Corn Farmers Intention towards Internet of Things (IoT) for Agricultural Production in Perak

Nurul Aqilah Binti Mohamed Sohaimi
F18A0182

A thesis submitted in fulfillments of the requirements for the degree of Bachelor of Applied Science (Food Security) with Honours

Faculty of Agro Based Industry
Universiti Malaysia Kelantan

2022

DECLARATION

I hereby declare that the work embodied in this report is the result of the original research except the excerpts and summaries that I have made clear of the sources.

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Signature

Student's name : Nurul Aqilah Binti Mohamed Sohaimi

Matric number : F18A0182

Date :

Approved by:

_____

Supervisor signature

Supervisor's name : Dr. Zul Ariff Bin Abdul Latiff

Stamp :

Date :

ACKNOWLEDGEMENT

Assalamualaikum, primarily, thanks to Allah S.W.T for his mercy and guidance for being able to complete this thesis with success. I would like to express my special thanks of gratitude to my supervisor, Dr. Zul Ariff Bin Abdul Latiff, for providing me with the golden opportunity to do this final year project on the topic "Corn Farmers Intention towards Internet of Things (IoT) for Agricultural Production in Perak", which also helped me with support and valuable suggestions throughout the writing process of this thesis. Also, big thanks to all respondents for giving their time and cooperation during my survey. Lastly, I acknowledge with a deep sense of reverence and gratitude to my family and friends for their continuous support and guidance towards the completion of this thesis.

Corn Farmers Intention towards IoT for Agricultural Production in Perak

ABSTRACT

IoT has a significant impact in agriculture since it has different purposes and offer multiple solutions. Besides, farmers' intention is the knowledge and behaviour of farmers to adopt new agricultural technology. Corn farmers with strong intentions towards the potential and benefits of IoT are likely endorse farmers' decisions to adopt the IoT. The main challenge for corn farmers including a lack of knowledge and awareness about IoT causing the farmers to be unable to manage the risk and uncertainties in corn production. Also, corn farmers currently have limited access to private or public extension as well as lack of information related to the use of IoT in agriculture. The sample size is 50 respondents of corn farmer and was conducted in Perak. This study was carried out based on three objectives, which is to determine corn farmers intention towards IoT for agricultural production in Perak. Secondly, to investigate the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak. Third objective is to identify the most influential factor of corn farmers intention towards IoT for agricultural production in Perak. Next, this study used purposive sampling method where a set of questionnaire survey was distributed among corn farmers in Perak by applying Theory of Planned Behaviour (TPB). The findings from this study are high-level intention of corn farmers towards IoT for agricultural production. Moreover, there is a positive relationship of attitude, subjective norms and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak. Meanwhile, the most influential factor of corn farmers intention towards IoT for agricultural production in Perak is attitude. Finally, Confirmatory Factor Analysis showed that the model fit is acceptable.

Keywords: Corn Farmer, Intention, IoT, Agricultural Production, Theory of Planned Behaviour

Niat Petani Jagung terhadap IoT untuk Pengeluaran Pertanian di Perak

ABSTRAK

IoT mempunyai kesan yang besar dalam pertanian kerana ia mempunyai tujuan yang berbeza dan menawarkan pelbagai penyelesaian. Selain itu, niat petani ialah pengetahuan dan tingkah laku petani untuk menggunakan teknologi pertanian baharu. Petani jagung dengan niat yang kuat terhadap potensi dan faedah IoT berkemungkinan menyokong keputusan petani untuk menerima pakai IoT. Cabaran utama petani jagung termasuklah kekurangan pengetahuan dan kesedaran tentang IoT menyebabkan petani tidak dapat menguruskan risiko dan ketidaktentuan dalam pengeluaran jagung. Petani jagung juga pada masa ini mempunyai akses yang terhad kepada sambungan swasta atau awam serta kekurangan maklumat berkaitan penggunaan IoT dalam pertanian. Saiz sampel adalah seramai 50 responden petani jagung dan telah dijalankan di Perak. Kajian ini dijalankan berdasarkan tiga objektif iaitu untuk menentukan niat petani jagung terhadap IoT untuk pengeluaran pertanian di Perak. Kedua, untuk menyiasat hubungan sikap, norma subjektif dan kawalan tingkah laku persepsi niat petani jagung terhadap IoT untuk pengeluaran pertanian di Perak. Objektif ketiga ialah mengenal pasti faktor yang paling mempengaruhi niat petani jagung terhadap IoT untuk pengeluaran pertanian di Perak. Seterusnya, kajian ini menggunakan kaedah persampelan bertujuan di mana satu set tinjauan soal selidik telah diedarkan dalam kalangan petani jagung di Perak dengan mengaplikasikan Teori Tingkah Laku Terancang (TPB). Hasil dapatan daripada kajian ini adalah niat petani jagung yang tinggi terhadap IoT untuk pengeluaran pertanian. Selain itu, terdapat hubungan positif antara sikap, norma subjektif dan persepsi kawalan tingkah laku niat petani jagung terhadap IoT untuk pengeluaran pertanian di Perak. Manakala faktor yang paling mempengaruhi niat petani jagung terhadap IoT untuk pengeluaran pertanian di Perak ialah sikap. Akhir sekali, Analisis Faktor Pengesahan menunjukkan bahawa kesesuaian model boleh diterima.

Kata kunci: Petani Jagung, Niat, IoT, Pengeluaran Pertanian, Teori Tingkah Laku Terancang

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LIST OF ABBREVIATIONS AND SYMBOLS

CFA	Confirmatory Factor Analysis
GPS	Global Positioning System
IoT	Internet of Things
KMO	Kaiser-Meyer-Olkin
PLS-SEM	Partial Least Squares Structural Equation Modelling
SPSS	Statistical Package for the Social Science
SRMR	Standardized Root Mean Square Residual
TPB	Theory of Planned Behaviour
r	Pearson Correlation Coefficient
&	And
$	Dollar
%	Percentage

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this study, chapter 1 consists of research background, problem statement, hypothesis, research question, objective, scope of study, significance of study and organization of study. This study focuses on the background of corn farmers towards Internet of Things (IoT) for agricultural production in Perak.

1.1 Research Background

1.1.1 Internet of Things (IoT)

Over the years, Internet of Things (IoT) plays a significant role in almost every industry including medical and healthcare, education, automotive, agriculture, manufacturing, sales and marketing. The concept of IoT is to provide daily life objects

with identifiers and wireless connectivity, so that these objects can communicate with each other and controlled by computers (Markeeva, A. V., 2016). In addition, IoT systems had affects number of sectors in reducing the inefficiency and increasing the productivity, as IoT can smartly operate and process the data to accomplish the specific tasks. Therefore, this advanced technology enables consumer and industry to access information easily, improve decision-making and have better security (McKinsey Global Institute, 2015).

1.1.2 Internet of Things (IoT) for Agricultural Production in Malaysia

Nowadays, IoT is expected to have a significant impact in agricultural sector since IoT has different purposes and offer multiple solutions for increasing production yield, reducing the risk of crop failure and lowering operating costs. This has been proven in a study showing that beneficial impacts of IoT give farmers to access new agricultural knowledge in improving the condition of farmland (Hamad et al., 2018). Besides, this information allow farmers to track farm operations, make better decisions to improve farm productivity and respond more quickly to current conditions.

For instance, smart sensors are one of the IoT technology used to increase agriculture productivity, where smart sensors are responsible for diagnosing the soil indicators such as temperature and humidity in order to have a proper planning of irrigation, sowing and fertilizing of crops. Soil diagnostic also aid in the selection of a crop in producing highest yield at lowest cost of production. Smart sensors commonly

used in Smart Greenhouse technology and Smart Farm technology (Titovskaia N. V. et al., 2020).

Nevertheless, most farmers in Malaysia still do not adopt IoT technology in crop farming due to lack of awareness, which can be one of the major challenges. In addition, other reasons may be due to higher setup and operating cost, lack knowledge of IoT or uneducated farmers and due to severe climate conditions that can lead to failures of IoT devices. Therefore, it is vital for IoT technology to be implemented in Malaysia as promises many benefits for various industry particularly the agricultural sector. This is because by applying IoT in agriculture, farmers can produce more high quality crops at lower price, to feed millions people in coming decades and to increase food production, which mirrors food security.

1.1.3 Corn Production in Malaysia

Malaysia is well known with varieties of corn production such as Sweet Corn and Grain Corn. Generally, corn is one of the most prominent crops and its production has been used for human consumption since this crop able to cultivated in rotation with other crops such as sweet potatoes, chillies and banana. During 16th century, the first types of corn was introduced, which is flint and dent is bought to Melaka, Malaysia. However, nowadays, almost all of state in Malaysia such as Perak, Selangor, and Johor has the corn cultivation farmers. In 2019, indicates that sweet corn cultivation in Malaysia has highest total among other cash crops in terms of planted area, harvested area and production (Figure 1.1).

JADUAL 1-5 (A): KELUASAN DAN PENGELUARAN TANAMAN LADANG, MALAYSIA MENGIKUT JENIS, 2019

Table 1-5 (A): Hectareage and Production Of Cash Crops, Malaysia by Types, 2019

Jenis Sayur *Types of Vegetables*	2019		
	Luas Bertanam *Planted area* (Ha)	Luas Berhasil *Harvested area* (Ha)	Pengeluaran *Production* (Mt)
Jagung Manis *(Sweet Corn)*	7,604.99	7,307.10	60,497.87
Kacang Tanah *(Ground Nut)*	93.51	86.59	261.70
Ubi Badak *( )*	0.20	0.20	3.23
Ubi Kayu *(Tapioca)*	2,876.68	2,454.91	42,285.29
Ubi Keladi *(Yam)*	669.30	559.70	3,590.64
Ubi Keledek *(Sweet Potato)*	3,417.73	3,318.68	56,343.47
Ubi Kentang *(Potato)*	2.70	2.00	44.00
Ubi Kemili *()*	2.80	2.80	9.89
Sengkuang *(Yambean)*	1,010.68	959.67	37,513.01
Tebu Kuning *(Sugar Cane)*	1,403.43	1,174.38	20,761.12
Jumlah *(Total)*	**17,082.02**	**15,866.03**	**221,310.21**

Figure 1.1: Hectareage and Production of Cash Crops

(Source: Department of Agriculture, Malaysia, 2019a)

1.1.4 Corn Production and Farmers in Perak

Sweet corn is such high-value crops and will be the key focus for farmers in Perak in order to increase income since corn farming could gain high profits to them. Datuk Seri Ahmad Shabery Cheek described “several studies are also being conducted on corn seed and the appropriate model to develop the industry as well as its ability to farmers increase farmers’ profit” (as cited in NST Online, 2016). As reported by Anem M. (2011), there are about 7 030 cash crops farmers in Perak with highest production of sweet corn, which is RM 118.3 million. Besides, Kinta district have the highest production value of sweet corn in 2019 compared to other districts in Perak (Figure 1.2).

DAERAH District	Jagung Manis (Sweet Corn)			
	Luas Bertanam *Planted area* (Ha)	Luas Berhasil *Harvested area* (Ha)	Pengeluaran *Production* (Mt)	Nilai Pengeluaran *Production Value* (RM '000)
BAGAN DATOH	-	-	-	-
BATANG PADANG	19.60	10.44	97.18	291.54
HILIR PERAK	-	-	-	-
HULU PERAK	0.85	0.75	6.80	20.40
KAMPAR	-	-	-	-
KERIAN	0.60	0.60	6.34	19.02
KINTA	2,207.16	2,207.16	19,995.62	59,986.86
KUALA KANGSAR	50.35	50.25	531.01	1,593.03
LARUT MATANG	9.20	9.20	74.81	224.44
MANJUNG	0.60	0.60	9.20	27.60
MUALIM	-	-	-	-
PERAK TENGAH	114.29	113.24	880.27	2,640.81
Jumlah Total	**2,402.65**	**2,392.24**	**21,601.23**	**64,803.70**

Figure 1.2: Hectereage, Production and Value of Production of Sweet Corn in Perak

(Source: Department of Agriculture, Malaysia, 2019b)

1.2 Problem Statements

The world's population is predicted to reach 10 billion people by 2050, which accounting for 80% of the global population. As a result, the rate of population growth will continue to increase as well as demand for food supply. Agriculture sector need to be more efficient in order to produce more crop production such as vegetables, fruit crops and cash crops to feed the increasing global population. Realising the importance of IoT as a tool for managing the risks and uncertainties in agriculture, it is crucial for farmers to improve and enhance their knowledge towards IoT. This is because some experts anticipate that IoT could help farmers to feed the world's population as this technology

provides sensors on farm equipment, self-driving tractors and drones, and GPS imaging for weather tracking to promote sustainable agricultural practices (Lohr, S., 2015).

Firstly, understanding farmers' intentions for dealing with agricultural task issues may help in encouraging the use of IoT technology amongst farmers. There are many difficulties faced by farmers in applying the IoT in agriculture due to several factors. For example, lack of knowledge about IoT, limited skills or expertise in agricultural practices, and little access to agricultural extension (Kutter, T. et al., 2011). Other major factors including negative opinions or perceptions towards IoT, small plantation field and poor organisation (Adnan, N. et al., 2017). Thus, all the important factors leading to the intention of farmers need to be identified to encourage the adoption of IoT technology.

Furthermore, the tendency for farmers to apply IoT technology is strongly linked to the geographical condition of farm and capital or resources. Morais, M. et al. (2018) stated that farmers who are struggling with financial problems or having an ineffective land preparation would have difficulty in implementing the IoT technologies because such factors are the necessity in technological adoption. Meanwhile for other researchers, farmers' capabilities and competencies are another concern towards new agricultural technologies, which lead to a significant impediment to successful adoption as well as reducing the farmers' job opportunities (Walter, A. et al., 2017).

Therefore, this study is mainly focuses on a better understanding to determine intention of corn farmers towards IoT and to identify most influential factors of corn farmers intention towards IoT for agricultural production in Perak.

1.3 Hypothesis

H_0: There is no significant value between the relationship of attitude, subjective norms and perceived behaviour control of corn farmers intention towards IoT for Agricultural production in Perak.

H_1: There is a significant value between the relationship of attitude, subjective norms and perceived behaviour control of corn farmers intention towards IoT for Agricultural production in Perak.

1.4 Research Question

1. What is the intention of corn farmers towards IoT for Agricultural production in Perak?
2. What are the significant relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for Agricultural production in Perak?
3. What is the most influential factor of corn farmers intention towards IoT for Agricultural production in Perak?

1.5 Objective of Study

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

1.6 Scope of Study

This study examines on corn farmers intention towards IoT for agricultural production in Perak by using purposive sampling methods. The survey questionnaire was distributed only to corn farmers in Perak. Next, the TPB used has independent variables and dependent variable. The independent variables for this study are attitude, subjective norm and perceived behaviour control. Meanwhile the corn farmers intention towards IoT for agricultural production in Perak as dependent variable.

1.7 Significance of Study

In this study, the results expected to give several beneficial effects for corn farmers in agricultural production. Firstly, farmers will be more knowledgeable towards IoT by applying this technology in order to improve their corn production performance in agriculture sector. Next, the adoption of IoT technologies can be a starting point for policymakers and stakeholders by developing effective strategies for corn farmers to enhance the agricultural productivity. In addition, researchers should propose a variety of IoT equipment for corn farmers so that farmers can easily track crop status information during different stages of crop in corn cultivation. Lastly, due to the growing market demand, government bodies also can maintain the food security by developing policies and guidelines for corn farmers towards the use of IoT technologies.

1.8 Organization of Study

Chapter 1: This chapter introduces research background of study, problem statements, hypothesis, research question, objective of study, scope of study and significance of study.

Chapter 2: This chapter covers the literature review from previous study regarding on the corn farmers intention towards IoT for agricultural production. Besides, this chapter provides related information based on understanding of this study.

Chapter 3: This chapter discusses the sampling techniques, research design and data analysis used in the theoretical framework and methodology.

Chapter 4: This chapter presents the findings from the data analysis, which include the analysis from corn farmers intention towards IoT for agricultural production, statistical test and summary.

Chapter 5: This chapter focuses on summarizing the findings, implementation and contribution of the study, as well as conclusion and recommendations for the future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this study, there are three objectives need to be identified which is intention of corn farmers towards IoT for agricultural production in Perak, the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak and the most influential factor of corn farmers intention towards IoT for agricultural production in Perak. Next, the related findings from previous study helps to analyse and interpret in supporting the research topic, research questions and hypothesis of study. In this study, main constructs from TPB regarding of attitude, subjective norm and perceived behavioural control was used in order to determine the corn farmers intention towards IoT for agricultural production in Perak.

2.1 Theoretical Framework

A theoretical framework is the application of a theory, or a collection of concepts taken from a single or similar theory to clarify a specific phenomenon or research problem. It is a framework that built based on a current theory in a field of research, which linked to and/or represents the hypothesis of a study. This is a blueprint that researchers often 'borrows' in order to build on study inquiry. In this study, the theoretical principle that have been used was Theory of Planned Behaviour (TPB), which provide the structures to define influential factors of corn farmers intention towards IoT for agricultural production in Perak based on attitude, subjective norm and perceived behaviour control.

2.1.1 Theory of Planned Behaviour

Theory of Planned Behaviour (TPB) by Ajzen, I. (1991a) assumes that human behaviour originates from individuals' intentions to perform a specific behaviour. There are three central psychological constructs including attitude, subjective norm and perceived behavioural control, which determine an individual's intention in TPB. As a result, the stronger a person's intention, the tendency to perform particular behaviours (Cheung et al., 2017). In addition, the TPB constructs has also been verified by few researchers and proved to be helpful in determining behavioural intention of an individual (Alavion et al., 2017).

Attitude is described as a positive and negative assessment of an individual's performance (Paul et al., 2016). For instance, the attitude of an individual towards IoT will increase the intention level of farmers towards IoT for agricultural production. This indicates attitude of an individual or other agricultural extension agent towards Iot will encourage corn farmers to receive information and facilitate the act of providing information by using IoT technology.

Subjective norm represents the intention or idea that a given behaviour is more or less expected by the people who are important to the decision-maker. For example, influences from other people may alter the intentions or beliefs of corn farmers regarding the IoT technologies. It was observed by Park, H. S. (2000), the TPB propose that individuals or groups adapt their opinions or change their behaviours as a result of social interactions with other individuals, such as family members, neighbours, and relatives.

Perceived behaviour control was person's readiness of ability in performing behaviours (Liobikienė et al., 2016). Based on this study, individual behaviour towards IoT for agricultural production influenced by attitude, subjective norm and perceived behaviour control.

Figure 2.1 depicts the Ajzen's Theory of Planned Behaviour (TPB), which includes three main constructs that influence individual's intention and behaviour.

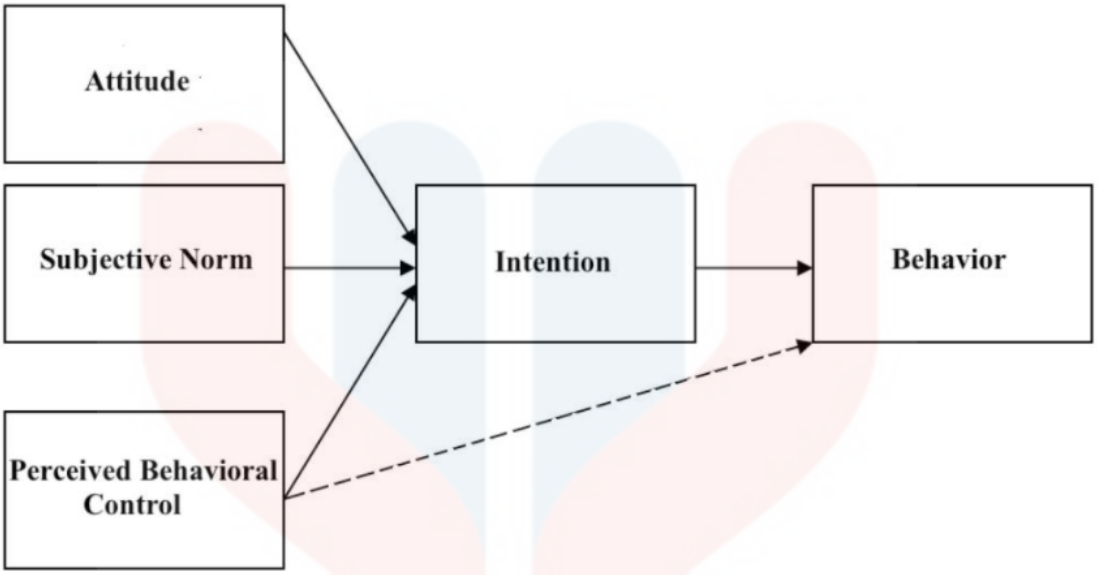

Figure 2.1: Theory of Planned Behaviour (Ajzen, 1991b)

2.2 Corn Farmers Intention towards IoT in Agricultural Production

Farmers' intention to use new concept or technology is mainly determined by its system including practicable, easy to use and affordable (Wang et al., 2006). In agriculture sector, IoT has been contributed to the improvement of precision agriculture, and being applied in smallholder agriculture (Ayaz, M. et al., 2019). IoT technology could help farmers in order to improve and increase agricultural productivity as well as saving time and money. Farmers' intention is the knowledge and behavior of farmers regarding something (Maswadi, O.S. et al., 2018). Intention is described where a person receives information from surroundings and transforms it into psychological awareness. In addition, there will be more opportunities for farmers to participate in global market and

improved crop returns and incomes once the intention to adopt new agricultural technology (Asfaw, S. et al., 2011).

2.3 The Relationship of Attitude, Subjective Norm and Perceived Behaviour Control of Corn Farmers Intention towards IoT for Agricultural Production

Assessing farmers' intentions and attitudes during uncertain conditions are crucial factors in determining decision (Akcaoz & Ozkan, 2005). The risks faced by corn farmers may be due to financial constraints, limitation of IoT adoption, decline in stability of production and economic conditions in agriculture. High farmers' intention on the risk reduce their perception toward technology's advantages. In addition to risks, the attitude of corn farmers can also be described in terms of poor decision making, still rely on traditional methods to manage farm and lack of knowledge towards IoT. This is important to understand and identify the intention of farmers regarding attitude towards IoT in order to have a stability of farming conditions. This is because the results offered by IoT in agricultural sector can be positive or increase in farmers' attitude (Saiz-Rubio, V., & Rovira-Más, F., 2020). However, inadequate information on farmers' attitudes and intentions give challenges for researchers and policy makers to develop successful management system at the farm level.

Next, subjective norms are generally the peer pressure whether from family members, fellow farmers or even extension farm staff. Besides, the subjective norms of corn farmers, which is created by social environment itself through interaction and communication with others, may influence farmers' intention towards IoT. Due to

pressure from subjective norms, they can communicate, exchange ideas and experiences, and access new knowledge between farmers. Therefore, these constant interactions affect farmers' beliefs, decisions, and behaviours (Jacques et al., 2018).

Perceived behavioural control is defined as the intentions of an individual towards ease or difficulty in performing that behaviour. Hence, farmers intention towards IoT may increase due to effectiveness or advantages of IoT technology used for agricultural production (Bir et al., 2018).

In addition, it shows that intention of farmer towards IoT could positively influence perception of farmers by measuring attitude, subjective norm and perceived behaviour control of farmer. For instance, recent analysis (Ali, M., Man, N., Farrah, M. M., & Omar, S. Z., 2020) showed that there were positive relationship between attitude, subjective norm and perceived behaviour control, which statistically able to predict behavioural intention of farmers.

2.4 The Most Influential Factor of Corn Farmers Intention towards IoT for Agricultural Production

Based on farmers intention towards IoT, several significant factors that influence farmers intention regarding the IoT adoption in agriculture including attitude, social norms and perceived behaviour control. This can be refers due to low education level, negative intentions towards IoT, as well as low motivation and willingness to adopt the technologies. Also, some farmers may act rationally and intentions may be influenced by knowledge, economic situation and farm enterprises.

As intention can be influenced by attitude of farmers, hence it is crucial for farmers to have an ideal attitude regarding higher level of knowledge towards IoT to have better agricultural management system. This is because current use of IoT technologies in agriculture nowadays make the farm process more effective on monitoring and controlling agricultural parameters. Besides, knowledge is one of traditional factors, which plays a critical role in crop production. To address the current attitude related on farmer's knowledge, should accordingly more focuses on IoT technologies that have been developed in country that can maximize profitability on crop cultivation. In addition, farmers that practice crop management using IoT also will reduce cost in field of agriculture since there are no human interaction and power utilization required.

Nevertheless, education and technology adoption are supposed to have a positive relationship especially those linked to IoT (Carrer et al., 2017 & Feder et al., 1985). For instance, higher education levels can improve farmers' ability to process information and make decisions. Hence, adoption of IoT by farmers has best effects on productivity and make agriculture more sustainable. This is because the first step in technology adoption process should access to information or knowledge (Rogers, 2003).

2.5 Chapter Summary

This chapter discussed by the previous researcher about corn farmers' intention towards IoT in agriculture production in Perak. The first section in this chapter shows the theoretical framework, which analyse the result for this study. The second section was told about TPB model used in this thesis which attitude, subjective norm and perceived

behaviour control as corn farmers' intention towards IoT in agriculture production in Perak. Third section was the studies from the previous research about the level of corn farmers' intention towards IoT in agriculture production in Perak. Next section was indicated the relationship of attitude, subjective norm and perceived behaviour control towards corn farmers' intention towards IoT for agricultural production in Perak. The last section shows about the most influential factor of corn farmers' intention towards IoT for agricultural production in Perak.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter explained the methodology used in order to achieve the objectives of this study. There are three sections in this chapter where the first section, described the conceptual framework used for this study. Then, the second section will be explained about the data and questionnaires used to distributed to corn farmers for agricultural production in Perak. Next, the third section explained the analysis used to achieve the objectives of descriptive analysis, reliability test, Pearson correlation analysis, factor analysis and partial least squares structural equation modelling.

3.1 Conceptual Framework

In order to achieve the objectives outlined previously, the Theory of Planned Behaviour (TPB) selected in this study was essentially to analyse the most significant factor and relationship between corn farmers intention towards IoT for agricultural production in Perak. The TPB model was suitable and correlated to the objectives, which is to investigate the relationship of attitude, subjective norm and perceived behaviour control on corn farmer intention towards IoT for agricultural production, to determine the corn farmers intention towards IoT for agricultural production and to identify the most influential factor of corn farmers intention towards IoT for agriculture production in Perak. As a result, the modified TPB model (in Figure 3.1) was implemented and used in this study as conceptual model including attitude, subjective norm and perceived behaviour control on corn farmers intention towards IoT for agricultural production.

Firstly, attitude is the first independent variable in TPB model that influence corn farmers intention towards IoT for agricultural production in Perak. Attitude is refer to as the level of implementation of farmer's behaviour that is judged either positively or negatively. In the case of attitude that influence corn farmers intention towards IoT, can be emphasized that each belief links the behaviour with particular outcome or attributes of IoT technology itself. Besides, other related factors that influence farmers intention towards IoT may due to farm size, level of knowledge, agricultural participation and communication exposure.

Next, subjective norm is the corn farmers intention due to social pressure upon them in making decision whether to apply or not IoT technologies for agricultural production. Generally, subjective norm is determined by the social pressure from others,

which an individual should behave in a certain manner to conform with those people's views. Since IoT are relatively new technologies, corn farmers may not have enough feedback regarding its application. Therefore, preferences or expectations from others are very significant as farmers' play major role in IoT adoption. Meanwhile perceived behaviour control refers the intention of corn farmers on own ability to implement the IoT for agricultural production in Perak.

As aforementioned, all these independent variables in TPB conceptual model are expected to determine corn farmers intention towards Internet of Things (IoT) for agricultural production while dependent variable is the intention of corn farmers towards Internet of Things (IoT) for agricultural production.

Figure 3.1 shows the conceptual framework of Theory Planned Behaviour (TPB) model with application to intention of corn farmers towards Internet of Things (IoT) for agricultural production in Perak.

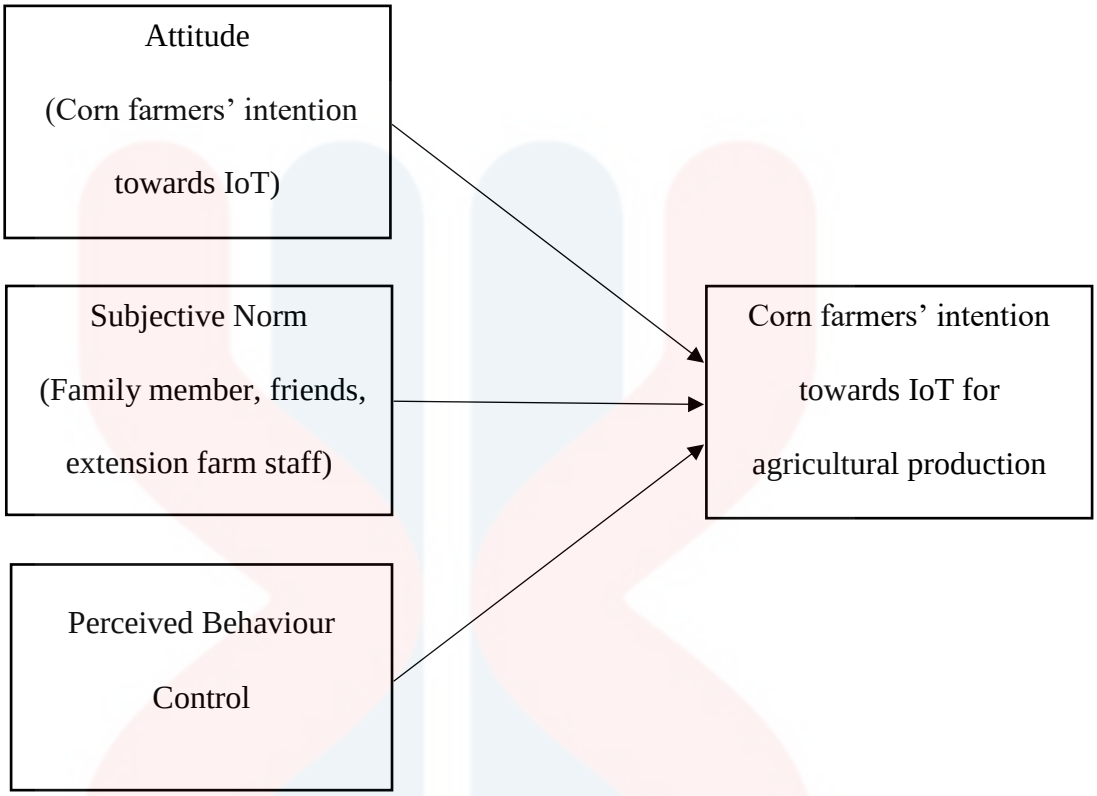

Figure 3.1: Conceptual Framework of Theory Planned Behavior Model

(Source: Adapted model from Ajzen, 1991c).

3.2 Data Collection

Data collection is described as a systematic process of preparing and collecting data from various sources that has been observed and recorded to obtain information and make decisions. This study was conducted in Perak during May 2021. The data used in this study was collected from a sample of 50 respondents. This rule was to select a sample size larger than 30 respondents and not more than 500 respondents (Sabir, Safdar, Khurshid, & Hafeez, 2014). To conduct survey among the respondents, a set of

questionnaire survey is distributed to determine the corn farmers intention towards IoT for agricultural production, the relationship between attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production and the most influential factor of corn farmers intention towards IoT for agricultural production.

3.2.1 Sampling Methods

This study was designed for corn farmers in Perak to determine respondents' intention towards Internet of Things (IoT) for agricultural production. The survey was targeted towards farmers who focused on producing and marketing the corn crop to identify their intention towards IoT for agricultural production. The sampling method used was purposive sampling method, which only distributed to corn farmers in Perak. Purposive sampling technique which known as nonprobability sampling techniques that used to select the sample of subjects from the population (Etikan et al., 2016).

3.2.2 Sample Size

The number of sample size in this study is 50 respondents of corn farmer in Perak. Comrey and Lee described that the sample size of 50 is very poor, 100 is poor, 200 is reasonable, 300 is good, 500 is very good and 1000 is excellent for research data collected via survey (as cited in Rahi, 2017).

3.2.3 Source of Data

Primary and secondary data was used in this study to explore the intention of corn farmers towards IoT. The primary data is a survey instrument collected from respondents including demographic questions and four sections of Likert scale statements. Meanwhile the secondary data was collected from various sources such as government departments' portal and university research journal that related to this study in order to have access to adequate documentation from the original study (Johnston, M., 2014).

3.2.4 Instrument Method

This questionnaire survey was prepared for corn farmers to determine their intention towards IoT for agricultural production in Perak. The questionnaire was designed according to previous research which related or similar to this study. Besides, the questionnaire constructed is based on the problem statements and literature review including the socio-demographic characteristics of corn farmer. Furthermore, the elements that influence the intention towards Internet of Things are attitude, subjective norm and perceived behaviour control. These elements is significant to determine the corn farmers intention towards IoT for agricultural production. In this study, the questionnaire was comprised into:

Section A: Demographic information about corn farmers intention towards IoT for agricultural production that related to study which comprise sex, gender, age, education level, race, religion, agricultural experience and family background.

Section B: The question based on intention of corn farmers towards IoT for agricultural production in Perak.

Section C: In this section, the question divided into three parts, which are attitude, subjective norm and perceived behaviour control:

a) Part 1: Attitude of corn farmer for agricultural production in Perak.

b) Part 2: Subjective norm of corn farmers, which influence the intentions of corn farmer towards IoT for agricultural production in Perak.

c) Part 3: Perceived behaviour control of corn farmer towards IoT for agricultural production in Perak.

The questions regarding the intention, attitude, subjective norm and perceived behaviour control of corn farmer is designed in form of a Likert scale, ranging from "strongly agree" to "strongly disagree" (worth 5 to 1) of each set of questions about the stimulus object (Malhotra, 2006).

3.2.5 Pilot Study

A previous research study was conducted using a similar type of questionnaire for corn farmers in Perak. The questionnaire in this study was tested before being used and was conducted on a small sample of corn farmer population in Perak to verify the questionnaire is reliable and to achieve desired outcomes. About 50 respondents have answered the questionnaire, which is sufficient to determine and measure the questionnaire's viability. The data was analyzed using the Statistical Package for the Social Science (SPSS) to determine whether the questionnaire is acceptable and easy to understand before it is distributed to the corn farmers in Perak.

3.3 Data Analysis

Data analysis is an integrated part of research design including process of cleaning, analysing, interpreting and modelling data by using analytical and statistical data analysis. By using the SPSS software, data collected can easily generate graphs or tables from descriptive statistics in terms of frequency, mean, standard deviation and percentage. In this study, inferential statistical analysis used was Reliability Test, Pearson's Correlation Analysis and Factor Analysis.

3.3.1 Descriptive Analysis

Descriptive analysis was used to analyse the data acquired by describing the objects studied through the sample or population as they are without interpreting and making general conclusions (Sugiyono, 2014). Besides, it also includes methods of data visualisation and description, which is to determine the demographic background of corn farmer by using graphs and charts. In this study, the data was analysed based on intention of farmer, attitude, subjective norm and perceived behavior control towards IoT for agricultural production.

3.3.2 Reliability Test

Reliability is a major concern when a psychological test was used to measure some attribute or behaviour (Rosenthal & Ronow, 1991). In this study, reliability test was used to measure the reliability or quality of primary data. The multiple Likert scale questions regarding the independent variables of study is measure by Cronbach's alpha using SPSS statistics. The Cronbach's alpha normal range values are usually between .00 and 1.00, which higher values indicate higher reliability. Table 3.1 shows alpha coefficients for all variables which is greater than 0.70. Hence, the reliable variable accepted if the Cronbach Alpha values at least 0.7 or more (Taber, 2018).

Table 3.1: Reliability Analysis

Constructs	No of items	Pilot Study (Cronbach Alpha)
Intention	8	0.840
Attitude	8	0.812
Subjective Norm	8	0.747
Perceived Behaviour Control	8	0.771

3.3.3 Correlation Analysis

The relationship between two variables, the independent and dependent variables was quantified using correlation analysis. The strength of linear association between two variables can be estimate through correlation coefficient, which ranges normally between -1 and +1 while the sign of correlation coefficient between the two variables can be positive or negative. Types of correlation coefficients including Pearson Correlation, Spearman Correlation and Kendall Correlation. In this study, the Pearson Correlation analysis is used to measure the relationship between variables.

3.3.3.1 Pearson Correlation Analysis

Pearson Correlation Coefficient (r) is used to measure the strength and direction of linear relationship between two variables. In this study, Pearson correlation coefficient was used to measure the relationship between dependent variable and independent

variable that influencing corn farmers' intention towards IoT for agricultural production. Besides, Pearson Correlation Coefficient, the r-values ranging from -1 to 1, where the -1 is a negative correlation and correlation of 1 is a positive correlation. Table 3.2 shows the strength of the relationship between the two variables was determined using correlation coefficients (Zou, K. H. et al., 2003).

Table 3.2: Strength of the relationship between the two variables using Pearson correlation coefficient (r)

No	Coefficient (r)	Direction and Strength of Correlation
1.	-1	Perfectly negative
2.	-0.8	Strongly negative
3.	-0.5	Moderately negative
4.	-0.2	Weakly negative
5.	0	No association
6.	0.2	Weakly positive
7.	0.5	Moderately positive
8.	0.8	Strongly positive
9.	1	Perfectly positive

3.3.4 Factor Analysis

Factor analysis was used to discover whether the two variables are relatively independent of one another. The main purpose of this technique is to reduce large number of variables to smaller number of factors and to classify variables by detecting structure in a relationship between the variables. In this study, the factor analysis used to determine the most influential factor of corn farmers intention towards IoT for agricultural production in Perak. Before analysing the factor analysis, Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity was used to determine the sampling adequacy and strength of the relationship among variables. For a satisfactory factor analysis, Kaiser (1974) recommended that 0.5 as minimum (barely accepted), values between 0.7 – 0.8 acceptable and values above 0.9 are superb. Also, the total variance explained for factor analysis should be between 50% and 90% (Dawson, J. F., 2017). If the KMO value is > 0.6 and Bartlett's test of Sphericity is .000 < 0.05, this indicates that factor analysis is rational for this study (Hadi et al., 2016).

3.3.5 Partial Least Squares Structural Equation Modeling (PLS-SEM)

In this study, Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to estimate the research model since it does not require big sample size and multivariate normal distribution. Partial Least Squares Structural Equation Modelling (PLS-SEM) known as multivariate analysis technique that was increasingly used in

research (Richter et al., 2016). Besides, PLS-SEM is suitable for the study since the objectives are prediction-oriented and able to evaluate the relationship with number of constructs and items.

Next, Confirmatory Factor Analysis (CFA) was used to determine the validity of the measured variables representing the constructed model (Hoofs et al., 2018). By using the Analysis of Moment Structures (AMOS) software, CFA can be used to determine the whether the factor structure required modification. Modification indices are suggestions made by AMOS for paths that can be entered into the model to improve the goodness of-fit (Kline, 1998). Moreover, the Standardized Root Mean Square Residual (SRMR) and chi-square value was used to test the model fit. If the value of SRMR < 0.08 this shows that the models was good and fits with the variables (Olutende, Wamukoya, & Wanzala, 2019a). The chi-square used to determine the significance values of the results and identify whether the distribution values match the theoretical distribution (Statistics Solution, n.d.).

3.4 Chapter Summary

This chapter showed the research design where it was explained about how the research has been conducted. There was five analysis used in this research in order to interpret or analyse the data which are descriptive analysis, reliability test, Pearson correlation analysis, factor analysis and partial least squares structural equation modelling.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

For this study, this chapter explained the results and discussion of the study. The study conducted with 50 corn farmers in Perak using the purposive sampling method where corn farmers who participate in agricultural production was selected. In this study, the data collected were used for further analysis. The analysis used discusses the objectives of the study that determine the level intention of corn farmers towards IoT for agricultural production in Perak, investigate the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak and identify the most influential factor of corn farmers intention towards IoT for agricultural production in Perak.

4.1 Demographic Profile of Corn Farmers

Descriptive analysis was used in this study to analyse the demographic profile of corn farmers in Perak which to summarize their socio-demographic information. For instance, age, gender, district, race, marital status, education level, total of farm workers, monthly income, farm size, any participation or working experience in the agricultural sector, the reason for being a farmer and type of IoT use in agricultural production.

According to Table 4.1, it shows that the age of corn farmers are mostly from 20 – 29 years old, which is 21 people (42%) while the remaining of 10 people (10%) at the age of 30 – 39 years old, 16 people (32%) at the age 40 – 49 years old and 3 people (6%) at the age of > 50 years old. The majority of corn farmers who participate in agricultural production in Perak are male farmers with 35 people (70%) and female farmers are only 15 people (30%). Next, Table 4.1 states that most of the corn farmers come from Kinta district, which 13 people (26%), while the remaining come from Bagan Datuk and Kampar district with 3 people (6%), 1 people (2%) from Batang Padang, 9 people (18%) from Hilir Perak, 4 people (8%) from Hulu Perak and Manjung, 2 people (4%) from Kerian, 5 people (10%) from Kuala Kangsar, and 6 people (12%) from Perak Tengah. There are no data available of corn farmers coming from Muallim, Larut, Matang and Selama districts.

Besides, the race of corn farmers who participated in this study mostly are Malays with 49 people (98%) and only 1 person (2%) is Chinese. However, no such Indian people were reported to have participated in answering this survey. Regarding the educational level, most of corn farmers are Undergraduate (Bachelor's Degree), which is 23 people (46%), meanwhile 11 people (22%) have SPM, 13 people (26%) have STPM / A-Level /

Diploma / Matriculation and last 3 people (6%) have SRP / PMR / PT3 background. There are no data available of corn farmers who have Master's Degree and PhD background in this study.

Table 4.1 shows the number of farm workers with < 10 people owned by corn farmer, which is 35 people (70%). Then, followed by a group of 11 – 15 people with 11 people (22%), a group of 16 – 20 people with 3 people (6%) and a group of > 20 people with only 1 person (2%). Apart from that, the monthly income of corn farmers is mostly between RM 1001 – RM 3000, which is 35 people (70%) while the remaining of 9 people (18%) are < RM 1000, and only 3 people (6%) with both monthly income of RM 3001 – RM 5000 and > RM 5001 respectively. In terms of farm size, about 20 people (40%) have only < 1 acre, meanwhile 19 people (38%) have 1 – 4 acres, 8 people (16%) have 5 – 9 acres, 1 person (2%) have 10 – 19 acres and only 3 people (6%) have > 20 acres of farm size.

In this study, about 24 people (48%) had no participation /working experience in agricultural sector. However, the highest number of corn farmers who participated in the agricultural sector for 1 – 10 years is about 20 people (40%), while the remaining only 5 people (10%) participated for 11 – 20 years, 1 person (2%) participated for 21 – 30 years and no one has been participated in the agricultural sector for over 31 years. Next, Table 4.1 shows that about 29 people (58%) had chosen interest as their reason to become a farmer while 15 people (30%) choose social impact (family member & friends) and 8 people (16%) choose no suitable occupation which caused them to become farmers. Lastly, regarding the type of IoT use, most of corn farmers use agriculture drone with 25 people (50%), followed by 24 people (48%) use smart green house and 12 people (24%) use automatic tractor. However, only 2 people (4%) use manual tractor owned by the corn farmers.

Table 4.1: The Demographic Profile of Corn Farmers in Perak

Variables	Frequency	Percentage (%)
Age		
> 20 years old	0	0
20 – 29 years old	21	42
30 – 39 years old	10	10
40 – 49 years old	16	32
> 50 years old	3	6
Gender		
Male	35	70
Female	15	30
District		
Bagan Datuk	3	6
Batang Padang	1	2
Hilir Perak	9	18
Hulu Perak	4	8
Kampar	3	6
Kerian	2	4
Kinta	13	26
Kuala Kangsar	5	10
Larut, Matang & Selama	0	0
Manjung	4	8
Muallim	0	0
Perak Tengah	6	12
Race		
Malays	49	98
Chinese	1	2
Indians	0	0
Marital Status		
Single	24	48
Married	22	44
Divorced	3	6
Widowed	1	2
Education Level		
SRP / PMR / PT3	3	6
SPM	11	22
STPM / A-Level / Diploma / Matriculation	13	26
Undergraduate (Bachelor's Degree)	23	46
Postgraduate (Master's Degree, PhD)	0	0
Farm Worker		
< 10 people	35	70
11 – 15 people	11	22
16 – 20 people	3	6
> 20 people	1	2
Monthly Income		
< RM 1000	9	18
RM 1001 – RM 3000	35	70
RM 3001 – RM 5000	3	6
> RM 5001	3	6

Farm Size		
< 1 acre	20	40
1 – 4 acres	19	38
5 – 9 acres	8	16
10 – 19 acres	1	2
> 20 acres	3	6
Any participation/working experience in agricultural sector, if yes how many years?		
1 – 10 years	20	40
11 – 20 years	5	10
21 – 30 years	1	2
Above 31 years	0	0
No	24	48
Reason become a farmer		
Interest	29	58
Social impact – family member & friends	15	30
No suitable occupation	8	16
Type of IoT use		
Agriculture Drone	25	50
Automatic Tractor	12	24
Smart Green House	24	48
Others	2	4

(Source: Survey, 2021)

4.2 Level Intention of Corn Farmers towards IoT for Agricultural Production

In this study, the first objective was to determine the level intention of corn farmers towards IoT for agricultural production in Perak. Based on Table 4.2, it shows the mean score and standard deviation of the level intention of corn farmers, where the mean score was divided into three categories, low levels (1.0 - 2.33), moderate (2.34 - 3.66) and high (3.67 - 5.0).

For the first statement "I intend to use IoT technology in my corn farming for agricultural production in Perak", the mean score is (M=4.54, SD=0.542) with (2%) average, (42%) agree and (56%) strongly agree. This indicates that corn farmers in Perak

are more likely to use IoT technology in their corn farming rather than using traditional techniques to manage their corn production. For example, the statement "Positive and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT" shows a mean score (M=4.54, SD=0.646) with (8%) average, (30%) agree and (62%) strongly agree.

Next, most of corn farmers chose to agree (40%) and followed by (56%) strongly agree for the statement "I think using IoT technology in corn farming can increase more production than before" with a mean score (M=4.52, SD=0.580) . This is because IoT technologies applied in corn farming has the ability to perform rapidly with highly efficient indicators in order to increase the corn production. For the statement "I will put more effort in learning and using the IoT technology for my future farming practices", the mean score is (M=4.56, SD=0.541) with (2%) average, (40%) agree and (58%) strongly agree. This is because some of corn farmers currently have limited access to private or public extension as well as lack of information related to the use of IoT in agriculture.

Furthermore, majority of corn farmers in Perak chose the average option (6%), agree (28%) and (66%) voted strongly agree for the statement "My high intention in corn farming can help to achieve my target to produce more yield production in Perak" with a mean score (M=4.60, SD=0.606). This is because having strong intention will lead to a better result in conducting an activity. Meanwhile for the statement "I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop", the mean score is (M=4.48, SD=0.677) with (10%) average, (32%) agree and (58%) strongly agree. This finding implies that IoT influences corn farmers' intention since they are aware of its ability to promote high-quality crop production.

Moreover, corn farmers chose the disagree option (2%), average (12%), agree (34%) and (52%) voted strongly agree for the statement "The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Perak" with a mean score (M=4.36, SD=0.776). Then, the statement "IoT can help me to attract more customers and buyers to purchase more good quality of corn production in Perak", the mean score is (M=4.40, SD=0.728), where most of the corn farmers chose the disagree option (2%), average (8%), agree (38%) and (52%) voted strongly agree. From the point of view of these last two statements, it can be assumed that farmers with strong intentions towards the potential and benefits of IoT are likely endorse farmers' decisions to adopt the IoT technology.

Overall, the results for this objective determine high mean score with the total (M=4.500, SD=0.637) and indicates a high mean level according to the mean level which is 3.67 - 5.0. Therefore, the first objective in this study was achieved due to the high-level intention of corn farmers towards IoT for agricultural production in Perak.

Table 4.2: Mean Score of Level Intention of Corn Farmers towards IoT for Agricultural Production in Perak

Statement	**Percentage (%)**					**Mean**	**S.D**	**Level**
	1*	**2***	**3***	**4***	**5***			
I intend to use IoT technology in my corn farming for agricultural production in Perak.	0	0	2	42	56	4.54	0.542	High
I think using IoT technology in corn farming can increase more production than before.	0	0	4	40	56	4.52	0.580	High
My high intention in corn farming can help to achieve my target to produce more yield production in Perak.	0	0	6	28	66	4.60	0.606	High
I will put more effort in learning and using the IoT technology for my future farming practices.	0	0	2	40	58	4.56	0.541	High

Positive and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT.	0	0	8	30	62	4.54	0.646	High
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	10	32	58	4.48	0.677	High
The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Perak.	0	2	12	34	52	4.36	0.776	High
IoT can help me to attract more customers and buyers to purchase more good quality of corn production in Perak.	0	2	8	38	52	4.40	0.728	High
Total mean score						4.500	0.637	High

*Indicator: 1. Strongly Disagree; 2. Disagree; 3. Average; 4. Agree; 5. Strongly Agree
Notes: mean values correspond to 1.0 - 2.33: Low; 2.34 - 3.66: Moderate; 3.67 - 5.0: High.
(Source: Survey, 2021)

4.3 The Relationship of Attitude, Subjective norm and Perceived Behaviour Control of Corn Farmers Intention towards IoT for Agricultural Production

The analysis used to investigate the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production is Pearson Correlation Analysis. In this study, the independent variables were attitude, subjective norms and perceived behaviour control while the dependent variable was the intention of corn farmers towards IoT for agricultural production. The main purpose of this study was to investigate the hypothesis of the relationship of attitude, subjective norms and perceived behaviour control with corn farmers' intention towards IoT for agricultural production.

The H_o shows that there was no significant value between the relationship of attitude, subjective norms and perceived behaviour control with corn farmers' intention towards IoT for agricultural production in Perak whereas the H_1 shows that there was significant value between the relationship of attitude, subjective norms and perceived behaviour control with corn farmers' intention towards IoT for agricultural production in Perak. The strength of the relationship between the dependent and independent variables can be determined based on Table 3.2.

Based on Table 4.3, it shows a strongly positive correlation of attitude with the intention of corn farmers towards IoT for agricultural production which the value of r=0.764 and significant at 0.01 level (2-tailed). As mentioned by Garforth et al. (2004), farmers' intentions to use a technology is highly influenced by their attitude towards it. Similarly, there was also a significant relationship between farmers' attitude and intention, which shows an understanding of the advantages of adopting agriculture technology (Saengavut, V. et al., 2021). Hence, attitude are considered to have a substantial positive correlation with farmers' intention as this would encourage farmers to adopt the IoT technology.

Furthermore, the subjective norm relationship towards intention indicates a moderately positive correlation at the value of r=0.522 and significant at 0.01 level (2-tailed). Burton (2004) stated that individuals' intentions are influenced by subjective norms since they do not act freely of cultural and social influences, but keep referring to their relevant groups such as family, friends, extension agents and government. This is because farmers also need to get the consent and opinions shared within the groups to gain benefit from people's expertise and knowledge. For example, Borges et al. (2014) found that subjective norm which represents the family member had the highest

correlation with farmers' intention to adopt the innovation as it plays an important role on farmer's decision.

In addition, Table 4.3 shows a moderately positive correlation of perceived behaviour control with the corn farmers intention towards IoT for agricultural production which r=0.673 with significant value at 0.01 level (2-tailed). Despotović et al. (2019) discovered that perceived behavioural control was found to be an important factor influencing the farmers' intention to adopt sustainable agriculture practices. This is because farmers will adopt new technology once they have higher perceived control as well as stronger intention (Ajzen et al., 1986).

In this study, the relationship of attitude, subjective norm, and perceived behavioural control with corn farmers intention towards IoT for agricultural production has a positive relationship. As a result, H_1 is accepted while H_0 is rejected in this study.

Table 4.3: Result of Pearson Correlation Analysis

		Attitude	**Subjective Norm**	**Perceived Behavioural Control**
Intention among corn farmers towards IoT for Agricultural Production in Perak	**Pearson Correlation**	.764**	.522**	.673**
	Sig.(2-tailed)	.000	.000	.000

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

(Source: Survey, 2021)

4.4 The Most Influential Factor of Corn Farmers Intention towards IoT for Agricultural Production

The third objective of this study was to identify the most influential factor of corn farmers intention towards IoT for agricultural production by using factor analysis. According to the Table 4.4, the Keiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of Sphericity for all variables showed values for attitude (0.842), subjective norms (0.598) and perceived behaviour control (0.812) from corn farmers intention towards IoT for agricultural production is greater than 0.5. As reported by Napitulu et al. (2017), if the KMO test value was more than 0.5, the data was acceptable for future study. Hence, this shows that the results of this study were significant.

Table 4.4: KMO and Bartlett's Test

		Attitude	**Subjective Norm**	**Perceived Behaviour Control**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.842	.598	.812
Bartlett's Test of Sphericity	**Approx. Chi-Square**	119.170	130.996	128.025
	df	28	28	28
	Sig.	.000	.000	.000

(Source: Survey, 2021)

4.4.1 Attitude of Corn Farmers Intention towards IoT for Agricultural Production

The first factor in this study was attitude, which consisted of eight statements with only seven of them scoring above 0.5, measured by using in a Likert scale, ranging from "strongly agree" to "strongly disagree" (worth 5 to 1). Based on Table 4.5, the result shows the factor analysis of attitude towards Perak corn farmer intention for agricultural production where 0.721 for "Internet of Things (IoT) for agricultural production in Perak is very important to me as a farmer", 0.785 for "I make sure that my corn production in Perak will be recognized by the public when using IoT technology", 0.613 for "The use of IoT technology is crucial for me to increase corn production in agriculture", 0.636 for "The emergence of IoT technology makes me realize how important the technology is in agricultural production", 0.772 for "I am not afraid of using IoT technology in my corn farming", 0.628 for "I am looking for suitable methods and farming practices for agricultural production towards IoT technology", 0.412 for "Choosing the right IoT technology is necessary for me before venturing into agriculture field" and 0.764 for "I will take the challenge as a farmer to apply IoT technology in my farming practices" statement. Therefore, this result showed that Perak corn farmer was most influenced by attitude. For attitude factors, the percentage of variance explained were 45.765%.

Table 4.5: Factor Analysis of Attitude of Corn Farmers Intention towards IoT for Agricultural Production in Perak

Statement	Factor Loading
Internet of Things (IoT) for agricultural production in Perak is very important to me as a farmer.	0.721
I make sure that my corn production in Perak will be recognized by the public when using IoT technology.	0.785

The use of IoT technology is crucial for me to increase corn production in agriculture.	0.613
The emergence of IoT technology makes me realize how important the technology is in agricultural production.	0.636
I am not afraid of using IoT technology in my corn farming.	0.772
I am looking for suitable methods and farming practices for agricultural production towards IoT technology.	0.628
Choosing the right IoT technology is necessary for me before venturing into agriculture field.	0.412
I will take the challenge as a farmer to apply IoT technology in my farming practices.	0.764
Variance (percent of explained)	45.765

(Source: Survey, 2021)

4.4.2 Subjective Norms of Corn Farmers Intention towards IoT for Agricultural Production

The second factor in this study was subjective norms, which consisted of eight statements with only seven of them scoring above 0.5, measured by using in a Likert scale, ranging from "strongly agree" to "strongly disagree" (worth 5 to 1). Based on Table 4.6, the result shows the factor analysis of subjective norm towards Perak corn farmer intention for agricultural production where 0.616 for “My family members prefer me to use IoT technology in corn farming”, 0.703 for “My friends will give support and agree with my decision to start using IoT technology for my farming practices”, 0.659 for “The social influence in agriculture sector makes me want to use the implementation of IoT in my farming practices”, 0.377 for “Government support and advertising influence me to get involved in using the IoT for my corn production”, 0.730 for “Workshop or seminar makes me want to participate in learning more about implementation of IoT in agricultural production”, 0.717 for “Media information influence me that corn production produced from IoT technology is better than traditional farming”, 0.450 for “Experts in agricultural

sector motivate and support me to produce and manage corn production using IoT technology" and 0.558 for "By using IoT technology in corn production will enable me to obtain external loans" statement. The percentage of variance explained were 37.638%.

Table 4.6: Factor Analysis of Subjective Norms of Corn Farmers Intention towards IoT for Agricultural Production in Perak

Statements	Factor Loading
My family members prefer me to use IoT technology in corn farming.	0.616
My friends will give support and agree with my decision to start using IoT technology for my farming practices.	0.703
The social influence in agriculture sector makes me want to use the implementation of IoT in my farming practices.	0.659
Government support and advertising influence me to get involved in using the IoT for my corn production.	0.377
Workshop or seminar makes me want to participate in learning more about implementation of IoT in agricultural production.	0.730
Media information influence me that corn production produced from IoT technology is better than traditional farming.	0.717
Experts in agricultural sector motivate and support me to produce and manage corn production using IoT technology.	0.450
By using IoT technology in corn production will enable me to obtain external loans.	0.558
Variance (percent of explained)	37.638

(Source: Survey, 2021)

4.4.3 Perceived Behaviour Control of Corn Farmers Intention towards IoT for Agricultural Production

For the last factor in this study was perceived behaviour control, which consisted of eight statements with only seven of them scoring above 0.5, measured by using in a Likert scale, ranging from "strongly agree" to "strongly disagree" (worth 5 to 1). Based on Table 4.7, the result shows the factor analysis of perceived behaviour control towards

Perak corn farmer intention for agricultural production where 0.692 for "If I want, I can produced more corn production yield using IoT technology", 0.842 for "Using IoT technology in my corn farming is more cost effective and can increase productivity", 0.507 for "IoT in corn farming can ensure consumer trust upon the health and safety of corn production", 0.135 for "I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn", 0.707 for "Due limited resources and time, IoT technology can take place and support of government policies", 0.723 for "In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn", 0.754 for "Using IoT technology for farming practices can improve more corn farmers perception towards IoT in agriculture production" and 0.773 for "I know that using IoT will become more effectively convenience for improving corn production" statement. The percentage of variance explained were 45.653%.

Table 4.7: Factor Analysis of Perceived Behaviour Control of Corn Farmers Intention towards IoT for Agricultural Production in Perak

Statements	Factor Loading
If I want, I can produced more corn production yield using IoT technology.	0.692
Using IoT technology in my corn farming is more cost effective and can increase productivity.	0.842
IoT in corn farming can ensure consumer trust upon the health and safety of corn production.	0.507
I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn.	0.135
Due limited resources and time, IoT technology can take place and support of government policies.	0.707
In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn.	0.723
Using IoT technology for farming practices can improve more corn farmers perception towards IoT in agriculture production.	0.754

I know that using IoT will become more effectively convenience for improving corn production.	0.773
Variance (percent of explained)	45.653

(Source: Survey, 2021)

4.4.4 Variance Explained

In this study, the percentage of variance explained was explained as shown in Table 4.8. According to Statistics Solution (2018), the minimal consideration level is larger than 30%, the most important level is 40%, and the practically significant level is greater than 50%. Thus, Table 4.8 shows all of the factors that were determined to be practically significant in this study, with the total variance for the attitude was 45.765%, 37.638% for the subjective norm, and 45.653% for the perceived behaviour control. This shows that the most influential factor of corn farmers intention towards IoT for agricultural production in Perak was attitude. This is because farmers intention were significantly influenced by their attitude in using a new technology (Garforth et al., 2006). Therefore, this finding practically means that corn farmers with positive attitude can lead in boosting the farmers intention to produce better quality and healthy crops by applying the IoT in their farming practices.

Table 4.8: Result of Variance explained

Dimension (Factors)	Variance (percent of explained)
The Attitude of corn farmers intention towards IoT for Agricultural Production in Perak	45.765
The Subjective Norm of corn farmers intention towards IoT for Agricultural Production in Perak	37.638

The Perceived Behaviour Control of corn farmers intention towards IoT for Agricultural Production in Perak	45.653

(Source: Survey, 2021)

4.4.5 Confirmatory Factor Analysis

The Confirmatory Factor Analysis (CFA) was used to determine the model fits through the validity of the measured variables, which represent the constructed model. Attitude, subjective norm, and perceived behaviour control were all variables in the model that influenced corn farmers intention towards IoT for agricultural production. In this study, the constructed variables were measured using a five-point Likert scale and confirmed 0.5 and above as shown in Figure 4.1.

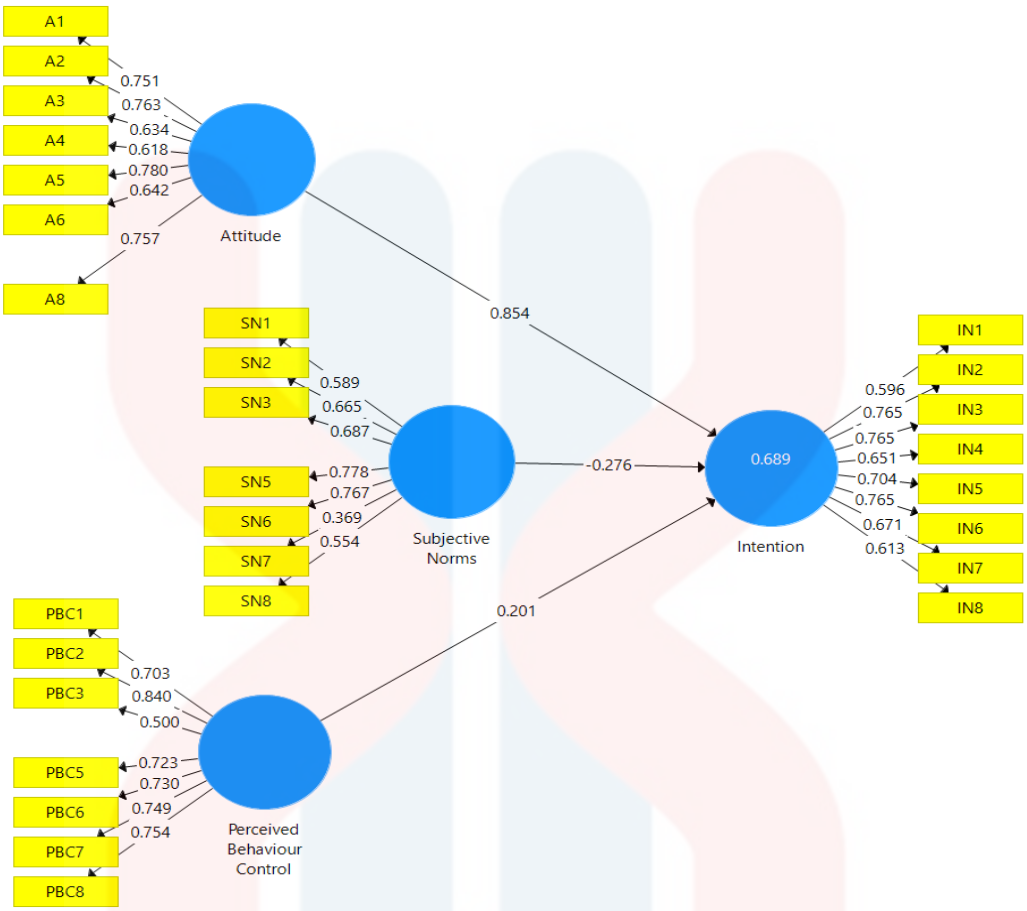

Figure 4.1: The model fits of Theory Planned Behaviour Model

Based on Table 4.9, the SRMR values in this study was 0.10. Thus, this indicates that the value of SRMR as an acceptable model fits for this study. As stated by Olutende et al. (2019b), when the SRMR value < 0.08, this indicates an acceptable model fit. Then, the value of chi-square was 832.455.

Table 4.9: Result of Confirmatory Factor Analysis

	Saturated Model	Estimated Model
SRMR	0.109	0.109
d_ULS	5.180	5.180
d_G	4.985	4.985
Chi-Square	832.455	832.455
NFI	0.399	0.399

(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 IoT for agricultural production in Perak where attitude, subjective norms and perceived behaviour control as independent variables. The results show that the attitude is the most influential factor influencing the corn farmers intention towards IoT for agricultural production in Perak where the percentage of variance is 45.765% while most of the factor loading was significant for this study.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In this study, there were three objectives discovered, namely to determine the level intention of corn farmers towards IoT for agricultural production in Perak, to investigate the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak and to identify the most influential factor of corn farmers intention towards IoT for agricultural production in Perak. Therefore, all the objectives of this study were achieved.

The first objective was achieved when the variable indicates a high mean score where the total mean score of intention is 4.500 based on the mean score corresponding to 3.67-5.0. Next, for the second objective of this study was achieved by showing the null hypothesis (H0) was rejected, indicating that there was a significant value between the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production in Perak. This objective was investigated using Pearson Correlation Analysis. Meanwhile for the third objective for this study was also achieved, which attitude was known as the most influential factor of

corn farmers intention towards IoT for agricultural production in Perak. This is because the variance explained for variable attitude showed the highest percentage variance explained which is 45.765 while the percentage of variance explained for subjective norm and perceived behaviour control is 37.638% and 45.653% respectively. This finding fundamentally shows that farmers' intention were influenced by their attitude to apply the IoT for agricultural production in Perak. In addition, the SRMR value of this study was 0.10, indicating that the model fit can be accepted by using the Confirmatory Factor Analysis (CFA).

In conclusion, this study revealed having positive or high intention level is important in recognizing the advantages of IoT, hence allowing corn farmers to apply it in the farming practices. Furthermore, this study clearly shows that variable factors such as attitude, subjective norm and perceived behaviour control play a significant role in corn farmer decision-making towards IoT for agricultural production. Therefore, the presence of these factors would facilitate corn farmers to use the IoT as it influences the corn farmers' intention towards IoT for agricultural production in Perak.

5.2 Limitation of Study

This study comes with some limitations that should be acknowledged since it is difficult to obtain in support of information from previous studies. This is due to related outcomes about the corn farmers intention towards IoT for agricultural production, the relationship of attitude, subjective norm and perceived behaviour control of corn farmers intention towards IoT for agricultural production, and the most influential factors of corn

farmers intention towards IoT for agricultural production. Firstly, the time frame for farmers to answer the survey was limited since it was conducted only for several weeks, which made it difficult to measure corn farmers' intention regarding the use of IoT. Next, the uncertainty of Internet or data access for farmers to use the IoT, especially corn farmers who living in rural areas. Finally, this study was conducted during the COVID-19 pandemic, which made it difficult for corn farmers to participate in IoT-related agricultural programs, organized by the extension agents or other institutes due to the Standard of Procedure (SOP) imposed by the government.

5.3 Recommendations

According to the findings, some practical recommendations will be made to improve future research and meet future expectations. As a recommendation, the survey should be conducted for year-on-year survey, as it is more reliable to find out whether the farmers had used the IoT or not. Besides, data network and Internet in rural areas need to be improved and secured to ease farmers use the IoT. This is because most of IoT equipment requires Internet access in order to enhance the agriculture processes. Finally, due to limited access of extension services in rural areas, extension agents should be widely available by creating more platforms or applications for farmers to gain important IoT-related information as well as providing affordable credit and other financial services to encourage the IoT adoption.

CHAPTER 6

GANTT CHART AND MILESTONE

Table 6.1: Gantt chart and Milestone of Research Activity

Year	**2021**											**2022**
Project (Activity)	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**
Preparation of the Proposal												
Preparation and Testing of Questionnaire												
Proposal Defence												
Conduction of Survey												
Data Checking and Analysis												
Thesis Preparation												

Milestone	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**
Finished set of questionnaire			**30**									
Submission of Research Proposal				**1**								
Finished Proposal Defence				**27**								
Completion of Survey										**18**		
Complete of Raw Data Analysis											**29**	
Completion of Statistical Data and Analysis											**30**	
Finished VIVA												**23**
Thesis Submission												**26**

REFERENCES

Adnan, N., Nordin, S. M., & bin Abu Bakar, Z. (2017). Understanding and facilitating sustainable agricultural practice: A comprehensive analysis of adoption behaviour among Malaysian paddy farmers. *Land Use Policy*, *68*, 372–382.

Anem, M. (2011). FARMERS IN MALAYSIA. Retrieved January 9, 2022 the Anim Agro Technology website: http://animhosnan.blogspot.com/2011/01/farmers-in-malaysia.html

Ajzen, I. (1991a). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50(2),* 179–211.

Ajzen, I. (1991b). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50(2),* 179–211.

Ajzen, I. (1991c). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50(2),* 179–211.

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology, 22(5),* 453–474.

Akcaoz H, Ozkan B. (2005). Determining risk sources and strategies among farmers of contrasting risk awareness: A case study for Cukurova region of Turkey. *Journal of Arid Environments, 62,* 661–675.

Alavion, S.J., M.S. Allahyari, A.S. Al-Rimawi and J. Surujlal. (2017). Adoption of agricultural e-marketing: Application of the theory of planned behavior. *J. Int. Food Agribus. Market., 29(1)*: 1-15.

Ali, M., Man, N., Farrah, M. M., & Omar, S. Z. (2020). Factors Influencing Behavioral Intention of Farmers to Use ICTs for Agricultural Risk Management in Malaysia. *Pakistan Journal of Agricultural Research, 33(2),* 295.

Asfaw, S., Simtowe, F., Shiferaw, B., & Mekbib, G., H. (2011). Agricultural technology adoption, seed access constraints and commercialization in Ethiopia. *Journal of Development and Agricultural Economics, 3(9),* 436–477.

Ayaz, M., Ammad-Uddin, M., Sharif, Z., Mansour, A., & Aggoune, E. H. M. (2019). Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk. *IEEE Access, 7,* 129551–129583.

Bir, C., Cummins, A. M., Widmar, N. O., & Wolf, C. A. (2018). Willingness to pay estimates informing agribusiness decision making: a cautionary tale. *International Food and Agribusiness Management Review*, *21*(7), 865–882.

Borges, J. A. R., Oude Lansink, A. G., Marques Ribeiro, C., & Lutke, V. (2014). Understanding farmers' intention to adopt improved natural grassland using the theory of planned behavior. *Livestock Science, 169,* 163–174.

Burton, R. J. (2004). Reconceptualising the 'behavioural approach' in agricultural studies: a socio-psychological perspective. *Journal of Rural Studies, 20(3),* 359–371.

Carrer, M.J., H.M. Souza Filho and M.O. Batalha. (2017). Factors influencing the adoption of farm management information systems (FMIS) by Brazilian citrus farmers. *Computers and Electronics in Agriculture 138*: 11-19.

Cangur, S., & Ercan, I. (2015). Comparison of model fit indices used in structural equation modeling under multivariate normality. *Journal of Modern Applied Statistical Methods, 14(1),* 14, 152-167.

Cheung, M.F. and W.M. To. (2017). The influence of the propensity to trust on mobile users' attitudes toward in-app advertisements: An extension of the theory of planned behavior. *Comput. Hum. Behav., 76*: 102-111.

Dawson, J. F. (2017). Analysing Quantitative Survey Data for Business and Management Students (Mastering Business Research Methods) (First ed.). SAGE Publications Ltd.

Department of Agriculture, Malaysia. (2019a). *Vegetables and Cash Crops Statistic*. http://www.doa.gov.my/index/resources/aktiviti_sumber/sumber_awam/maklumat_pertanian/perangkaan_tanaman/perangkaan_sayur_tnmn_ladang_2019.pdf

Department of Agriculture, Malaysia. (2019b). *Vegetables and Cash Crops Statistic*. http://www.doa.gov.my/index/resources/aktiviti_sumber/sumber_awam/maklumat_pertanian/perangkaan_tanaman/perangkaan_sayur_tnmn_ladang_2019.pdf

Despotović, J., Rodić, V., & Caracciolo, F. (2019). Factors affecting farmers' adoption of integrated pest management in Serbia: an application of the theory of planned behavior. *Journal of Cleaner Production, 228*, 1196-1205.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics, 5(1)*, 1-4.

Garforth, C., Rehman, T., McKemey, K., Tranter, R., Cooke, R., Yates, C., Park, J., & Dorward, P. (2004). Improving the design of knowledge transfer strategies by understanding farmer attitudes and behaviour. *Journal of Farm Management, 12(1)*, 17–32.

Garforth, C., McKemey, K., Rehman, T., Tranter, R., Cooke, R., Park, J., Dorward, P., & Yates, C. (2006). Farmers' attitudes towards techniques for improving oestrus detection in dairy herds in South West England. *Livestock Science, 103(1–2)*, 158–168.

Hadi, N. U., Abdullah, N., & Sentosa, I. (2016). An easy approach to exploratory factor analysis: Marketing perspective. *Journal of Educational and Social Research, 6(1)*, 215.

Hamad, M. A. A., Eltahir, M. E. S., Ali, A. E. M., & Hamdan, A. M. (2018). Efficiency of Using Smart-Mobile Phones in Accessing Agricultural Information by Smallholder Farmers in North Kordofan – Sudan. *SSRN Electronic Journal*.

Hoofs, H., van de Schoot, R., Jansen, N. W., & Kant, I. (2018). Evaluating model fit in Bayesian confirmatory factor analysis with large samples: Simulation study introducing the BRMSEA. . *Educational and Psychological Measurement, 78(4)*, 537-568.

Jacques, D. C., Marinho, E., d'Andrimont, R., Waldner, F., Radoux, J., Gaspart, F., & Defourny, P. (2018). Social capital and transaction costs in millet markets. *Heliyon, 4(1)*, e00505.

Johnston, M. (2014). Secondary Data Analysis: A Method of which the Time Has Come. *Qualitative and Quantitative Methods in Libraries*, 619–626.

Kaiser, H. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31-6.

Kline, R. B. (1998). Principles and practice of structural equation modeling. *New York: Guildford Press*.

Kutter, T., Tiemann, S., Siebert, R., & Fountas, S. (2011). The role of communication and co-operation in the adoption of precision farming. *Precis. Agric. 12*, 2–17.

Liobikienė, G., Mandravickaitė, J., & Bernatonienė, J. (2016). Theory of planned behavior approach to understand the green purchasing behavior in the EU: A cross-cultural study. *Ecological Economics, 125*, 38-46.

Lohr, S. (2015). The Internet of Things and the Future of Farming. Retrieved January 9, 2022 from the The New York Times website: https://bits.blogs.nytimes.com/2015/08/03/the-internet-of-things-and-the-future-of-farming/

Malhotra, N. K. (2006). *Questionnaire Design and Scale Development*. 176–202.

Markeeva, A. V. (2016) *Society: Sociology, Psychology, Pedagogy* 2. 42-6

Maswadi, M., Oktoriana, S., & Suharyani, A. (2018). THE EFFECT OF FARMER CHARACTERISTICS ON PERCEPTIONS OF THE FERMENTED COCOA BEANS TECHNOLOGY IN BENGKAYANG REGENCY, WEST KALIMANTAN. AGRITROPICA: *Journal of Agricultural Sciences, 1(2)*, 85–92.

McKinsey Global Institute. (2015). *The Internet of Things: Mapping the value beyond the hype.* San Francisco.

Morais, M., Borges, J. A. R., & Binotto, E. (2018). Using the reasoned action approach to understand Brazilian successors' intention to take over the farm. *Land Use Policy*, *71*, 445–452.

Napitupulu, D., Kadar, J. A., & Jati, R. K. (2017). Validity testing of technology acceptance model based on factor analysis approach . *Indonesian Journal of Electrical Engineering and Computer Science, 5(3)*, 697-704.

Nasa, A. (2016). Corn-farming could yield high profits for Malaysia. Retrieved January 9, 2022 from the NST Online website: https://www.nst.com.my/news/2016/10/182923/corn-farming-could-yield-high-profits-malaysia

Olutende, O. M., Wamukoya, E. K., & Wanzala, M. N. (2019a). Validation of a Four-Factor Measurement Model of the Health Promoting Lifestyle Profile-II: a Confirmatory Study with Kenyan Undergraduate Students. *ResearchGate*, 396-406.

Olutende, O. M., Wamukoya, E. K., & Wanzala, M. N. (2019b). Validation of a Four-Factor Measurement Model of the Health Promoting Lifestyle Profile-II: a Confirmatory Study with Kenyan Undergraduate Students. *ResearchGate*, 396-406.

Park, H. S. (2000). Relationships among attitudes and subjective norms: Testing the theory of reasoned action across cultures. *Communication Studies, 51(2)*, 162-175.

Paul, J., Modi, A., & Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services, 29*, 123-134.

Rahi, S. (2017). Research Design and Methods: A Systematic Review of Research Paradigms, Sampling Issues and Instruments Development. *International Journal of Economics & Management Sciences, 6(403)*, 2.

Richter, N. F., Cepeda-Carrión, G., Roldán Salgueiro, J. L., & Ringle, C. M. (2016). European management research using partial least squares structural equation modeling (PLS-SEM). *European Management Journal, 34 (6)*, 589-597.

Rogers, E. M. (2003). *Diffusion of Innovations, 5th Edition (5th ed.)*. Free Press.

Rosenthal, R. (1991). *Essentials of Behavioral Research*: Methods and Data Analysis (2nd ed.). McGraw-Hill Book Co Ltd. 46-65.

Sabir, R. I., Safdar, M., Khurshid, N., & Hafeez, I. (2014). Influence of Factors in Green Advertising upon Purchase Intentions- A Study of Pakistani University Students. *International Review of Management and Business Research, 3*(4), 2131–2138.

Saengavut, V., & Jirasatthumb, N. (2021). Smallholder decision-making process in technology adoption intention: implications for Dipterocarpus alatus in Northeastern Thailand. *Heliyon, 7(4)*.

Saiz-Rubio, V., & Rovira-Más, F. (2020). From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management. *Agronomy, 10(2)*, 207.

Statistics Solution. (2018). Exploratory Factor Analysis. Retrieved January 9, 2022 from the Statistics Solution website: https://www.statisticssolutions.com/factor-analysis-sem-exploratory-factor-analysis/

Statistics Solution. (n.d.). Chi-Square Goodness of Fit Test. Retrieved January 9, 2022 from Statistics Solution website: https://www.statisticssolutions.com/chi-square-goodness-of-fit-test/

Sugiyono, P. D. (2014). Populasi dan sampel. Metode Penelitian Kuantitatif, *Kualitatif dan R&D*, 291, 292.

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education, 48(6)*, 1273-1296.

Titovskaia, N. V., Titovskaya, T. S., & Titovskii, S. N. (2020). Application of the IoT technology in agriculture. IOP Conference Series: *Earth and Environmental Science*, 548, 032021.

Wang, Y. S., Lin, H. H., & Luarn, P. (2006). Predicting consumer intention to use mobile service. *Information Systems Journal*, *16*(2), 157–179.

Walter, A., Finger, R., Huber, R., & Buchmann, N. (2017). Opinion: Smart farming is key to developing sustainable agriculture. *Proceedings of the National Academy of Sciences of the United States of America, 114(24)*, 6148–6150.

Zou, K. H., Tuncali, K., & Silverman, S. G. (2003). Correlation and Simple Linear Regression. *Radiology, 227(3)*, 617–628.

APPENDICES

Dear respondent,

I am doing an academic research entitled:

Corn Farmers Intention towards IoT for Agricultural production in Perak

Congratulations, you have been selected as a respondent for this study. Your sincere cooperation is crucial in determining the success of this study. In this study, I would like to assess certain factors of your intention towards IoT for agricultural production. Please read all the instructions related to each section and answer each question sincerely. All your information is confidential and will be used for this research purposes only.

Thank you very much for your time and cooperation.

Sincerely,

……
Nurul Aqilah Binti Mohamed Sohaimi
Faculty of Agro Based Industry,
Universiti Malaysia Kelantan,
17600 Jeli, Kelantan
Email: aqilahsohaimi711@gmail.com

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF CORN FARMER

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

1.	**Age**	□ < 20 years □ 20 – 29 years □ 30 – 39 years □ 40 – 49 years □ > 50 years
2.	**Gender**	□ Male □ Female
3.	**District**	□ Bagan Datuk □ Batang Padang □ Hilir Perak □ Hulu Perak □ Kampar □ Kerian □ Kinta □ Kuala Kangsar □ Larut, Matang & Selama □ Manjung □ Muallim □ Perak Tengah
4.	**Race**	□ Malays □ Chinese □ Indians □ Others
5.	**Marital Status**	□ Single □ Married □ Widow / Widower □ Divorced
6.	**Education Level**	□ Not going to school □ SRP/PMR □ SPM □ Kem Skill / Technical Certificate □ STPM / A-Level / Diploma / Matriculation □ Undergraduate (Bachelor's Degree) □ Postgraduate (Master's Degree, PhD)

7.	**Farm Worker**	□ < 10 people □ 11 – 15 people □ 16 – 20 people □ > 20 people
8.	**Monthly Income**	□ < RM 1000 □ RM 1001 – RM 3000 □ RM 3001 – RM 5000 □ > RM 5001
9.	**Farm Size**	□ < 1 acre □ 1 – 4 acres □ 5 – 9 acres □ 10 – 19 acres □ > 20 acres
10.	**Any participation / working experience in agricultural sector**	□ If yes, how many years? ( ) 1 – 10 years ( ) 11 – 20 years ( ) 21 – 30 years ( ) Above 31 years □ No
11.	**Reason become a farmer**	□ Interest □ Social impact (family member / friends) □ No suitable occupation
12.	**Type of IoT use**	□ Agriculture Drone □ Automatic Tractor □ Smart Green House □ Others (Please state your answer):

Instruction: For statement on SECTION B and C, 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 CORN FARMERS' INTENTION TOWARDS IOT FOR AGRICULTURAL PRODUCTION IN PERAK

Each statement below represents corn farmers' intention for agricultural production.

In my opinion:		1	2	3	4	5
1	I intend to use IoT technology in my corn farming for agriculture production in Perak.					
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 Perak.					
4	I will put more effort in learning and using the 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 Perak.					
8	IoT can help me to attract more customers or buyers to purchase more good quality of corn production in Perak.					

SECTION C: THE RELATIONSHIP OF ATTITUDE, SUBJECTIVE NORMS AND PERCEIVED BEHAVIOUR CONTROL OF CORN FARMERS TOWARDS IOT FOR AGRICULTURAL PRODUCTION IN PERAK

ATTITUDE

Each statement below represents attitude of corn farmers for agricultural production.

In my opinion:		1	2	3	4	5
1	Internet of Things (IoT) for agricultural production in Perak is very important to me as a farmer.					
2	I make sure that my corn production in Perak 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 makes 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 field.					
8	I will take the challenge as a farmer to apply IoT technology in my farming practices.					

SUBJECTIVE NORMS

Each statement below represents subjective norms which influence corn farmers for agricultural production.

In my opinion:		1	2	3	4	5
1	My family members 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 IoT in my farming practices.					
4	Government support and advertising influence me to get involved in using the IoT for my corn production.					
5	Workshop or seminar makes me want to participate in learning more about implementation of IoT in agricultural production.					
6	Media information influence me that corn production produced from IoT technology is better than traditional farming.					
7	Experts in agricultural 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 BEHAVIOUR CONTROL

Each statement below represents ability of corn farmers for agricultural production.

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