THE INTERNET OF THINGS TECHNOLOGY ACCEPTANCE IN SUPPLY CHAIN MANAGEMENT

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Abstrak

Kajian ini menyelidik penerimaan teknologi *Internet of Things (IoT)* dalam Pengurusan Rantai Bekalan (SCM) di Malaysia. Kemunculan Industri 4.0 telah memperkenalkan teknologi maklumat moden yang tidak hanya meningkatkan keberkesanan rantai bekalan tetapi juga menakrif semula operasi organisasi. Ini menyebabkan teknologi terkini seperti IoT dijangka memberi impak besar kepada operasi perniagaan dan pengurusan rantai bekalan (SCM). Dalam menangani cabaran yang dihadapi oleh SCM tradisional, kajian ini menekankan kepentingan penerimaan IoT dalam mengurangkan risiko dan meningkatkan keberkesanan keseluruhan dalam SCM. Kajian ini mengkaji hubungan antara *real-time visibility, data-driven decision-making, perceived usefulness*, dan *perceived ease of use* dengan penerimaan teknologi IoT dalam SCM. Kajian juga menggunakan rangka kerja *Technology Acceptance Model (TAM)* untuk memberikan pemahaman holistik tentang tahap penerimaan IoT. Soal selidik digunakan sebagai instrumen dalam mengumpul data daripada responden. Sebanyak 400 set borang soal selidik telah diedarkan secara rawak kepada responden dan hanya 361 borang soal selidik telah dikembalikan kepada penyelidik. *Pearson Correlation Analysis* digunakan untuk menilai kekuatan hubungan antara pembolehubah dan untuk menentukan sejauh mana dua pembolehubah berkait antara satu sama lain. Keputusan membuktikan bahawa terdapat hubungan yang penting antara *real-time visibility* dengan penerimaan teknologi IoT dalam SCM ($r = 0.915$), *data-driven decision-making* dengan penerimaan teknologi IoT dalam SCM ($r = 0.899$), *perceived usefulness* dengan penerimaan teknologi IoT dalam SCM ($r = 0.762$) dan *perceived ease of use* dengan penerimaan teknologi IoT dalam SCM ($r = 0.394$). Berdasarkan hasil kajian, kesemua faktor yang dikaji mempunyai hubungan yang positif dengan penerimaan teknologi IoT dalam SCM. Sebagai kesimpulan, kajian ini menekankan kepentingan teknologi IoT dalam SCM dan memberi pandangan yang samgat berharga untuk memudahkan penerimaannya dan aplikasi praktikal kepada pekerja. Kajian ini boleh menjadi panduan kepada setiap organisasi dalam membuat keputusan untuk menerima teknologi IoT. Kelemahan dan cadangan untuk kajian masa depan juga dibincangkan dalam kajian ini.

Kata kunci: Pengurusan rantai bekalan, *Internet of Things, real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use*

Abstract

This study explores into the Internet of Things (IoT) technology acceptance in Supply Chain Management (SCM) in Malaysia. The advent of Industry 4.0 has ushered in modern information technologies that not only enhance supply chain effectiveness but also redefine organisational operations. As a result, cutting-edge technology like the IoT is projected to have a significant impact on business operations and supply chain management SCM. In addressing the challenges faced by traditional SCM, the research underscores the significance of IoT acceptance in mitigating risks and improving overall efficiency in SCM. This study investigates on the relationship between real-time visibility, data-driven decision-making, perceived usefulness, and perceived ease of use with the IoT technology acceptance in SCM. The study also applied the Technology Acceptance Model (TAM) framework, to provide a holistic understanding of the level of acceptance of IoT. The questionnaire was used as the instrument in collecting data from the respondents. There were 400 questionnaires distributed randomly to the respondents and 361 were returned to the researcher. Pearson Correlation Analysis was used to assess the strength of the correlations between the variables and to determine how strongly two variables are related to each other. Findings have shown that there was a significant relationship between real-time visibility with IoT technology acceptance in SCM ($r = 0.915$), data-driven decision-making with IoT technology acceptance in SCM ($r = 0.899$), perceived usefulness with IoT technology acceptance in SCM ($r = 0.762$) and perceived ease of use with IoT technology acceptance in SCM ($r = 0.394$). Based on the results of the research, the results showed that all the factors studied had positive relationship with the IoT technology acceptance in SCM. In conclusion, this study emphasises the significance of IoT technology within SCM and provides valuable insights and contributions to facilitate its broad adoption and practical application among employees. This study can be a guideline to every organisation in decision to accept IoT technology. The limitations and recommendation for future study has been highlighted in this study.

Keywords: Supply chain management, Internet of Things, real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use

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I extend my heartfelt gratitude to God for His unwavering guidance, strength, and grace throughout the entirety of this academic pursuit. His presence has been a source of inspiration and solace, guiding me through the challenges and triumphs encountered along this journey. I can complete this whole thesis through Him who strengthens me.

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List of Abbreviations

DDDM	Data-Driven Decision-Making
ICT	Information and Communication Technologies
IOT	Internet of Things
IT	Information Technology
M2M	Machine to Machine
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RFID	Radio Frequency Identification
RTV	Real-Time Visibility
SCI	Supply Chain Integration
SCM	Supply Chain Management
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
WSN	Wireless Sensor Network

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The global shift in supply chain management, known as Industry 4.0 or the Fourth Industrial Revolution, is currently underway. Alongside influencing the efficiency of the supply chain sector, advanced information technologies empower organisations to identify enhancements in operational strategies. Supply chain management has seen the emergence of several technologies to deal with growing business trends, which are customer-focused (Bouzida & Merzoug, 2021) especially in supply chain industry. The capability of Information Technology (IT) to enhance operational efficiency, eradicate inefficiencies, and elevate customer service has led to a growing inclination among organisations, especially those in the supply chain sector, to integrate IT applications (Bouzida & Merzoug, 2021). Third-party logistics providers' technological ability is a crucial aspect in sustaining a successful and robust supply chain outsourcing relationship (Sauvage, 2003).

Kevin Ashton invented the term "Internet of Things" in 1999, and it refers to a system made up of both tangible and digital items that can exchange information, perceive, and interact with one another and their environment (Gokhale et al. 2018). The Internet of Things (IoT) bridges the gap between the digital and physical worlds by collecting data from sensors installed in everyday objects and relaying that information to other nodes in the network (Obaidat et al., 2020). Among the many services and products that make use of the IoT, five main technologies stand out. The Internet of Things (IoT) encompasses several technologies such as Radio Frequency Identification (RFID), cloud computing, middleware, Wireless Sensor Network (WSN), and software particularly designed for IoT applications (I. Lee & Lee, 2015). The Internet of Things is being utilised more often in supply chain management to enhance resiliency, efficiency, quality, and productivity (Frederico, 2021). The Internet of Things (IoT) is a rapidly growing field with many potential applications, ranging from consumer electronics and industrial automation to healthcare and environmental monitoring. This network encompasses a range of tangible elements that facilitate the digitalisation of supply chain operations, including adaptability, transparency, information sharing, and monitoring (Ben-Daya, 2022). These capabilities empower organisations to evaluate the scope of detection, surveillance, and engagement both internally and externally (Abdel-Basset et al., 2018).

In today's competitive landscape, inefficiency is increasingly unsustainable. However, the positive aspect is that supply chain technology has the capability to simplify and streamline all business operations (Bouzida & Merzoug, 2021). That is why it is critical for businesses to constantly innovate, improve and try to adapt advanced technologies in their supply chain, and software certainly gives the most return for the money (Javaid et al., 2022). The best service supply chain technology helps organisations to get more visibility into the supply chain, obtain greater control over inventories, lower operational expenses, and, ultimately, outperform the competition in supply chain industry (Günes, 2022). Besides that, it also helps to provide higher level of transparency and flexibility across the supply chain (Vass et al., 2018). The objective of the IoT is to facilitate communication, interaction, process automation, and data collection and sharing among these devices, ultimately enhancing efficiency, convenience, and sustainability in people's lives. For instance, a smart home system can use sensors and gadgets to track a home's temperature, humidity, and lighting and then make necessary adjustments to maintain a pleasant living space (Al-Talib et al., 2020). A smart car can collect and analyse data from its sensors to improve performance and safety, while also providing drivers with real-time traffic and weather updates (Yasar & Shea, 2023).

1.2 Problem Statement

In a time where the effectiveness of supply chains is crucial for the long-term viability of businesses, the integration and adaption of supply chain technology processes has become increasingly important for enhancing performance (Imam, 2023). According to Statista, the global IoT market size is projected to reach over $1.6 trillion by 2025, with industries such as manufacturing, transportation, and logistics being significant contributors. Supply chain integration (SCI) is about linking all the moving parts of a supply chain, from suppliers to customers, through shared information, coordinated activities, technology, and strategic alignment, to improve efficiency, responsiveness, and customer satisfaction. By coordinating the management of internal and external activities at the strategic, tactical, and operational levels, SCI aims to maximise customer satisfaction while decreasing costs and increasing efficiency (Alfalla-Luque et al., 2013). IoT adoption has been steadily increasing worldwide across various industries, including supply chain and logistics.

Few researchers argue that traditional supply chain management faces challenges such as competition, globalisation, aligning supply with demand, global catastrophes, understanding customer needs, and adapting to rapidly changing markets, particularly in the absence of technological integration (Ben-Daya, 2022). The traditional supply chain is dealing with more issues related to uncertainty, cost, complexity, and vulnerability (Pal & Yasar, 2023). Traditional supply chain management faces various issues, such as overstocking, delivery delays, and inventory stocked out which cause cost inefficiencies to the organisation (Kamisli Ozturk, 2020). Besides that, a traditional Information and Communication Technologies (ICT) has faced several limitations when it comes to detecting and gathering extra-transactional data. Its believe that without the involvement of advanced technology, every supply chain manager having trouble to focus on strategic issues in the realm of regular operations as they couldn't easily assign the routine tasks to lower operational levels and also make an accurate decision (Gubbi et al., 2013).

Other than that, it's also proven that the primary challenge in supply chain revolves around inadequate transparency concerning information related to the product's movement from manufacturers to end-users. This lack of transparency is pivotal for improving the operational processes of the company and has led to significant challenges, particularly in combating counterfeiting issues (Owczarek, 2023). The challenges arise from the complex nature of supply chain operations, where timely and accurate information is paramount, strategic decisions impact overall efficiency, and cost dynamics play a pivotal role in organisational competitiveness. Therefore, the developing technological and applications such as the IoTs enable the accurate integration of physical objects with the digital realm (Constantinides et al., 2017). Besides that, a significant amount of previous research has been centered on exploring the design and utilisation of IoT technologies from the standpoint of organisations or industries (Fantana et al., 2022). According to the TAM framework which has been introduced by Davis (1989), which draws from psychological theory, user behavior hinges on the perceived usefulness and perceived ease of use of the technology, aiming to elucidate the primary factors driving user behavior in relation to technology acceptance (Doyduk & Bayarçelik, 2019). However, there has been little focus dedicated to analysing the acceptance of IoT technology from the perspective of individual (Li & Wang, 2013). Therefore, there is urge to explore the acceptance and understanding of IoT technology from the perspective of employees and how them perceive emerging IT technologies (Alzahrani, 2023).

1.3 Research Questions

The following questions have been established for this study:

1) What is the relationship between real-time visibility with the Internet of Things technology acceptance in supply chain management?

2) What is the relationship between data-driven decision-making with the Internet of Things technology acceptance in supply chain management?

3) What is the relationship between perceived usefulness with the Internet of Things technology acceptance in supply chain management?

4) What is the relationship between perceived ease of use with the Internet of Things technology acceptance in supply chain management?

1.4 Research Objectives

To achieve the purpose of this study, the following objectives have been outlined:

1) To investigate the relationship between real-time visibility with the Internet of Things technology acceptance in supply chain management.
2) To identify the relationship between data-driven decision-making with the Internet of Things technology acceptance in supply chain management.
3) To investigate the relationship between perceived usefulness with the Internet of Things technology acceptance in supply chain management.
4) To investigate the relationship between perceived ease of use with the Internet of Things technology acceptance in supply chain management.

1.5 Significance of the Study

The outcomes of this study would make a major contribution to both theoretical understanding and practical application in the field of IoT technology acceptability in SCM. From a theoretical perspective, the potential findings would enrich the current body of knowledge by providing empirical support for the role of key variables such as real-time visibility, data-driven decision-making, perceived usefulness, and perceived ease of use in influencing the adoption of IoT technology within supply chain management. By examining how these factors interact and affect technology acceptance, this study adds depth to existing theoretical frameworks, benefiting scholars and researchers with similar interests. Practically, the insights gained from this study have implications for various stakeholders. They may inform policymakers, supply chain professionals, and technology developers on strategies to facilitate the integration of IoT technology into supply chain operations. By uncovering the underlying reasons behind organisations' reluctance to adopt IoT solutions, the study offers practical guidance for overcoming barriers and promoting acceptance. Furthermore, these findings extend beyond the confines of the Malaysian, offering valuable insights applicable to supply chain management practices globally. Overall, this study has the potential to drive positive change by promoting the efficient integration of IoT technology in SCM, thereby enhancing efficiency, resilience, and innovation in these sectors.

1.6 Scope of the Study

For the scope of research, the study emphasises on supply chain management employees in Malaysia. This includes all level of employees including supply chain employees, managers, logistics professionals, technology specialists, and decision-makers who are responsible for implementing technological solutions within their supply chain operations. The duration of the study spanned approximately 3 months. This time frame allowed for data gathering, analysis, and interpretation of findings within a reasonable period. Besides that, the study were discusses various topics related to IoT technology acceptance and its implications for supply chain management. These topics include real-time visibility, data-driven decision-making benefits, Technology Acceptance Models (TAM) and theories which including perceived usefulness and perceived ease of use in technology adoption. Moreover, the study also specifically concentrated on SCM companies operating within Malaysia. By narrowing the geographic focus to Malaysia, the study focus to provide views and feedbacks that are relevant and applicable to the local. This approach will allow for a detailed examination of IoT technology acceptance within the Malaysian supply chain landscape, considering factors such as industry dynamics, regulatory environment, and technological infrastructure specific to the region.

1.7 Definition of Key Terms

Table 1.1 displays the definitions of key terms referenced in this study.

Table 1. 1
Definition of Key Terms

Term	Definition	Source
Supply Chain Management (SCM)	The skillful practice of management focused on delivering the appropriate product to the end user at the right time, in the right place, and at the right cost. Described as the work required to produce and distribute a finished product from the originating source to the end client.	Kranz, 1996; Stadtler, 2008
Internet of Things (IoT)	Defined as any of devices with any kind of integrated sensor that can gather data and send it over the network without human involvement.	Mouha, 2021
Real-Time Visibility (RTV)	The ability to access and monitor live data or information as it is generated or updated in real-time without any delay. Real-time visibility allows organisations to have immediate access to up to date information, enabling them to make timely and updated decisions.	Hurtado, 2016
Data-Driven Decision-making (DDDM)	An approach to making strategic choices and solving problems that relies on analysing and interpreting data. This process includes gathering relevant data, arranging and scrutinising it to detect patterns and trends, and leveraging that knowledge to guide decision-making.	Rejikumar et al., 2018
Technology Acceptance Model (TAM)	A theoretical model crafted to clarify and predict individuals' acceptance and usage of information technology. Central to this framework are the concepts of PU and PEOU, which are pivotal factors shaping an individual's inclination towards using a technology, consequently impacting their actual usage patterns.	Venkatesh, V., & Davis, F. D. (2000)
Perceived Usefulness (PU)	An individual's personal evaluation of how much they perceive that utilising a specific technology will improve their job performance, productivity, or effectiveness.	Davis, 1989
Perceived Ease of Use (PEOU)	An individual's personal evaluation of the amount of effort needed to comprehend and utilise a specific technology.	Davis, 1989

1.8 The Organisation of the Study

The present study comprises five chapters that systematically address the research objectives. Chapter One serves as the foundation, offering a comprehensive overview background of study, problem statements, and the significance of study and scope of the research. Additionally, key terms relevant to the study are defined to establish a clear understanding of terminology. In Chapter Two, an extensive literature review is presented, focusing on the IoT technology acceptance in SCM and establishing the theoretical frame work for the study. Chapter Three examines into hypotheses development between independent variables and dependent variable. Besides that, chapter Three also examines the methodology utilised, outlining the quantitative research approach utilised to conduct an online survey by creating questionnaires forms to participants. These online survey through questionnaire forms aim to capture firsthand experiences and opinions on the IoT technology acceptance in supply chain management within Malaysia. Chapter Four discusses about the information gathered from the online survey, identifying key themes that emerged from respondent's responses. Finally, Chapter Five synthesises the findings, providing a conclusion based on the research outcomes. Furthermore, recommendations are made, limitations are acknowledged, and future research ideas are presented.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss literature reviews, which involves critically examining existing research that is relevant to the study. According to (Bennett, 2012), literature review is defined as a comprehensive study, interpretation of academic journal and article that addresses a specific topic. In this research, the dependent variable (DV) is the IoT technology acceptance in SCM. While, there are four independent variables (IV) in this study that focus on the real-time visibility, data-driven decision-making, perceived usefulness and perceived ease of use.

2.2 The Internet of Things Technology Acceptance in Supply Chain Management

The Internet of Things (IoT) technology stands out as a forefront illustration of contemporary technology. It is experiencing rapid expansion across various industries, driven by the necessity to establish connections among machines, applications, and devices over a network (Muhamad et al., 2023). The integration of IoT is influenced by diverse perspectives that blend technological and psychological dimensions, involving an emotional, cognitive, behavioral, and technological factors throughout the adoption process (Tsourela & Nerantzaki, 2020). In the previous study, Attaran (2020) acknowledged the consideration of the IoT implementation costs and the proper integration of the IoT systems holds significant potential. In the delivery process to the end customer, couriers are adopting practices such collecting the client's signature on the delivery page while handing over the goods (Hasan, 2019).

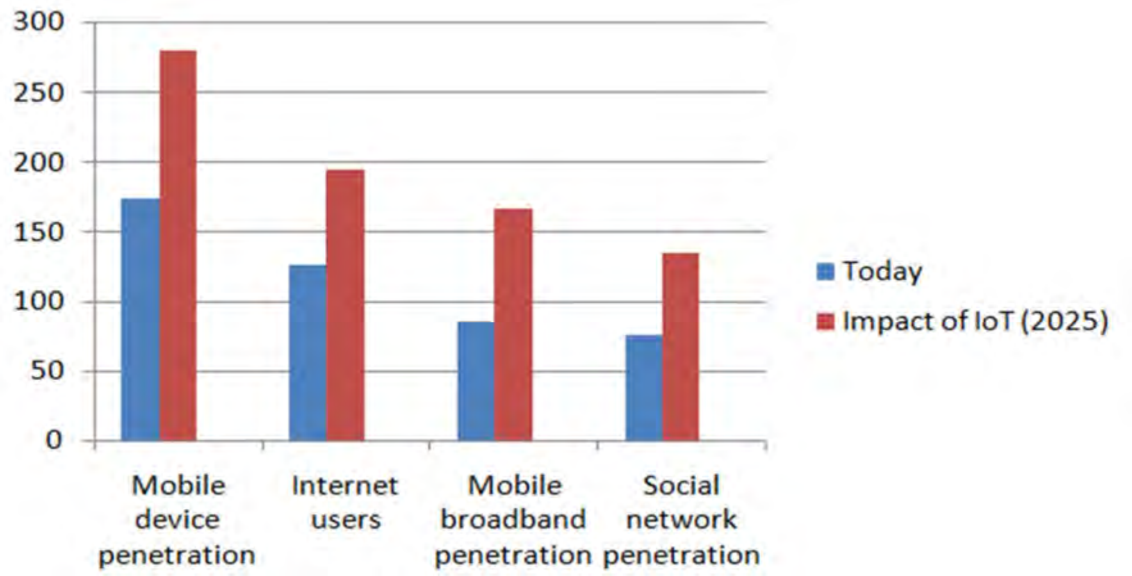

Figure 2. 1
The Impact of The Internet of Things (IoT)
Source: (Badarudin et al., 2018)

Figure 2.1 from an earlier study shows that the rise of the IoT technology in Malaysia is due to a number of different factors. The graph shows how the IoT is projected to change things until 2025. The rate of usage of mobile devices in Malaysia has already gone over 150 percent, and it is expected to hit 280 percent by 2025, which means that a lot more people are using their phones. Currently, the percentage of Malaysians that use the Internet is 137 percent, and it is projected to rise dramatically to 190 percent by 2025. The rise in usage can be attributed to the active online behavior of Malaysian internet users, with over 59 percent of them downloading mobile apps. However, this figure is slightly below the average of 67 percent in Southeast Asia (Weber & Studer, 2016). The adoption of broadband in Malaysia is nearly universal, with a rate of approximately 100 percent. The predicted growth rate is expected to reach 170 percent by 2025, mostly driven by the increasing number of broadband customers. As stated in the report "Mobile Malaysia, Ahead of the Pack" from the One Device research, the average annual expenditure of Malaysians on online shopping is approximately

US$2,000 (Saarikko et al., 2017). On the flip side, nearly half of Malaysians actively engage in social networking, resulting in a 75 percent penetration rate for social networking. Overall, with the rising prevalence of mobile devices and broader internet access, Malaysia is poised to be a conducive environment for the implementation of the IoT (Maharjan, 2010). In Malaysia, the implementation of the IoT holds great potential for various industries, particularly in supply chains. Utilising the IoT technologies can mitigate risks and enhance profitability for businesses. The capability to trace products within the supply chain is already firmly established. As the IoT continues to advance industrially, the sector is actively striving to outpace competitors.

2.3 Real- Time Visibility

Real-time visibility refers to the immediate availability of data or information that allows us to monitor the movement of items and determine their exact and correct position at any given time (FarEye, 2022). In various contexts, such as business operations, logistics, or monitoring systems, real-time visibility allows users to have an up-to-the-moment understanding of events, processes, or data points (Owczarek, 2023). This instantaneous access to information enables quicker and more informed decision-making. This independent variable pertains to the extent to which the IoT contributes to establishing real-time visibility within supply chain operations in Malaysia. Based from previous study, it proves that IoT have crucial functions in providing rapid insight, especially in asset monitoring and improving visibility within global logistics networks (Teucke et al., 2018). Global logistics systems use real-time data to track asset status and environmental factors (such as temperature, and moisture levels), location, fields of magnets, and metrics affected by vibration and shocks. (Zhang et al., 2018). By integrating physical and virtual checkpoints in supply chains alongside IoT sensors, information can flow swiftly, ensuring real-time visibility of shipments even when they are not actively in transit. (Reyes, 2020). It emphasises how the IoT enhances transparency and provides timely information for decision-making. Previous research has demonstrated that real-time visibility, facilitated by the IoT, leads to improved responsiveness, reduced delays, and better decision-making within supply chain operations (Bouzida & Merzoug, 2021). IoT technology promotes efficiency by facilitating communication between multiple devices, commonly known as Machine to Machine (M2M) communication (Khan et al., 2012). This includes connecting physical devices to facilitate communication with individuals, updating them on the status and location of these devices. In the logistics industry, trucks or vessels have the ability to communicate with other devices and humans to handle and control supply chain data (Bhardwaj & Kole, 2016).

2.4 Data-Driven Decision-Making

Decision-making that is driven by data involves making well-informed and strategic choices based on quantitative analysis of pertinent data and empirical facts. In this approach, decisions are not solely dependent on intuition or experience but are guided by both quantitative and qualitative data. Organisations use data-driven decision-making to enhance the precision and efficacy of their decisions, with the ultimate goal of attaining superior results and enhancing overall performance (Koot et al., 2021). This independent variable explores how the IoT facilitates data-driven decision-making processes within Malaysian supply chain industries. It seeks to comprehend how data generated by the IoT impacts strategic decisions. The necessity for data-driven decision-making in Industry 4.0 has encouraged the creation of novel techniques and algorithms. These are designed to help engineers make the best maintenance and operational decisions (Ruschel et al., 2017). IoT devices provide significant amount of data, and predictive analytics may use this data to better accurately predict demand. This assists supply chain managers in optimising inventory levels, production schedules, and distribution processes (Badarudin et al., 2018). The IoT is well-known for its ability to strengthen decision-making. The connectivity of devices allows for autonomous decision-making, resulting in energy efficiency without the need for human involvement. A massive amount of data acquired by numerous sensor devices may be kept in big data storage, informing both strategic and operational decision-making. When devices assess larger trends resulting from empirical data, smarter decisions are made (I. Lee & Lee, 2015). Previous study has proved the advancement of the IoT in Malaysia holds the potential to offer various advantages to the public, included improved economic efficiency and productivity that is achieved by automating and optimising processes. Furthermore, the development of the IoT can contribute to minimising environmental risks by employing real-time sensing and information provision (Falkenreck & Wagner, 2017).

2.5 Perceived Usefulness

A technology or system's perceived usefulness is the extent to which a person believes it would enhance their job performance or assist them in achieving their objectives. In simpler terms, it's about whether someone thinks a technology will be helpful or beneficial to them in their work or daily activities. The role of perceived usefulness as a critical determinant of IoT technology acceptance in SCM. The research was done by Liang et al. (2007) to investigate the factors that affect the integration of RFID in supply chains. The study found that users' intentions to embrace the technology were highly influenced by their perception of its utility. A studies have begun to specifically investigate the relationship between perceived usefulness and the acceptance of IoT technologies in supply chain management. Furthermore, Tsourela and Nerantzaki (2020) investigated various technological and psychological perspectives influencing

IoT acceptance in supply chains, emphasising the importance of perceived usefulness as a key factor in shaping people's attitudes and intentions toward IoT technology adoption. Perceived usefulness is critical in affecting people's attitudes and intentions to employ IoT technology in supply chain management.

2.6 Perceived Ease of Use

Perceived ease of use is the subjective estimate of how easy or simple it is for users to utilise a certain technology, system, or product. In essence, it reflects the user's belief about the simplicity and accessibility of interacting with the technology to accomplish tasks or goals. For instance, if someone finds a technology intuitive and straightforward to operate, they are likely to perceive it as having a high level of ease of use (Zhang & Lee, 2023). As in this research is to understand how users' perceptions of a IoT technology's usability influence their willingness to adopt and use it. Venkatesh and Davis (2000) proposed the Technology Acceptance Model (TAM), which states that users' actions and intentions to embrace new technologies are influenced by their evaluation of the technology's ease of use. Besides that, study by Kamble et al. (2018) investigated variables impacting the adoption of IoT in supply chain management, indicating perceived ease of use as a crucial element in consumers' desire to use IoT technology. Their findings suggested that the perceived ease and user-friendliness of IoT solutions play a crucial role in encouraging their adoption among supply chain employees. Perceived ease of use is a crucial determinant of individuals' attitudes and intentions towards adopting IoT technology in supply chain management. As supply chain operations become increasingly complex and interconnected, the ease with which employees can interact with IoT solutions becomes paramount. In SCM, where users may have diverse technical backgrounds and responsibilities, ensuring that IoT technology are easy to understand and operate is essential for fostering widespread adoption. Employees are more likely to embrace and accept IoT technologies if they perceive them as accessible and straightforward to use in their day-to-day activities. As a result, efforts to design and execute IoT solutions with a focus on usability and user experience are crucial for increasing technological acceptability and achieving IoT's potential advantages in streamlining supply chain operations.

2.7 Theoretical Framework

The figure 2.2 below shows the theoretical framework of the study. The model includes of four independent variables which are real-time visibility (RTV), data-driven decision-making (DDDM), perceived usefulness (PU) and perceived ease of use (PEOU). The study is to find out the relationship between these four IVs with the DV, which is the IoT technology acceptance in supply chain management.

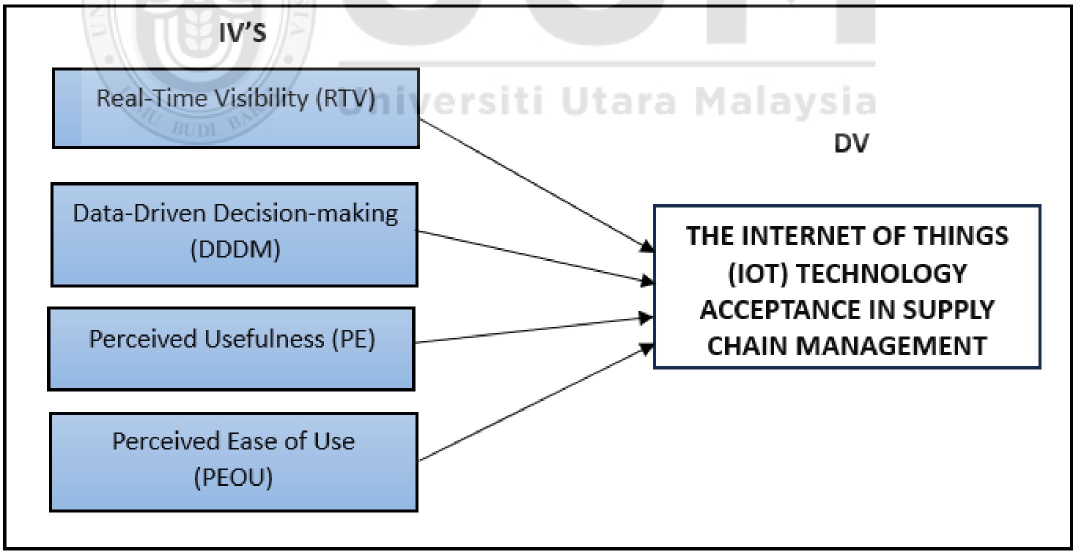

Figure 2. 2
Research Framework

2.8 Underpinning Theory

The Technology Acceptance Model (TAM) serves as the foundation for this study, with the goal of understanding and predicting consumers' acceptance and uptake of new technologies. TAM suggests that an individual's propensity to adopt a system is impacted by two fundamental beliefs which were perceived usefulness and perceived ease of use. Perceived usefulness is the degree to which an individual believes that using a specific system will increase productivity (Tsourela & Nerantzaki, 2020). Meanwhile, perceived ease of use relates to an individual's belief that utilising a certain system would be straightforward or effortless (Pazvant & Faiz, 2018). Perceived ease of use is directly proportional to perceived usefulness and technological adoption. TAM offers a basis for understanding how individuals within organisations perceive and decide to use IoT technologies. Perceived usefulness is the assumption that using IoT would improve work performance or make jobs simpler, whereas perceived ease of use is the perception of how simple it is to utilise IoT technology (Pazvant & Faiz, 2018). It is important to note that factors such as organisational and environmental influences can also impact technology acceptance and should be considered in conjunction with TAM when assessing IoT acceptance in SCM (Skarmeta et al., 2014).

As mentioned previously, a similar approach to the TAM framework was followed as by initially focusing on the two main variables which were perceived usefulness and perceived ease of use. These variables are crucial in understanding why employees adopt or reject new technologies, such as IoT in supply chain management. Recognising that real-world scenarios often involve more complex factors, there were additional variables that also influenced the acceptance of IoT technology in supply chain management. These new variables which are real-time visibility and data-driven decision-making, were seen as external factors that might play a role in shaping individuals' attitudes and behaviors toward accepting IoT technology. As a result, while the study framework already comprised the initial TAM components, it was enlarged to include the newly uncovered external elements. By empirically testing the significance of these additional variables alongside the core TAM constructs, the study sought to contribute to a nuanced understanding of technology acceptance dynamics, particularly within the SCM. As per a complete model framework shown in Figure 2.3 below, in this research, the study's hypotheses are aligned with TAM, as they explore the relationships between real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use and IoT technology acceptance in supply chain management.

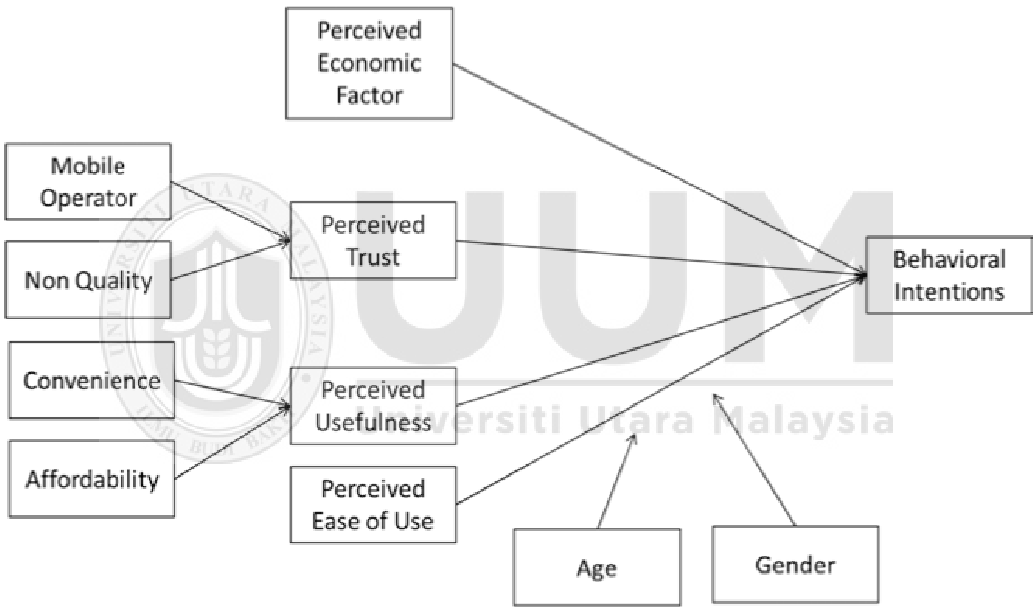

Figure 2. 3
A Complete Model For TAM
Source: (Schierz et al. 2010; Nicoletti, 2014)

2.9 Summary of the Chapter

This chapter focused on gathering the thoughts and perspectives of other academics, as well as building on prior studies, to develop a more solid and comprehensive scientific basis. This chapter has provided an overview of the key variables, their definitions, and concepts. It also presented a summary of previous studies related to these variables and developed hypotheses that will be tested in the subsequent chapters. The theoretical framework and underpinning theory were discussed to provide a conceptual foundation for the research.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research method that will be used to investigate the IoT technology acceptance in SCM in Malaysia, focusing on the four independent variables. Following that, it will outline the essential and important details of the research which is the hypotheses development of the study. This chapter also included research design, the target population, sample size and sampling technique. The subsequent section will cover the research instruments, concentrating on the development of questionnaires and measurement scales. Then it will be continued data collection with procedure for data analysis such as descriptive analysis, reliability and also Pearson's Correlation. Overall, this chapter will give a thorough comprehension of the research methodology.

3.2 Hypotheses Development

This section outlines the formulation of hypotheses. Aligned with the research questions and objectives outlined in Chapter 1, the subsequent discussion is centered on past empirical discoveries. Consequently, four hypotheses have been developed to explore the influence of the IoT, serving as independent variables, on supply chain industries in Malaysia. In the field of SCM, there are both expectations and concerns about the use of the IoT to improve corporate performance. When numerous difficulties develop in supply chain management, the IoT permits machines to make choices with little or no human interaction. Due to the complexities and uncertainties involved, difficulties such as real-world challenges, excess inventory, and delayed delivery are common prior to adding the IoT into the supply chain management system. Consequently, the integration of IoT technology enhances the functionality of the SCM system, allowing it to address the limitations observed in past experiences (Abdel-Basset et al., 2018).

3.2.1 The Relationship between Real-Time Visibility with the Internet of Things Technology Acceptance in Supply Chain Management

Real-time visibility (RTV) pertains to data or updates that are promptly sent and processed without significant delay as events unfold. Prior research has confirmed that real-time visibility, supported by the IoT technology, contributes to increased responsiveness, reduced delays, and improved decision-making skills in supply chain operations (Bouzida & Merzoug, 2021). Consequently, hypotheses are proposed to elucidate the correlation between real-time visibility and the adoption of IoT technology in SCM in Malaysia.

H_1: *There is a positive significant relationship between real-time visibility with the Internet of Things technology acceptance in supply chain management.*

3.2.2 The Relationship between Data-Driven Decision-Making with the Internet of Things Technology Acceptance in Supply Chain Management

Data-driven decision-making (DDDM) means using information to help you decide what to do. IoT applications generated a vast amount of information, and predictive analytics can use this data to more accurately predict demand. Badarudin et al., 2018 argues the IoT helps supply chain managers optimise inventory levels, production schedules, and distribution processes. The Internet of Things (IoT) is renowned for enhancing decision-making. Device connectivity enables autonomous decision-making, promoting energy efficiency without human intervention. The substantial data collected by various sensor devices can be stored in big data storage, influencing both strategic and operational decision-making. When devices analyse broader trends from empirical data, more intelligent decisions are made (I. Lee & Lee, 2015). Prior research has demonstrated that the progression of the IoT technology in Malaysia has the potential to give various advantages to the public, including enhanced economic efficiency and productivity through the automation and optimisation of activities. Moreover, the advancement of the IoT acceptance can contribute to reducing environmental risks through real-time sensing and information provision (Falkenreck & Wagner, 2017). Consequently, hypotheses are proposed to enhance comprehension of the correlation between data-driven decision-making and the use of IoT technology in SCM.

H_2: *There is a positive significant relationship between data-driven decision-making with the Internet of Things technology acceptance in supply chain management.*

3.2.3 The Relationship between Perceived Usefulness with the Internet of Things Technology Acceptance in Supply Chain Management

Perceived usefulness (PU) is the subjective assessment of how much a person believes that a technology would improve their work performance or help them achieve specified objectives (Davis, 1989). In supply chain management, stakeholders assess the usefulness of IoT technologies based on their perceived ability to streamline processes, improve decision-making, and achieve operational objectives. Perceived usefulness plays a pivotal role in the acceptance of technology and is positively linked to individuals' attitudes regarding IoT products and applications (Tsourela & Nerantzaki, 2020). This continuous stream of data allows employees to make more informed decisions, optimise resource allocation, and respond promptly to disruptions or fluctuations in demand. Previous studies have highlighted the crucial role of PU in influencing individuals' attitudes and intentions towards adopting new technologies (Venkatesh & Davis, 2000).

H_3: *There is a positive significant relationship between perceived usefulness and the Internet of Things technology acceptance in supply chain management.*

3.2.4 The Relationship between Perceived Ease of Use with the Internet of Things Technology Acceptance in Supply Chain Management

Perceived ease of use (PEOU) refers to an individual's subjective perception of how effortless or convenient it is to use a particular technology (Davis, 1989). IoT technologies offer various functionalities and features designed to streamline supply chain operations and enhance decision-making capabilities. For example, user-friendly interfaces, intuitive dashboards, and simplified data visualisation tools enable employees to navigate and interact with IoT systems with minimal effort (Protopsaltis et al., 2020). Additionally, the integration of IoT sensors and devices into existing infrastructure facilitates seamless data capture and transmission, reducing the complexity of technology usage for supply chain professionals. Previous research has highlighted the critical role of PEOU in influencing individuals' attitudes and intentions towards adopting new technologies (Venkatesh & Davis, 2000).

H_4: *There is a positive significant relationship between perceived usefulness and the Internet of Things technology acceptance in supply chain management.*

3.3 Research Design

As Sekaran (2013) indicates, research design involves making strategic decisions. This study utilises a quantitative method of study to gather numerical data that can be statistically analysed. The researcher utilises a cross-sectional survey method to gather data, enabling responses to the research questions. Participants will be given a series of questions using Google Form in order to collect data directly from employees. This questionnaire is the primary method for collecting data for the study, ensuring the capture of accurate and reliable data. As per in Figure 3.1, a proper flow chart needs to be followed to get a reliable and updated data that needed for this research.

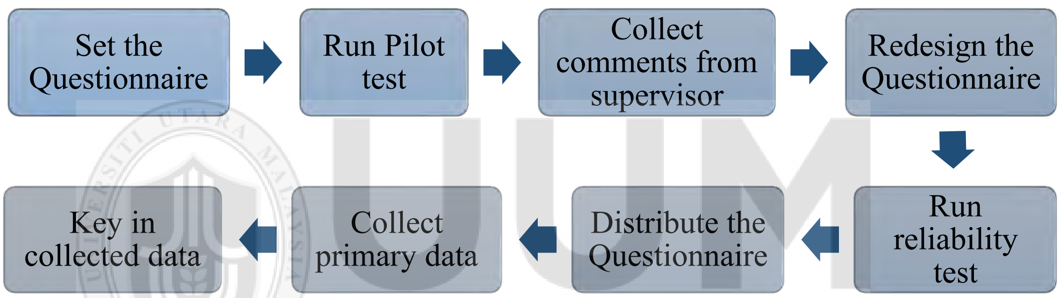

Figure 3. 1
Data collection flow chart

3.4 Population, Sample Size and Sampling Technique

3.4.1 Target Population

According to Sekaran (2013), populations can be defined as respondents drawn from a specific group of individuals relevant to the research. Employees are the respondents of the study as they represent the group being investigated to explore their attitudes and perspectives regarding work. The study will concentrate on employees who are working in supply chain in Malaysia. Employees will be selected by a simple random sampling approach. This approach is often used in research to guarantee that the data acquired correctly reflects the whole population. The estimated population for this study comprises more than 49,000 employees who are directly involves in supply chain management in Malaysia. The updated population list for this study was obtained from two reliable sources which are the Federation of Malaysian Manufacturers (FMMs) and the Department of Statistics Malaysia (DOSM). The criteria for respondents in this study include individuals working in entry-level to senior management positions, with a minimum of one year of work experience in supply chain management field.

3.4.2 Sample Size

According to Roscoe (1975), most research studies consider a sample size between 30 and 500 to be appropriate. Increasing the sample size improves the accuracy of survey data and findings, making them more precise. Sample size is a crucial concept in statistics. Initially, there were 385 targeted respondents for this study but only 361 employees who were responded to the survey.

3.4.3 Sampling Technique

Simple random sampling technique was used for his research as the researcher selected respondents who are working in SCM companies in Malaysia. This simple random sampling technique was used to ensure that every employee in Malaysian SCM enterprises had an equal opportunity to be chosen for participation. This impartiality helps to eliminate bias and ensures that the sample accurately represents the entire population, thereby enhancing the generalisability of the study's findings. Moreover, simple random sampling offers particular advantages when efficiency and speed in sample selection are paramount. In this study, respondents who were involved actively in SCM was selected, the straightforward and uncomplicated nature of this method facilitated a rapid and efficient process of participant selection. Quantitative analysis will be held in this research which every data will be collect from the questionnaire. There were 400 questionnaires were distributed randomly as the target of respondents were 385 but only 361 were returned to the researcher. This questionnaire is the main tool used to gather data for this study, allowing us to obtain dependable and precise information. The content and input from the questionnaire will help to investigate the relationship of the IoT technology acceptance with the real-time visibility, data-driven decision-making and perceived usefulness and perceived ease of use in supply chain management in Malaysia.

3.5 Questionnaire Design

The chosen research tool for this investigation is a questionnaire. In alignment with the study's research objectives, meticulous attention will be given to the construction of each item within the instrument. A comprehensive review of survey items was undertaken to ensure their relevance to this descriptive study. A systematic questionnaire was created based on the study objectives and questions. The questionnaire were included items related to the IoT, real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use and IoT acceptance in supply chain management. The questions will be designed to capture in quantitative data. Survey questionnaire method is used as the instrument to collect related data to complete this study. This study will gather data using a questionnaire given to respondents with the objective of evaluating quantitative data. This research will solely be focusing on 361 respondents who are involve in supply chain management to obtain the genuine and valid feedback. Following the approach suggested by Parmjit et al. (2006), a Five-point Likert scale was used tool in survey research to measure attitudes, opinions, or perceptions of respondents. The primary method of evaluating data involves scoring the structural responses based on this scale.

3.6 Research Measurement

The measurement of variables will involve using Likert scales for quantitative assessments. For example, respondents may be asked to rate the relationship of IoT technology acceptance with perceived of useful in supply chain management on a scale of 1 to 5. This study will use nominal scale and interval scale to measure the data. Nominal scales referred to a technique that used to indicate the categories without any numerical significance and will divide into different groups as well (Stevens, 1946). Interval scales is known as a rating scale that will using Likert scale for the measurement (Stevens, 1946). Likert scale refers to the scale that prepares multiple categories which allow the respondents to point out their opinion about the question prepared. The questionnaire selection column used a five-point Likert scale ranging from strongly disagree to strongly agree (Beglar & Nemoto, 2014). Using a Five-point Likert scale is anticipated to produce more precise data, allowing for the assessment of the reliability of respondents' feedback. The study's questionnaire is divided into three sections which are Section A, B, and C. In Sections B and C will also utilise the Likert Scale to create the options column for the participants. This questionnaire will be conduct by using Google Form platform and all statements will be written in English. Below will explain the section description in the questionnaire:

3.6.1 Section A – Demographic Profile

This section will analyse different categories of demography among the respondents. The study will use nominal scale to collect the data that indicates the age, education level, professional level of the respondents and year of experiences in Supply Chain Management (SCM).

3.6.2 Section B – Independent Variables

For this section, the study will use interval scale to point out respondents feedbacks. This section will contain the four independent variables which are real-time visibility, data-driven decision-making, perceived usefulness and perceived ease of use that will be used to indicate the respondent's feedback on this variable as well.

3.6.3 Section C – Dependent Variable

This section will gather feedbacks about the general knowledges and the IoT technology acceptance in supply chain management in Malaysia. This section also will use interval scale to measure the respondent's opinions, thoughts and acceptance level on technological advancement and benefits especially IoT technology acceptance in supply chain management in Malaysia.

Table 3. 1
Variables and Sources

Section	Dimension	Sources
A	Demography Profile	
B	Real-time visibility	(Bouzida & Merzoug, 2021);
	Data-driven decision-making	(Badarudin et al., 2018);
	Perceived usefulness	(Tsourela, Nerantzaki, 2020);
	Perceived ease of use	(Pazvant & Faiz, 2018)
C	The Internet of Things Technology Acceptance in SCM	(Muhamad et al., 2023); (Mouha, 2021)

3.7 Pilot Test

This study will perform a pilot test to improve the questionnaire's content validity. Pilot test is a test to figure out the possibility of the questionnaire whether the data can use or not by trying it on a few groups of employees first (Tobacco Control Evaluation Centre, 2011). A preliminary survey was carried out for this research, with a sample of 30 respondents who are working in supply chain management in Malaysia.

3.8 Data Collection Technique

Data collection will be conducted to achieve the research objectives. This process will entail distributing structured questionnaires to chosen respondents. The survey may be administered via online platforms, emails, or in-person interviews, depending on respondents' convenience. The study will provide a brief overview of its objectives and the confidentiality measures implemented to encourage participants' willingness to participate. Data collection involves gathering information from various pertinent sources. In this study, a quantitative data collection method was utilised, gathering data from respondents through questionnaire surveys. There are two types of data sources: primary data, which consist of information obtained directly from the respondents, and secondary data, which are derived from already published materials.

3.8.1 Primary Data

Primary data are facts collected directly from individuals, organisations, or target respondents. A questionnaire distributed over the internet was used to collect the main data for the investigation. The respondent's opinions and contributions are crucial to the study's fundamental data gathering. The primary data for this study would be the responses and feedback provided by 361 Malaysian supply chain management employees.

3.8.2 Secondary Data

Secondary data is information collected from previously published sources such as documents, newspapers, books, journals, articles, and other sources relevant to the study topic. This method of data collection was used to review and analyse data that had been readily available by some researchers. For this study, the secondary data would be the previous articles and journals related to the topic of this study.

3.9 Data Analysis Techniques

The data analysis technique provided an in-depth description of the statistical analysis conducted in this research. The data was processed using a specialised software application, which is a Statistical Package for the Social Sciences (SPSS) version 29. This software is chosen for its capability to generate precise calculations required for the study. SPSS is a statistical program utilised to expedite and accurately process statistical data. It produces variety of output that required by the researcher. Hence, with the use of words and SPSS facilitates data acquisition, this analysis was done to provide answers to research questions. Apart from that, this analysis was done as to the IoT technology acceptance in supply chain management in Malaysia in the aspect of variables real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use. The descriptive statistics used to measure the data from the questionnaires will include frequencies, percentages, and mean values.

3.9.1 Descriptive Analysis

Descriptive analysis is typically utilised to illustrate fundamental characteristics of data presented in a study. It provides concise summaries regarding graphical analysis, samples, and measures employed in the research. Despite the various measures utilised to present the study model in research, descriptive analysis assists in simplifying the large amount of data into a manageable format (Kopcha et al., 2014). In most cases, descriptive analysis will be used to characterise the demographic profile, which may include gender, age, educational level, and employment experiences. The information will be presented in the form of percentages and frequencies. Central tendencies measurement such as mean, mode, average and standard deviation will be constructing for each variable.

3.9.2 Reliability Analysis

Reliability refers to stability and consistency of a test where data collection method or analysis is consistent with the reliable results. Cronbach's coefficient alpha, often referred to as Cronbach's alpha, is the most frequently utilised reliability test in various study projects. As shown in Figure 3.2, it evaluates the extent to which the feedback that respondents offer are consistent across all of the components that include in a measurement. A Cronbach alpha value ranging from 0.7 to 0.9 for all variables is considered acceptable for indicating excellent measurement reliability. Cronbach (2016) supports this claim, stating that higher values of Cronbach's alpha are indicative of more internal consistency among the items of the scale.

Cronbach's Alpha	Strength of Association
a ≥ 0.9	Excellent
0.7 ≤ a < 0.9	Good
0.6 ≤ a < 0.7	Acceptable
0.5 ≤ a < 0.6	Poor
< 0.5	Unacceptable

Figure 3. 2
Cronbach's Alpha
Source: (Wikarsa, Liza & Angdresey, Apriandy, 2021)

3.9.3 Pearson Correlation Analysis

Correlation assesses the relationship between variables. Each variable examined at the interval or ratio level possesses bivariate relationships, and a Pearson Correlation matrix unveils the direction, strength, and significance of these associations (Yeager, 2018). The answer to this question will offer you with an in-depth understanding of the relationship between two variables, which are referred to as independent and dependent variables. Theoretically, Pearson Correlation ranges between -1.0 and +1.0, with a significance level of p=0.05 typically accepted as statistically significant. This indicates that in 95% of cases, the study can reliably detect a significant and meaningful relationship between both independent and dependent variables, with just a 5% chance that the connection is not present. According to Andale (2012), the value of R falls within the range of -1 to +1. A correlation exceeding 0.8 (80) is often characterised as strong, while a correlation less than 0.5 is typically considered weak. To simplify, a positive correlation number indicates that the independent and dependent variables are positively correlated, while a negative correlation value implies the opposite.

3.10 Summary of the Chapter

This chapter only examines the research methodologies used in this study. The chapter provides a comprehensive overview of the study methodology, including the framework, hypotheses, design, population, sample, questionnaire, measurement, data collecting, and analytic tools. This chapter plays a role in addressing the main research challenges. The selected approach offer a comprehensive understanding of IoT technology acceptance in SCM in Malaysia, focusing on four variables. In conclusion, this research makes use of a cross-sectional design and a quantitative methodology to gather data via the use of a questionnaire survey as the major source, with secondary sources serving as other sources of information. A Likert scale of five points is used to evaluate the data collected from the questionnaire questions, which were modified from earlier research. Following a pilot test, the actual survey will be conducted. After the surveys have been completed, the information that was gathered will be analysed with the SPSS Version 29 programme. Results will be analysed using descriptive statistics, reliability analysis, and Pearson's correlation. Ensuring the validity and trustworthiness of the data is vital to demonstrate the usefulness and success of the study. Therefore, the study adheres to established procedures, and the data obtained will be essential for achieving the research objectives and supporting the findings.

CHAPTER FOUR

FINDING AND ANALYSIS

4.1 Introduction

The empirical findings of the study are presented in this chapter. The findings start with the profile summary of respondents that described the demographic variables of the sample and any related information accessed that may influence the findings. This research has collected back 361 respondents from 400 set of questionnaire which were distributed randomly to gain more variety perception from the respondents as well. The result for this research is analysed by using SPSS. The data outcomes demonstrated the Internet of Things technology acceptance in SCM employees in Malaysia. The results were based on descriptive analysis, reliability analysis and Pearson's Correlation analysis.

4.2 Pilot Test Result

Chapter 3 outlines the execution of a preliminary trial in preparation for a larger investigation, commonly referred to as a pilot test (Pallant, 2001). This endeavour resulted in the development of new tools, with assessments conducted to ensure respondents understood the material. The importance of conducting a pilot test lies in its ability to uncover potential issues throughout the research process, including challenges related to wording or instrument quality. 30 set of questionnaires had been distributed via Google Form to five SCM companies in Kedah and Penang. The reliability test for each instrument aimed to gauge the consistency of the items. Table 4.1 shows that all variables produced reliability estimates ranging from 0.9, which is acceptable for an excellent measure according to Hair et al. (2010), a Cronbach's alpha value of 0.70 or higher indicates reliability.

Table 4. 1
Reliability results for Pilot Test

Variables	Cronbach's Alpha	N of Items	Reliability Level
Real-Time Visibility	.961	5	Excellent
Data-Driven Decision-making	.951	5	Excellent
Perceived Usefulness	.957	5	Excellent
Perceived Ease of Use	.946	5	Excellent
The IoT Technology Acceptance in SCM	.908	5	Excellent

4.3 Descriptive Analysis for Demographic Information

4.3.1 Respondent's Gender

Table 4. 2
Respondent's Gender

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	183	50.7	50.7	50.7
	Female	178	49.3	49.3	100.0
	Total	361	100.0	100.0	

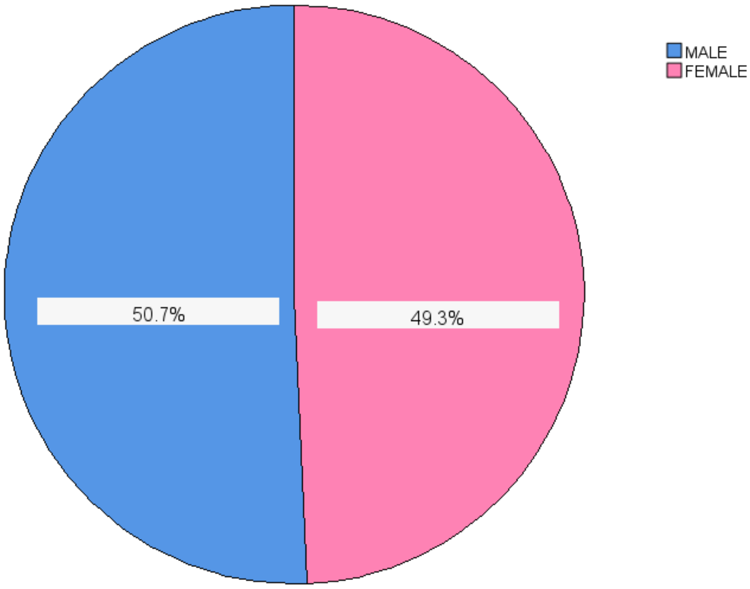

Figure 4. 1
Respondent's Gender

This table 4.2 and figure 4.1 display the distribution of respondents by gender. Out of 361 respondents, 183 (50.7%) are male and 178 (49.3%) are female in supply chain management. The total cumulative percentage accounts for 100% of the respondents.

4.3.2 Respondent's Age

Table 4. 3
Respondent's Age

	Items	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25 years old	19	5.3	5.3	5.3
	26-39 years old	318	88.1	88.1	93.4
	40 and above	24	6.6	6.6	100.0
	Total	361	100.0	100.0	

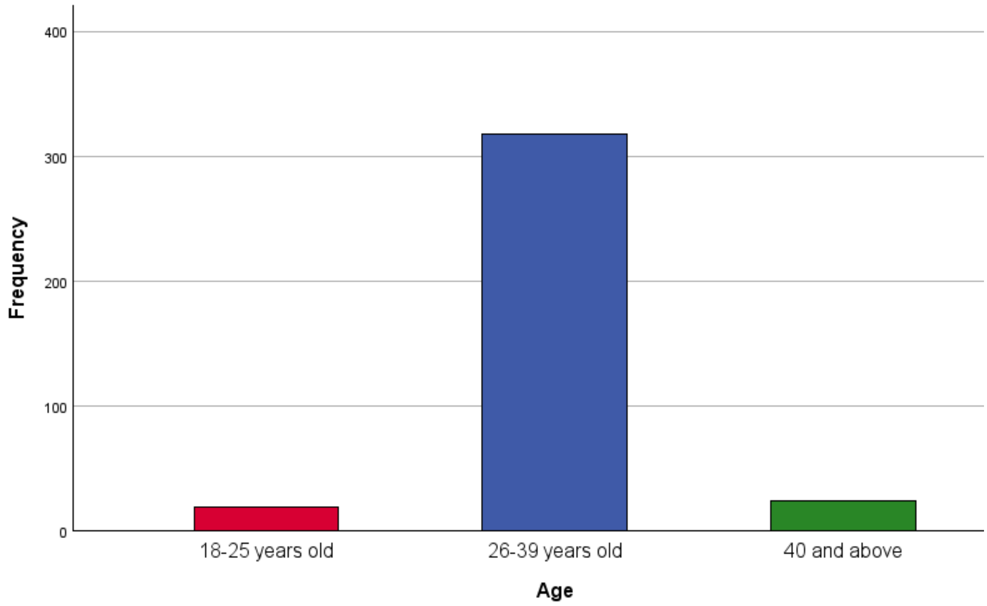

Figure 4. 2
Respondent's Age

The distribution of respondents according to age group is shown in this table 4.3 and figure 4.2. Among the 361 respondents, 19 (5.3%) are aged 18-25 years old, 318 (88.1%) are aged 26-39 years old, and 24 (6.6%) are aged 40 and above. The cumulative percentage accounts for 100% of the respondents.

4.3.3 Respondent's Education Level

Table 4. 4
Respondent's Education Level

	Items	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma or equivalent	20	5.5	5.5	5.5
	Bachelor's Degree	278	77.0	77.0	82.5
	Master's Degree	45	12.5	12.5	95.0
	Doctorate or higher	18	5.0	5.0	100.0
	Total	361	100.0	100.0	

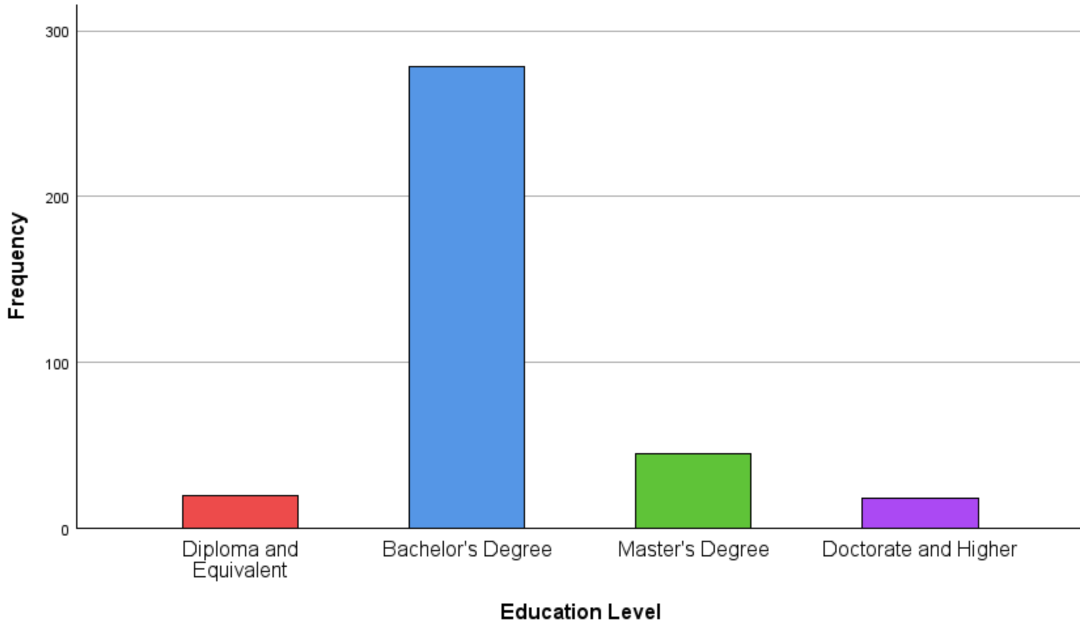

Figure 4. 3
Respondent's Education Level

This table 4.4 and figure 4.3 presents the distribution of respondents by education level. Out of 361 respondents, 20 (5.5%) have a Diploma or equivalent, 278 (77.0%) hold a Bachelor's Degree, 45 (12.5%) have a Master's Degree, and 18 (5.0%) possess a Doctorate or higher. The cumulative percentage accounts for 100% of the respondents.

4.3.4 Respondent's Job Position

Table 4. 5
Respondent's Job Position

	Items	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Entry-level	4	1.1	1.1	1.1
	Mid-Level	37	10.2	10.2	11.4
	Senior-Level	264	73.1	73.1	84.5
	Managerial	56	15.5	15.5	100.0
	Total	361	100.0	100.0	

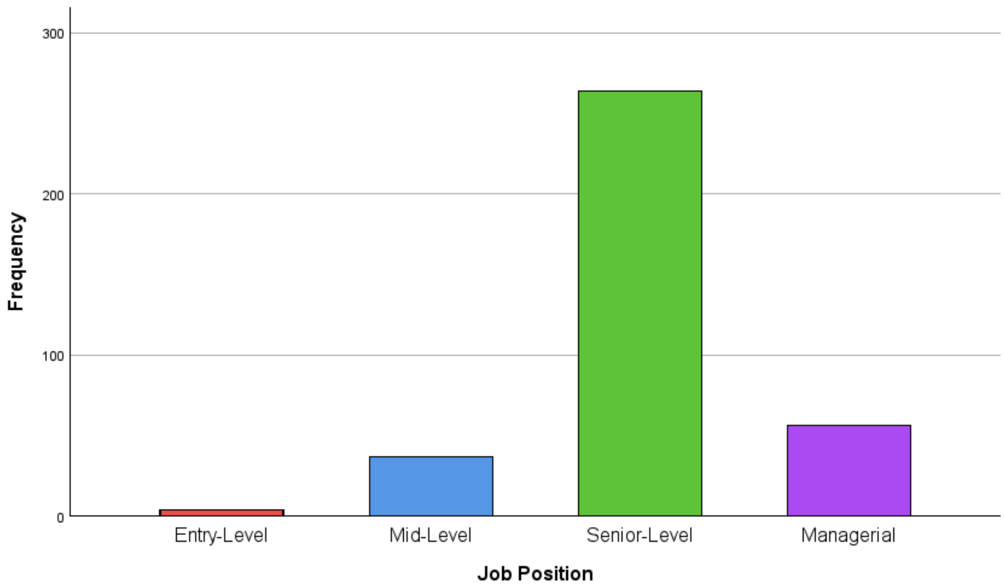

Figure 4. 4
Respondent's Job Position

This table 4.5 and figure 4.4 displays the distribution of respondents by job position. Among the 361 respondents, 4 (1.1%) are in entry-level positions, 37 (10.2%) are in mid-level positions, 264 (73.1%) are in senior-level positions, and 56 (15.5%) hold managerial positions. The cumulative percentage accounts for 100% of the respondents.

4.3.5 Respondent's Years of Experience in SCM

Table 4. 6
Respondent's years of experience involved in the SCM

	Items	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3 years	25	6.9	6.9	6.9
	4-6 years	275	76.2	76.2	83.1
	7 and above	61	16.9	16.9	100.0
	Total	361	100.0	100.0	

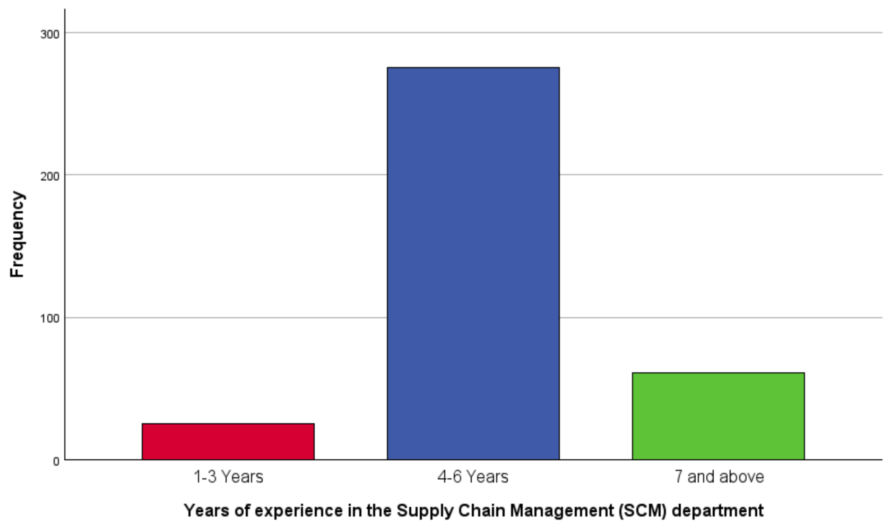

Figure 4. 5
Respondent's years of experience in the SCM

This table 4.6 and figure 4.5 illustrates the distribution of respondents by years of experience in the SCM department. Out of 361 respondents, 25 (6.9%) have 1-3 years of experience, 275 (76.2%) have 4-6 years of experience, and 61 (16.9%) have 7 or more years of experience. The cumulative percentage accounts for 100% of the respondents.

4.4 Descriptive Analysis for Variables

In descriptive analysis, the data of all items for each variable are organised into summaries that can be evaluated in terms of frequency, mean, and standard deviation. This is accomplished via the use of descriptive analysis. Attempts are made to quantify the effects of real-time visibility, data-driven decision-making, perceived usefulness, and perceived ease of use in relation to the acceptance of the IoT technology in SCM This is accomplished via the use of a five-point Likert scale to compute all items.

4.4.1 Real-Time Visibility

Table 4. 7
Descriptive Statistics for Real-Time Visibility (RTV)

Items	N	Minimum	Maximum	Mean	Std. Deviation
RTV1	361	4	5	4.53	.500
RTV2	361	4	5	4.98	.128
RTV3	361	4	5	4.52	.500
RTV4	361	3	5	4.90	.419
RTV5	361	4	5	4.52	.500
Overall	361	4.00	5.00	4.6898	.33521

Based from Table 4.7, a descriptive statistic for research independent variable 1 which is the real-time visibility reveal an overall mean score of 4.6898 (SD = 0.33521). This suggests that, on average, respondents tend to exhibit a positive perception of real-time visibility within the supply chainThe highest mean score was obtained for RTV3, showing that IoT technology's capacity to monitor supply chain processes in real time improves response to changing market circumstances and consumer needs.

4.4.2 Data-Driven Decision-making

Table 4. 8
Descriptive Statistics for Data-Driven Decision-Making (DDDM)

Items	N	Minimum	Maximum	Mean	Std. Deviation
DDDM1	361	3	5	4.52	.506
DDDM2	361	3	5	4.90	.419
DDDM3	361	4	5	4.53	.500
DDDM4	361	3	5	4.90	.426
DDDM5	361	3	5	4.56	.503
Overall	361	3.40	5.00	4.6803	.35789

Table 4.8 shows descriptive statistics for research independent variable 2 which is the data-driven decision-making shows an overall mean score of 4.6803 (SD = 0.35789). According to the results, DDDM2 and DDDM4 had the highest average value, indicating that the use of IoT technology can produce large amounts of data for analysis. This ensures that the data is accurate and clear, allowing for actionable insights and decisions based on evidence throughout the supply chain process. Moreover, IoT devices can assist in the real-time collection of data. This process comprises collecting and analysing data, using algorithms to make decisions, monitoring real-time operations, and relying on human expertise to make informed decisions.

4.4.3 Perceived Usefulness

Table 4. 9
Descriptive Statistics for Perceived Usefulness (PU)

Items	N	Minimum	Maximum	Mean	Std. Deviation
PU1	361	3	5	4.47	.582
PU2	361	3	5	4.80	.570
PU3	361	3	5	4.47	.586
PU4	361	3	5	4.89	.431
PU5	361	3	5	4.52	.506
Overall	361	3.00	5.00	4.6288	.43211

Table 4.9 reveals descriptive statistics for research independent variable 3 which is the perceived usefulness shows an overall mean score of 4.6288 (SD = 0.43211). This implies a strong consensus among participants on the technology's perceived usefulness in boosting their employment or supply chain management procedures. The PU4 group earned the highest mean score, indicating that employees are more likely to accept IoT when their managers properly explain the benefits of new technology using logical reasoning, increasing their view of its utility.

4.4.4 Perceived Ease of Use

Table 4. 10
Descriptive Statistics for Perceived Ease of Use (PEOU)

Items	N	Minimum	Maximum	Mean	Std. Deviation
PEOU1	361	2	5	4.17	.720
PEOU2	361	2	5	3.66	.929
PEOU3	361	2	5	3.86	1.086
PEOU4	361	2	5	3.58	1.011
PEOU5	361	2	5	4.09	.723
Overall	361	2.00	5.00	3.8737	.82206

Table 4.10 proves descriptive statistics for research independent variable 3 which is the perceived ease of use shows an overall mean score of 3.8737 (SD = 0. 82206). This means that, on average, respondents in the survey rate the ease of use of the technology as relatively good. The mean score represents respondents' moderate agreement on the ease of use of technology in SCM tasks or procedures. PEOU1 had the highest mean value, which proves that the user interface of IoT systems designed for supply chain applications is easy to use, intuitive, and user-friendly. It suggests that respondents perceive the design of IoT systems in supply chain applications favourably, finding them accessible and straightforward to interact with.

4.4.5 The Internet of Things Technology Acceptance in SCM

Table 4. 11
Descriptive Statistics for The IoT Technology Acceptance in SCM

Items	N	Minimum	Maximum	Mean	Std. Deviation
IoT1	361	4	5	4.94	.234
IoT2	361	3	5	4.56	.503
IoT3	361	4	5	4.98	.147
IoT4	361	4	5	4.53	.500
IoT5	361	3	5	4.98	.173
Overall	361	3.60	5.00	4.7961	.22580

Based from table 4.11, descriptive statistics for research dependent variable which is the Internet of Things (IoT) technology acceptance in SCM reveal an overall mean score of 4.7961 (SD = 0.22580). This suggests that, on average, respondents tend to exhibit a high level of acceptance toward IoT technology within the supply chain management. The standard deviation of 0.22580 indicates that the responses are relatively tightly clustered around the mean, indicating a degree of consistency in the level of acceptance among respondents. IoT3 and IoT5 exhibited the highest mean value, demonstrating that IoT technology enables organisations to meet customer expectations of transparency, reliability, and responsiveness in their interactions. Moreover, it is worth noting that the integration of suppliers and the Internet of Things (IoT) technology within the supply chain has the potential to decrease operational costs, optimise resource utilisation, and streamline workflows. Consequently, this has the ability to improve the overall financial efficiency and profitability of the organisation.

4.5 Reliability Test

Table 4. 12
Reliability Analysis for Variables

Variables	Cronbach's Alpha	N of Items	Reliability Level
Real-Time Visibility	.831	5	Good
Data-Driven Decision-making	.815	5	Good
Perceived Usefulness	.862	5	Good
Perceived Ease of Use	.946	5	Excellent
The Internet of Things Technology Acceptance in Supply Chain Management	.701	5	Acceptable

The reliability test conducted on the study variables reveals varying levels of internal consistency. The reliability of real-time visibility, data-driven decision-making, and perceived usefulness was determined to be satisfactory good, as indicated by Cronbach's Alpha values ranging from 0.815 to 0.862, as shown in Table 4.12. Perceived ease of use was extremely reliable, with a Cronbach's Alpha of 0.946 suggesting great consistency among its components. However, IoT technology acceptance in SCM demonstrated reasonable dependability, with a Cronbach's Alpha of 0.701, indicating significantly poorer internal consistency. These findings underscore the reliability of the measurement scales used for each variable, with most demonstrating good to excellent levels of consistency in capturing the intended constructs.

4.6 Pearson Correlation Result and Analysis

The analysis of the relationship between two sets of data, one dependent and the other independent, was performed using Pearson's correlation coefficient. Based on the obtained results, it is evident that there are two variables that exhibit a high positive correlation, one variable that shows a high correlation, and one variable that demonstrates a low correlation.

4.6.1 Correlation analysis between Real-Time Visibility and The Internet of Things Technology Acceptance in SCM

Table 4. 13
The Correlation between RTV and The IoT Technology Acceptance in SCM

Items		RTV	The IoT Technology Acceptance in SCM
RTV	Pearson Correlation	1	.915**
	Sig. (2-tailed)		<.001
	N	361	361
The IoT Technology Acceptance in SCM	Pearson Correlation	.915**	1
	Sig. (2-tailed)	<.001	
	N	361	361

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

Based from table 4.13, the Pearson correlation coefficient between two variable which are RTV and IoT technology acceptance in SCM is a remarkable 0.915, indicating a very high positive correlation between these two variables. The connection is extremely significant at the 0.01 level (2-tailed), with $p < 0.001$, based on 361 observations for both variables.

4.6.2 Correlation analysis between Data-Driven Decision-making and The Internet of Things Technology Acceptance in SCM

Table 4. 14

The Correlation between DDDM and The IoT Technology Acceptance in SCM

Items		DDDM	The IoT Technology Acceptance in SCM
DDDM	Pearson Correlation	1	.899**
	Sig. (2-tailed)		<.001
	N	361	361
The IoT Technology Acceptance in SCM	Pearson Correlation	.899**	1
	Sig. (2-tailed)	<.001	
	N	361	361

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

Based from Table 4.14, the Pearson correlation coefficient between DDDM and IoT technology acceptance in SCM is 0.899, indicating a very high correlation between these two variables. This correlation is highly significant at the 0.01 level (2-tailed), with $p < 0.001$, based on a sample size of 361 observations for both variables.

4.6.3 Correlation analysis between Perceived Usefulness and The Internet of Things Technology Acceptance in SCM

Table 4. 15

The Correlation between PU and The IoT Technology Acceptance in SCM

Items		PU	The IoT Technology Acceptance in SCM
PU	Pearson Correlation	1	.762**
	Sig. (2-tailed)		<.001
	N	361	361
The IoT Technology Acceptance in SCM	Pearson Correlation	.762**	1
	Sig. (2-tailed)	<.001	
	N	361	361

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

The correlation analysis in Table 4.15 which was conducted using Pearson's correlation coefficient reveals a high correlation ($r = 0.762$, $p < 0.001$) between PU and IoT technology acceptance in SCM. This finding is based on a dataset of 361 observations for both variables.

4.6.4 Correlation analysis between Perceived Ease of Use and The Internet of Things Technology Acceptance in SCM

Table 4. 16
The Correlation between PEOU and The IoT Technology Acceptance in SCM

Items		PEOU	The IoT Technology Acceptance in SCM
PEOU	Pearson Correlation	1	.394**
	Sig. (2-tailed)		<.001
	N	361	361
The IoT Technology Acceptance in SCM	Pearson Correlation	.394**	1
	Sig. (2-tailed)	<.001	
	N	361	361

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

The Pearson correlation coefficient between PEOU and IoT technology acceptance in SCM in Table 4.16 is 0.394, indicating a low correlation between these two variables. This correlation is highly significant at the 0.01 level (2-tailed), with $p < 0.001$, based on a sample size of 361 observations for both variables.

4.7 Hypothesis Testing

Table 4. 17
Hypothesis testing results for variables

	Hypothesis	Pearson Correlation	Result
H1	There is a positive relationship between real-time visibility with the IoT technology acceptance in supply chain management.	$r = 0.915$ $p = 0.001$ $p < 0.05$	Supported
H2	There is a positive relationship between data-driven decision-making with the IoT technology acceptance in supply chain management.	$r = 0.899$ $p = 0.001$ $p < 0.05$	Supported
H3	There is a positive relationship between perceived usefulness and the IoT technology acceptance in supply chain management.	$r = 0.762$ $p = 0.001$ $p < 0.05$	Supported
H4	There is a positive relationship between perceived ease of use and the IoT technology acceptance in supply chain management.	$r = 0.394$ $p = 0.001$ $p < 0.05$	Supported

Based on the hypothesis testing results in Table 4.17, H1 shows a positive relationship between real-time visibility and IoT technology acceptance in SCM. The Pearson correlation coefficient (r) of 0.915 suggests a very strong positive relationship. In addition, the obtained p-value of 0.001, which is below the predetermined significance level of 0.05, offers evidence in favour of the hypothesis. For H2, there exists a positive relationship between data-driven decision-making and IoT technology acceptance in SCM. The Pearson correlation coefficient (r) of 0.899 signifies a strong positive relationship. In addition, the p-value of 0.001, which is lower than the significance level of 0.05, offers supporting evidence for the hypothesis. Meanwhile, in the case of H3, there exists a positive correlation between the perceived usefulness and the acceptance of IoT technology in SCM. The Pearson correlation coefficient (r) of 0.762 indicates a moderately strong positive relationship. Additionally, the p-value of 0.001, which is below the significance level of 0.05, supports the hypothesis. Lastly, for H4, there exists a positive relationship between perceived ease of use and IoT technology acceptance in SCM. The Pearson correlation coefficient (r) of 0.394 indicates a low positive relationship. Furthermore, the p-value of 0.001, which is below the significance level of 0.05, provides support for the hypothesis. In conclusion, all hypotheses are validated since they show positive relationships between the significant independent variables: real-time visibility, data-driven decision-making, perceived usefulness, perceived ease of use, and IoT technology acceptance in SCM.

4.8 Summary of the Chapter

In this chapter, data analysis included examining the real data obtained from the survey. A reliability test study was conducted to evaluate the accuracy and consistency of the instrument's results. In addition, a descriptive analysis was conducted to provide a detailed description and explanation of the respondent's profile. The relationships between the dependent variable in this study and the four independent variables were then confirmed by a hypothesis test utilising Pearson Correlation analysis. The correlation analysis of this study is used to address all of its hypotheses. By using these statistical analyses, the research question and all of the study's objectives have been successfully addressed. The next chapter will provide a concise overview of the research results, explaining the constraints of the study, proposing ideas for further investigations, and concluding with the recommendations derived from the study.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter provides an in-depth analysis of the findings presented in Chapter 4. It specifically focuses on the empirical results of the study, which examine the acceptance of the Internet of Things (IoT) technology in supply chain management (SCM) among employees in Malaysia. The chapter is organised into four sections. The initial section presents an overview of the findings, which is then followed by a concise summary of said findings. The following section will discuss the limitations of the study, followed by suggestions for future research. The conclusion is presented in the final section.

5.2 Overview of the Findings

The findings discussed in Chapter 4 provided numerous important insights into the elements that influence IoT technology acceptance in SCM. The objectives of this study were to explore the relationship of research questions and the finding of study are established as listed as below.

Table 5. 1
Overview of the Finding

Research Objectives	Research Questions	Findings
1) To investigate the relationship between real-time visibility and the IoT technology acceptance in SCM.	What is the relationship between real-time visibility and the IoT technology acceptance in SCM?	Real-time visibility statistically has very high positive relationship and significantly influenced IoT acceptance in SCM.
2) To investigate the relationship between data-driven decision-making and the IoT technology acceptance in SCM.	What is the relationship between data-driven decision-making and the IoT technology acceptance in SCM?	Data-driven decision-making statistically has very high positive relationship and significantly influenced IoT acceptance in SCM.
3) To investigate the relationship between perceived usefulness and the IoT technology acceptance in SCM.	What is the relationship between perceived usefulness and the IoT technology acceptance in SCM?	Perceived usefulness statistically has high positive relationship and significantly influenced IoT acceptance in SCM.
4) To investigate the relationship between perceived ease of use and the IoT technology acceptance in SCM.	What is the relationship between perceived ease of use and the IoT technology acceptance in SCM?	Perceived ease of use statistically has low positive relationship and influenced IoT acceptance in SCM.

5.3 Summary of the Findings

5.3.1 Real-Time Visibility with the Internet of Things Technology Acceptance in Supply Chain Management

There is a very high positive correlation and a significant association between real-time visibility and the acceptance of the Internet of Things technology in supply chain management, according to the results of the Pearson correlation analysis presented in Chapter 4. Bouzida and Merzoug (2021) has mentioned the importance of the IoT technology in enhancing transparency and delivering timely information to enhance decision-making. They also have affirmed that real-time visibility, facilitated by the IoT technology, leads to heightened responsiveness and minimised delays in supply chain activities. In the study of Bertolini et al. (2013), real-time visibility provided by the IoT technologies also allows companies to swiftly react to demand fluctuations, reduce instances of stockouts or overstock situations, and optimise inventory levels. Besides that, this finding aligns with the results reported by Sallam and Mohamed (2023), who demonstrated that integrating the IoT into supply chain management offers several advantages, including real-time visibility, improved accuracy, cost reduction, and enhanced forecasting.

5.3.2 Data-Driven Decision-making with the Internet of Things Technology Acceptance in Supply Chain Management

Based on Pearson correlation analysis result for this variable, there also exists a very high positive correlation and a strong relationship between DDDM and the IoT technology acceptance in supply chain management. As previous research study, I. Lee & Lee, (2015), strongly argues that the vast amount of data generated by the IoT devices in the supply chain provides an opportunity for data-driven decision-making. Businesses can analyse this data to gain insights into their operations and make informed choices that drive efficiency. This integration the IoT technology makes their daily work processes smoother and efficiently. The result was supported by the researcher Aryal et al. (2018) as the implementation of the IoT technology can generate big data streams for analysis, ensuring accurate, clear data, actionable insights, and evidence-based decisions throughout the supply chain.

5.3.3 Perceived Usefulness with the Internet of Things Technology Acceptance in Supply Chain Management

Based on Pearson correlation analysis result for this PU and the IoT acceptance, there are high positive correlation and a strong relationship between these two variables. Perceived usefulness (PU) has high correlation with the IoT technology acceptance in supply chain management, which means many people tend to adapt new technology such as the IoT in their organisation if they know the advantage and usefulness of the IoT in supply chain management. The result was consistent with the previous study of Doyduk & Bayarçelik (2019) as people tend to accept the IoT in supply chain management if it able to accomplish tasks more quickly and easily, significantly improving the quality and output of daily life. In addition, Gong et al. (2004) also emphasises that employees are likely to embrace and accept the IoT technologies when companies articulate the benefits and advantages of new technologies through logical reasoning, consequently enhancing the perceived usefulness.

5.3.4 Perceived Ease of Use with the Internet of Things Technology Acceptance in Supply Chain Management

Based on Pearson correlation analysis result for PEOU and the IoT acceptance, there are a low positive correlation and a weak relationship between these perceived ease of use and the IoT technology acceptance in SCM. Most of respondents were tend to assume the IoT technologies are not really convenient and the operation process is not straightforward. Conversely, some participants express that incorporating the IoT technology into their daily routines would require minimal effort as long as they receive proper guidance and instructions. As mentioned by Dendy Jonas & Evi Maria (2023), the user interface of the IoT systems designed for supply chain applications is easy to use, intuitive, and user-friendly. This has been supported by Kanchan Patil (2016) where he emphasises the integration of the IoT technology in supply chain communication would be clear and understandable.

5.4 Limitations of Research

Despite the valuable insights provided by this study, several limitations should be acknowledged. The limitations for study on the IoT technology acceptance in Malaysian supply chain management companies is including the sample size and representativeness. Despite the fact that attempts were made to collect data from a wide variety of Malaysian supply chain management organisations, the sample size (n=361) may not have adequately captured the total population, which may have resulted in biases in the findings. Subsequent investigations might examine bigger and more varied populations in order to improve the generalisability of the results. Another constraint of this research is to the methodology used for data gathering. A questionnaire survey was carried out using Google Forms to gather much of the data required for the investigation. It is possible for this approach to introduce answer biases or errors due to self-reporting or subjective interpretation of questions by participants, despite the fact that it enables efficient data collection from a large number of participants while also allowing for efficient data gathering. In other circumstances, participants also may refuse to speak out against their organisations due to confidentiality. Furthermore, researchers are encouraged to utilise qualitative methods to gather data for their studies. Qualitative methodology involves conducting in-depth interviews with respondents, facilitating a broader understanding of their perspectives and producing more detailed data.

5.5 Recommendations for Future Research

Based on the findings of this study, future research might examine other aspects influencing the IoT technology acceptance in SCM, such as organisational culture, leadership support, and external environmental factors. Longitudinal studies examine the enduring consequences of adopting the IoT technology on the performance of supply chains and organisational outcomes. Moreover, conducting comparative studies across various industries and geographic regions might provide valuable insights on disparities in the acceptance and implementation processes of technology. As the industry, particularly SCM, logistics and manufacturing get a in depth of understanding of the Internet of Things (IoT) capabilities, it is getting popularity in every market, not only locally but also globaly. In order to interact with mobile devices that are part of the communication network, the IoT has emerged as sensors and actuators. The new generation of the IoT offers a wide range of opportunities (Ben-Daya, 2022). The emergence of the IoT has attracted significant attention and is recognised as a cutting-edge technology with widespread interest in several industries worldwide (Al-Fuqaha et al., 2015). It mainly provides insights into the factors influencing adoption, such as real-time visibility, data-driven decision-making, perceived usefulness, and perceived ease of use. The study also promises to enhance supply chain efficiency through improved operations and risk management. In Malaysia, like other Southeast Asian nations, possesses the necessary infrastructure for embracing the IoT. The Malaysian government initiated national IoT adoption in 2015. The 2014 National Internet of Things Strategic Roadmap states that Malaysia has a strong foundation that is well-suited for the growth of the Internet of Things. In the context of the local market, this foundation is crucial for strengthening and driving the growth of the IoT (Sivakumar et al., 2017). In 2015, Malaysia was recognised as the fourth country in the Online Services Index by the UN E-Government Commission. Due to this positioning, Malaysia has regained its status as the foremost digital economy in the developing world. The implementation and acceptance of the Internet of Things (IoT) technology in Malaysia has been extensive and has significantly influenced every industry.

The use of a suitable information system leads to the creation of unique company value (Radhakrishnan et al., 2008). Therefore, every company and organisation should consider the implementation of the advanced technologic such as the IoT to align with the introduction of Industry 4.0 and 5.0. It's proven the IoT can significantly help manufacturers to optimise their processes, reduce costs, and improve quality, leading to better business outcomes with the integrations of the IoT technologies.

5.6 Conclusion

In the conclusion, the study's important findings and consequences are adequately summarised. It emphasises the acceptance of the IoT technology in SCM and the importance of factors such as real-time visibility, data-driven decision-making, perceived usefulness, and perceived ease of use in driving employee adoption. The conclusion effectively underscores the practical implications of the research findings for organisations, urging them to leverage the IoT technology as a strategic enabler of operational excellence, agility, and competitive advantage in the current ever-changing corporate environment. It also appropriately acknowledges the importance of continued investment in user-centric design principles to enhance the usability and accessibility of the IoT systems. In the current competitive environment, entrepreneurs and forward-thinkers need to adopt swift innovation to succeed. The merging of the IoT and supply chain management offers an exceptional chance to influence the future positively. Through the utilisation of the IoT advancements, companies can improve transparency, streamline processes, and reduce risks. This not only boosts productivity but also facilitates the exploration of fresh concepts and feasible implementations. Overall, this study contributes a compelling call to action for organisations to embrace the IoT technology as a cornerstone of SCM innovation and digital transformation. It effectively ties together the study's contributions and implications, leaving future researchers with a clear understanding of the significance of the research findings and the actionable insights they offer for organisational practice and future research endeavors. This kind of advanced technology offers an effective means of documenting transactions or digital interactions securely, transparently, and with a high level of resilience against interruptions. It is also easily auditable. Although this technology is relatively recent and evolving rapidly, its widespread adoption in the commercial sphere is still a few years away. Nevertheless, decision-makers in various industries and business sectors should focus their attention now and begin examining the potential applications of this technology particularly in conjunction with Internet of Things (IoT) technology to prevent unexpected disruptions or overlooked opportunities. By exploring these possibilities help mitigate unforeseen disruptions and capitalise on potential opportunities in the future (Atlam et al., 2018). Moreover, there has been limited research into the acceptance of the IoT technology among employees. It’s crucial to understand how employees feel about using the IoT technology at work. By considering what they perceive as the benefits and risks, how easy it is for them to use, and the support they receive, organisations can ensure that their IoT plans align with employees’ needs. This leads to smoother adoption and better results for everyone involved.

References

Abdel-Basset, M., Manogaran, G., & Mohamed, M. (2018). Internet of things (IoT) and its impact on supply chain: A framework for building smart, secure and efficient systems. *Future Generation Computer Systems, 86*, 614–628. https://doi.org/10.1016/j.future.2018.04.051

Alfalla-Luque, R., Medina-Lopez, C., & Dey, P. K. (2013). Supply chain integration framework using literature review. *Production Planning and Control*, *24*(8–9), 800–817. https://doi.org/10.1080/09537287.2012.666870

Al-Fuqaha, A., Guizani, M., Mohammadi, M., Aledhari, M., & Ayyash, M. (2015). Internet of things: A survey on enabling technologies, protocols, and applications. *IEEE Communications Surveys and Tutorials*, *17*(4), 2347–2376. https://doi.org/10.1109/COMST.2015.2444095

Allioui, H., & Mourdi, Y. (2023). Exploring the full potentials of iot for better financial growth and stability: A comprehensive survey. *Sensors*, *23*(19), 8015. https://doi.org/10.3390/s23198015

Al-Talib, M., Melhem, W. Y., Anosike, A. I., Garza Reyes, J. A., Nadeem, S. P., & Kumar, A. (2020). Achieving resilience in the supply chain by applying IoT technology. *Procedia CIRP*, *91*, 752–757. https://doi.org/10.1016/j.procir.2020.02.231

Alzahrani, A. (2023). An analysis of the Technology Acceptance Model TAM in understanding Faculty's behavioral intention to use Internet of Things IOT. *International Journal of Educational Research and Innovation*, *2023*(19), 153–169. https://doi.org/10.46661/ijeri.7461

Aryal, A., Liao, Y., Nattuthurai, P., & Li, B. (2020). The emerging big data analytics and IoT in supply chain management: A systematic review. *Supply Chain Management, 25*(2), 141–156. https://doi.org/10.1108/SCM-03-2018-0149

Atlam, H. F., Alenezi, A., Alassafi, M. O., & Wills, G. B. (2018). Blockchain with Internet of Things: Benefits, challenges, and future directions. *International Journal of Intelligent Systems and Applications*, *10*(6), 40–48. https://doi.org/10.5815/ijisa.2018.06.05

Aurore, L. (2023, February 23). Malaysia: an opportunity for many sectors. SNECi. https://www.sneci.com/blog/malaysia-an-opportunity-for-many-sectors/#:~:text=Malaysian%20manufacturing%20is%20one%20of,most%20of%20which%20are%20SMEs.

Ben-Daya, M., Hassini, E., & Bahroun, Z. (2019). Internet of things and supply chain management: A literature review. *International Journal of Production Research, 57*(15–16), 4719–4742. https://doi.org/10.1080/00207543.2017.1402140

Ben-Daya, M., Hassini, E., & Bahroun, Z. (2022). A conceptual framework for understanding the impact of internet of things on supply chain management. *Operations and Supply Chain Management*, *15*(2), 251–268.

Bertolini, M., Ferretti, G., Vignali, G., & Volpi, A. (2013). Reducing out of stock, shrinkage and overstock through RFID in the fresh food supply chain: Evidence from an Italian retail pilot. *International Journal of RF Technologies: Research and Applications*, *4*(2), 107–125. https://doi.org/10.3233/RFT-120040

Bhardwaj, S., & Kole, A. (2016). Review and study of internet of things: It's the future. *2016 International Conference on Intelligent Control Power and Instrumentation (ICICPI)*, 47–50. https://doi.org/10.1109/ICICPI.2016.7859671

Bhat, O., Gokhale, P., & Bhat, S. (2007). Introduction to IOT. *International Advanced Research Journal in Science, Engineering and Technology ISO*, *3297*(1). https://doi.org/10.17148/IARJSET.2018.517

Bouzida, I. B., & Merzoug, S. (2021). Impact of logistics information systems on supply chain optimisation: Case of Group Bachir Rachid. *Journal of Sustainable Development of Transport and Logistics*, *6*(2), 60–80. https://doi.org/10.14254/jsdtl.2021.6-2.4

Damini. (2023, June 12). *The impact of the Internet of Things (IoT) on inventory control in manufacturing*. Deskera Blog; Deskera Blog. https://www.deskera.com/blog/iot-inventory-control/

De Vass, T., Shee, H., & Miah, S. J. (2018). The effect of "Internet of Things" on supply chain integration and performance: An organisational capability perspective. *Australasian Journal of Information Systems*, *22*. https://doi.org/10.3127/ajis.v22i0.1734

Department of Statistics Malaysia. (2024). *Publications | OpenDOSM*. Dosm.gov.my; OpenDOSM. https://open.dosm.gov.my/publications/technical-notes

Doyduk, H. B., & Bayarçelik, E. B. (2019). Consumers' acceptance of Internet of Things technology. *İstanbul Gelişim Üniversitesi Sosyal Bilimler Dergisi*, *6*(2), 351–371. https://doi.org/10.17336/igusbd.538182

Duraisamy, S. (2017). *A case study review: Future of Internet of Things (IoT) in Malaysia*. https://doi.org/10.24924/ijise/2017.11/v5.iss2/126.138

Faiz, E., & Pazvant, E. (2018). Evaluation of the intention of using products with internet of things within the context of technology acceptance model. *Pressacademia*, *5*(1), 41–54. https://doi.org/10.17261/Pressacademia.2018.806

Falkenreck, C., & Wagner, R. (2017). The Internet of Things – Chance and challenge in industrial business relationships. *Industrial Marketing Management*, *66*, 181–195. https://doi.org/10.1016/j.indmarman.2017.08.007

Fantana, N. L., Riedel, T., Schlick, J., Ferber, S., Hupp, J., Miles, S., Michahelles, F., & Svensson, S. (2022). IoT Applications — Value Creation for Industry. In O. Vermesan & P Friess, *Internet of Things* (pp. 153–206). River Publishers. https://doi.org/10.1201/9781003338659-3

Frederico, G. F. (2021). Towards a Supply Chain 4.0 on the post-COVID-19 pandemic: A conceptual and strategic discussion for more resilient supply chains. *Rajagiri Management Journal*, *15*(2), 94–104. https://doi.org/10.1108/RAMJ-08-2020-0047

Gong Yan Xu, M. (2004). An enhanced technology acceptance model for web-based learning. *Journal of Information Systems Education, 15*(4), 365–374.

Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, *29*(7), 1645–1660. https://doi.org/10.1016/j.future.2013.01.010

Haddud, A., DeSouza, A., Khare, A., & Lee, H. (2017). Examining potential benefits and challenges associated with the Internet of Things integration in supply chains. *Journal of Manufacturing Technology Management*, *28*(8), 1055–1085. https://doi.org/10.1108/JMTM-05-2017-0094

Imam, S. G. (2024). The importance of supply chain integration in the performance nexus: A case from developing country. *South Asian Journal of Operations and Logistics*, *3*(2), 1–21. https://doi.org/10.57044/SAJOL.2024.3.2.2426

Javaid, M., Haleem, A., Singh, R. P., Suman, R., & Gonzalez, E. S. (2022). Understanding the adoption of Industry 4.0 technologies in improving environmental sustainability. *Sustainable Operations and Computers*, *3*, 203–217. https://doi.org/10.1016/j.susoc.2022.01.008

Jonas, D., Maria, E., Sutarto, Ratna Widiasari, I., Rahardja, U., & Wellem, T. (2023). Design of a TAM Framework with Emotional Variables in the Acceptance of Health-based IoT in Indonesia. *ADI Journal on Recent Innovation (AJRI)*, *5*(2), 146–154. https://doi.org/10.34306/ajri.v5i2.1005

Kahlert, M., Constantinides, E., & de Vries, S. A. (2017). The relevance of technological autonomy in the customer acceptance of IoT services in retail. In *ICC '17: Proceedings of the Second International Conference on Internet of things, Data and Cloud Computing, 22-23 March 2017, Cambridge, United Kingdom*. https://doi.org/10.1145/3018896.3018906

Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the Blockchain technology adoption in supply chains-Indian context. *International Journal of*

Production Research, *57*(7), 2009–2033. https://doi.org/10.1080/00207543.2018.1518610

Khan, R., Khan, S. U., Zaheer, R., & Khan, S. (2012). Future Internet: The Internet of Things architecture, possible applications and key challenges. *2012 10th International Conference on Frontiers of Information Technology*, 257–260. https://doi.org/10.1109/FIT.2012.53

Koot, M., Mes, M. R. K., & Iacob, M. E. (2021). A systematic literature review of supply chain decision making supported by the Internet of Things and Big Data Analytics. *Computers and Industrial Engineering*, *154*, 107076. https://doi.org/10.1016/J.CIE.2020.107076

Kopcha, T. J., & Alger, C. (2014). Student teacher communication and performance during a clinical experience supported by a technology-enhanced cognitive apprenticeship. *Computers and Education*, *72*, 48–58. https://doi.org/10.1016/j.compedu.2013.10.011

Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. *Business Horizons*, *58*(4), 431–440. https://doi.org/10.1016/j.bushor.2015.03.008

Li, X. J., & Wang, D. (2013). Architecture and existing applications for Internet of Things. *Applied Mechanics and Materials*, *347–350*, 3317–3321. https://doi.org/10.4028/www.scientific.net/AMM.347-350.3317

Lin, X., Mamun, A. al, Yang, Q., & Masukujjaman, M. (2023). Examining the effect of logistics service quality on customer satisfaction and re-use intention. *PLOS ONE*, *18*(5), e0286382. https://doi.org/10.1371/journal.pone.0286382

Marmolejo-Saucedo, J. A., Hurtado-Hernandez, M., & Suarez-Valdes, R. (2020). Digital Twins in Supply Chain Management: A Brief Literature Review. *Advances in Intelligent Systems and Computing*, *1072*, 653–661. https://doi.org/10.1007/978-3-030-33585-4_63

Mohd Hilmi Hasan, Aimi Amirah Khairuddin, & Akashah, E. (2019). A case study to explore IoT readiness in outbound logistics. *International Journal of Supply Chain Management*, *8*(2), 947–953. https://doi.org/10.59160/ijscm.v8i2.3013

Muhamad, N. A., Zahid, F. S., Othman, N., & Md Sin, N. D. (2023). The role of IoT technologies in Malaysia during the Covid-19 pandemic: A mini-review. *Jurnal Kejuruteraan*, *35*(3), 587–595. https://doi.org/10.17576/jkukm-2023-35(3)-06

Nemoto, T., & Beglar, D. (2014). *Developing likert-scale questionnaires campus reference data*. https://jalt-publications.org/files/pdf-article/jalt2013_001.pdf

Obaidat, M. A., Obeidat, S., Holst, J., al Hayajneh, A., & Brown, J. (2020). A comprehensive and systematic survey on the Internet of Things: Security and *Privacy Challenges, Security Frameworks, Enabling Technologies, Threats, Vulnerabilities and Countermeasures*. *Computers*, *9*(2), 44. https://doi.org/10.3390/computers9020044

Omotayo, O. O., Iortimbir, A. I., & Oluwadamilare, B. E. (2023). Internet of Things and Supply Chain Management: An Empirical Analysis of Nigeria Perspective. *Journal of Techno-Social*, *15*(1). https://doi.org/10.30880/jts.2023.15.01.005

Ozturk, Z. K. (n.d.). *Inventory Management in Supply Chains*. Tukey: Anadolu University. https://www.researchgate.net/publication/356085653

Pal, K., & Yasar, A. U. H. (2023). Internet of Things impact on Supply Chain Management. *Procedia Computer Science*, *220*, 478–485. https://doi.org/10.1016/j.procs.2023.03.061

Patil, K. (2017). Retail adoption of Internet of Things: Applying TAM model. In *Proceedings of the International Conference on Computing, Analytics and Security Trends, CAST 2016*, 404–409. https://doi.org/10.1109/CAST.2016.7915003

Protopsaltis, A., Sarigiannidis, P., Margounakis, D., & Lytos, A. (2020, August 25). Data visualisation in internet of things: Tools, methodologies, and challenges. In *ARES '20: Proceedings of the 15th International Conference on Availability, Reliability and Security*, 25-28 August 2020, Ireland. https://doi.org/10.1145/3407023.3409228

Radhakrishnan, A., Zu, X., & Grover, V. (2008). A process-oriented perspective on differential business value creation by information technology: An empirical investigation. *Omega*, *36*(6), 1105–1125. https://doi.org/10.1016/j.omega.2006.06.003

Radouan Ait Mouha, R. A. (2021). Internet of Things (IoT). *Journal of Data Analysis and Information Processing*, *09*(02), 77–101. https://doi.org/10.4236/jdaip.2021.92006

Fareye (2022). *Real-time visibility in the supply chain. Why is it important?* FarEye. https://fareye.com/resources/blogs/real-time-visibility

Rejeb, A., Keogh, J. G., & Treiblmaier, H. (2019). Leveraging the Internet of Things and Blockchain Technology in Supply Chain Management. *Future Internet*, *11*(7), 161. https://doi.org/10.3390/fi11070161

Reyes, P. M., Visich, J. K., & Jaska, P. (2020). Managing the dynamics of new technologies in the global supply chain. *IEEE Engineering Management Review*, *48*(1), 156–162. https://doi.org/10.1109/EMR.2020.2968889

Ruschel, E., Santos, E. A. P., & Loures, E. de F. R. (2017). Industrial maintenance decision-making: A systematic literature review. *Journal of Manufacturing Systems*, *45*, 180–194. https://doi.org/10.1016/j.jmsy.2017.09.003

Saarikko, T., Westergren, U. H., & Blomquist, T. (2017). The Internet of Things: Are you ready for what's coming? *Business Horizons*, *60*(5), 667–676. https://doi.org/10.1016/j.bushor.2017.05.010

Sallam, K., Mohamed, M., & Wagdy Mohamed, A. (2023). Internet of Things (IoT) in Supply Chain Management: Challenges, opportunities, and best practices. *Sustainable Machine Intelligence Journal*, *2*. https://doi.org/10.61185/SMIJ.2023.22103

Sauvage, T. (2003). The relationship between technology and logistics third-party providers. *International Journal of Physical Distribution and Logistics Management*, *33*(3), 236–253. https://doi.org/10.1108/09600030310471989

Skarmeta, A. F., Hernandez-Ramos, J. L., & Moreno, M. V. (2014). A decentralised approach for security and privacy challenges in the Internet of Things. *2014 IEEE World Forum on Internet of Things (WF-IoT)*, 67–72. https://doi.org/10.1109/WF-IoT.2014.6803122

Soori, M., Arezoo, B., & Dastres, R. (2023). Internet of things for smart factories in industry 4.0, a review. *Internet of Things and Cyber-Physical Systems, 3*, 192–204. https://doi.org/10.1016/j.iotcps.2023.04.006

Stadtler, H. (2008). Supply Chain Management — An Overview. In *Supply Chain Management and Advanced Planning*. Berlin: Springer. https://doi.org/10.1007/978-3-540-74512-9_2

Stevens, S. S. (1946). On the Theory of Scales of Measurement. *Science: New Series,* 103(2684), 677–680.

Team, T. (2023, September 21). *Supply chain resilience through technology - TheCodeWork*. TheCodeWork. https://thecodework.com/blog/supply-chain-resilience-through-technology/

Teucke, M., Sommerfeld, D., & Freitag, M. (2018). Sharing sensor based quality data in automotive supply chain processes. *IFAC-PapersOnLine*, *51*(11), 770–775. https://doi.org/10.1016/j.ifacol.2018.08.412

Tsourela, M., & Nerantzaki, D.-M. (2020). An Internet of Things (IoT) acceptance model. assessing consumer's behavior toward IoT products and applications. *Future Internet*, *12*(11), 191. https://doi.org/10.3390/fi12110191

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, *27*(3), 451–481. https://doi.org/10.1111/j.1540-5915.1996.tb00860.x

Wahida, U., B., Sofiah, W. I., Din, W., Prasetyo, Y. A., Musa, Z., & Kasim, S. (2018). Internet of Things: An implementation and its challenges in Malaysia.

International Journal on Advanced Science, Engineering and Information Technology, 8(6), 2641–2647.

Weber, R. H., & Studer, E. (2016). Cybersecurity in the Internet of Things: Legal aspects. *Computer Law and Security Review*, *32*(5), 715–728. https://doi.org/10.1016/j.clsr.2016.07.002

Yasar, K., & Shea, S. (2023, August 1). Smart home. IoT Agenda. https://www.techtarget.com/iotagenda/definition/smart-home-or-building

Yerpude, S., & Singhal, T. K. (2017). Impact of Internet of Things (IoT) data on demand forecasting. *Indian Journal of Science and Technology*, *10*(15), 1–5. https://doi.org/10.17485/ijst/2017/v10i15/111794

Yesodha, K. R. K., Jagadeesan, A., & Logeshwaran, J. (2023). IoT applications in Modern Supply Chains: Enhancing Efficiency and Product Quality. *2023 IEEE 2nd International Conference on Industrial Electronics: Developments and Applications (ICIDeA)*, 366–371. https://doi.org/10.1109/ICIDeA59866.2023.10295273

Zand, S. (2023). Impact of IoT on Supply Chain Management case of E-commerce firms. https://www.diva-portal.org/smash/get/diva2:1759012/FULLTEXT01.pdf

Zhang, X. Y., & Lee, S. Y. (2023). A research on users' behavioral intention to adopt Internet of Things (IoT) technology in the logistics industry: the case of Cainiao Logistics Network. *Journal of International Logistics and Trade*, *21*(1), 41–60. https://doi.org/10.1108/JILT-11-2022-0067

Zhang, Y., Guo, Z., Lv, J., & Liu, Y. (2018). A Framework for Smart Production-Logistics Systems Based on CPS and Industrial IoT. *IEEE Transactions on Industrial Informatics*, *14*(9), 4019–4032. https://doi.org/10.1109/TII.2018.2845683

Appendix A

Questionnaires Title: THE INTERNET OF THINGS TECHNOLOGY ACCEPTANCE IN SUPPLY CHAIN MANAGEMENT.

Section A – Demographic Profile

Please choose the best answer to represent your demographic information.

1) Gender:
    - Male
    - Female

2) Age:
    - 18-25 years old
    - 26-39 years old
    - 40 and above

3) Education Level:
    - Diploma or equivalent
    - Bachelor’s Degree
    - Master’s Degree
    - Doctorate or higher

4) Job Position:
    - Entry-level
    - Mid-level
    - Senior-level
    - Managerial

5) Years of Experience in supply chain industry:
    - 1-3 Years
    - 4-6 Years
    - 7-above

Section B – 1) Real-Time Visibility

The following set of statements relates to the real-time visibility with the Internet of Things (IoT) technology acceptance in supply chain management. Please express your level of agreement with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree) using a Five-point Likert scale.

1) The integration of IoT technologies can enhance real-time visibility and control over inventory, enabling continuous monitoring of the location, status, and movement of goods throughout the supply chain. (Damini,2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2) Real-time visibility by IoT technologies enables companies to promptly respond to changes in demand, minimise occurrences of stockouts or overstock situations, and optimise inventory levels. (Bertolini Massimo, Ferretti Gino, Vignali Giuseppe, Volpi Andrea, 2013)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3) The capability of IoT technologies to monitor supply chain activities in real-time enhances responsiveness to changing market conditions and customer demands. (Team T, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4) Real-time visibility through IoT technologies can enhance productivity, lower operational costs, and improve customer satisfaction within the supply chain. (Rejeb, Abderahman, John G Keogh, and Horst Treiblmaier, 2019)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5) The Internet of Things (IoT) technology is essential for enhancing supply chain efficiency, enabling end-to-end real-time visibility, and promoting sustainable practices. (Bouzida & Merzoug, 2021)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Section B – 2) Data-Driven Decision-Making

The following set of statements relates to the data-driven decision-making with the Internet of Things (IoT) technology acceptance in supply chain management. Please express your level of agreement with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree) using a Five-point Likert scale.

1) The larger amount of data generated by the Internet of Things (IoT) devices in the supply chain provides an opportunity for data-driven decision-making. (DrighnaTech, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2) The implementation of IoT technology can generate big data streams for analysis, ensuring accurate, clear data, actionable insights, and evidence-based decisions throughout the supply chain. (Arun Aryal, Ying Liao, Prasnna Nattuthurai, Bo Li, 2018)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3) Managers can utilise advanced technologies such as IoT for data analysis to achieve accurate demand forecasting and enhance the decision-making process in the supply chain. (Samir Yerpude, Tarun Kumar Singhal, 2017)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4) The IoT devices can assist in collecting data for real-time decision-making, which involves gathering and analysing data, implementing decision-making algorithms, monitoring operations in real-time, and leveraging human expertise to make informed decisions. (Mohsen Soori, Behrooz Arezoo, Roza Dastres, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5) The integration of IoT in data analysis for decision-making can enhance overall supply chain efficiency, leading to greater customer satisfaction and performance. (Karthik Raj Kumar Yesodha, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Section B – 3) Perceived Usefulness

The following set of statements relates to the perceived usefulness with the Internet of Things (IoT) technology acceptance in supply chain management. Please express your level of agreement with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree) using a Five-point Likert scale.

1) I believe that IoT technologies offer valuable functionalities that can enhance supply chain operations and performance. (Venkatesh, Davis, 1996)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2) I think implementing IoT applications would make it easier for me to have greater control over energy use within the supply chain process. (Xin Yue Zhang, Sang Yoon Lee, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3) I find using IoT technologies advantageous as they enable me to accomplish tasks more quickly and easily, significantly improving the quality and output of my life. (Doyduk & Bayarçelik, 2019)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4) I believe that employees are more likely to accept IoT when companies explain the benefits and advantages of new technologies with logical arguments, thereby increasing the perception of usefulness. (Gong, Xu, & Yu, 2004)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5) If employees are given sufficient time and opportunities to practice with IoT technologies until they reach a level of comfort, they can use IoT effectively and recognise its usefulness in contributing to effective instruction. (Abdulaziz Alzahrani, 2022)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Section B – 4) Perceived Ease of Use

The following set of statements relates to the perceived ease of use with the Internet of Things (IoT) technology acceptance in supply chain management. Please express your level of agreement with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree) using a Five-point Likert scale.

1) The user interface of IoT systems designed for supply chain applications is easy to use, intuitive, and user-friendly. (Dendy Jonas, Evi Maria, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2) I find it easy to navigate through the various features and functions of IoT platforms for supply chain management. (Kanchan Patil, 2016)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3) I believe IoT technologies are convenient, and the operation process is straightforward. (Xin Yue Zhang, Sang Yoon Lee, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4) The integration of IoT technology in supply chain communication would be clear and understandable. (Kanchan Patil,2016)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5) I believe that using IoT technologies is not complicated and does not require a lot of mental and physical effort. (Maria Tsourela and Dafni-Maria Nerantzaki, 2020)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Section C - The Internet of Things (IoT) Technology Acceptance in Supply Chain Management.

The following set of statements relates to the Internet of Things (IoT) technology acceptance in supply chain management. Please express your level of agreement with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree) using a Five-point Likert scale.

1) The integration of IoT technologies is crucial for companies to remain competitive and efficient in supply chain management. (Kamalendu Pala, 2019)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

The Internet of Things (IoT) has revolutionised supply chain management, enabling companies to leverage technological advancements in warehouse management to provide better customer support. (Sajjad Zandi Zand, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2) IoT technology helps empower organisations to deliver on customers' values of transparency, reliability, and responsiveness in their interactions with suppliers. (Karam M. Sallam, Ali Wagdy Mohamed, Mona Mohamed, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3) Utilising IoT data for real-time risk assessment and mitigation strategies can significantly enhance supply chain resilience. (Karam M. Sallam, Ali Wagdy Mohamed, Mona Mohamed, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4) I believe IoT technology in the supply chain can reduce operational costs, improve resource utilisation, and streamline workflows, contributing to overall financial efficiency and profitability. (Hanane Allioui and Youssef Mourdi, 2023)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5