agriculture sector in Pahang must be greater than 0.5.

As a result, all of the variables in this study are satisfactory. Cronbach's Alpha values of less than 0.5 are considered weak, those of less than 0.7 are considered satisfactory, and those of more than 0.8 are considered excellent (Mohtar et al., 2014).

3.3 Data Processing and Data Analysis

The accuracy of the data obtained from the survey will be tested and proven. The data cleaning process will be completed by looking for recurrence and descriptive statistics, and coding and knowledge flow. The survey data will be cleaned for obvious inconsistencies and errors, and balanced for missing data and exceptions.

3.3.12 Descriptive Analysis

The descriptive analysis was the transformation of raw data into a format that was simple to understand and interpret. Descriptive statistics include mean estimations based on nominal data obtained through analysis. Data that is organized in demographic and socioeconomic aspects is referred to as nominal data. This test would strengthen the comparison of the variables.

3.3.13 Reliability Analysis

A reliability study was performed to confirm that things were stable and quantify the variables. The reliability analysis approach discusses some commonly used proportions of scale dependability and also provides information on the relationships between individual items on that scale. Cronbach's Alpha coefficient is the most widely used formula for determining a scale's dependability. Cronbach's Alpha is used to assess how an improvement in a test score is precise or consistent. Its value ranges from 0.00 to 1.00, depending on the number of scale items and their distance. When the number of errors is smaller, the reliability analysis is higher (Vicol and Zait, 2014).

3.3.14 Chi-square Analysis

The Chi Square test is a statistical test that is commonly used to distinguish between observed and predicted data based on particular hypotheses. The null hypothesis states that the difference between the predicted and observed results is not important. If the predicted value for any group is less than 5, it cannot be determined (Independent Research Project: Biology 110 laboratory). This test is used to investigate the relationship between demographic factors and independent variables, such as perceived ease of use, perceived usefulness, and subjective norms, regarding to farmer behavior intention to use IoT.

3.3.15 Regression Analysis

Regression analysis is a set of measurable techniques for assessing the relationships between variables. When the focus is on the relationship between a dependent variable and at least one independent variable (or 'indicator,' it includes a number of procedures for explaining and breaking down a few variables. Relapse analysis, however, allows one to see how the normal calculation of the reliant variable (or ‘paradigm variable') changes when any of the free factors is changed while the other autonomous factors remain constant.

3.3.16 Partial Least Squares Structural Equation Modelling (PLS-SEM)

Partial Least Squares Structural Equation Modelling (PLS-SEM) is a multivariate analysis technique that is becoming more common in academia (Richter et al., 2016). Multivariate analysis is a tool for identifying complex data and predicting models in research where the variances in dependent variables can be explained.

The validity of the calculated variables describing the constructed model was determined using Confirmatory Factor Analysis (CFA) in this research (Hoofs et al., 2018). This method aids in determining whether or not the structure model is compatible with the new data collection. The Model Fits section of this analysis is used to interpret the variables used to match the PLS-SEM model (Gelman et al., 2019). In order to obtain an accurate result, it is necessary to evaluate the relationship between the variables. To be approved for the PLS model, the loading indicator must be greater than 0.6. (Sukor & Fisal, 2020). The Standardized Root Mean Square Residual (SRMR) and chi-square value were used to test the model fit. If the SRMR value is less than 0.08, the model is nice and suits the variables (Olutende, Wamukoya, & Wanzala, 2019). The chi-square test was used to assess the findings' significance and see whether the distribution values matched the theoretical distribution (Statistics Solution, n.d.).

3.4 Chapter Summary

The research design of the study was explained in this section. The different types of analyses that would be run were listed and described. To achieve the goals of this study, four types of analyses will be used: descriptive analysis, reliability analysis, chi-square analysis, and regression analysis.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Overview of the Chapter

This chapter explained the findings obtained based on the research questionnaire. The main focus of the study referred to the data generated from the questionnaire. All the data gathered are analyzed using *Statistical Package For The Social Sciences (SPSS), Version 23 For Windows*. The analysis involved reliability, descriptive, correlation and factor analysis.

4.2 Demographic Profile

Respondent chose among corn farmers in Pahang agriculture product to analyse demographic distribution. The information is about gender, age, district, race, marital status, educational level, farm worker, monthly income, farm size, working experience and type of IoT use comprised of 50 respondents.

4.2.1 Gender

Table 4.5 showed the respondents' frequency and percentage (%) based on gender. Respondents consist of 32 males (64%) and 18 females (36%). This represented that, the highest number of respondents are male and the lowest number of respondents are female.

Table 4.5: Frequency Table of Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	32	64.0	64.0	64.0
	Female	18	36.0	36.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.2 Age

Table 4.6 showed the respondents' frequency and percentage (%) based on age. This finding reported, there were 1 respondent (2%) are less than 20 years old followed by 20 respondents (40%) are between 20 to 29 years, 18 respondents (36%) are between 30 to 39 years, 6 respondents (12%) are between 40 to 49 years and 5 respondents (105) are more than 50 years. This illustrated the highest number of respondents in the range of 20 to 29 years and the lowest allocated by the respondents less than 20 years.

Table 4.6: Frequency Table of Age

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<20 years	1	2.0	2.0	2.0
	20-29 years	20	40.0	40.0	42.0
	30-39 years	18	36.0	36.0	78.0
	40-49 years	6	12.0	12.0	90.0
	>50 years	5	10.0	10.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.3 District

Table 4.7 showed the respondents' frequency and percentage (%) based on district. This finding reported, there were 3 respondents (6%) from Bentong and Maran, 1 respondent (2%) from Bera, 6 respondents (12%) from Cameron Highlands and Lipis, 5 respondents (10%) from Jerantut, 10 respondents (20%) from Kuantan and temerloh and 2 respondents (4%) form Pekan, Raub and Rompin. This illustrated that the highest number of respondents from Kuantan and Temerloh and the lowest allocated by the respondents are from Bera.

Table 4.7: Frequency Table of District

District					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bentong	3	6.0	6.0	6.0
	Bera	1	2.0	2.0	8.0
	Cameron Highlands	6	12.0	12.0	20.0
	Jerantut	5	10.0	10.0	30.0
	Kuantan	10	20.0	20.0	50.0
	Lipis	6	12.0	12.0	62.0
	Maran	3	6.0	6.0	68.0
	Pekan	2	4.0	4.0	72.0
	Raub	2	4.0	4.0	76.0
	Rompin	2	4.0	4.0	80.0
	Temerloh	10	20.0	20.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.4 Race

Table 4.8 showed the respondents' frequency and percentage (%) based on race. This finding reported, there were 44 respondents (88%) are Malay. Then, the Chinese respondents comprised 5 respondents (10%) of the overall respondents and Indian with 1 respondent (2%). This illustrated that the highest number of respondents are Malay and the lowest allocated by the respondents are Indian.

Table 4.8: Frequency Table of Race

Race					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malay	44	88.0	88.0	88.0
	Chinese	5	10.0	10.0	98.0
	Indians	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.5 Marital Status

Table 4.9 showed the respondents' frequency and percentage (%) based on marital status. This finding reported, there were 26 respondents (52%) are single. Then, the married respondents comprised of 21 respondents (42%) of the overall respondents and widowed/divorced with 3 respondents (6%). This illustrated that the highest number of respondents are single and the lowest allocated by the respondents are widowed/divorced.

Table 4.9: Frequency Table of Marital Status

Marital Status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	26	52.0	52.0	52.0
	Married	21	42.0	42.0	94.0
	Widowed/Divorced	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.6 Education

Table 4.10 showed the respondents' frequency and percentage (%) based on education. This finding reported, that 16 respondents (32%) are SPM. Then, the respondents for STPM/A-Level/Matriculation comprised of 15 respondents (30%) of the overall respondents and Undergraduate with 19 respondents (38%). This illustrated that the highest number of respondents are Undergraduate and the lowest allocated by the respondents are STPM/A-Level/Matriculation.

Table 4.10 Frequency Table of Education

Education Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SPM	16	32.0	32.0	32.0
	STPM/A-Level/Matriculation	15	30.0	30.0	62.0
	Undergraduate	19	38.0	38.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.7 Farm Worker

Table 4.11 showed the respondents' frequency and percentage (%) based on farm worker. This finding reported, there were 38 respondents (76%) are less than 10 people followed by 8 respondents (16%) are between 11 to 15 people and 2 respondents (4%) are between 16 to 20 people and more than 20 people. This illustrated that the highest number of respondents are less than 10 people and the lowest allocated by the respondents are between 16 to 20 people and more than 20 people.

Table 4.11 Frequency Table of Farm Worker

Farm Worker					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<10 people	38	76.0	76.0	76.0
	11-15 people	8	16.0	16.0	92.0
	16-20 people	2	4.0	4.0	96.0
	>20 people	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.8 Monthly Income

Table 4.12 showed the respondents' frequency and percentage (%) based on monthly income. This finding reported, there were 13 respondents (26%) are less than RM 1000 followed by 29 respondents (58%) are between RM 1001 to RM 3000, 3 respondents (6%) are between RM 3001 to RM 5000 and 5 respondents (19%) are more than RM 5001. This illustrated that the highest number of respondents in the range RM 1001 to RM 3000 and the lowest allocated by the respondents in the range RM 3001 to RM 5000.

Table 4.12 Frequency Table of Monthly Income

Monthly Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<RM 1000	13	26.0	26.0	26.0
	RM 1001-RM 3000	29	58.0	58.0	84.0
	RM 3001 - RM 5000	3	6.0	6.0	90.0
	>RM 5001	5	10.0	10.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.9 Farms Size

Table 4.13 showed the respondents' frequency and percentage (%) based on farm size. This finding reported, there were 21 respondents (42%) are less than 1 acre followed by 23 respondents (46%) are between 1 to 4 acres, 3 respondents (6%) are between 5 to 9 acres, 1 respondent (2%) are between 10 to 19 acres and 2 respondents (4%) are more than 20 acres. This illustrated that the highest number of respondents in the range 1 to 4 acres and the lowest allocated by the respondents in the range 10 to 19 acres.

Table 4.13 Frequency Table of Farm Size

Farm Size					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1 acre	21	42.0	42.0	42.0
	1-4 acres	23	46.0	46.0	88.0
	5-9 acres	3	6.0	6.0	94.0
	10-19 acres	1	2.0	2.0	96.0
	>20 acres	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.10 Working Experience

Table 4.14 showed the respondents' frequency and percentage (%) based on working experience in agricultural sector. This finding reported, there were 29 respondents (58%) are between 1 to 10 years followed by 9 respondents (18%) are between 11 to 20 years, 2 respondents (4%) are between 21 to 30 years and 10 respondents (20%) are no experience in agricultural sector. This illustrated that the highest number of respondents in the range 1 to 10 years and the lowest allocated by the respondents between 21 to 30 years.

Table 4.14 Frequency Table of Working Experience

Any participation / working experience in agricultural sector					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10 years	29	58.0	58.0	58.0
	11-20 years	9	18.0	18.0	76.0
	21-30 years	2	4.0	4.0	80.0
	No experience	10	20.0	20.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.11 Reason become a farmer

Table 4.15 showed the respondents' frequency and percentage (%) based on reason to become a farmer. This finding reported, that 22 respondents (44%) are about interest. Then, the respondents choose social impact comprised of 15 respondents (30%) and no suitable occupation with 13 respondents (26%). This illustrated that the highest number of respondents are interest and the lowest allocated by the respondents are no suitable occupation.

Table 4.15 Frequency Table of Reason become a farmer

Reason become a farmer					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Interest	22	44.0	44.0	44.0
	Social Impact	15	30.0	30.0	74.0
	No suitable occupation	13	26.0	26.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.2.12 Type of IoT use

Table 4.16 showed the respondents' frequency and percentage (%) based on type of IoT use. This finding reported, there were 23 respondents (46%) are Agriculture Drone. Then, the respondents chose Automatic Drone comprised of 3 respondents (6%) of the overall respondents and Smart Green House with 18 respondents (36%). Meanwhile 6 respondents (12%) do not use technology. This illustrated that the highest number of respondents are Agriculture Drone and the lowest allocated by the respondents are Automatic Tractor.

Table 4.16 Frequency Table of Type of IoT use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agriculture Drone	23	46.0	46.0	46.0
	Automatic Tractor	3	6.0	6.0	52.0
	Smart Green House	18	36.0	36.0	88.0
	No Technology Use	6	12.0	12.0	100.0
	Total	50	100.0	100.0	

(Source: Survey, 2021)

4.3 Reliability Analysis

Reliability tests are conducted to determine the suitability for the overall instrument in the questionnaire and examine whether the respondents understand the statement stated or vice versa. Reliability test is a measure for assessing the consistency of the scores of each item. They used Cronbach's Coefficient Alpha (α) to measure the reliability of the questionnaire items.

4.2.1 Level Intention of Corn Farmers

Table 4.1 showed the reliability of level intention of corn farmers. Regarding to the result, the Cronbach's Alpha with 8 items is higher than 0.7 is 0.871. Thus the item is good.

Table 4.1: Reliability of Level Intention of Corn Farmers

Cronbach's Alpha	N of Items
.871	8

4.2.2 Attitude of Corn farmers

Table 4.2 showed the reliability of attitude of corn farmers. Regarding to the result, the Cronbach's Alpha with 8 items is higher than 0.7 is 0.851. Thus the item is good.

Table 4.2: Reliability of Attitude of Corn Farmers

Reliability Statistics	
Cronbach's Alpha	N of Items
.851	8

4.2.3 Subjective Norms of Corn Farmers

Table 4.3 showed the reliability of subjective norms of corn farmers. Regarding to the result, the Cronbach's Alpha with 8 items is higher than 0.7 is 0.864. Thus the item is good.

Table 4.3: Reliability of Subjective Norms of Corn Farmers

Reliability Statistics	
Cronbach's Alpha	N of Items
.864	8

4.2.4 Perceived Behavioral Control of Corn Farmers

Table 4.4 showed the reliability of perceived behavioral control of corn farmers. Regarding to the result, the Cronbach's Alpha with 8 items is higher than 0.7 is 0.878. Thus the item is good.

Table 4.4: Reliability of Perceived Behavioral Control of Corn Farmers

Reliability Statistics	
Cronbach's Alpha	N of Items
.878	8

4.3 Descriptive Analysis

Descriptive analysis involves the summarize of the data in the simple and easy way such as table, figure, frequency, percentage, mean and standard deviation. The finding consisted the intention of corm farmers towards internet of things (IoT) in agriculture products in Pahang and also the factors influencing them.

4.3.1 To determine the level intention of corm farmers towards internet of things (IoT) in agriculture products in Pahang

The descriptive statistics of intention of corm farmers towards internet of things (IoT) have eight items are listed in Table 4.17. Majority of the respondents strongly agree when a farmer intend to use Internet of Things (IoT) technology in their corn farming for agriculture production in Pahang (74%) and the level intention in corn farming can help to achieve target to produce more yield production in Pahang (60%). Besides that, the respondents strongly agree when the farmers put more effort in learning and using the used of IoT technology for future farming practices and positivity and awareness in using IoT in farming rather than using traditional farming can be motivated to use IoT (56%). Next respondents also strongly agree about the implementation of IoT in corn farming can boost productivity and reduce production costs in Pahang and agree that using IoT technology in corn farming can increase production more than before (54%). Regarding to the finding, the respondents showed various reactions towards the intention of corm farmers towards internet of things (IoT). The mean of items ranged from 4.26 to 4.70 and standard deviation showed ranged between 0.543 to 0.752. The overall mean for intention of corm farmers towards internet of things (IoT) is 4.44 and standard deviation is 0.474. In conclusion the respondents agree about intention of corm farmers towards internet of things (IoT). The highest mean reported respondents agree about *"I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Pahang"* (M=4.700, SD=0.543). Meanwhile the lowest mean reported that, the respondents also agree about *"I think the main purpose of using IoT in corn farming is to produce more quality"* (M=4.26, SD=0.723). As claimed by Pillai & Sivathanu (2020), Internet of Things (IoT) highly used in the agriculture industry as it gives ease for the farmers to carry out their works. It can be seen clearly through the adoption of artificial intelligence as it could increase the production yield of the products. The adoption of artificial intelligence could reduce the labour cost.

Table 4.17: Frequency Table the intention of corm farmers towards internet of things (IoT)

Statement	SD		D		A		A		SA		Mean	Standard Deviation
	N	%	N	%	N	%	N	%	N	%		
I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Pahang.	0	0	0	0	2	4	11	22	37	74	4.7	0.543
I think using IoT technology in corn farming can increase more production than before.	0	0	0	0	3	6	27	54	20	40	4.34	0.592
My level intention in corn farming can help to achieve my target to produce more yield production in Pahang.	0	0	0	0	2	4	18	36	30	60	4.56	0.577
I will put more effort in learning and using the used of IoT technology for my future farming practices.	0	0	0	0	5	10	17	34	28	56	4.46	0.676
Positivity and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT.	0	0	0	0	4	8	18	36	28	56	4.48	0.646
I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop.	0	0	0	0	8	16	21	42	21	42	4.26	0.723
The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Pahang.	0	0	0	0	8	16	15	30	27	54	4.38	0.752
The Internet of Things can help me to attract more customers or buyers to purchase more good quality of corn production in Pahang.	0	0	0	0	6	12	20	40	24	48	4.36	0.692
Overall											4.44	0.474

(Source: Survey, 2021)

The descriptive statistics of attitude of corm farmers have eight items are listed in Table 4.18. Majority of the respondents strongly agree when a farmer take the challenge to apply IoT technology in farming practices (58%). There is followed IoT for agricultural production in Pahang is very important as a farmer and looking for suitable methods and farming practices for agricultural production (54%). Regarding to the finding, the respondents showed various reactions towards the attitude of corm farmers. The mean of items ranged from 4.4 to 4.54 and standard deviation showed ranged between 0.579 to 0.674. The overall mean for attitude of corm farmers is 4.447 and standard deviation is 0.438. In conclusion the respondents agree about attitude of corm farmers. The highest mean reported respondents agree about *"I will take the challenge as a farmer to apply IoT technology in my farming practices" (*M=4.447, SD=0.438). Meanwhile the lowest mean reported that, the respondents also agree about *"I am sure that my corn production in Pahang will be recognized by the public when using IoT technology"* and "*I am not afraid of using IoT technology in my corn farming"* (M=4.40, SD=0.638). The positive attitude shown by the corm farmers towards Internet of Thing (IoT) helps the sustainability development of the agriculture sector (Dlodlo & Kalezhi, 2015). It can be seen clearly through the effort done by the farmers in looking for the suitable method which do not give side effect towards the environment. The action taken by the farmers help to ensure the sustainability of the environment.

Table 4.18: Frequency Table the attitude of corm farmers

Statement	SD		D		A		A		SA		Mean	Standard Deviation
	N	%	N	%	N	%	N	%	N	%		
IoT for agricultural production in Pahang is very important to me as a farmer.	0	0	0	0	5	10	18	36	27	54	4.44	0.674
I am sure that my corn production in Pahang will be recognized by the public when using IoT technology.	0	0	0	0	4	8	22	44	24	48	4.4	0.638
The use of IoT technology is crucial for me to increase corn production in agriculture.	0	0	0	0	4	8	21	42	25	50	4.42	0.641
The emergence of IoT technology made me realize how important the technology is in agricultural production.	0	0	0	0	2	4	22	44	26	52	4.48	0.579
I am not afraid of using IoT technology in my corn farming.	0	0	0	0	4	8	22	44	24	48	4.4	0.638
I am looking for suitable methods and farming practices for agricultural production towards IoT technology.	0	0	0	0	3	6	20	40	27	54	4.48	0.614
Choosing the right IoT technology is necessary for me before venturing into agriculture.	0	0	0	0	4	8	21	42	25	50	4.42	0.641
I will take the challenge as a farmer to apply IoT technology in my farming practices.	0	0	0	0	2	4	19	38	29	58	4.54	0.578
Overall											4.447	0.438

(Source: Survey, 2021)

The descriptive statistics of subjective norms of corm farmers have eight items are listed in Table 4.19. Majority of the respondents strongly agree when a farmer's family members would perefer to use IoT technology in corn farming (54%). There is followed when workshop or seminar makes them to take part in using IoT for corn farming production and expert in agriculture sector motivate and support them to produce and manage corn production using IoT technology (52%). Besides that, the respondents also strongly agree when the social influence in agriculture sector makes them want to use the implementation of Internet of Things in farming practices and agree when medias information influences them that corn family produced using IoT technology is better than traditional farming (50%). Regarding to the finding, the respondents showed various reactions towards the subjective norms of corm farmers. The mean of items ranged from 4.2 to 4.42 and standard deviation showed ranged between 0.67 to 0.867. The overall mean for subjective norms corn farmers is 4.302 and standard deviation is 0.528. In conclusion the respondents agree about subjective norms of corn farmers. The highest mean reported respondents agree about *"Workshop or seminar makes me want to take part in learning more about implementation"* (M=4.42, SD=0.672). Meanwhile the lowest mean reported that, the respondents also agree about *"My friends will give support and agree with my decision to start using IoT technology for my farming practices"* (M=4.20, SD=0.728). Khanna & Kaur (2019) reported the similar finding as subjective norms is one of the contributing factor towards the farmers' intention to adopt Internet of Thing (IoT) in the agriculture sector. It can be seen clearly as the action taken by the family members encourage the farmers to adopt Internet of Thing (IoT) in the agriculture sector they involved. It is due to the benefits they could gain.

Table 4.19: Frequency Table the subjective norms of corm farmers

Statement	SD		D		A		A		SA		Mean	Standard Deviation
	N	%	N	%	N	%	N	%	N	%		
My family members would prefer me to use IoT technology in corn farming.	0	0	2	4	7	14	14	28	27	54	4.32	0.867
My friends will give support and agree with my decision to start using IoT technology for my farming practices.	0	0	0	0	9	18	22	44	19	38	4.2	0.728
The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices.	0	0	0	0	5	10	20	40	25	50	4.4	0.67
Government support and advertisement influence me to take part in using IoT for my corn farming production.	0	0	1	2	5	10	24	48	20	40	4.26	0.723
Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production.	0	0	0	0	5	10	19	38	26	52	4.42	0.672
Media's information influence me that corn farming produced using IoT technology is better than traditional farming.	0	0	0	0	7	14	25	50	18	36	4.22	0.678
Expert in agriculture sector motivate and support me to produce and manage corn production using IoT technology.	0	0	0	0	7	14	17	34	26	52	4.38	0.725
By using IoT technology in corn production will enable me to obtain external loans.	0	0	2	4	6	12	21	42	21	42	4.22	0.815
Overall											4.302	0.528

(Source: Survey, 2021)

The descriptive statistics of perceived behavior control of corm farmers have eight items are listed in Table 4.20. Majority of the respondents strongly agree corn farming using IoT technologies are more cost effective and can boost more productivity (60%). Besides that, the respondents agree when IoT in corn farming van ensure consumer trust upon the health and safety of the corn production (58%). There is followed with the produced more corn production yield using IoT technology and the quality of corn production will become attractive for consumer or reseller to purchase the corn (52%). Regarding to the finding, the respondents showed various reactions towards the perceived behavioral control of corm farmers. The mean of items ranged from 4.18 to 4.56 and standard deviation showed ranged between 0.577 to 0.658. The overall mean for perceived behavioral control corn farmers is 4.337 and standard deviation is 0.465. In conclusion the respondents agree about perceived behavior control of corn farmers. The highest mean reported respondents agree about *“My corn farming using IoT technologies are more cost effective and can boost more productivity” (*M=4.56, SD=0.577). Meanwhile the lowest mean reported that, the respondents also agree that “I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even if it is *more expensive than other corn”* (M=4.18, SD=0.719). As claimed by Gao & Bai (2014), perceived behavioral control among the farmer is one of the influential factor which influence their acceptance towards Internet of Things (IoT). The obvious benefit can be seen is the increment of the productivity through the implementation of IoT in agricultural sector.

Table 4.20: Frequency Table the perceived behavior control of corm farmers

Statement	SD		D		A		A		SA		Mean	Standard Deviation
	N	%	N	%	N	%	N	%	N	%		
If I want, I can produced more corn production yield using IoT technology.	0	0	0	0	5	10	26	52	19	38	4.28	0.64
My corn farming using IoT technologies are more cost effective and can boost more productivity.	0	0	0	0	2	4	18	36	30	60	4.56	0.577
IoT in corn farming can ensure consumer trust upon the health and safety of the corn production.	0	0	0	0	3	6	29	58	18	36	4.3	0.58
I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn.	0	0	0	0	9	18	23	46	18	36	4.18	0.719
Due limited resources and time, IoT technology can take place and support of government policies.	0	0	0	0	5	10	23	46	22	44	4.34	0.658
In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn.	0	0	0	0	4	8	26	52	20	40	4.32	0.62
Using IoT technology for farming practices can improve more corn farmersâ€™ perception towards IoT in agriculture production.	0	0	0	0	4	8	24	48	22	44	4.36	0.631
I know that using IoT will become more effectively convenience for	0	0	0	0	4	8	24	48	22	44	4.36	0.631

improving corn production.			
	Overall	4.337	0.465

(Source: Survey, 2021)

4.4 Correlation Analysis

As this is a correlation study, the results report Spearman correlation coefficients as a measure of the linear relationships that exist among the factors.

4.4.1 To investigate the relationship of attitude, subjective norm and perceived behaviour control towards level intention towards internet of things (IoT) in agriculture products among corn farmers in Pahang.

H_0: There is no significant value between the relationship of attitude, subjective norms and perceived behavior control of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.

H_1: There is a significant value between the relationship of attitude, subjective norms and perceived behavior control of corn farmers' intention towards Internet of Things (IoT) for Agricultural production in Pahang.

Table 4.21 showed the relationship between intention and attitude. As indicated by the R-value of the Spearmen correlation showed the intention is the significantly strongly positive relationship with attitude (r=0.784, n=50, p=0.000). Thus, based on the P-value, corn farmers have a significant linear relationship between intention and attitude.

Besides that, the finding of R-value Spearmen correlation showed that intention has a significantly moderately positive relationship with subjective norms (r=0.526, n=50, p=0.000). Thus, based on the P-value, corn farmers have a significant linear relationship between intention and subjective norms.

Lastly, the finding of R-value Spearmen correlation showed that intention has a significantly strongly positive relationship with perceived behavioral control (r=0.714, n=50, p=0.000). Thus, based on the P-value, corn farmers have a significant linear relationship between intention and perceived behavioral control.

It is in agreement with the finding reported by Salim & Sa'don (2021) that attitude, subjective norms, and perceived behavioral control have a significant relationship with the intention among the farmers to adopt Internet of Thing (IoT). Adoption of IoT positively contributes to the increment of yield for the productivity of the products produced.

Table 4.21: Correlation Between Variables

Correlations

			Intention	Attitude	Subjective Norms	Perceived Behavioural Control
Spearman's rho	Intention	Correlation Coefficient	1.000	.784**	.526**	.714**
		Sig. (2-tailed)	.	.000	.000	.000
		N	50	50	50	50
	Attitude	Correlation Coefficient	.784**	1.000	.650**	.813**
		Sig. (2-tailed)	.000	.	.000	.000
		N	50	50	50	50
	Subjective Norms	Correlation Coefficient	.526**	.650**	1.000	.696**
		Sig. (2-tailed)	.000	.000	.	.000
		N	50	50	50	50
	Perceived Behavioural Control	Correlation Coefficient	.714**	.813**	.696**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	50	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

4.4 To identify the most influential factor of level intention of corm farmers towards internet of things (IoT) in agriculture products in Pahang

Referring to the finding of Kaiser-Meyer-Olkin Measure of Sampling Adequancy (KMO) in Table 4.22 the value of attitude is 0.726, subjective norms are 0.814 and perceived behavior control is 0.829. These values showed where is 0.6 or above. Hence, the attitude, subjective norms and perceived behavioral control can be considered as significant and correlated between the items. Next, the result of Barlett's test of Sphericity is highly significant at $p<0.05$ for the attitude, subjective norms and perceived behavior control when $p=0.000$. The similar finding reported by Monteleone et al., (2020) as attitude, subjective norms, and perceived behavioral control are the influential factors towards an individual's intention. This present situation focused on the intention to adopt

IoT in the agriculture sector. It is reported that all the variables are significant and correlated to each other.

Table 4.22: KMO and Bartlett's Test

		Attitude	Subjective Norm	Perceived Behaviour Control
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.726	0.814	0.829
Bartlett's Test of Sphericity	Approx. Chi-Square	163.666	167.945	181.633
	Df	28	28	28
	Sig.	.000	.000	.000

(Source: Survey, 2021)

4.4.1 Attitude towards intention towards internet of things (IoT) in agriculture products

Table 4.23 displays the finding of the factors loading of attitude towards internet of things (IoT) in agriculture product. The finding reported that the factor loading of Item 1 is 0.828, Item 2 is 0.713, Item 3 is 0.714, Item 4 is 0.738, Item 5 is 0.54, Item 6 is 0.75, Item 7 is 0.576 and Item 8 is 0.737. Thus, all the item of attitude showed the factor loading is > 0.40, indicating that they represent the factor. For attitude factors, the percentage of variance explained were 72.57%. It agrees with the finding reported by Elijah et al., (2018) as attitude is one of the contributing factors towards the usage of IoT. The attitude shown by the farmers towards IoT is satisfying.

Table 4.23: Factor analysis of attitude towards internet of things (IoT) in agriculture products

Statement	Factor Loading
IoT for agricultural production in Pahang is very important to me as a farmer.	0.828
I am sure that my corn production in Pahang will be recognized by the public when using IoT technology.	0.713
The use of IoT technology is crucial for me to increase corn production in agriculture.	0.714
The emergence of IoT technology made me realize how important the technology is in agricultural production.	0.738
I am not afraid of using IoT technology in my corn farming.	0.541
I am looking for suitable methods and farming practices for agricultural production towards IoT technology.	0.75
Choosing the right IoT technology is necessary for me before venturing into agriculture.	0.576
I will take the challenge as a farmer to apply IoT technology in my farming practices.	0.737
Variance	49.72%

(Source: Survey, 2021)

4.4.2 Subjective norms towards internet of things (IoT) in agriculture products

Table 4.24 displays the factors loading of subjective norms towards internet of things (IoT) in agriculture product. The finding reported that the factor loading of Item 1 is 0.680, Item 2 is 0.846, Item 3 is 0.693, Item 4 is 0.715, Item 5 is 0.769, Item 6 is 0.568, Item 7 is 0.671 and Item 8 is 0.792. Thus all the item of subjective norms showed the factor loading is > 0.40 indicates that they are representative of the factor. For subjective norms factors, the percentage of variance explained were 52.00%. Similarly, Khanna & Kaur (2019) stated that subjective norms are influential factors towards the internet of things among the farmers. It can be seen how family members, friends and media information influence the farmers to adopt IoT in agriculture sector.

Table 4.24: Factor analysis of subjective norms towards internet of things (IoT) in agriculture products

Statement	Factor Loading
My family members would prefer me to use IoT technology in corn farming.	.680
My friends will give support and agree with my decision to start using IoT technology for my farming practices.	.846
The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices.	.693
Government support and advertisement influence me to take part in using IoT for my corn farming production.	.715
Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production.	.769
Media's information influence me that corn farming produced using IoT technology is better than traditional farming.	.568
Expert in agriculture sector motivate and support me to produce and manage corn production using IoT technology.	.671
By using IoT technology in corn production will enable me to obtain external loans.	.792
Variance	52.00%

(Source: Survey, 2021)

4.4.3 Perceived Behavioural Control towards internet of things (IoT) in agriculture products

Table 4.25 displays the finding of the factors loading of perceived behavioral control towards internet of things (IoT) in agriculture product. The finding reported that the factor loading of Item 1 is 0.721, Item 2 is 0.714, Item 3 is 0.746, Item 4 is 0.658, Item 5 is 0.654, Item 6 is 0.753, Item 7 is 0.842 and Item 8 is 0.803. Thus, all the item of perceived behavior control showed the factor loading is > 0.40, indicating that they represent the factor. The percentage of variance explained for perceived behavior control factors was 54.58%. It is supported by Tzounis et al., (2017) as the perceived behavioral control is one of the important indicators that influence the farmer's intention to adopt

IoT. Referring to the factor loading, it proved the importance of perceived behavioral control towards the intention to adopt IoT.

Table 4.25: Factor analysis of perceived behavioral control towards internet of things (IoT) in agriculture products

Statement	Factor Loading
If I want, I can produced more corn production yield using IoT technology.	.721
My corn farming using IoT technologies are more cost effective and can boost more productivity.	.714
IoT in corn farming can ensure consumer trust upon the health and safety of the corn production.	.746
I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn.	.658
Due limited resources and time, IoT technology can take place and support of government policies.	.654
In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn.	.753
Using IoT technology for farming practices can improve more corn farmersâ€™ perception towards IoT in agriculture production.	.842
I know that using IoT will become more effectively convenience for improving corn production.	.803
Variance	54.58%

(Source: Survey, 2021)

4.4.4 Variance Explained

The percentage of variance explained was used to measure the total variance explained by factor. If the variance explained was greater than 30% was considered the minimum consideration level, if greater than 40% the most important level, and if greater than 50% was considered practically significant. Table below showed the result of variance explained.

Table 4.26 indicates the result of variance explained. The subjective norms and perceived behavior control were considered practically significant factors for this study where the total variance for subjective norms was 52.00% and the perceived behavior control was 54.58%. next, the attitude indicates the most important level with 49.72%. According to the total variance explained the highest significant are perceived behavioral control with 54.58% and the lowest are attitude with 49.72%. It is supported by Gao & Bai (2014) as the perceived behavioral control is the most influential factor in the farmers' intention to adopt IoT in the agriculture sector. However, it was found that attitude is the least influential towards implementing of IoT among the farmers.

Table 4.26: Result of variance explained

Factors	Variance
The Attitude towards internet of things (IoT) in agriculture product	49.72%
The Subjective Norm towards internet of things (IoT) in agriculture product	52.00%
The Perceived Behaviour Control towards internet of things (IoT) in agriculture product	54.58%

(Source: Survey, 2021)

4.4.5 Confirmatory Factor Analysis

The Confirmatory Factor Analysis (CFA) is used to identify the model fits this study. The model explained the corn farmers' intention towards Internet of Thing(IoT) for agricultural production in Pahang: attitude, subjective norm and perceived behaviour control. Figure 4.1 shows the model used in this study where the constructed variables were measured using a five-point Likert scales and recorded above 0.6.

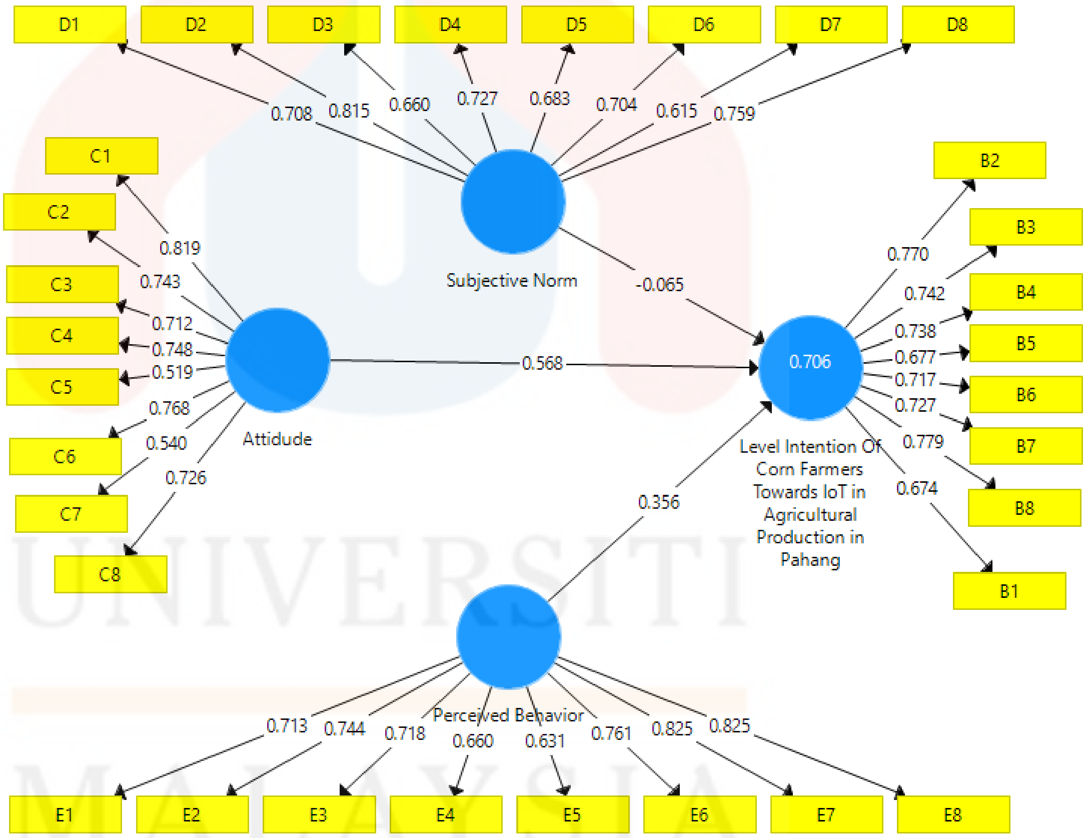

Figure 4.1: The model fits of Theory Planned Behaviour Model

Based on Table 4.27 shows the SRMR values for this study was 0.104. Thus, this indicates that the value of SRMR as an acceptable model fits for this study. Cangur & Ercan (2015) stated that, the Standardized Root Mean Square Residual (SRMR) value in the range of 0.08-0.10 indicates an acceptable fit. Then, the value of chi-square was 984.084.

Table 4.27: Result of confirmatory factor analysis

	Saturated Model	Estimated Model
SRMR	0.104	0.104
d_ULS	6.839	6.839
d_G	6.146	6.146
Chi-Square	984.084	984.084
NFI	0.412	0.412

(Source: Survey, 2021)

4.5 Chapter Summary

In this chapter, the results of this study are determined by using the Theory of Planned Behaviour of the corn farmers' intention towards Internet of Thing(IoT) for agricultural production in Pahang where attitude, subjective norms and perceived behaviours control as independent variables. The results show that the perceived behaviour control is the most influential corn farmers' intention towards Internet of Thing(IoT) for agricultural production in Pahang where the percentage of variance is 54.58% while most of the factor loading was significant for this study.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

There were three objectives in this study that would be employed for this research investigation which is to identify the level of intention of corn farmers towards IoT in agricultural crop production in Pahang, to investigate the relationship of attitude, subjective norms, and perceived behavior control towards partaking of corn farmers towards IoT in agricultural crop production in Pahang and identify the most influential factor of corn farmers' intention towards Internet of Thing(IoT) for agricultural production in Pahang. All of this objective has been achieved for this research study.

The first objective was met when the mean of the items varied from 4.18 to 4.56 and the standard deviation ranged from 0.577 to 0.658. The overall mean for perceived behavioural control corn farmers is 4.337 and standard deviation is 0.465. It can be concluded that the respondents agree about perceived behaviour control of corn farmers. Furthermore, the second objective of this study was met when the null hypothesis (H_0) was rejected. Thus indicating that there was a significant value between the relationship of attitude, subjective norms, and perceived behaviour control towards corn farmers' intention to use IoT in agricultural crop production in Pahang. This objective was investigated using Spearman's Correlation Analysis. Then, the third objective was also achieved for this study which perceived behaviour control was known as the most influential factor of corn farmers' intention toward IoT in Pahang. This is because the variance explained for perceived behaviour control is the highest percentage of variance explained which is 54.58% while the percentage of variance explained for attitude and the subjective norm is 49.72% and 52.00% respectively. In this study, the Confirmatory Factors Analysis (CFA) showed an acceptable model fit as the SRMR values were 0.10.

In conclusion, this research study for the uses of the Internet of Things (IoT) is critical in attracting more corn farmers to utilise it since it can help them increase their productivity more effectively than traditional farming. Furthermore, this helps to increase corn farmers' knowledge and awareness of the importance of adopting IoT, attracting more corn farmers to utilise IoT in their farming methods. Thus, this study found that all variables, including attitudes, subjective norms, and perceived behaviour control, influenced corn farmers' engagement in IoT in agricultural crop production.

5.2 Limitation of Study

This study has some limitations in terms of collecting supporting information about corn farmers' intentions toward IoT for agricultural production in Pahang, the relationship between attitude, subjective norm, and perceived behaviour control of corn farmers, and the most influential factor of corn farmers' intentions toward IoT for agricultural production. The study's shortcomings were beyond its control because it was conducted during COVID-19, making it difficult to get accurate information on respondents' participation in the IoT. This is because most farmers are unable to participate in IoT for agricultural production due to government-recommended restrictions on people's travel. Furthermore, a lot of people from the agriculture sector did not participate in answering the questionnaire. As a result of the complications that arose, the deadline for this study was pushed back.

5.3 Recommendations

As a result of interpreting the data acquired in this study, some valuable recommendations for future research in order to comprehend the existing challenges and design solutions have emerged. According to the findings, most corn farmers in Pahang support the use of IoT technology in agriculture since it will boost production in a shorter period. Furthermore, researchers have suggested many IoT-based solutions, including climate and soil monitoring, greenhouse farming, and irrigation automation. However, the data reveal that corn farmers choose irrigation automation to carry out their agricultural farming duties. This is because this technology is more scalable and self-organizing, as it autonomously controls the sprinkler valve to water the field without the need for human interaction.

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APPENDICES

APPENDIX A

Dear respondent,

I am doing an academic research entitled:

Corn Farmers Intention Towards Internet of Thing(IoT) for Agricultural Production in Pahang

Congratulations, you have been selected as a respondent for this research. Your sincere cooperation is crucial in determining the success of this study. In this study, I would like to assess your perception concerning certain factors of your intention toward Internet of Thing(IoT) for agricultural production. Please read carefully all the instructions pertaining to every section and answer every question sincerely. There is no right or wrong answer.

All responses provided will be treated with strict confidential and will be used for this academic research only.

Thank you very much for your cooperation.

Sincerely,

……………………………………

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QUESTIONNAIRE SURVEY

The Intention of Corn Farmers towards Internet of Things (IoT) in Agriculture Production in Pahang

SECTION A – DEMOGRAPHIC CHARACTERISTICS OF CORN FARMER IN PAHANG

Please answer the questions below and tick (/) in the box provided to indicate your answer.

1.	**Age** *Umur*	☐ < 20 years ☐ 20 – 29 years ☐ 30 – 39 years ☐ 40 – 49 years ☐ > 50 years
2.	**Gender** *Jantina*	☐ Male ☐ Female
3.	**District** *Daerah*	☐ Lipis ☐ Jerantut ☐ Raub ☐ Temerloh ☐ Maran ☐ Kuantan ☐ Pekan ☐ Bera ☐ Bentong ☐ Rompin ☐ Cameron Highlands
4.	**Race** *Keturunan*	☐ Malays ☐ Chinese ☐ Indians ☐ Others
5.	**Marital Status** *Status Perkahwinan*	☐ Single ☐ Married ☐ Widowed / Divorced
6.	**Education Level** *Peringkat Pendidikan*	☐ SPM ☐ STPM / A-Level / Diploma / Matriculation ☐ Undergraduate (Bachelor's Degree) ☐ Postgraduate (Master's Degree, PhD)

7.	**Farm Worker** *Pekerja Ladang*	☐ < 10 people ☐ 11 – 15 people ☐ 16 – 20 people ☐ > 20 people
8.	**Monthly Income** *Pendapatan Bulanan*	☐ < RM 1000 ☐ RM 1001 – RM 3000 ☐ RM 3001 – RM 5000 ☐ > RM 5001
9.	**Farm Size** *Saiz Ladang*	☐ < 1 acre ☐ 1 – 4 acres ☐ 5 – 9 acres ☐ 10 – 19 acres ☐ > 20 acres
10.	**Any participation / working experience in agricultural sector** *Sebarang penyertaan / pengalaman bekerja di sektor pertanian*	☐ If yes, how many years? ( ) 1 – 10 years ( ) 11 – 20 years ( ) 21 – 30 years ( ) Above 31 years ☐ No
11.	**Reason become a farmer** *Sebab menjadi seorang petani*	☐ Interest ☐ Social impact (family member / friends) ☐ No suitable occupation
12.	**Type of IoT use** *Jenis penggunaan IoT*	☐ Agriculture Drone ☐ Automatic Tractor ☐ Smart Green House

Instruction: For statement on SECTION B, C, D and E please read for each item and indicate your answer between one (1) to five (5). Your score (1) would indicate you strongly disagree with the statement and score (5) would indicate you strongly agree with respective statement.

Strongly disagree	Disagree	Average	Agree	Strongly agree
1	2	3	4	5

SECTION B – THE LEVEL INTENTION OF CORN FARMERS TOWARDS IOT IN AGRICULTURE PRODUCTION IN PAHANG

In my opinion:		1	2	3	4	5
1	I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Pahang.					
2	I think using IoT technology in corn farming can increase more production than before.					
3	My level intention in corn farming can help to achieve my target to produce more yield production in Pahang.					
4	I will put more effort in learning and using the used of IoT technology for my future farming practices.					
5	Positivity and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT.					
6	I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop.					
7	The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Pahang.					
8	The Internet of Things can help me to attract more customers or buyers to purchase more good quality of corn production in Pahang.					

SECTION C - THE RELATIONSHIP OF ATTITUDE, SUBJECTIVE NORMS AND PERCEIVED BEHAVIOR CONTROL OF CORN FARMERS IN PAHANG

ATTITUDE:

In my opinion:		1	2	3	4	5
1	IoT for agricultural production in Pahang is very important to me as a farmer.					
2	I am sure that my corn production in Pahang will be recognized by the public when using IoT technology.					

3	The use of IoT technology is crucial for me to increase corn production in agriculture.					
4	The emergence of IoT technology made me realize how important the technology is in agricultural production.					
5	I am not afraid of using IoT technology in my corn farming.					
6	I am looking for suitable methods and farming practices for agricultural production towards IoT technology.					
7	Choosing the right IoT technology is necessary for me before venturing into agriculture.					
8	I will take the challenge as a farmer to apply IoT technology in my farming practices.					

SUBJECTIVE NORMS:

In my opinion:		1	2	3	4	5
1	My family members would prefer me to use IoT technology in corn farming					
2	My friends will give support and agree with my decision to start using IoT technology for my farming practices					
3	The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices					
4	Government support and advertisement influence me to take part in using IoT for my corn farming production					
5	Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production					
6	Media's information influences me that corn farming produced using IoT technology is better than traditional farming.					
7	Expert in agriculture sector motivate and support me to produce and manage corn production using IoT technology.					
8	By using IoT technology in corn production will enable me to obtain external loans.					

PERCEIVED BEHAVIOR CONTROL:

In my opinion:		1	2	3	4	5
1	If I want, I can produced more corn production yield using IoT technology.					
2	My corn farming using IoT technologies are more cost effective and can boost more productivity.					
3	IoT in corn farming can ensure consumer trust upon the health and safety of the corn production.					

4	I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn.					
5	Due limited resources and time, IoT technology can take place and support of government policies.					
6	In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn.					
7	Using IoT technology for farming practices can improve more corn farmers' perception towards IoT in agriculture production.					
8	I know that using IoT will become more effectively convenience for improving corn production.					

THANK YOU VERY MUCH FOR YOUR SINCERE COOPERATION IN THIS STUDY