THE ADOPTION OF SMART WAREHOUSE IN SHAH ALAM: A QUALITATIVE STUDY ON THE DECISIVE FACTORS

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ABSTRACT

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Abstract: The adoption of smart warehouse has been an emerging trend, especially in other foreign countries, due to the boom in the e-commerce, online retailing as well as the emergence of industry 4.0. However, there is a lack of warehouse in Malaysia that adopt the use of smart warehouse, and many are still on manual operation. Therefore, the purpose of this research is to study the determinant factors that influence the adoption of smart warehouse within warehouse operators that operates in Shah Alam. There are three objectives in this research in tandem with the main goal. Firstly, to assess the current technologies used in warehouses in Shah Alam that can be linked back to smart warehouses. Secondly, to identify the factor that influences organizational readiness towards smart warehousing. Thirdly, to understand the external environment factors that could support the implementation of smart warehouse. Researchers utilize qualitative method in the form of interview question to acquired data. TOE framework has been employed by the researchers to analyse and represent the findings for this study. Lastly, by offering insight into the factors that influence adoption, this study has

contributed to encourage Malaysian warehouses to adopt smart warehouse approaches.
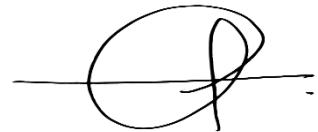
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DECLARATION

We hereby declare that this research project is the end result based on our original work except for quotations and citations which have been duly acknowledged. We also declare that his research project has not been previously or concurrently submitted for any other degree qualification in UTAR or other institutes of learning.

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APPROVAL SHEET

This final year project report entitled "**THE ADOPTION OF SMART WAREHOUSE IN SHAH ALAM: A QUALITATIVE STUDY ON THE DECISIVE FACTORS**" was prepared by OOI JIA XINAG, PANG XIAO TONG and TENG ZI XUAN and submitted as partial fulfilment of the requirements for the degree of Bachelor of Science (Hons) Logistics and International Shipping at University Tunku Abdul Rahman.

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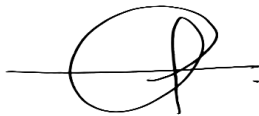
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PERMISSION SHEET

It is hereby certified that **OOI JIA XIANG** (ID No: **19ADB01505**), **PANG XIAO TONG** (ID No: **19ADB03084**) and **TENG ZI XUAN** (ID No: **19ADB02401**) has completed this final year project entitled "THE ADOPTION OF SMART WAREHOUSE IN SHAH ALAM: A QUALITATIVE STUDY ON THE DECISIVE FACTORS" under the supervision of MR. AFWAN HAKIM BIN MD MAHDZIR from the Department of Physical and Mathematical Science, Faculty of Science.

I hereby give permission to the University to upload the softcopy of my final year project report in pdf format into the UTAR Institutional Repository, which may be made accessible to the UTAR community and public.

Yours truly,

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   (OOI JIA XIANG)

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   (PANG XIAO TONG)   (TENG ZI XUAN)

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LIST OF ABBREVIATIONS

WMS   Warehouse Management System

SAP   System Applications and Product

RFID   Radio Frequency Identification

IoT   Internet of Things

MHE   Material Handling Equipment

RPA   Robotic Process Automation

CHAPTER 1

INTRODUCTION

1.0 Introduction

The first chapter introduces the study by providing the related information of smart warehousing from the global perspective and to the local context for better understanding of the current issues in the lack of smart warehouse adoption in Malaysia. Next, the chapter explains the problem statement, research objectives, research questions, significance of the study, scope of study and followed by the limitations of study.

1.1 Background of Study

The significance of warehouses and distribution centres in supply chain management is undeniable since they are crucial for generating effective logistics operations, particularly in the modern supply chain with its high market volatility, shorter product life cycles, and global supply chains. In today's fast-paced world, where same-day delivery and the rapid expansion of e-commerce have led to a surge in demand and market volatility worldwide and consumers increasingly turning to online shopping for the most basic requirements, businesses need to be able to store and transport goods quickly and efficiently in order to keep up with demand (Hao *et al.*, 2020; Premchandra Patil, 2021). As a result, warehouses play a crucial role now than ever in the success or failure of today's businesses due to the fact that the whole flow of a company runs

smoothly with respect to its warehouse (Khan, Ul Huda and Uz Zaman, 2022). As warehouse and warehousing in general aid in the production of goods by predicting the future by keeping the raw materials that will be used for regular production, time utility by making goods available in accordance with demand, storing excess goods to meet future changing market demand, maintain a source of supply, supporting just-in-time programs among other benefit(Kadwe and Saha, 2018).

In the last decade, due to warehouse operations have become more intricate, it has led to technology playing an increasingly vital role in transforming warehouse operations and improving supply chain management, as traditional manual methods of warehouse management are no longer practical. As such advanced technologies and algorithms system such as Warehouse Management System (WMS), has emerged to manage warehouse more efficiently. WMS is an information system that integrates software systems to monitor, control, manage quantities and storage locations, and optimize warehousing decisions(N. A. Mostafa *et al.*, 2018). Its key functions include order processing, order release, and master data, while extended functions include receiving (inbound), put-away, and warehouse control. The most commonly used software for managing warehouses is Enterprise Resource Planning (ERP) systems, which provide tools for various functions of the enterprise, including accounting, finance, control, and production planning (Nettsträter et al., 2015).

However, since 2019, the Covid-19 crisis has caused the steady rise of the e-commerce sector, has caused a spike in demand and market volatility globally, making the market more dynamic and necessitating more adaptable software besides WMS and ERP to meet market requirements and challenges (N. A. Mostafa *et al.*, 2018; Organisation for Economic Co-operation and Development, 2020; Zou and Cheshmehzangi, 2022). Figure 1.1 below displays the growth rate of retail e-commerce sales from 2015 to 2024, indicating a notable increase in online retail sales resulting from the paradigm shift brought about by the disruptions caused by the COVID-19 pandemic. This chart highlights the sustained upward trend in e-commerce sales, and it is expected to continue as businesses continue to adapt to the changes in consumer behaviour towards online shopping (International Trade Administration U.S. Department of Commerce, n.d.).
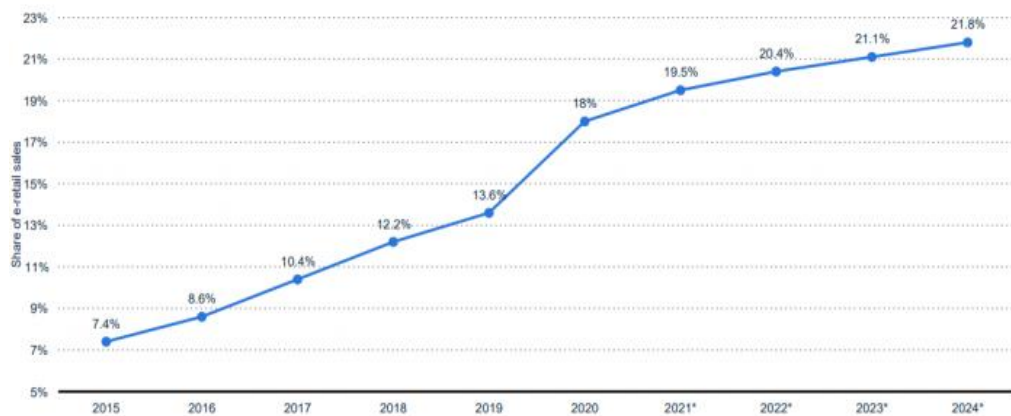
Figure 1.1 : : E-Commerce Share of Total Global Retail Sales 2015-2024

Therefore, with the introduction of Industry 4.0, which focuses on the continuous digitization and interconnection of operational units, has empowered warehouses to address diverse business requirements and market instability. This is facilitated by Industry 4.0 ability to extract knowledge from data, transform the enterprise into a flexible entity, and constantly adjust to the market's fluctuations (Barbalho and Dantas, 2021). According to Bahrin et al., (2016), industry 4.0 can be define as "a new area where the Internet of things alongside cyber-physical systems interconnect in a way where the combination of software, sensor, processor and communication technology plays a huge role for making things to have the potential to feed information into it and eventually adds value to manufacturing processes". The advent of Industry 4.0 has transformed the way warehouses operate and manage their product distribution, with new technologies enabling them to meet manufacturing, production, and consumer demands. These cutting-edge technologies, including the Internet of Things (IoT), cloud computing, big data and analytics, sensors, AI, and autonomous machines, are now integrated into warehouse operations to monitor and control their processes (Zheng *et al.*, 2021; Aravindaraj and Rajan Chinna, 2022a). Figure 1.2 below illustrates that are several technological areas that underpin Industry 4.0. This integration of advanced technologies and automation found in industry 4.0 creates what Nur et al., (2021), call a "smart warehouse," where the technologies work in tandem to boost productivity, efficiency, and accuracy, while minimizing human errors and the need for manual labour.
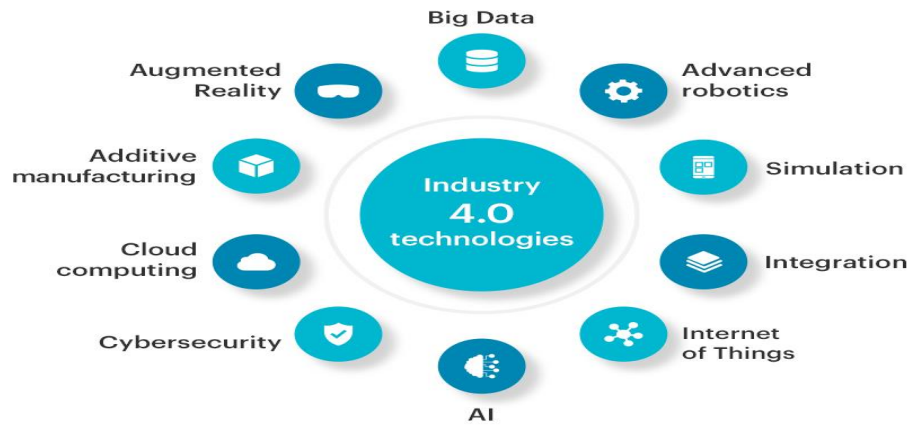
Figure 1.2 : Technologies Related to Industry 4.0

The rapid advancement of this technology brought by Industry 4.0 has led to disruptive growth in the logistic section, and with the product of smart technologies it has given rise to the emergence of smart warehouses, which offer numerous benefits to those who adopt them(Zhen and Li, 2022). These warehouses can eliminate manual labor, reduce costs, and increase data input speed through the implementation of advanced technology (Nur *et al.*, 2021). Additionally, integrated real time location system can help to enhance the warehouse safety and improve operation efficiency, as warehouse management has the potential to increase safety and efficiency in forklift placement and tracking, as well as order processing in inventory(Halawa *et al.*, 2020). Furthermore, the automation of warehouses using AS/RS systems through Industry 4.0 can reduce cycle times and energy usage, particularly in large warehouses(Yetkin Ekren, 2021). The benefits of smart warehouses that adopt different Industry 4.0 technologies are diverse, including cost reduction, greater visibility, real-time analysis, and improved tracking of stock items, , leading to more accurate and efficient order fulfilment. Ultimately the benefit depends on

what type of this technology is being adopted by the smart warehouse(Aravindaraj and Rajan Chinna, 2022b).
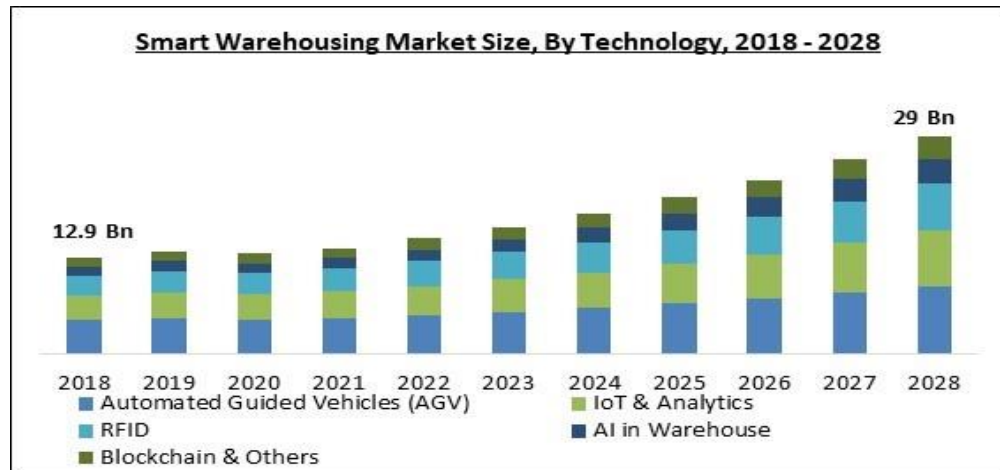
Figure 1.3 : Smart Warehousing Market Size By Technology 2018-2028

Additionally, the utilization of advanced technologies, such as AGV, RFID, Blockchain, IOT, and AI, has witnessed a significant rise in the context of smart warehousing. This trend is projected to continue until 2028, as indicated by the Figure 1.3 above (*Smart Warehousing Market Size, Share & Forecast to 2022-2028*, 2022). As a result, in recent years many companies have taken the lead in smart warehousing by adopting different types of advanced technology, with a particular focus on developing automated warehouse robots to manage their operations. By using robots connected to the Internet, businesses have been able to replace human labor with more efficient technology, resulting in improved operations and reduced costs. Amazon in America is a good example of a company that has implemented such technology. (Kamali Ali, 2019). Amazon have utilized a variety of robotic arms to pick up and transfer items as needed.

For example, a smaller robot known as a palletizer picks up items from a conveyor belt and arranges them on a tray. In contrast, Robot-Stow, a more powerful 6-ton robotic arm, can lift cargo pallets 7.3 meters between floors (Laber *et al.*, 2020). Below are pictures of robotic technology being implemented by Amazon in their warehouses.
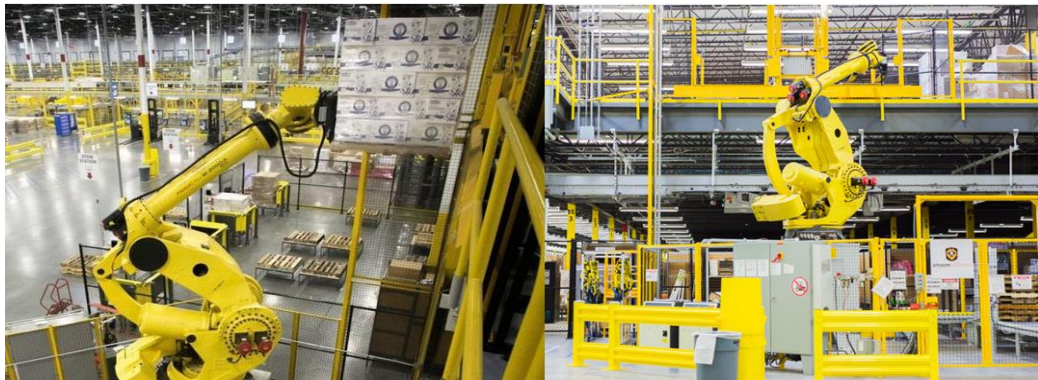
Figure 1.4: Amazon Robot-Stow

In addition to Amazon, Meijer, an American company, has also successfully optimized its operations through advanced technology. Meijer utilizes order picking machinery (OPM) to efficiently select and pack incoming products from distributors in their warehouse. The OPM system ensures that the products are organized on plastic pallets for transportation to Meijer stores. The implementation of this technology has resulted in a more efficient and streamlined process, ultimately leading to improved productivity and reduced costs (Witron, 2017). Furthermore, outside of America, Alibaba, a Chinese-based company, is another notable example of a company that has embraced advanced technology in its warehousing operations. The company has automated 70% of its warehouse personnel with robots that are equipped with

Wi-Fi communication and 360-degree rotation capabilities. These robots are responsible for transporting products with ease, which are then delivered to human workers for packing and mailing. To ensure the safety of the workforce and prevent collisions, the robots have lasers and an intelligent system to restart them when their batteries run low. Alibaba's use of robots has significantly increased production output, allowing them to accomplish five hours' worth of labor in just five minutes (Salleh et al., 2020). Below are pictures of robotic technology being implemented by Amazon in their warehouses.

Figure 1.5: Alibaba AGV

1.1.1 Current State of Malaysia Smart Warehouse Adoption

The current state of smart warehouse in Malaysia is in its early stages, where many companies are still using manual process of inventory management and order fulfilment. One of the reasons for this is that many companies are hesitant to invest in automation, as the demand for adoption it in Malaysia is relatively low compared to other countries (Salleh, 2022). Additionally, most warehouses in Malaysia do not have a significant demand for receiving and issuing goods, which leads some to question the necessity of automation when more staff can simply be hired to handle the workload. In another news, similar statement has

been made, where one of the factors that the use of technology, especially automation and robotics in warehouses, is still not as common in Malaysia as overseas is due to the high cost of adoption as compared to the affordable labour cost (Tan, 2022).

Despite this reason, some companies have already begun implementing smart warehouse technology. Mr. DIY Malaysia, situated in Selangor's Seri Kembangan, is a notable example of a company that has adopted smart warehouse technology to automate their e-commerce operations. They have implemented automated guided vehicles (AGVs) in their warehouse, which have increased their online order fulfilment efficiency by 200% compared to a manual system (MR.DIY, 2022). The picking process is automated using programmable robots, with the AGVs responsible for transporting the selected items to the packers. After the picking process is completed, the AGVs return the racks to their storage positions, ready for the next order or item to be picked, thus facilitating a seamless and efficient order fulfilment process. (Tan, 2022; Banoo, 2022). Besides, there are also other several notable companies in Malaysia that have implemented smart warehouse technology, including Ally Logistic Property from Taiwan, which will soon be opening its first smart warehousing facility in Bukit Raja Omega by the third quarter of 2024. IKEA Malaysia, located in Pulai Indah, Selangor, has also adopted data-driven automation and software-powered warehousing to enhance its operations. Additionally, some of the key players in the smart warehouse industry in Malaysia include DNC Automation Sdn Bhd, Daifuku Malaysia Sdn Bhd, and Dematic Sdn Bhd, among others.

Nevertheless, despite growing number of firms beginning to adopt smart warehouse technology, the overall usage of such warehouses in Malaysia remains relatively small compared to other countries. According to Reima et al. (2019), research shows that many warehouses in Malaysia still operate manually, with a lack of adaptation towards smart warehouse technology. Moreover, the research highlights that there is a greater focus on specific research into the implementation of business intelligence systems in SMEs and green warehouses in Malaysia ratter that Smart warehousing. Therefore, the purpose of this study is to identify the factor that influence the adoption of smart warehouse in Shah Alam, Malaysia, through the use of TOE framework. A total of three companies are going to be interviewed in regard to the smart warehouse adoption in Malaysia. The objective of this research is to identify the current available technologies implemented in Malaysian warehouses that can be associated with smart warehouse, identify the factor that influences an organizational readiness towards smart warehousing, and lastly, to understand the external environment factors that could support the implementation of smart warehouse.

1.2 Problem Statement

Today's warehouses are rapidly investing in smart warehouses to meet the growing logistic demand, and the notion of combining technology and automation has expanded across many sectors and become mainstream solution for warehouses to meet the market's changing demands and boosting productivity (Kamali Ali, 2019). The adoption of this smart warehouse with different technology enables companies boost productivity, decrease expenses,

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improve efficiency, prevent accidents, reduce human error, and reap other benefits (Marchuk, Harmash and Ovdiienko, 2020).

Unfortunately, the reality in the Malaysian warehouse industry is that many warehouses still operate manually and have not yet adopted smart warehousing practices, cause Malaysian warehouse to enable to benefit from the advantages. Although there is no precise statistic on the number of warehouses that have adopted these practices versus those that have not, a research study conducted by Reima et al. (2019) suggests that only a few warehouses in Malaysia have implemented significant levels of automation in their warehousing processes. Most warehouses still rely on primitive technology and have only adopted basic system software, such as WMS and scanners, which only scratch the surface of available technology. The lack of adoption can hinder Malaysia potential to become the region's logistics hub. As it could result in several problems, including disruptions and bottlenecks at warehouses. The absence of sensors and other advanced technologies to manage the large inflow of information could lead to inaccurate data, shipment delays, and lost packages (Reima, Krishnan and Wahab, 2019).

Lastly, a prior study had examined the factors affecting the adoption of warehouses in Malaysia on a large scale, but the number of informants was limited to just five companies (Reima, Krishnan and Wahab, 2019). Hence, the outcomes of that study may not be generalizable to other warehouse companies operating in Malaysia. Therefore, this research project will be carried out on a

smaller scale and will focus specifically at the area of Shah Alam, on the factors of adoption of smart warehouse. Qualitative methods will be used to gain in-depth insight into the factors that influence the adoption of smart warehouse in the Shah Alam.

1.3 Research Gap

The research gap is identified as a situation in which there is a very limited amount of literature that discusses the factors that influence the adoption of smart warehouses. The majority of the relevant studies were carried out in foreign countries such as China, and very little to none of them are in the context of Malaysia. To this day, the research topic of this study, which focuses on the factors that influence the adoption of smart warehouses, can only be found in a few numbers of papers that are relevant to the setting of Malaysia. The research that was mentioned was called "A Qualitative Case Study on the Adoption of Smart Warehouse Approaches in Malaysia" and it was carried out by Reima and other in 2019. In that research paper, the author also mentions that there has been no corresponding research on the deployment of smart warehouses in Malaysia. Therefore, researchers identified a knowledge gap in this research study. Furthermore, it is now 2023, and five years have passed since the research conducted by Reima and other in 2019, hence researchers identified a time gap in this research.

1.4 Research Objectives

The purpose of this study is to explores the factors that influence the adoption of smart warehouse in Malaysia. This is to ensure that the current warehouse practice in Malaysia is in line with the current times. In order to achieve the aims of this study, the following supporting objectives are established (RO):

RO 1 : To evaluate the current technologies implemented in warehouses within Shah Alam that can be associated with smart warehouse.

RO 2 : To identify the factor that influences organizational readiness towards smart warehousing.

RO 3 : To understand the external environment factors that could support the implementation of smart warehouse.

1.5 Research Questions

In order to achieve the above-mentioned objectives, the following research questions were formulated (RQ):

RQ 1 : What are the current technologies implemented in warehouses in Shah Alam that can be associated with smart warehouse?

RQ 2 : What influences the organizational readiness towards smart warehousing?

RQ 3 : How does the external environment factors support the implementation of smart warehouse?

1.6 Significance of Study

The implementation of advanced technologies, such as Warehouse Management Systems, RFID, and automated guided forklifts, has greatly increased the efficiency of warehouse operations. However, many warehouses in Malaysia still rely on conventional manual operations, leading to slower and less efficient processes. This study aims to address this issue by providing Malaysia companies with insights on the benefits and factors influencing the adoption of smart warehouse technologies. One of the significant contributions of this study is to provide a comprehensive understanding of the adoption of smart warehouse technologies in Malaysia. As there is a limited number of resources available in the country, companies may lack knowledge and awareness of the benefits of implementing such technologies. Therefore, this study aims to increase the resources available to companies that wish to implement smart warehouses. Overall, this study aims to provide valuable insights into the adoption of smart warehouses in Malaysia, which can serve as a useful reference for both companies and academics. By understanding the benefits and factors influencing the adoption of smart warehouse technologies, companies can improve their operational efficiency and contribute to a more sustainable environment.

1.7 Conclusion

In a nutshell, this chapter covers the background study and problem statement, which serve as the foundation of the research. The objectives of this research are illustrated in section four and followed by research questions in the next section. The significance of study is described in the following section last section in this

chapter. The following chapter discussed previous research projects and introduced the theoretical framework of this research paper.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter is going to discuss the study of relevant literature related to the smart warehouse as well as factor that influence the adoption of smart warehouse. This chapter will illustrate the TOE framework theory which is used in this research. Then, followed by the technology involved in smart warehouse, and organization readiness.

2.1 Academic Theory

The academic theory that researchers are going to discuss in this study is Technology–Organization–Environment (TOE) framework. The TOE framework states that three contexts have an impact on how organisations adopt new technologies (Sandu and Gide, 2018). The TOE structure includes technological, organisational, and environmental elements to investigate technology innovation implementation at the enterprise level (Chandra and Kumar, 2018). When deployed, the TOE framework can be utilized to discover aspects of novel ideas that influence how well they are implemented (Schmitt *et al.*, 2019). According to (Bhattacharya and Wamba, 2018), the TOE framework which developed by Tornatzky and Fleishcher has been used as a framework for many studies on organisational technology adoption. The TOE framework has been extensively utilised as a theoretical framework for earlier studies of

enterprise-level IS innovation, including material requirements planning (MRP), electronic data interchange (EDI), open systems, adoption of e-commerce, e-procurement, enterprise resource planning (ERP), knowledge Management Systems (KMS), and software as a service (SaaS) (Jia, Guo and Barnes, 2017).

The TOE framework more emphasises on social and psychological viewpoints. Individual problems are considered as organisational factors in the TOE framework (Awa, Ukoha and Igwe, 2017). In comparison to many other adoption frameworks, the TOE framework addresses the demand for more socioeconomic advancement and has higher theoretical and empirical support in the IS sector. The framework is legitimate, primary, and suitable for utilize in enterprise situations since the generic characteristics it presents provide a more meaningful viewpoint for examining user opinions on a specific system (Awa, Ojiabo and Orokor, 2017).
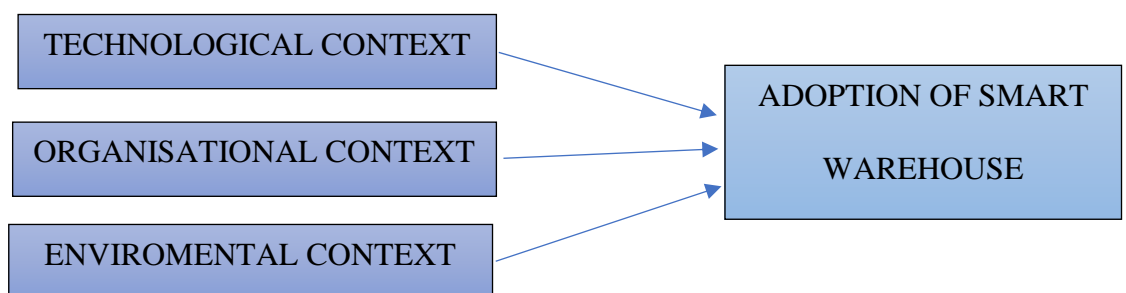
Figure 2.1: Theoretical Framework

2.1.1 Technological Context In TOE Framework

First of all, the technological context refers to both internal and external technology that the company can utilise (Chong and Olesen, 2017). These include the company's current procedures and tools, as well as some readily available outside the company technology. The appropriate skills need to employ that specific technology might also be indicated by the technological context. The five types of technological factor is relative advantage, compatibility, complexity, trialability and observability. Relative advantage, which is the first technological component, is described as the degree to which an innovation is regarded to be superior to the concept it replaces. Besides, the compatibility is describes as to what extent is an innovation regarded to be consistent with current values, past experience, and the demands of future users (Bhattacharya and Wamba, 2018). Complexity is the extent to which an innovation is viewed as kind of challenging to apply and comprehend. Furthermore, trialability is described as the extent that an innovation may be tried with on a limited basis. The term "observability" refers to the extent in which an innovation's results are visible to others (Badi *et al.*, 2021). From the perspective of warehouse, technological context refer to the technology in warehouse that can be utilized to stimulate the warehouse operation. The advanced technology that used in warehouse operation to facilitates the daily operation such as automated guided vehicle, RFID, IoT, barcoding system and so on. These advanced technologies can make the production and operation more effective when it is used by the warehouse.

2.1.2 Organisational Context In TOE Framework

The organisational context includes internal firm problems such as management, employees, products, and services (Chiu, Chen and Chen, 2017). Furthermore, the "organisational context" is made up of firm resources, employee connections, internal communication channels, firm size, and the number of slack resources. More specifically, it describes the scope and scale of an organisation as well as the management structure (Matikiti, Mpinganjira and Roberts-Lombard, 2018). The knowledge of top management about the technology's advantages and the enterprise's aspirations, as well as the accompanying support, are crucial adoption determinants of new technology. Besides, the adoption of new technology is significantly influenced by the size of the company. This is due to the fact that as an organization's size grows, job complexity and coordination become more difficult, and reliance on contemporary technologies expands. As a result, an organization's size has a significant impact on the adoption of new technologies (Awa, Ukoha and Igwe, 2017).From the warehouse's perspective, organisation context refers to the employees and the management in the warehouse. The top management of the warehouse must have knowledge about the advanced technology which adopted in the smart warehouse that make the operation faster. Moreover, the employees in the warehouse must know how to manage the advanced technology such as how to use the WMS system, how to drive the automated guided vehicle, how to use the barcoding system and so on. So, the top management must ensure that the employees have go through the training before they used the advanced technology.

2.1.3 Environmental Context In TOE Framework

Environmental context in TOE framework refers to the environment in which a firm conducts its operations, which includes the industry they operate in, rivals, as well as dealings with the government governing the area (Chandra and Kumar, 2018). Moreover, (Chiu, Chen and Chen, 2017) defines the environmental context includes problems with competitors and business partners that are relevant to the field of business. The three categories of environmental factors are industry characteristics, government regulation, and technology support infrastructure. The TOE framework has highlighted regulatory support as an important environmental factor driving technological adoption. Government laws may encourage or deter businesses from implementing technical breakthroughs. Government regulations are more likely to limit the adoption of green initiatives when they contain specific requirements, such as pollution control devices for energy companies and strict safety and testing requirements for industry. While regulatory support might induce companies to implement a technology advance, such as the offering of financial support, needed resources, and tax advantages (Chong and Olesen, 2017). In the perspective of warehouse, one of the environment context refers to the competitors of the company. The company may face with their competitors who have used the advanced technology in their warehouse. So, their competitors will gain advantages such as agile operation and short lead time. In order to compete with the competitors, the company must adopt advanced technology in their warehouse to gain the customer satisfaction with their quality service.

2.2 Concept of Warehouses

2.2.1 Smart Warehouse

Figure 2.2.1: Smart warehouse interior

The term "smart" has found its way into a variety of contexts as a direct result of the rapid development of technology and the Internet of Things (IoT) in recent years. For instance, a smart house is an automated home that will monitor and/or regulate home features such as lighting, climate, entertainment systems, and appliances. A smart automobile, on the other hand, is a set of procedures that give the drivers with safety and convenience through the intelligence of the vehicle itself. However, the definition of 'smart' varies depending on the context. In 1935, the presence of an electric light in each room of a house is one of the criteria for classifying it as a "smart house." In recent years, the criteria for classifying a house as a "smart house" shifted to include televisions and computers. Thus, with that being said, in the year 2022, according(Żuchowski, 2022), definition of a smart warehouse with a Internet of Things (IoT) perspective is defined as "A smart warehouse is a large building in which raw materials and manufactured goods are stored that uses machines and computers to complete the common warehouse operations previously performed by humans". Several studies have used smart warehousing to describe a warehouse

that includes a combination of automated material handling and AI (Kembro and Norrman, 2022).

In addition, a smart warehouse may be characterized as a combination of advanced Industry 4.0 technologies that contribute to the enhancement of supply chain performance. A smart warehouse is one that is automated, unmanned, and paperless when it comes to pick up, delivery, and bookkeeping (Karunarathna, Vidanagamachchi and Wickramarachchi, 2020). Some examples of these technologies are RFID, 5G, block chain, Internet of Things, cloud computing, etc. These technologies are incorporated into warehouses because they allow for the traceability and trackability of each product item, which improves the visualization of product data for consumers and industrial practitioners, as well as the innovativeness and dependability(Tang *et al.*, 2022). The advanced technologies of Industry 4.0, which make dehumanization possible, are ultimately the factor that came to define what a "smart warehouse" is in the 21st century. Many corporations have been developing smart warehouses in recent years and managing their operations by using automated warehouse robots. Robots connected to the internet have replaced the use of human labour in moving around the warehouse and picking customer-ordered goods (A Kamali, 2019).

2.2.2 Sustainable Warehouse

Warehousing is one of the elements that is absolutely necessary for the operation of any company. The term "warehouse" refers to a huge facility that is used to temporarily keep items and resources until they are sold or exported, so to many people it may seem to be pretty easy; yet the term really encompasses a great deal of variation. People commonly get a "smart warehouse" and a "sustainable warehouse" mixed up since there are many various kinds of warehouses, and each one serves a distinct function. A warehouse that is automated and unman does not necessary is label as a sustainable warehouse. According to Malinowska et al.(2018), "a sustainable warehouse means integration, management and balance of economic and social aspects, and in particular the environmental facilities and processes, although these aspects should be supplemented with technological and organizational aspects". To put it another way, a sustainable warehouse is one that manages to strike a balance between proper organisational, technological, economic, and social functioning and the effect on the environment.

In general, a warehouse that is integrated with modern technology is not considered to be a sustainable warehouse. This is because a sustainable warehouse is one that achieves this balance. A sustainable warehouse must be effective in the warehouse process while keeping the greatest social standards and reducing the damage to the environment in terms of financial efficiency. This is necessary for a sustainable warehouse. Overall, the economic, social, and environmental aspects of sustainability all play an equally essential role in ensuring the long-term viability of warehouses.

2.3 Technology Founded in Smart Warehouse

2.3.1 Warehouse Management System (WMS)

Figure 2.3.1: Warehouse management system illustration

WMS software, which stands for "warehouse management system," is an essential component for any business operation that involved in third-party logistics (3PL). This is due to the fact that businesses need to have the capacity to react fast using warehouse management software that improves their fulfilment skills in order to be able to satisfy the increasing expectations that are being placed on them by customers. It is a crucial component of the business of the organisation and it may make procedures easy to track (Zunic *et al.*, 2018). According to (N. Mostafa *et al.*, 2018), "WMS is an information system that integrates software systems to monitor, control, manage quantities and storage locations and optimize warehousing decisions". Order processing, order release, and master data are the three most important activities of a WMS, while the additional tasks include receiving (inbound), put-away, and warehouse management. So, WMS is an essential part of the organization's operations and it might make tracking procedures simple (Pane, Awangga and Azhari, 2018). Warehouse management system offers excellent warehouse process supports (Anđelković and Radosavljević, 2018). There are different types of warehouse

management systems and multiple options within each of these categories, and when broken down, the software use by 3PL companies may be classified into one of four types. These include integrated enterprise resource planning (ERP), cloud-based solutions, standalone warehouse management systems, and supply chain execution modules. The core capabilities and characteristics of each system are, for the most part, interchangeable; what sets them apart is their presentation and mode of distribution. Among the four mention type of system, the Enterprise Resource Planning (ERP) system is the most frequent kind of software used for warehouse management. This type of system offers capabilities for a wide variety of enterprise operations, including accounting, finance, and control, as well as production planning (Mostafa et al., 2018).

2.3.2 Barcoding System

Figure 2.3.2: Barcoding system illustration

Barcoding is the method of recognizing individual goods using vertical or horizontal bars. Through scanners, barcodes are used to identify stock products throughout storage, retrieval, extraction, inspection, and distribution. Barcoding offers a number of advantages, such as a decrease in human error due to the

distinctive symbol used to represent inventory information, a reduction in paperwork and processing time, and an improvement in the effectiveness of logistics systems due to its rapid data entry, accuracy, and dependability (Kamali, 2019). Numerous industries utilize bar codes in various ways. Bar codes have changed several industries, including food manufacturing, packaging, retail, healthcare, pharmaceuticals, electronics, automotive, industrial, and aviation. Barcodes are found on all electronics and mass-produced items, like the battery in your phone and the package for your new shoes. Industry has also used barcodes for safety and liability considerations. Manufacturers of medical and pharmaceutical products must now print mechanically readable barcodes on all of their packaging, including the individual medicine packages, according to several nations. Automatic package tracking will speed up product recalls if pharmacies receive defective products while also ensuring that quality control data is available throughout the supply chain (Mohamed, 2019). According to (Udom Phunlarp, 2019), the warehouse operate more efficiently after using a barcode system.

2.3.3 System Applications and Product (SAP)

The well-known enterprise resource planning (ERP) technology system applications and products, generally known as SAP, allows companies to establish a centralised system that enables all departments to use and share common data, improving the working environment for all staff members. The most popular ERP programme is SAP, which provides a wide selection of completely integrated components that essentially handle every area of business

management. ERP systems often include a number of software components, each of which focuses on a different aspect of how firms run, such as accounting and finance human resources, production, materials management, and customer relationship management (CRM). The organization uses only the modules needed to carry out a particular operation. Business processes include elements like operations, corporate services, finance, and human capital management. Through ERP software, users will be able to organize consumer interactions amongst several departments, including sales, customer service, and marketing (Ishak, 2021). Based on (LUBIS *et al.*, 2021), SAP was created to help a business conduct out its daily operations more productively and efficiently. SAP is best recognised for being one of the ERP that provides great practises from famous firms around the world, thereby supplying assistance for businesses that apply them on how best practises should be conducted so that the company's performance increases along with the adoption of ERP and SAP (Tyas Darmaningrat, Muqtadiroh and Bukit, 2019).

2.3.4 SYSPRO System

SYSPRO is an independent global supplier of industrial ERP software designed for manufacturers and distributors. SYSPRO systems can be set up locally, in the cloud, or through mobile platforms. The SYSPRO ERP system offers advanced capabilities for supply chain management and outbound distribution control tasks (Lunga, 2021). Once the daily orders have been entered, a Syspro order intake query can be created to provide a line-by-line inquiry of every order

line entered over a given time period (Cynthia Garlick, 2019). Syspro was created specifically for the manufacturing industry to assist companies there coordinate, integrate, and control their production process. Users have the option of installing locally or using the cloud. By handling distribution well, Syspro can help users meet the growing need for warehouse automation. Additionally, this system has abilities for inventory optimization. Syspro allows users to identify potential issues (YI, 2020).

2.3.6 Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is a way for automatically identifying items (Gradetsky *et al.*, 2020). The use of RFID technology enables the provision of real-time data on supply chain processes. Warehouses have used it to reduce shrinkage, improve material handling and fastening, and increase data collecting accuracy (Seng and Yew, 2019). RFID operations can also be carried out in a variety of settings, as it may be used for tracking and identification. For instance, RFID is frequently employed in warehouse management systems to track and trace information discrepancy brought on by updates and changes to warehouse activities (Aamer and Sahara, 2021). The tracking of the components in the warehouse is an important factor of the data required.

Real-time part tracking data is produced using RFID linked to a wireless sensor network (WSN). By scanning RFID tags, RFID sensors continuously collect signals, and through wireless sensor networks, they send data to public servers.

To make various judgments, all the data is gathered and examined. RFID tags are inexpensive tags that can be made into smart tags by encoding the tag and storing data on it. The Internet of Things can provide real-time data used by a range of applications and assess business models by merging RFID tags with smart shelves that can track parts (Samir Yerpude, 2018). RFID is also utilized to expedite the billing process (Seng and Yew, 2019). RFID is one of the key components in the smart warehouse that helps workers become more productive. Additionally, RFID identifies the containers, pallets, boxes, and goods produced, distributed, and sold along the supply chain, ensuring that clients receive the appropriate goods at the right time and place and thus assisting in the important company's sales growth. Other than that, radio frequency identification (RFID) is a technical advancement that is utilized to continuously offer information on supply chain activities. Additionally, RFID can boost customer satisfaction by streamlining business operations, lowering labor costs, enhancing business efficiency, and improving the accuracy of inventory movement and location (Samir Yerpude, 2018).

2.3.6 Internet of Things (IoT)

A network of automated systems that let users manage and coordinate objects on the Internet is known as the "Internet of Things" (Khan *et al.*, 2022). One of the authors of the study referred to the Internet of Things as a "universal worldwide network that enables and delivers functions that integrate the physical world" in their analysis. The information produced by IoT sensors, which will be integrated into all things and connected to public communication

networks, is gathered, processed, and analysed to achieve this. The Internet of Things' basic idea is that everything should be able to be recognized, felt, connected to the Internet, and be able to communicate with one another (Mostafa *et al.*, 2018). These links generated a huge number of data, which was then converted into knowledge to support decisions. Decentralized management and control are aided. The Internet of Things (IoT)-based automation has a wide range of applications and is a crucial piece of the industry 4.0 revolution. Additionally, as part of the Internet of Things' (IoT) return on investment, organizations may use it to achieve concrete advantages. It offers superior lifecycle management, collaboration-enhanced management visibility, and inventory management. These are a few of the plain advantages of IoT adoption in warehouses (Samir Yerpude, 2018).

Based on (Buntak, Kovačić and Mutavdžija, 2019), Internet of Things (IoT) is a network that connects physical elements and is capable of gathering performance data to improve a process or its individual parts, such as machines and gadgets, as well as to enable their management. It can aid in improving demand forecasting, developing a smart transportation system, and establishing a smart warehouse management system (Mostafa, Hamdy and Elawady, 2020). Besides, the Internet of Things-based warehouse system connects actual warehouses to enable continuous real-time information from various places in the smart warehouse to be entered into a single database. Utilizing warehousing technology increases efficiency by bringing accuracy and transparency. IoT-based warehouses offer strong business insight as well, including data storage for actions, choices, and extraneous procedures. A lack of effective management

is what is causing the transition from traditional warehousing operations to highly automated warehousing systems. In the context of Industry 4.0, the Internet of Things is essential to the realization of intelligent warehousing and logistics. The brain that enables traceability and decision support for warehouse and logistics activities is the integration of technologies in the Internet of Things (Aamer and Sahara, 2021).

2.3.7 Battery Powered MHE

Materials Handling Equipment (MHE) is frequently used for moving and storing a wide range of items and materials in warehouses, distribution centres, and other facilities. Forklifts, pallet jacks, and cranes are examples of such equipment. Lead-acid batteries are the most typical Energy Storage System (ESS) for an electric MHE. These require approximately 8 hours to recharge and another 8 hours to cool down before usage, requiring the use of battery rooms equipped with changing equipment and charging devices. To improve efficiency and reduce environmental effect, lithium-ion batteries are utilised to power electric MHE. Their chargers are more secure as well as simpler to use, and they can be set up anywhere in the building, eliminating the require for dedicated charging rooms and creating more space to optimise the business's operating flow (Manuel et al., 2023). Electric forklifts and lift trucks are quiet, environmentally friendly, smooth functioning, and simple to maintain Supply Chain Dive，2021. In warehouses with 'picker-to-part' operations, energy savings from material handling activities can be realised by a variety of

approaches, such as the adoption of energy-efficient material handling equipment (Carli et al., 2020).

2.3.8 Cloud Computing

Cloud computing virtualizes resources from several geographic locations into a resource pool through virtualization technology, (Lin et al., 2019). In its most basic form, cloud computing is the process of keeping and using data and applications over the Internet rather than on a computer's hard drive. The combination of hardware and software that offers services through a network is known as cloud computing. Cloud computing allows users to browse files and run apps from any device that has Internet access. Google's Gmail is an example of a cloud computing provider. Cloud computing is a network access model that provides anywhere, anytime access to a shared pool of configurable computing resources that can be quickly provisioned and distributed with little administrative work or interaction between service providers. Cloud computing has produced significant advances in information technology. When it first appeared, it completely transformed the IT business. It is critical in fulfilling rising storage and infrastructural demands. The capacity of the cloud to supply resources such as hardware and software through a network is a unique characteristic. Cloud computing platforms are designed especially for commercial or research use. It can help firms operate more efficiently by saving money on software and hardware, both of which are needed for carrying out various processes smoothly. Cloud computing allows businesses to enhance

their IT capabilities or capacity instead of adding software, staff, making investments in further training, or establishing new infrastructure (Rashid & Chaturvedi, 2019). Cloud computing services are classified into three types, which are infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). Cloud computing has experienced several issues as the number of users has grown due to the rapidly increasing need for sharing of resources and utilisation (Gamal et al., 2019).

2.3.9 Big Data Analysis

Big data is now an international phrase that is extensively used in industry and academics. Big data has been a revolutionary accomplishment for an extensive variety of businesses, which means it now has multiple meanings based on how it is applied in those industries. Big data is defined as the mix of volume, diversity, speed, and accuracy which enables organisations to acquire a competitive advantage in today's digital economy (Yaseen & Obaid, 2020). The importance of big data analytics has been extensively recognised over the past few years throughout a wide range of sectors and corporate operations. Big data analytics has proven to have huge potential for improving marketing and sales. Supply chain executives acknowledge that big data analytics are going to alter an organization's competitive landscape in the future, allowing it to deliver excellent data accuracy, clarity, and insight across its supply network and combining big data analytics into optimisation and decision-making tools. The

supply chains which make use of big data to build new competitive advantages will win (Aryal et al., 2020).

2.4 Organizational Readiness

2.4.1 Top Management

Top management support (TMS) is critical in the development of enterprise service innovation strategy and decisions. TMS refers to managers' technical competence to understand and accept new technology systems (Maroufkhani, 2020). TMS also means the degree of support received from upper management for the adoption of innovative business technologies (Abed, 2020). TMS also gives enough resources and funding for each innovative initiative. Top management has always played a significant role in supporting employees, assisting them in resolving issues, establishing peaceful communications and collaboration among different job functions, encouraging bottom-up brainstorming and stimulation, and laying a clear foundation to guide line managers in supporting creativity through providing clear and consistent signals. Support from top management is critical in navigating challenges and improving a company's technological abilities in order to successfully implement or execute new goods or services (Hsu et al., 2019). TMS is one of the organisational circumstances that has the most influence on the outsourcing of IT. One of the main reasons of customer relationship management failure is a lack of top management support. TMS is a deciding factor that has the ability to manage all strategic planning and decision-making procedures behind modern

technology. Support from top management is a key motivator for identifying, adopting, and implementing new technologies at the level of the company (Cruz-Jesus et al., 2019).

2.4.2 Employee Training

A company-initiated initiative to encourage learning among employees is training. Organisations promote growth and raise the standard of both new and existing workers through organization training (Chahar *et al.*, 2019). Additionally, the purpose of training is to improve employees' contributions to the company. The goal of training and development is to increase an employee's capacity for learning and creativity, which will enhance their competence and organizational performance. Employee training plays a critical role in the adoption of the smart warehouse system and can have an impact on how quickly it proceeds. Every organization may increase employee productivity and efficiency by investing in training (Ameen and Baharom, 2019).

Training is required for warehouse staff in order to improve their skills. The goal of this training is to increase the knowledge and skill of warehouse employees (Indrawati *et al.*, 2018). The employee expertise could affect how well the smart warehouse system performs. Employee training is crucial in order for the staff to prepare for the adoption of the warehouse early. For instance, if staff members have practiced using robotics, RFID, and IoT equipment. Companies may find it simpler to install efficient intelligent warehouse solutions as a result. The

smart warehouse's overall productivity can be raised. For improved human-machine interactions in smart warehouses, employee training is required. This demonstrates their capability to manage warehouses efficiently, support operators through virtual training, expedite the reconfiguration of manufacturing lines, and engage with the working environment to reduce risk (Freund and Launberg, 2020).

2.5 Conclusion

In conclusion, this chapter provides an overview into the research area from the existing literatures. The academic theory that is explored by researchers which is suitable with this research paper is TOE framework. The outline of the related referencing material relevant to smart warehouse are provided in this chapter.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

In this chapter, the researchers discussed the research techniques and methods utilized to obtain useful data for the research. This study used the qualitative research method identify the factor that influence the adoption of smart warehouse in Shah Alam. A dissection of research design, research sampling, and target population, sampling technique, data processing, data analysis and ethical considerations were presented in the following components of Chapter 3.

3.1 Research Design

1. Problem Statement

2. Research Questions

3. Judgment Sampling

4. Collect Data

5. Grouping Data

6. Saturate Categories

7. Explore Relationships Between Categories
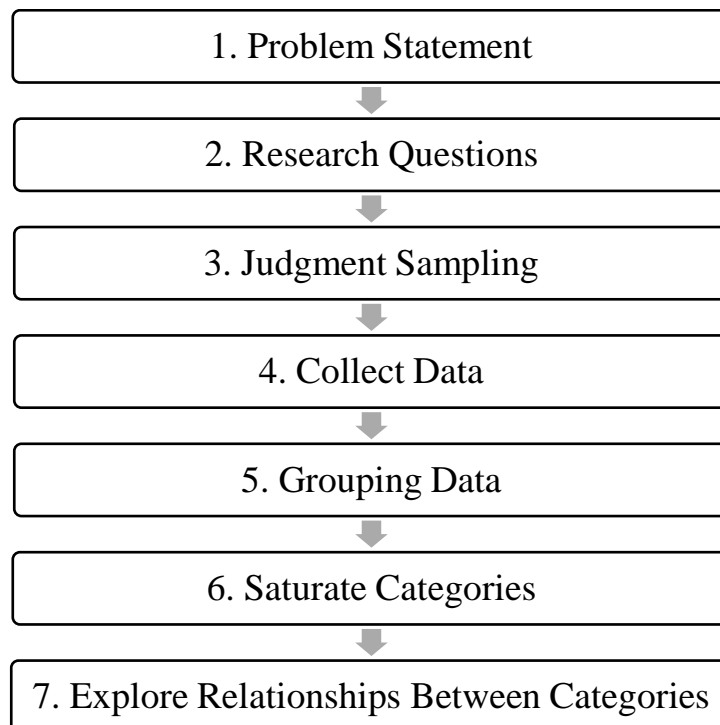
Figure 3.1 Data analysis steps

A qualitative research design is employed to perform in this study. In this section, researchers explore a basic understanding of how research is conducted. According to (Wutich *et al.*, 2021), the literature on qualitative methods of theme analysis provides some guidance for identifying large-scale or higher-order themes. By generating responses to questions like how, what, and why to inspire behaviour, qualitative research has the virtue of being able to record information on feelings, beliefs, and values (Bazen, Barg and Takeshita, 2021). Prior to scientific explanation, the qualitative method enables understanding of a problem from the viewpoint of the subject, reveals the significance of people's experiences, and clarifies the context in which they live.

An outline of the strategy that can analyse the problem as well as manage and monitor the study execution will be seen in the study design. All research questions will be analysed and answered one by one by means of variance management. This would reflect the contribution of informants to the research outcomes. The main focus of this study is on the factors influencing the adoption of smart warehouses by Malaysian companies. Therefore, relevant sources and information are the focus of researchers. This study selected and implemented qualitative research methods as the way of data collection. This is the research method of this study. This approach helps to understand the research question in more deeply and detail.

3.2 Research Method

In qualitative research, the research methods used are classify under 3 types, which are participation observation, in-depth interview, and focus groups, and each method is suitable for obtaining a specific type of data (Jamshed, 2014). For the purpose of this study, researchers have decided to employ the use of the in-depth interviews as the primary data collection method. According to Malbašic *et al.* (2019), the in-depth interviews method is a technique that involve intensive individual interviews with a small number of respondents to explore their view and experiences on a particular issues, ideas, plan, or situation. This method will greatly benefit the study as it allows researchers to collect a much-detailed information, compare to other methods such as surveys, questionnaire etc, given the fact that an in-depth interview is done with the purpose of gathering in-depth information n of the interviewee's experience and opinion on a topic (Showkat, Parveen and Parveen NayeemShowkat, 2017). For the in-depth interview sessions, information obtain form interviewees will be recorded by researchers through the use of on-site recorded audio tapes, video tapes and written down notes, and all will subsequently be converted into words to record and organized the data.

3.2.1 Semi-Structured Interviews

Interview are divided into three types, which are structured interview, semi-structured interview, and unstructured interview (Adhabi and Anozie, 2017). For the purpose of this study, semi-structured interviews were selected to obtain the qualitative data, as it is more flexible and iterative compared to structured

interviews. According to Jamshed (2014), the interview questions posed in a semi-structured interview are open-ended, allowing the interviewee to respond in their own words rather than being constrained to a list of fixed answers. The implementation of semi-structured interviews is depending on how interviewees respond to the to the question or topics laid across by the researcher, as although there is a set of leading questions, the interviewee's answer allows higher flexibility for the researcher to propose more enhanced queries than the ones that were first developed (Adhabi and Anozie, 2017; Jamshed, 2014). Therefore, it enables researchers to acquire an in-depth insight about the factor that influence the adoption of smart warehouse.

The purpose of using a semi-structured interview is to guide the interviewee through the research topic with pre-written questions and to establish two-way interaction. This study does not intend to simply analyse a restricted collection of factors, but rather to probe deeply into the issue and uncover any possible response from the interviewees. The limitation of using semi-structured interviews is that it can be time consuming as it is open-ended and may require a relatively long period to obtain sufficient information for any new idea. Moreover, generalized and united answer may not be obtained because different interviewees from different companies will have different points of views and perspectives even though all the interview questions will be focused on implementation of smart warehouse.

3.3 Research Instrument

The purpose of this study is to conduct an analysis of the factors that have an impact on the implementation of smart warehousing in Malaysia. When it comes to the collection of data for qualitative investigations, the interview approach is a very useful instrument. In order to gather perspectives from industry specialists for the purposes of this research, open-ended interviewing approaches have been selected. A list of open-ended interview questions derived from the research questions was created in order to prepare the research instrument. The same set of questions were sent to all respondents via email before the planned interview time. As shown in Table 3.1, there were four sections to the interview questions.

Table 3.1 The different parts of the interview questions

PART	DESCRIPTION
A	Demographic background of the respondents
B	Technology influence in smart warehouse adoption
C	Organizational readiness in smart warehouse adoption
D	External environment factors that influence the adoption of smart warehouse

The design of the interview question is separated into four parts. In part A researcher asked respondents about the demographic profile, in Part B which consists of six questions asking information regarding to the first independent variable, Technology, Part C which consists of four questions asking information regarding to the second independent variable, Organizational Readiness and the last part, part D which consists of three questions asking

information regarding to the dependent variable, External Environment Factors. There consist of no negative questions in the questionnaires. The question asked in each of the part is link back to the research objective.

3.4 Data Collection

In order to study a problem, data collection is an important process of collecting actual information from informants for analysis. Data collection is an important process that the researchers might utilize to gather data. The tool used for data collection is one that has been chosen and utilized by researchers so that the activity is made systematic and aided by it (Aini *et al.*, 2018). The data collection which adopted in this research are primary data and secondary data.

3.4.1 Primary data

In line with (Windle and Silke, 2019), primary data is defined as information gathered "first hand for the particular goal of addressing the study issue" in this context. Primary sources frequently include data based on first-hand involvement with or observation of a particular issue. A primary source would be, for instance, the text of a terrorist leader's talk (Schuurman, 2020a). Primary data is data that has not yet been published and is first-hand information that has not been altered by anyone. In other words, researchers employ a variety of methods to obtain and collect primary data for a specific objective. As a result,

the validity, dependability, objectivity, and authenticity of data are greater in primary data than in secondary data (Taherdoost, 2021).

Utilizing primary sources allows you to obtain high-quality data that can enhance outcomes and gives you the chance to add more material as needed throughout the research process (Taherdoost, 2021). Real-time data, or information gathered by researchers themselves, is referred to as primary data. This normally requires significant time, effort, and cost. Quantitative and qualitative data are typically collected using different primary data collection techniques. The quantitative data is based on mathematical computations presented in a variety of formats, including inferential and descriptive statistics. The other important data source is qualitative data, which does not entail quantitative computations (Gunawan, Marzilli and Aungsuroch, 2022).

3.4.2 Secondary data

Secondary data is information gathered for other purposes by other people or organisations. Comparable to primary data collecting, secondary data can be cheaper, simpler, and less risky (Windle and Silke, 2019b). The process of gathering secondary data is quick, and it requires less time and money (Gunawan, Marzilli and Aungsuroch, 2022). According to (Schuurman, 2020), there is an example of a secondary source is a newspaper story that presents a journalist's analysis of the speech's main topics. When information is gathered from published sources, it is considered secondary data since it has previously been

collected for another reason and can be used for other research reasons (Taherdoost, 2021b).

Secondary data may be referred as previously obtained information that is being considered for reuse for new inquiries for which the data obtained was not originally intended (Martins, Cunha and Serra, 2018). In addition, secondary data can come from both direct and indirect observation, and it can also be private or public (Kusrini, Novendri and Helia, 2018). Based on (Kneale *et al.*, 2019), secondary data could be useful in assisting researchers and decision-makers in assessing the feasibility of treatments contained in systematic reviews, as well as recognising potential disparities in the size and direction of intervention effects, though their potential stays untapped.

3.5 Research sampling

In qualitative research, initial decisions about sampling methods are guided by the research question and TOE framework of the study. The sampling method of this study is consistent with the research questions in the previous part. It helps to establish the boundaries of the studied scenario and focus on the main objective (Farrugia, 2019). Research sampling allows the researcher to select an interest group that will provide the most critical feedback on the research topic.

3.5.1 Target Population

This research has made the individuals that are involved in the adoption of the smart warehouse in the area of Shah Alam. As reflected in the previous research, there are few companies that adopt smart warehouses in Shah Alam. The targeted group includes the managerial level of warehouses, such as warehouse managers, inventory managers, manager executive, and higher-level management members such as assistant general manager that are able to provide the critical information into the research topic investigated. The researchers have conducted interviews until the data collected is saturated.

3.5.2 Sampling Technique

According to Farrugia (2019), sampling techniques are divided into two categories; which are conceptually driven approaches and non-conceptually driven approaches. Conceptually driven approaches have purposive and theoretical sampling, while convenience sampling and opportunistic sampling are categorized under non-conceptually driven approaches which are not specific focus or guiding principles. In this research, the researchers used purposive sampling. This method is also known as judgment sampling. Basically, researchers search for sources of information that they believe will satisfy their research interests, based on their own knowledge and judgment. The use of purposeful sampling enables informants to provide an average level of insight into the survey questions at the management level, avoiding biased results from a particular perspective. Additionally, they also offer the variables that can be straightforward demographics like age, gender and socioeconomic status but can

also include more complicated aspects such as particular attitudes or beliefs. Beyond that, this approach is more appropriate because the factors of adopting the smart warehouse can be many type of effects that need to be studied.

3.6 Location of Study

This study is being conducted in Shah Alam to investigate the factors that influence the adoption of smart warehouses in Malaysia. Sampling has been conducted around the location of study to assess the affect the adoption smart warehouses on those companies in Malaysia. In the figure 3.6, Shah Alam is the capital of the Malaysian state of Selangor, located in a small part of the Petaling district and adjacent Klang district. Shah Alam replaced Kuala Lumpur as the capital of Selangor. Therefore, only the companies that have warehouses in Shah Alam were selected to form the sample of the research.

Figure 3.6: The location of Shah Alam in the map of Malaysia.

3.7 Data Processing

Data processing is the process of transforming and organizing data into applicable stages and interpreting existing information. Researchers must filter through and process the information they receive from respondents after they have gathered all the necessary data. As previously mentioned, the researchers used online tools like Microsoft Teams or Zoom Meeting to capture the entire interview. The researchers recorded the entire interview and turn the recorded audio into a written transcript after the session. To enable researchers to properly convey the correlations and findings of the data, this raw data is gathered, filtered, selected, processed, analysed, and turned into a readable and more understandable format. The researchers then gave a brief summary of the data collected.

3.7.1 Data Reliability and Validity

According to (Cypress, 2017), qualitative research is in many ways more complex than traditional surveys. Reliability and validity are two essential components of every study. Validity generally refers to "the extent to which the conclusions drawn in a study give an accurate description or explanation of what happened". However, it is used very differently in qualitative research, where it means "The objective is to give the study an assurance that the report or description is correct." This indicated that the reports and descriptions are factual and accurate descriptions of the phenomena mentioned and are deterministic such as supported by evidence. Reliability usually refers to "the extent to which a measurement, procedure, or instrument produces the same results in repeated

trials". To put it another way, it has to do with minimizing biases and errors (Kihn and Ihantola, 2015). The researchers assert that the rigor of qualitative research is equivalent to the reliability and validity of the concept, both of which are necessary components of quality. Therefore, the researchers screened and collated the collected data to ensure the authenticity of the data and the consistency and validity of the data.

3.8 Data Analysis

Data analysis is essentially the process of transforming raw data into useful information. In order to use the data in the data analysis process, it must be prepared (Taherdoost, 2020). Furthermore, data analysis is one of the most difficult components of the qualitative research process, particularly when dealing with huge volumes of complicated qualitative data. It seeks to create robust theoretical ideas or frameworks based on the data gathered to help understand complex phenomena (Bernadette DIERCKX dE CASTERLé, Kristel DE VLIEGHER1, Chris GASTMANS, 2021). Additionally, one of the most important but least understood phases of qualitative research is data analysis. At this point, in-depth fieldwork and persuasive data are converted into substantive and actionable conclusions (Raskind *et al.*, 2019).

Based on (Lowe *et al.*, 2018), the regular requirement in qualitative data analysis is the gathering of relevant information and its organization into themes that indicate developing patterns and lead to a theoretical understanding of the situation under research. There are numerous qualitative data analysis software

packages available, including ATLAS.ti, MAXQDA, and NVivo (Lester, Cho and Lochmiller, 2020). In this study, researcher used ATLAS.ti software to do the data analysis. According to (Ronzani, 2020), ALTAS.ti software is needed to reveal an academic study data introduction, analysis, and retrieval findings on how commitment, development, and innovation help to mobilize resources and push the ability of a traditional business's research, development, and innovation (R&D&I) team. ATLAS.ti software helped researchers to manage all kinds of data. ATLAS.ti can used to creating Heurmeunistic Unit (HU), input data, selecting data, providing coding, doing analysis, searching data, creating memo and producing an output. Researchers used the powerful workbench of ALTAS.ti to conduct the data analysis of the study.

3.8.1 Content Analysis

Qualitative content analysis is a common method in nursing research, applicable to a variety of backgrounds and data. However, there are multiple challenges to performing the analysis process. A common criticism of qualitative content analysis is that it is a technical tool for basic, superficial, and simple ordering of texts, and that its results lack depth, scientific rigor, and evidence (Lindgren, Lundman and Graneheim, 2020). In line with Devi Prasad and Bammidi (2019), qualitative content analysis is a systematic method to analyse qualitative data. It provides the opportunity to analyse explicit and descriptive content to form categories, as well as underlying and explanatory content to form themes. Content analysis is defined in three broad categories. In the first type, which is the majority, the emphasis is on the quantitative orientation of the method. In

the second type, mention of quantitative dimensions is deliberately avoided and qualitative dimensions are not explicitly mentioned. It is only in the definition of the third type that the subjective and qualitative dimensions of the method are boldly stated, or that both the qualitative and quantitative directions of the method are accommodated while favouring the interpretive method. In published papers, abstract and interpretive analytical processes are often rarely described. As researchers are able to properly use qualitative research methods, the standard of publication will improve. By using these content analysis to interpret the virtual interview session throughout the data processing, the findings will be more clearer, accurate and valuable.

3.9 Ethical Consideration

Ethical considerations include the protection of rights of informant, gaining informed permission, and the institutional review procedure. The researcher must offer appropriate information on each of these criteria. Besides, all researcher in the study were needed to provide written informed consent. Moreover, the researcher also need to obtain permission to record the interview from informants (Arifin Siti Roshaidai, 2018). According to (Ngozwana, 2018), the researcher must adhere to the proper ethical standard that given in the Research ethics committees (RECs) when doing the research proposals. The rights of participants are protected, and these rights include the right to make decisions for themselves, the right to privacy, the right to autonomy and confidentiality, the right to receive equitable treatment, and the right to be free from pain and harm (Klopper, 2008). When the informants give personal data

for research purposes, the informants believe that it will be kept confidential and that only specific individuals will have access to it. As a result, the researcher has a duty to protect the personal data that participants have provided by the informant (Mikkonen, 2020). Last but not least, the researcher also needs to ensure that the collected data is only used for academic purpose.

3.10 Conclusion

In a nutshell, this chapter discuss the type of study design and the methods used to obtain the data for this research. A judgment sampling method was used to sample the company's warehouse managers, warehouse supervisors, and senior managers in Shah Alam. Furthermore, we used the face-to-face interviews to gather the raw data, and all obtained data were transcribed, analysed and investigated in depth. The researcher also used ATLAS.ti to conduct a content analysis of the collected data as a tool while adhering to ethical guidelines throughout the process.

CHAPTER 4

DATA COLLECTION & ANALYSIS

4.0 Introduction

This chapter presents the data collected through the qualitative method as mentioned in Chapter 3. The data were interpreted and analysed by three themes, which aligned closely to the research objective. Throughout this chapter, the results that were collected from the respondent will be analysed by using Atlas.ti and it will also present in tables and figures. The findings were categorized according to the sub-themes under the relevant theme and each of the sub-themes were interpreted and analysed in this chapter.

As displayed in Table 4.1, the sample of this study was formed by three Informants that sit in the managerial level of the warehouse department. All three informants had answered the semi-structured interview question, referring to Appendix A, that were prepared by the researchers and all the answers had been recorded and transcript as in Appendix B to Appendix D. To improve the process of data analysis, researchers have utilized ATLAS.ti to better code and analyse the transcripts. The visualization of data in a network diagram using ATLAS.ti was attached after the interpretation of each sub-theme.

Table 4.1: Informant Profile

Organisation	Informant	Department	Date
G Company	**Informant 1**	- Head of Logistics	23 March
	Informant 2	- Chief Sustainability and	2023
		Strategy	(Thursday)
P Company	**Informant 3**	- Warehouse Senior	6 March
		Manager	2023
			(Monday)
T Company	**Informant 4**	- Warehouse General	10 March
		Manager	2023
			(Friday)

Informant 1 is the head of logistics in the warehouse. She has experience in the warehouse operation for about 10 years altogether. She has 18 years' experience with the company, eight years on the distribution. Now she has moved to a logistics site for about 10 years.

Informant 2 is the chief sustainability and strategy officer of the company. He has been here for four years in the logistics business.

Informant 3 have experience for about 15 years, so based in Shah Alam. He was based in the station near Shah Alam that handles for a few warehouses and also the main task is to handle the warehouse operation and the current position is general manager for the branches in the Shah Alam warehouse.

Informant 4 has experience in warehousing for the past 13 years. But in a different company. In current company he has already joined eight years here as

an assistant manager and now he is a senior manager managing a few accounts for different operations.

4.1 Informants' Answer Based on Themes and Sub-Themes in the Table

4.1.1 Theme 1 ： Technology Factors that affecting the Adoption of Smart Warehousing and Advanced Technologies in Shah Alam

Table 4.2: Technology Factors that Affecting the Adoption of Smart Warehouse in Three Compared Informants

Technology Factor	Informant 1	Informant 2	Informant 3
Technology Available	- Semi or partly smart	- Yes	- Not consider as smart warehouse.
Current Practice for the Advanced technologies	- WMS System, Light system, conveyor system	- WMS System, RPA, RF scanner	- MHG forklift, WMS, RF scanner
Reliability	- Yes. WMS managed the whole movement of the item inside the warehouse right from in until out so the accuracy and the inventory are always there.	- Yes. WMS system is very helpful for the inventory accuracy and efficiency. - WMS can easily check back the record transaction a few years back with single click. - It knows how to track back the movement if there's stock missing.	- Yes. Current implemented technologies is very helpful for the day-to-day operation. - The scanning process of the WMS helps to improve the accuracy of inventory and also picking and packing.

		-Current technologies implemented can help to do two jobs at one time.	
Performance	- It can measure the KPI, key performance index, how fast we go from pick to pack until outbound. - We can reduce some cost on the manpower and keep the record manually like the papers. - It improves the operation speed as well the productivity of the workers and increased the customers' experience.	- It can eliminate the error of picking the wrong orders as well as save cost for that account.	- The scanning process helps to improve the accuracy of inventory and also picking and packing. - It will eliminate the human errors or the mistakes. - The customer could get the live result of their products
Benefits	- N/A.	- Cost saving, reduce overtime, new technologies such as MHG batteries have last longer working hours compared to classic forklift	- Easier to reach information at your fingertips, reduce human error, provide customers with real time information.
Challenges	- The accuracy is always traceable so cannot miss out any process any steps in order to get to the end result so we don't face big challenges.	- The system will sometime go down because some customers are not willing to pay for their own dedicated Internet line for security.	- Consistency of our network or our in-house system because sometimes we are facing some of the network issues.

	- There is new system that we implement, system migration will probably face the system down although it is quite smooth.	- Some of the area is not connected or maybe has a poor connection cause the IT team could be having some lost connection to our system. - Sometimes the wrong data will probably happen.	
Future Implementation	- I would say automation is always something that we want to go for.	- ASRS, Robotic Forklift	- Currently no, but in the future will have.
Positive or negative views for the implementation of smart warehouse	- Positive site	- Positive site	- Positive site - Demand of this warehousing is getting higher

To distinguish the factors affecting the adoption of smart warehouse and advanced technologies in Shah Alam, researchers had questioned around eight elements towards the respondents for the first theme factors which is technology factors. All informants had provided the information for each sub-theme, as indicated in Table 4.2. According to the table above, **Informant 1** stated that their companies currently have a semi or partly smart warehouse while **Informant 2** stated that they are fully smart warehouses. In contrast, **Informant 3** respond that their warehouses currently are not considered as smart warehouses.

In current practice for the advanced technologies, three of the informants also mentioned about the implementation of the WMS system. For the RF scanner, **Informant 2** and **Informant 3** were mentioned in our interview session. Furthermore, **Informant 1** also stated that they implemented a light system and conveyor system for their warehouse operation and **Informant 2** had mentioned how RPA helped them to improve the productivity of the daily operation in the warehouse. Lastly, **Informant 3** stated that they also implement MHG forklift in their warehouse.

For the reliability of the technology implemented, all three respondents also mentioned the WMS is very helpful for them. For example, WMS helps them to improve their inventory accuracy and inventory efficiency based on the Table 4.2. Moreover, **Informant 1** also mentioned that WMS is a very strong automation to manage the whole movement of the item inside the warehouse right from in until out. **Informant 2** stated that current advanced technologies implemented help them to do two jobs at one time. Besides, **Informant 2** also points out that WMS makes it easier for them to check back the transaction record in a few years with a single click and help them to track back the stock movement if any of the stock is missing. **Informant 3** stated that the current technologies that implement in their warehouse is very helpful in their day-to-day operation. Additionally, they also mentioned that the scanning process that they currently implemented helps them improve the accuracy of inventory and also picking and packing.

In the performance of the technologies, **Informant 1** stated that the technologies that they already have in their warehouse helps them to measure the KPI and fasten their pick to pack process. They also stated in the interview session: *"We can reduce some cost on the manpower and keep the record manually like the papers."* Additionally, **Informant 2** and **Informant 3** said that the technologies help them to eliminate the errors. **Informant 3** stated that the scanning process helps them to improve the accuracy of inventory and also help them to provide customer for the live result of their products.

In benefits of technologies, we are unable to collect the correct answer from **Informant 1**. However, for **Informant 2**, they stated that the technology helps them to save cost, reduce overtime and the new technologies such as MHG forklift batteries last longer working hours compared to classic forklift as stated in Table 4.2. This helps them to save time. Moreover, **Informant 3** mentioned that it is easier to reach the information at their fingertips, reduce human error and provide customers with real time information with the implementation of technologies.

Other than that, the challenges of technologies for **Informant 1** said that they currently didn't face any big challenges as mentioned in interview session: *"The accuracy is always traceable so cannot miss out any process any steps in order to get to the end result so we don't face big challenges."*. For **Informant 2** and **Informant 3**, they stated that the system will go down sometimes. **Informant 2** said this is due to some customers not being willing to pay for their own

dedicated Internet line for security. Besides, the system migration will probably cause the system to go down although it is quite smooth during the implementation of the new system. **Informant 3** stated that this problem is due to the consistency of their network or our in-house system will face the network issues. Lastly, **Informant 3** said: *"Some of the area is not connected or maybe has a poor connection cause the IT team could be having some lost connection to our system and sometimes the wrong data will probably happen."*

As refer to Table 4.2, for the future advanced technology implementation, **Informant 1** said that they would say no because automation is always something that they want to go for. For **Informant 2**, the advanced technology that they decided to implement in the future are ASRS, Robotic Forklift. For **Informant 3**, they stated that currently no but, in the future, will have the intention to implement the advanced technology. For the views for the implementation of smart warehouses, **all the three Informant** said that the implementation of advanced technology into warehouses has a positive side in the current market since nowadays the demand of this smart warehousing is getting higher.
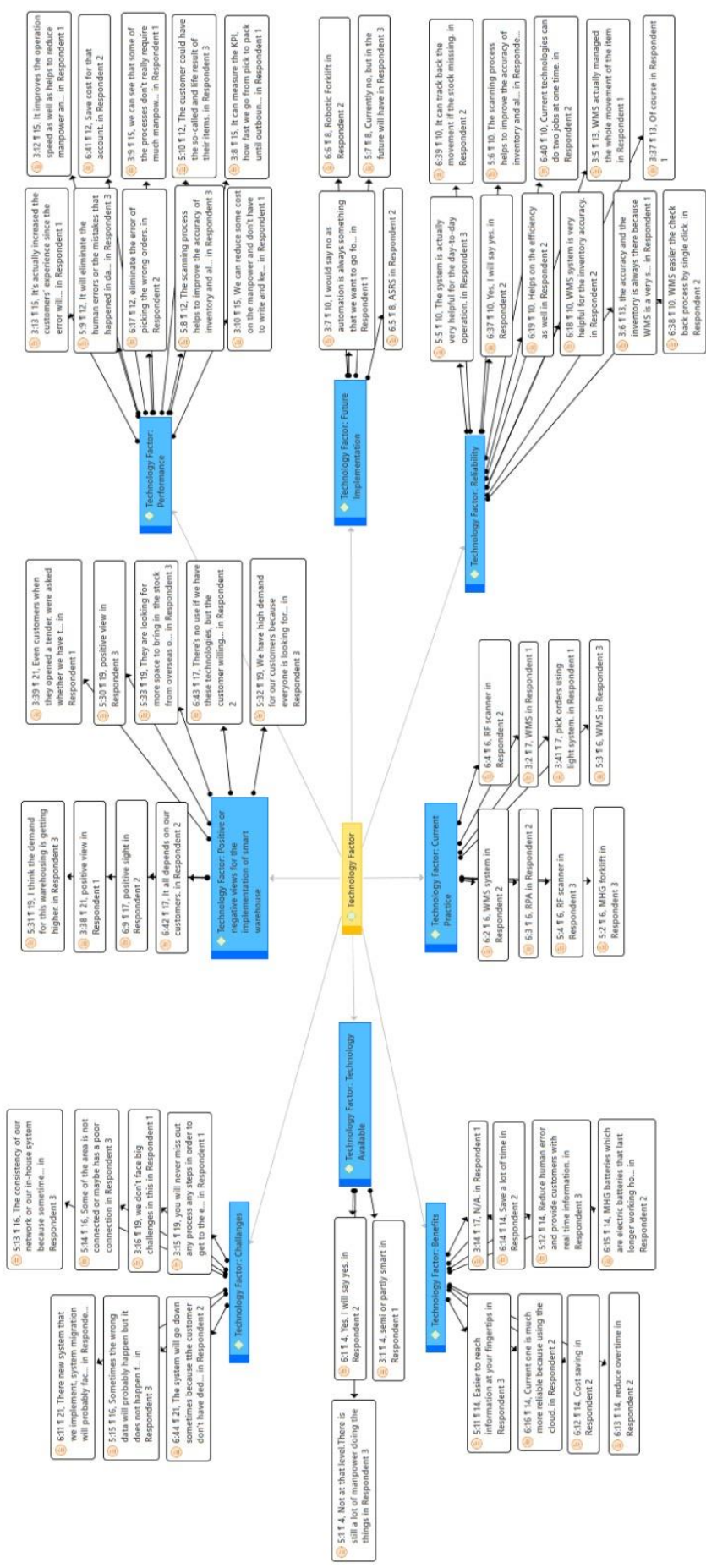
Figure 4.1: Summary of the Technology Factors that affecting the Adoption of Smart Warehousing and Advanced Technologies (Source: ATLAS.ti).

4.1.2 Theme 2： Organization Readiness Factors that Affect the Adoption of Smart Warehouse and Advanced Technologies in Shah Alam

Table 4.3: Organization Readiness Factors that Affecting the Adoption of Smart Warehouse in Three Compared Informants

Organizational Readiness Factors	Informant 1	Informant 2 (PKT)	Informant 3
Top Management	- I would say no as the feedback comes from people on the ground or operation site and then the top management also equally important to determine whether they continue to be old school type or want to be a warehouse with a state of art technology. - It's not only when there is a new automation that we are only going for training, even if driving a lift truck also needs training. - We will be the one who proposed and we need to tell the management why we need to and	- I'll say yes. Top management should lead, encourage and briefing on what technology that is in the market, should have training or more exposure to the staff on hold this technology.	- Top management plays an important role on this technology or even towards the smart warehouse they are going to implement. - Top management needs to review and discuss internally before the technology implementation. - Top management is also responsible for providing training for people in 3 months to 6 months before bringing some new technology.

	must have some figures and presentation for them. - It is both ways of communication to determine whether to implement the technology or not.		
Cost And Return of Investment	- It's definitely very important to look at the ROI because the negative ROI is no point to implement the technology. - The technology implementation is a long-term investment, it is not important for the period, it is important that we look into the positive return. Definitely It would be positive, but it won't be a short term.	- It is very important to set the finance task force to decide to make sure that the ROI is there or not. - The shorter ROI is better for us.	- The cost is one of the major to be considered by the management because we do have the assessment, we need to be gone on before we have to implement. - The ROI is usually shorter the better.

To distinguish the factors affecting the adoption of smart warehouse and advanced technologies in Shah Alam, researchers also questioned about the organization readiness that included two main elements towards the respondents for the second theme factors All respondents had provided the information for each sub-theme, as indicated in Table 4.3. However, two of the sub-themes such

as organization culture and human resources factors cannot further explain because insufficient answer.

As a result, all the respondents agree that **top management** plays an important role in the organization whether they need to implement new technologies and smart warehouses. **All three informants** also mentioned that top management is important as they are responsible to review and discuss internally and provide the training program for employees before the implementation of advanced technology. However, **Informant 1** not agree at all on this points as mentioned in the interview session: *"I would say no as the feedback comes from people on the ground or operation site and then the top management also equally important to determine whether they continue to be old school type or want to be a warehouse with a state of art technology"*. Moreover, **Informant 1** also stated that the driving of a lift truck will also need training but not only when there is a new automation that only needs training. They also said that they are the one who will propose and need to inform the management why they need to implement the technology and must show the figures and present to them. So, the **Informant 1** said it is the both ways of communication to determine whether to implement the technology or not. Meanwhile, as refer to Table 4.3, **Informant 2** they stated that the top management should lead, encourage and briefing on what is the technology that is in the market. They also said that the training should be provided to workers and make more exposure to the staff in order for them to hold the technologies. Lastly, **Informant 3** agree that top management play an important role and also stated that: *"Top management is*

responsible for providing training for people in 3 months to 6 months before bringing some new technology.".

According to the table 4.3 above, for the **cost and investment**, **Informant 1** stated that it is definitely very important to look at the ROI because there is no point to implement the technology with negative ROI. They said that: *"The technology implementation is a long-term investment, it is not important for the period, it is important that we look into the positive return. Definitely It would be positive, but it won't be a short term."*. For **Informant 2**, they have different opinion as it is very important to set the financial task to make sure that the ROI is there or not. The cost is one of the major factors to be concerned by the management because they do have the assessment and they need to go on before they implement the advanced technologies for **Informant 3**. Both of the **Informant 2 and Informant 3** stated that the shorter ROI is better for them. Only **Informant 1** is preferring longer ROI is better and suitable for them.
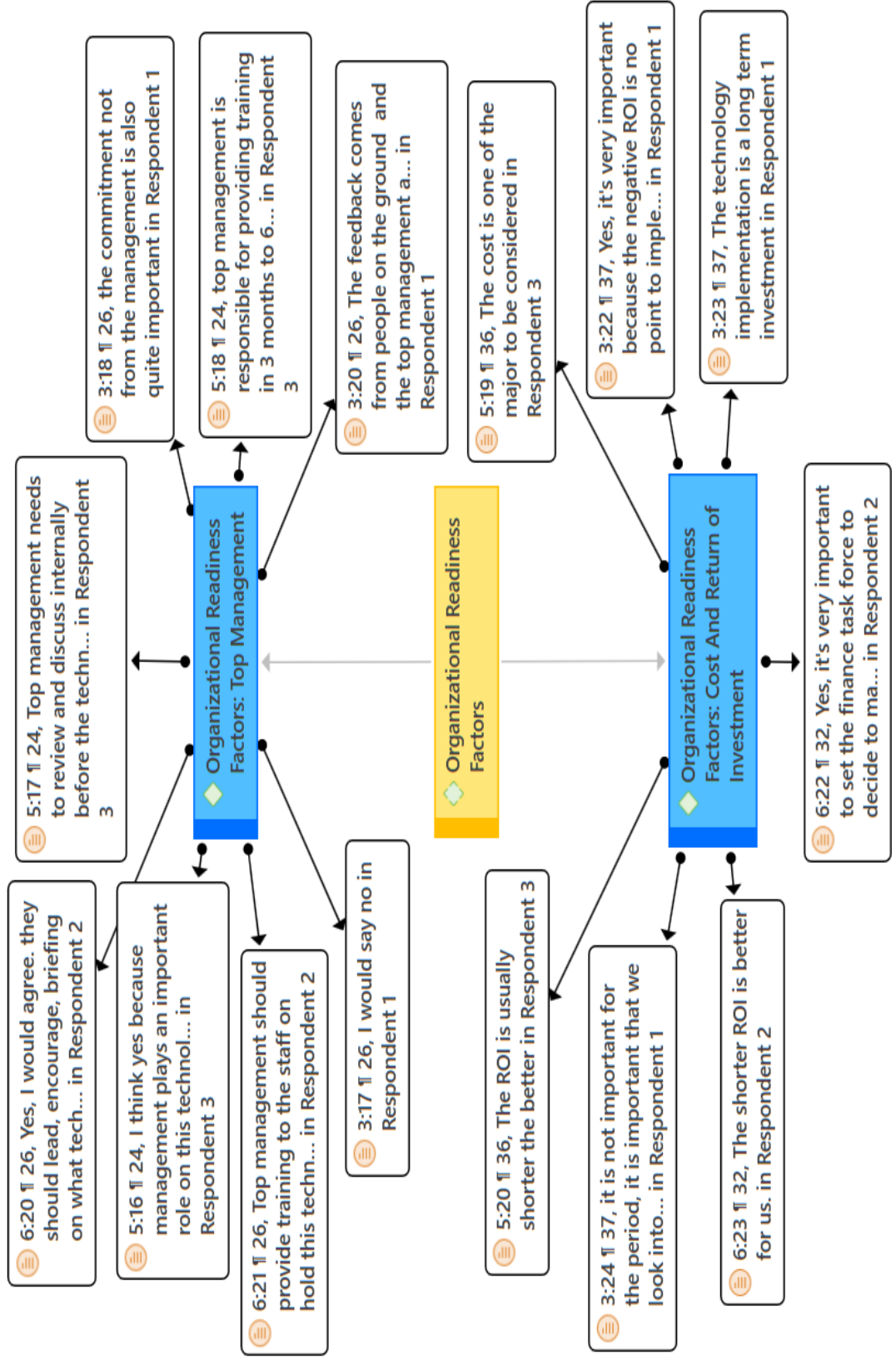
Figure 4.2: Summary of the Organization Readiness Factors that Affect the Adoption of Smart Warehouse and Advanced Technology (Source: ATLAS.ti).

4.1.3 Theme 3：External Environmental Factors that Affect the Adoption of Smart Warehouse and Advanced Technologies in Shah Alam

Table 4.4: External Environmental Factors that Affecting the Adoption of Smart Warehouse in Three Compared Informants

External Environment Factors	Informant 1	Informant 2	Informant 3
Competition	- Decrease our company market share and then they stream down our customer base if don't have technology. - We move forward towards automation like others, then we can keep up. - Need to be ahead of your peers to win in the battle field. - Always standing of the competitors.	- I would agree that. -Be up to date with the current market and see what technology they have in the market right now, what benefit they do gain by using that technology. - All come back to the customer whether this technology can help the customer.	- The market is very challenging especially for us, the logistics, there are so many players in the market so implementation of new technology can help to boost competition.
Customer	- Customers have a lot of suggestions and what they want is how to turn around their item faster. - Gain the market share and gain the	- Need to look into two different clients, global customer requires to meet up with their level, Malaysia customer will be happy if bring in advanced technology.	- Some customers will require we come out with their standard to compatible with their company. - Discussion with customer to probably sharing the cost for

	customer service experience.	- Call customers and meeting with them so that we can share with the customer once we have the technology and tell them we want to implement the system in their place so that we all can link together.	50%50% before the implementation of technology.
Government Support	- Yes. Grants the incentive for company. - Need to get approval or permit if not may slow down the whole process. - Support from locals and incentives.	- Yes. Encourage and pressuring logistics to cope with these smart warehouses. - Joined a few programs with Polytech students.	- Yes. Provide with some subsidies or even some programs to attend.
Government Incentives	- Tax incentive such as double tax deductions such as CapEx under IPA tax allowance. - Provide some support incentive to send people to go to	- Make the incentive more aware to the warehouses.	- Give training. - Duty exemption when there has any system or the technology that bring in from overseas so we can lower our cost.

	learn advanced technology. - Experts from other countries helpful to attract talents.

Lastly, researchers also questioned about the four elements towards the respondents for the third theme factors which is external environmental factors. All respondents had provided the information for each sub-theme, as indicated in Table 4.4. As a result, **Informant 1** agrees that **competition** is one of the external factors as they need to move forwards towards automation like others, as mentioned in the interview session: *"We move forward towards automation like others, then we can keep up. We need to be ahead of our peers to win in the battle field."* They also said that they need to always stand out from the competitors. In addition, **Informant 2** also agrees that competition is one of the external factors as they need to depend on customers to decide whether this technology can help the customers and what benefits they do gain by using the advanced technologies. They conclude that all come back to customers whether this technology can help those customers. Lastly, **Informant 3** agrees competition is one of the factors affecting the adoption of smart warehouse and advanced technologies in Shah Alam as they think that the market is very challenging especially for the logistics sectors, there are so many players in the market so implementation of new technology can help to boost the competition.

According to Table 4.4 above, **Informant 1** and **Informant 2** agree that the **customers** also will be one of the external factors that affect them to implement the new technologies since it is important for them whether the new technologies can help them to increase the customers satisfaction. **Informant 1** mentioned that the customers have a lot of suggestions and the things that they want is how to turn around their item in the shortest time. Other than that, **Informant 2** points out in the visual interview session: *"We need to look into two different clients, global customer requires to meet up with their level, Malaysia customer will be happy if bring in advanced technology."* Besides, they also mentioned that: "We will call customers and meeting with them so that we can share with the customer once we have the technology and tell them we want to implement the system in their place so that we all can link together.". **Informant 3** states that customers are also considered one of the external factors as they will require the company come out with their standard to be compatible with their company. Moreover, they will have discussion with customer to probably sharing the cost for 50% 50% before the implementation of technology.

Furthermore, **Informant 1, Informant 2 and Informant 3** agree that the **government support** is important for them to implement the advanced technologies based on Table 4.4. **Informant 1** stated that the government can] get support from locals, grant the incentive and get the approval or permit for the company. For **Informant 2**, they said that the government encourages and presses the warehouse to cope with the smart warehouse. They also said that they have joined a few programs with Polytech students. **Informant 3** stated that

the government should provide some subsidies or programs to the warehouse workers.

Lastly, for **the incentives that the government should provide**, **Informant 1** thinks that the government should provide a tax incentive to warehouse such as double tax deductions such as CapEx under IPA tax allowance, send people to learn advanced technology and give tax allowance to experts from other countries which is helpful to attract talents according to Table 4.4. While for **Informant 2**, they said that the government can make the incentive more aware of the warehouses. Besides, **Informant 3**, they said the government can give training and duty exemption when there is any system or the technology that is brought in from overseas so we can lower our cost.
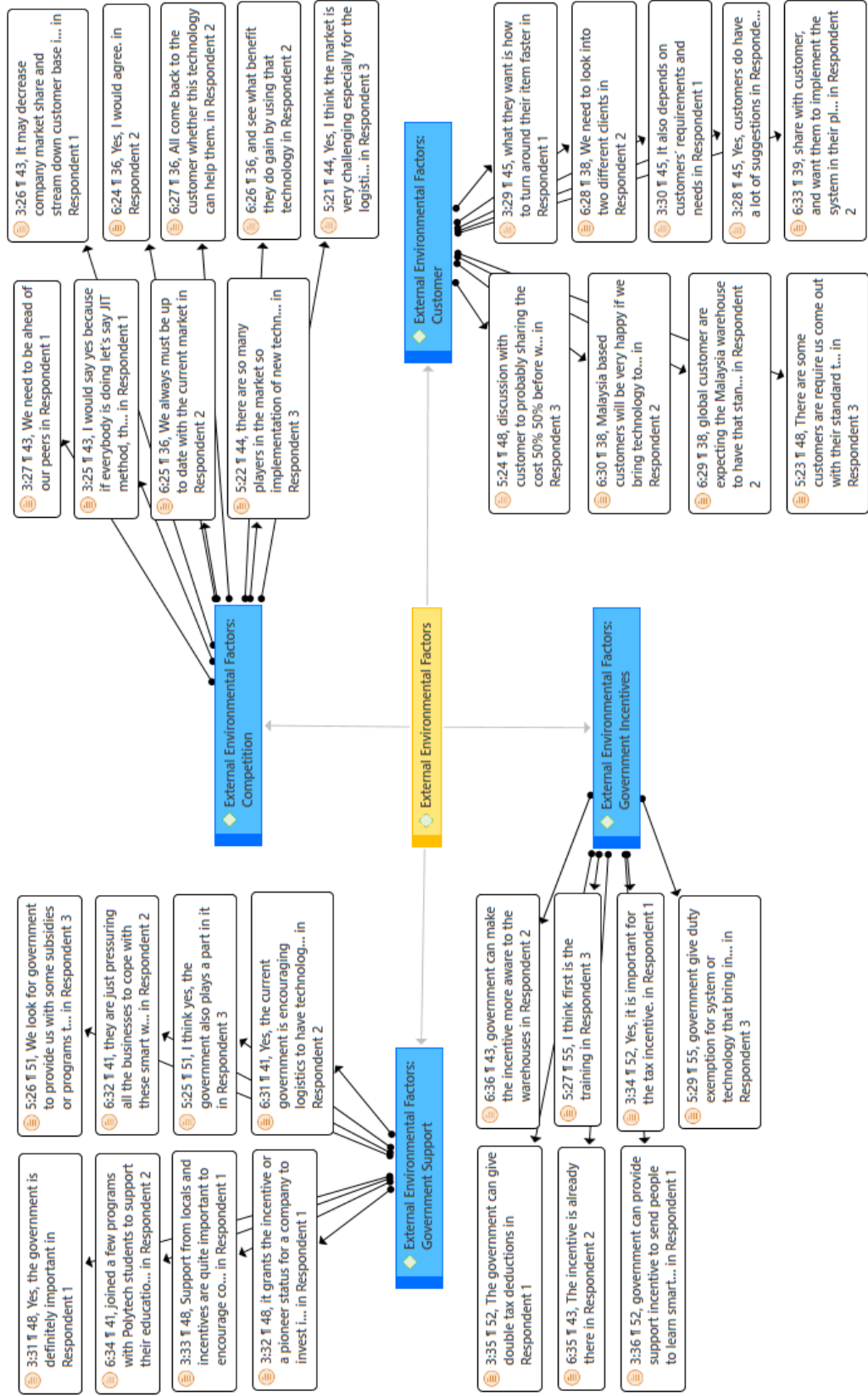
Figure 4.3: Summary of the External Environment Factors that Affect the Adoption of Smart Warehouse and Advanced Technology (Source: ATLAS.ti).
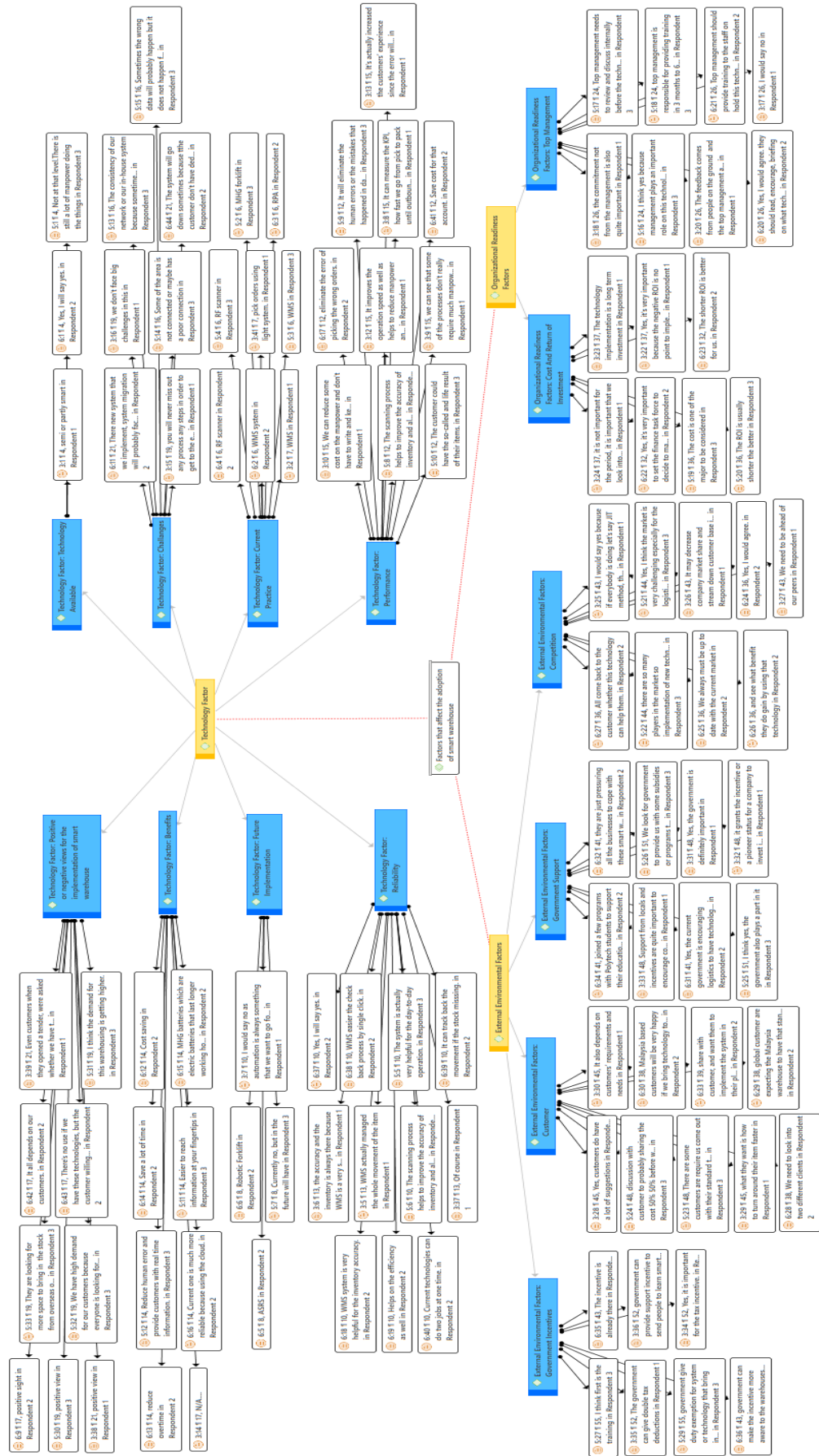
Figure 4.4: All Factors that Affecting the Adoption of Smart Warehouse and Advanced Technologies in Shah Alam (**Source: ATLAS.ti**)

4.2 Summary of All the Findings Contributed by Informants

Figures 4.4 summarizes the information obtained by the researchers through the semi-structured interview sessions according to the themes and sub-themes that were categorized under each of the themes. Under the first theme, there are eight sub-themes contributed by all three informants, two sub-themes under the second theme, as well as four sub-themes being group within the third theme. In **Figure 4.4** is the analysis done using ATLAS.ti that displayed all the findings according to the theme as well as sub-themes mapped in the network diagram.

4.3 Conclusion

In a nutshell, data analysis was completed in this chapter by using the findings extracted from the interview transcript. Codes were created and established as the main categories. This chapter discussed all the findings obtained by the researchers during the data collection process. The data obtained from all three interview sessions are useful in portraying the three factors that affect the adoption of smart warehouse and advanced technology according to our TOE frameworks which including Technology Factors, Organization Readiness Factors, and External Environmental Factors.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.0 Introduction

In this chapter, the researchers draw conclusions from the research as well as answered all the research questions from the conclusions. The conclusions of this chapter refer to the results obtained in the previous chapter. All the research objectives have been analysed and the findings will address in this chapter to interpret the factors that influence the adoption of smart warehouse in the Shah Alam.

5.1 Discussion On Research Questions

In this section, researchers will answer the three-research questions proposed in Chapter 1 based on the findings of the interviews.

5.1.1 What are the current technologies implemented in warehouses in Shah Alam that can be associated with smart warehouse?

Based on the data collected from the interview sessions with the three informants, the first research objective was achieved by identifying the current technologies implemented in the informants' warehouse that can be associated with smart warehouses. This is because A firm's existing technologies are important in the

adoption process because they set a broad limit on the scope and pace of technological change that a firm can undertake (Baker, 2012). The data collected from the interviews revealed that the most commonly utilized technologies in the informant warehouses include Warehouse Management Systems (WMS), Radio Frequency (RF) scanners, Portable scanners, conveyor systems, and battery-powered Material Handling Equipment (MHE). The least commonly implemented systems brought up in the interviews were Pick to Light system, Robotic Process Automation (RPA) and Cloud Computing, which were implemented by Informant 1 and 2, respectively. The findings of this study suggest that the warehouse industry is increasingly leveraging technology to enhance operational efficiency and productivity and moving toward smart warehousing. As the slowly growing trend of smart warehousing is evidenced by the adoption of technology that can associated with smart warehouse, especially the use of Pick to Light system, Robotic Process Automation (RPA), and Cloud Computing according (Kamali, 2019)

However, when asked whether their warehouses were considered smart warehouses, only two out of the three informants reported that their warehouses were partially or semi-smart. Despite having similar systems in place, including WMS, RF scanners, and battery powered MHE, informant 3 did not consider their warehouse to be smart. This disparity in the classification of a smart warehouse among the informants suggests that the definition varies and is subjective. Some informants consider the use of certain technologies as sufficient for a semi-smart classification, while others, such as informant 3, require full automation to be considered a smart warehouse. The outcome is

consistent with the outcomes of a prior study conducted by Reima et al., (2019) as in the study each of the informant has their own definition of smart warehouse and even one of the responded does not know the meaning of smart warehouse. Additionally, smart warehouses have been defined in various studies based on their perceptions. Nonetheless, the most prevalent definition involves implementing advanced technologies such as IoT, AI, and robotics to enhance efficiency, productivity, and service quality while reducing costs and errors. The varying definitions of a smart warehouse can be attributed to the evolving technology around us, which contributes to changes in its definition over time.

Additional, after gaining an understanding of the technology being implemented, the characteristics of the current technology were further discussed. As according to Abed, (2020); Gutierrez et al., (2015), an organization's technological characteristics, including the technology currently in use, can typically clarify the IT innovation attributes that impact the adoption of IT innovation within the organization. The attributes of the current technology, such as reliability, performance, benefits, and challenges, can significantly influence the organizational decision to adopt innovative technology. Therefore, it was discussed in the interview to further understanding each informant's current technology attributes was crucial to comprehending their adoption of IT innovation.

Based on the finding, all three of the informants agreed that the current technology had brought many relative advantages to their warehouse operation in term of their reliability and benefit able to increase their performance and

efficient in their warehouse operation. A variety of technologies was discussed, firstly, the use of WMS, the use of WMS is reliable as it helps to manage the whole movement of the item inside the warehouse right from in until out. This means that there is a clear record of where each item is at all times, and that employees can easily find and retrieve items as needed. Additionally, by keeping track of the location of each item in the warehouse, the WMS can provide accurate information about inventory levels at any given time and being able to check back on transactions from a few years ago with a single click. This makes it easier to conduct regular inventory counts and ensure that the physical inventory matches the inventory records in the WMS, enables easy access to item information, which reduces the time and effort required to obtain crucial information. This can be especially important for businesses that have a large number of SKUs or that handle a high volume of inventory, as it can help on reduce the problem of such as stockouts, overstocking, and order fulfilment errors. Therefore, help in improving the inventory management of a warehouse operation, which aligns to what was highlighted by Cross, (2019) and Damoulakis,(2023) in their respective study on the benefit of WMS conjunction with warehouse inventory management.

Additionally, integrating additional technologies, such as RF Scanners and Portable Scanners, with a Warehouse Management System (WMS) can significantly enhance warehouse performance as additional benefits are added as stated by each of the informants. The adoption of these technologies delivers a range of improvements, including increased productivity, faster handling activities, improved accuracy, elimination of waste, and cost savings. An RF

scanner allows warehouse workers to scan barcodes and update inventory in real-time, reducing the time and effort needed for manual data entry, reducing human error and providing customer visibility on their products. Moreover, scanner provides even more flexibility, allowing workers to scan items from anywhere in the warehouse without needing to bring them to a specific location for scanning or checking. As the use of scanning technology eliminates errors caused by human factors, as workers are not able to pick items that the system does not allow. Workers can easily and quickly confirm that they have the correct item for the correct location, reducing the likelihood of errors, and increasing the speed of order fulfillment, ultimately improving customer satisfaction. Besides the integrated RF and Portable scanners, informant 1 with the integration of the use of Pick to Light systems conjunction with WMS, RF and Portable scanners further add on to the reducing the likelihood of errors and increasing the speed of order fulfillment. As the WMS place the order and Pick to Light system can direct employees to the correct pick location, the RF scanner can confirm that the correct item was picked, and the portable scanner can update inventory levels in real-time. This can help reduce errors caused by manual data entry and can also help speed up the picking process.

Furthermore, the integration of a more advanced technology by Informant 2, specifically the combination of RPA and WMS, has resulted in the elimination of redundant labor and a boost in productivity, as stated by the informant. This is because the system automates repetitive and mundane tasks in the warehouse, such as data entry, order processing, and invoice management. The use of RPA enables warehouse managers to streamline and automate these tasks, freeing up

workers' time to focus on other essential areas that require human intervention. For instance, RPA can read and convert email orders to excel systems and then into WMS, reducing the time and effort required for manual data entry. This automation enhances warehouse operations by reducing errors caused by manual data entry, which are often prone to mistakes due to factors such as human fatigue. Consequently, workers can focus on more important tasks such as managing inventory, ensuring the accuracy of orders, and providing excellent customer service.

Moreover, also highlighted the advantages of cloud computing, emphasizing its reliability over traditional server-based systems. As In traditional systems, if the servers become jammed or overloaded, they can crash, causing significant downtime. This can result in a loss of revenue and productivity for the business. However, with cloud computing, the system is connected to the cloud, and if one device fails, it can easily switch to another device and continue to connect to the cloud. This seamless transition ensures that businesses can operate without any disruption, reducing the downtime and improving productivity. Furthermore, cloud computing offers a range of other benefits, including cost-effectiveness, scalability, and flexibility. By using cloud-based services, businesses can save on costs associated with maintaining and upgrading on-premises servers. Cloud computing services allow businesses to scale up or down their resources as needed, providing greater flexibility and agility to adapt to changing market demands. Lastly, the last advantage of technology discussed was the implementation of electric battery-powered Material Handling Equipment (MHE). It has also improved productivity. Compared to traditional forklifts,

electric MHEs have longer working hours, require less time to recharge, and enable workers to work longer, thus reducing the need for overtime.

Despite the positive part of current implementation of technology bring to each of the informants' warehouse, there are also challenges that was brought up and discussed. Notably, only two out of the three informants expressed their concerns regarding the difficulties they encounter. As, informant one highlighted that they do not face significant challenges, as they can always resort to manual operation in the event of a technology failure since they initially started with manual operations. Additionally, informant 1 added that current technology implement is idiot proved, as there is a step-by-step way to operate the equipment, and when the wrong step is made the process will not proceed. However, this view can be argued because if workers repeatedly make mistakes or forget steps while operating the technology, it can disrupt the process and cause errors that ultimately reduce productivity. Thus, this can be seen as a significant challenge to the efficient use of technology in the warehouse.

While on the other hand, for informant 2 and 3, brings up the challenges of network issues, as often time some areas of the warehouse are not connected or have poor connection causing technically issues with the technology and devices used. This aligns with the findings of Nur et al., (2021), where internet stability was bought up as a concern for smart warehousing. Network issues can cause delays and interruptions when using cloud-based applications and services, leading to productivity loss and slower response times. For example, if a warehouse worker is using a handheld device to scan inventory, the slow

network connection may cause delays in transmitting the data to the cloud-based application, leading to a slower response time. These network issues can also affect the use of other technology solutions in the warehouse, such as wireless barcode scanners, radio frequency identification (RFID) readers, and automated picking systems, which rely on network connectivity to operate. When these systems are disrupted, productivity can be impacted, leading to delays in order processing, inventory management, and other warehouse operations. However, informant 2 notes that customer who have their own dedicated server will have less problem with networking issues. Apart from this, the implementation of technology always entails a period of fine-tuning during which workers and organizations undergo a trial phase to test and become accustomed to the new technology. As Nur et al. (2021) mentioned, challenges often arise during the initial implementation phase when adjusting to the changes before the system "Goes Live".

Lastly, although the informants highlighted several advantages and minor challenges of the current technology implementation, they stated that they currently have not planning on implementing any new technology. As one of the reasons for informant 1 said they just upgraded their WMS system to Honeywell. Another reason can be added the current technology is performing well in terms of the advantage, benefit and reliability and performance mention above are meeting the needs of the of warehouse, thus there may be less of a push to adopt new technology. As adopting new technology can be expensive, and if the current technology is meeting the needs of the users, it may not make financial sense to invest in new technology. This can be back up by another study whereby

according to Nur et al. (2021) found, some companies may be hesitant to implement new technology, as they believe that their existing systems are already performing at a high level of accuracy.

However, despite that, each of the informant stated that they are looking into technology to being implemented in the future, as warehouses are always constantly ongoing continuous improvement, and trends and needs are constantly evolving, and what is suitable today may not be tomorrow., so upgrading is always in their mind. Moreover, informant 2 also highlighted that future implementation will also be depending on their operational needs, as some simple operations do not require a significant amount of technology and can be done manually. Technology that are being looked into for future implementations are robotics, ASRS system, and RFID. The potential technology that they are exploring for future implementation includes robotics, ASRS systems, and RFID. Finally, the findings of objective one in this study are similar to a previous study conducted by Reima et al., (2019), which showed that the warehouse industry in Malaysia still relies heavily on manual approaches rather than more advanced technology. However, the three informants in this study agreed that the implementation of advanced technology in warehouses is progressing in a positive direction. This indicates that there is a growing recognition of the benefits of technology adoption in the industry, and that organizations are starting to explore and adopt more advanced technology solutions to improve their operations. However, it's important to note that technology adoption can be a gradual process, and organizations may face barriers such as cost, skills gaps, and resistance to change. Therefore, continued

efforts are needed to support the industry's adoption of advanced technology and to overcome any challenges that arise along the way.

5.1.2 What Influences The Organizational Readiness Towards Smart Warehousing?

In addition, the second research objective was accomplished by identifying the factors that influence organizational readiness towards smart warehousing. Based on the data gathered from the interviews, all three informants agreed upon that top management and return on investment are among the important factors that influence organizational readiness toward smart warehousing adoption. Firstly, top management factor as an influencing factor. According to Abed, (2020), top management and the support they give is a crucial factor that influences the adoption of IT innovation on the organizational level. This support is considered one of the most important predictors, and it has a significant and positive correlation with an organization's decision to adopt innovative technology. This statement is inline with the respond given by all three of the informants, whereby all agreed that top management plays an important role in organizational readiness, particularly in terms of the support they provide. This support includes leading by example, encouraging innovation, providing feedback opportunities, briefing employees on new technology, and offering necessary training.

According to informant 2, top management support should take the form of leading by example and encouraging. This is because when top management visibly embraces and utilizes new technology, it can significantly influence their employees' attitudes towards it. Observing their superiors utilizing and benefiting from the technology can inspire employees to follow suit, increasing their engagement and adoption of the new technology. Besides, it's important for top management to communicate the benefits of the new technology to their employees. By sharing their experiences and how it has positively impacted their work, top management can motivate their employees to try it out themselves. By creating a positive and encouraging environment, top management can inspire employees to embrace new technology and create a culture of innovation within the organization. Additionally, encouraging feedback and facilitating two-way communication is crucial for top management to effectively communicate with workers and understand their needs, concerns, and feedback during the adoption of new technology. According to Informant 1, ground workers often have valuable insights and suggestions about what technology would benefit their work processes. Top management can consider these proposals and determine whether the warehouse will adopt the proposed technology. However, a lack of effective communication and feedback opportunities can lead to resistance to change.

Furthermore, according to informant 2 and 3 by briefing on new technology and providing necessary training to worker won't be shocked and will be less resistance to change and can adopt it more easily. This is because by having training and briefing sessions it can prepare employees for the arrival of new

technology and help them understand its features, benefits, and applications. This early understanding and familiarity with the technology can make workers more receptive to its adoption and willing to use it in their daily tasks. Therefore, it is highly expected that organizations with stronger top management support for new innovative technology would be more likely to adopt new technology due to organizational readiness.

Lastly, in terms of return of investment, all informants agrees that it is another important factor that influences organizational readiness. As Calculating the ROI for an implementation project helps organizations determine the potential benefits they can expect from investing in a particular initiative, helps organization to determine if the investment is worth it, and justify the allocation of budget (Lebied, 2022). However, while the informants concur on the importance of ROI on organizational readiness, they have divergent opinions on what a desirable ROI entails and how to attain it. Firstly, Informant 1 believes that looking at the positive return is more important than the duration of the ROI. They suggest that implementing technology is a long-term investment, and the focus should be on achieving a positive ROI over time, even if it takes longer to realize. This viewpoint may be more suitable for companies with a longer-term outlook or those who prioritize sustainability over short-term gains.

On the other hand, informant 2 emphasizes the importance of setting financial goals to ensure a positive ROI before implementing new technologies. For them, cost is a significant factor in decision-making, and proper assessment is necessary before making any investments. This viewpoint is more aligned with

companies that are more risk-averse and prefer to have a clear idea of the potential financial benefits before committing to any new technology. Lastly, informant 3 shares Informant 2's view that a shorter ROI is better, but also notes the importance of considering the costs involved in implementing new technologies. They emphasize the need for a balance between cost and ROI, indicating that while they would prefer a shorter ROI, it should not come at the expense of incurring high costs.

5.1.3 How does the external environment factors support the implementation of smart warehouse?

According to research conducted by Gutierrez et al. (2015) and Taylor (2019), the external environmental context of a Technology-Organization-Environment (TOE) framework can provide a better understanding of the impact of external environmental pressures on organizational adoption. Building on this knowledge, the third research objective was accomplished by identifying the influences of external environmental factors on the adoption of smart warehousing. The study's informant unanimously acknowledged that external factors, such as competition, customer demands, and government factors, were significant pressures driving the adoption of smart warehousing practices in their warehouses.

According to Taylor, (2019), competition fuels companies' drive to adopt new technologies as the adoption of new technologies will improve their business

performance and competitive position in the marketplace. In the context of the logistics industry, the highly competitive nature of the market means that many players are constantly seeking ways to stand out from their competitors. As such the first point discussed was **competition pressure**, as intense competition can help to stimulates the adoption of innovation as technology is now viewed as a strategic weapon to achieve sustainable competitive advantage and support the competitive strategy of the firm (Baker, 2012; Ellitan, 2022). The study revealed a consensus among all three informants that competition is a among the factor driving for the adoption of innovation in their warehouses. This is due to the highly competitive nature of the logistics industry, which features many players in the market. Accordingly, Informants 1 and 3 stressed the importance of staying ahead of competitors and standing out through the implementation of new technology. Such adoption can boost their competitiveness in the market, setting them apart from competitors that have not implemented advanced technology. For instance, if a competitor adopts a new technology that enhances their efficiency and lowers their costs, they may offer better prices or faster turnover rate to customers. By staying on top of the latest technological advancements, logistics companies can improve their operations, offer better services to customers, and potentially gain an edge over their competitors. Furthermore, Informant 2 highlighted their ongoing analysis of the market and competitors to identify technological advancements that could be beneficial to their operations. This is consistent with the notion that dominant firms in the value chain can influence other value chain partners to innovate (Baker, 2012). However, informant 2 also stated that although competition is a factor in

pressuring their adoption, ultimately the adoption must be driven by the needs and benefits of their customers.

The following factor mention was customer. Through the three interviews with informants, it was observed that the customer's preferences, requirements, and demands had a crucial role in the decision-making process. The phrase "depends on customer" was frequently used by the informants to highlight the importance of the customer's input in technology adoption. One possible reason for this could be that the customer ultimately pays for the products or services provided by the warehouse, and therefore, their preferences and needs must be taken into account. As according to informant, they mentioned that some clients preferred the current operation and were not interested in adopting advanced technology. They suggested keeping costs within a reasonable range and avoiding overspending on technology. On the other hand, some customers had several recommendations for technology adoption and demanded faster turnaround times for their items. Therefore, the informant emphasized that the adoption of technology should be considered in such cases. As ultimately, it is the customer who is the end-user of the products and services being offered. The technology used in the warehouse can directly impact the customer experience, including the speed and accuracy of order fulfilment, product availability, and overall satisfaction with the service.

Next, based on the data collected, another reason behind the significe of customer is that customer may have specific requirements for the type of technology used in the warehouse. For instance, the customer may prefer certain

types of automated systems or robotics that are compatible with their own technology infrastructure to be also implemented or except the same of system are being used. As Informants 2 and 3 revealed that some customers require the warehouse to adopt their standard systems to ensure compatibility with their company, and international clients may also expect the warehouse to meet their system standards by adopting similar systems. To meet these requirements, it is necessary for informants to accept the changes and implement a compatible or similar system to the customer's. This can lead to improved efficiency and productivity, as well as cost savings, by seamlessly integrating with other systems and processes in the organization. Furthermore, customers who are already familiar with a particular type of automated system or robotics find it easier to use and maintain, resulting in less downtime. As such the finding aligns with previous research indicating that customers play a critical role in the adoption of new technology. Furthermore, satisfying customer expectations can stimulate a favorable inclination towards adoption. (Abed, 2020; Chatzoglou & Chatzoudes, 2016; Maduku et al., 2016; Nugroho, Susilo, Fajar, & Rahmawati, 2017).

Moreover, government was agreed upon as the last external environment factor that can influence the adoption of new technology. As according to the informants, the government support in term of the subsidy, training program and the incentive the government give can greatly push warehouse to adopt new technologies. As government can provide financial incentives such as tax breaks or grants to companies that invest in technology for their warehouses. This can encourage companies to adopt new technologies that can improve their

efficiency and productivity. Additionally, informant 3 emphasize education programs that the government provide can help in the adoptions. This is because provide training and education programs to help companies learn how to use new technologies in their warehouses. This can help to reduce the learning curve and make it easier for companies to adopt new technologies. Besides, Informant 1 emphasized the importance of government support, specifically in obtaining approvals or permits from the local authority, in implementing new technology such as smart warehouse technology. As without such support, the process can be significantly slowed down, as obtaining necessary permissions, and complying with regulations may take longer or become more difficult. Government support can help facilitate the adoption of new technology by providing the necessary resources and streamlining the process. Therefore, it is important to have a supportive government to encourage and promote the adoption of new technology. Overall, the findings outcome is similar to what Nguyen et al., (2022) said as governmental financial and non-financial support would increase the firm probability of innovation acceptance.

Lastly, through the interview talking about government as an external factor, it became evident that the government can plays a significant role in driving the adoption of new technologies. As when ask what incentives that government can provide to drive the adoption of smart warehouse, each of the informant provide different suggestion. Informant 1 mentioned that government should provide an attractive tax incentive called the Double tax deductions for Capital Expenditure (CapEx) under IPA tax allowance. This incentive can be very beneficial in reducing the financial burden of investing in new technology for warehouses.

Essentially, businesses can deduct twice the amount of their CapEx expenses from their taxable income, resulting in a significant reduction in their tax liability. As a result, this incentive can encourage businesses to invest more in new technology, as it will be less financially stressful. Furthermore, the government can offer tax allowances for experts from other countries. This incentive can attract highly skilled talent to work on implementing and maintaining new technology. This can be especially beneficial for warehouses that lack the necessary expertise in-house, and it can ultimately lead to a more efficient and effective operation.

Besides, informants 3 and 1 also again emphasize that government should provide training programs to educate warehouse workers about advanced technologies. These training programs can help employees gain the skills and knowledge needed to operate and maintain new technology. Moreover, informant 3 also suggest that said that government can provide duty exemptions for new technology imported from overseas. This incentive can help reduce the cost of adopting new technology, which is a significant hurdle for many businesses. Lowering costs can encourage more warehouses to invest in new technology, as they may not have to worry as much about the financial risks involved. However, informant 2 voice out that in reality there are already many governments incentive already in place, and government should let this incentive and subsidies be well known and easy to find.

5.2 Implication of Study

According to the findings of this study, the TOE Framework factors have a significant impact on the adoption of smart warehouse and advanced technologies. The findings show significant consequences for the companies in Shah Alam from various perspectives of respective parties. As suggested by the informants in the virtual interview session, the government sector should give incentives and support such as provide resources for company to implement advanced technology and smart warehousing. For example, government can provide employee training for the knowledge of advanced technology and smart warehousing. There will be less challenges when the organization wants to implement new technology. Additionally, governments can provide funding, tax incentives, and other financial support to encourage organizations to adopt smart warehouse technologies. This can help to offset the costs of implementation and make it more accessible for smaller businesses.

Apart from that, organization also can invest in training and education for the employees. Employees should be trained on the new technologies and provided with the necessary education to help them understand how to use them effectively. This includes not only technical training but also soft skills training such as communication and problem-solving. As a result, the employees and also top management can gain new knowledge before they implement their planning for the adoption of smart warehouse and advanced technologies. They also can have a better communication on problem solving when facing any obstacles. This can increase the possibility on implementing the advanced technology and smart warehouse in Shah Alam area. Moreover, partnership with

technology vendors is also one of the implications that can be take action. Organizations can partner with technology vendors to implement smart warehouse and advanced technologies and leverage their expertise in designing and implementing these systems. They can also collaborate with other organizations that have successfully implemented similar technologies to learn from their experiences. Hence, the organization can be benefited as they can adopt new advanced technologies by collaborate with technology vendors. In a nutshell, the adoption of smart warehousing and advanced technologies can be implemented if government and organization sectors can try to support the companies in Malaysia.

5.3 Limitation of Study

Researchers faced some limitations in conducting the study. The first limitation is the small sample size, with only 3 informants in the study. There is a lot of warehouses in Malaysia, but researchers were only able to focus the research on Shah Alam. Researchers only able to find three warehouse companies to interview because many of them are not available to participate in this study. So, the final results of this study cannot represent the entire warehouse in Malaysia, and it may only represent the warehouses in Shah Alam.

Besides, researchers conduct the interview session through online platform, which is MS Team because researchers are unable to conduct the interview session physically. The disadvantage of online interview is the poor connection

of network. Sometimes researchers or interviewees have network issues that make it difficult to capture the pronunciation. When more than one person is speaking at the same time, it will also be difficult to get an exact answer from the interviewee. Online interviews also make it difficult to capture the moment-to-moment feelings of the interviewee such as the body language or facial expression of the interviewees. This led to poor communication between the researchers and interviewees.

5.4 Recommendation for Future Research

The recommendation to eliminate the limitation of study is future researcher are recommended to conduct face-to-face interviews instead of online interviews. This is because face-to-face interviews can help researchers have more interaction with informant, leading to more comprehensive and accurate data. Sometimes, informant will explain again if they feel the researcher does not understand the information they are providing. Researchers can also get more information through field visits to the company's warehouses. In addition, future researchers need to ensure that the internet connection is good in order to eliminate internet problems. Future researchers also suggest using mobile phones to sound record the interviews, rather than just recording them in the MS Team. The sound recordings are for backup purposes in case the MS Team encounters problems and researchers can't retrieve the footage, they can also refer to the sound recordings for their study.

Next, moving on to the recommendation for future study. In order to improve the quality of the future study, future researchers are suggested to conduct their study in different regions within Malaysia. Future researcher is suggested to expand their studies in different geographically region such as Penang, Johor, Melaka and so on. This can make the result of study more comprehensive and reliable with the large scope of data collection. Besides, it will also increase the opportunities for future researchers to interview warehouse companies, as there are many choice warehouses in Malaysia. Furthermore, it is worth studying the factors that that affects the adoption of advanced technologies in warehouse more deeply by physical interview because it will bring different perspectives compare to face-to-face interview. Besides, it is recommended that future researchers conduct their study on a specific warehouse rather than a general warehouse. The study that based on the specific warehouse will only focus on discuss the requirement and problems of the certain type of warehouse, which will bring clearer direction to the warehouse companies that considered to implement the advanced technologies in their warehouse. Nevertheless, it is recommended that the future research exploit more on the relationship between customer and the adoption of smart warehouse. It is because thought our research, customer was an important factor that was frequently brought up by the informant. This obviously show that customers are the most significant factors that influence the adoption of smart warehouse, and the future researcher are suggested to focus more on it in the future study.

5.5 Conclusion

In a nutshell, this chapter have discussed the findings obtained by the researchers. The three research questions proposed in Chapter 1 have been answered in this chapter, brings about the fulfilment of all three objectives. The implications of this studies are directed to the organization and government sectors to have a better preparation for the implementation of the new advanced technologies and smart warehousing. Limitation of this study was proposed after the implications, followed by the recommendation for future research.

REFERENCES

Aamer, A.M. and Sahara, C.R. (2021) 'Real-time data integration of an internet-of-things-based smart warehouse: a case study', *International Journal of Pervasive Computing and Communications* [Preprint], (May 2022). Available at: https://doi.org/10.1108/IJPCC-08-2020-0113.

Abed, S.S. (2020) 'Social commerce adoption using TOE framework: An empirical investigation of Saudi Arabian SMEs', *International Journal of Information Management*, 53(March), p. 102118. Available at: https://doi.org/10.1016/j.ijinfomgt.2020.102118.

Adhabi, E.A. and Anozie, C.B., 2017. Literature Review for the Type of Interview in Qualitative Research. *International Journal of Education*, 9(3), pp.86-97.

Aini, Q., Zaharuddin, Z. and Yuliana, Y. (2018) 'Compilation of Criteria for Types of Data Collection in Management of Research Methods', Aptisi Transactions on Management (ATM), 2(2), pp. 97–103. Available at: https://doi.org/10.33050/atm.v2i2.787.

Ameen, A. and Baharom, M.N. (2019) 'Assessing The Effect of Employee Engagement on Employee Performance in An Organisation: A Theoretical Discussion', *International Journal of Economics, Commerce and Management*, VII(3), pp. 328–338.

Anđelković, A. and Radosavljević, M. (2018) 'Improving order-picking process through implementation of warehouse management system', *Strategic Management*, 23(2), pp. 3–10. Available at: https://doi.org/10.5937/straman1801003a.

Antony, J. *et al.* (2023) 'An exploration of organizational readiness factors for Quality 4.0: an intercontinental study and future research directions', *International Journal of Quality and Reliability Management*, 40(2), pp. 582–606. Available at: https://doi.org/10.1108/IJQRM-10-2021-0357.

Aravindaraj, K., & Rajan Chinna, P. (2022a). A systematic literature review of integration of industry 4.0 and warehouse management to achieve Sustainable Development Goals (SDGs). *Cleaner Logistics and Supply Chain*, 5(100072), 100072. https://doi.org/10.1016/j.clscn.2022.100072

Aravindaraj, K., & Rajan Chinna, P. (2022b). A systematic literature review of integration of industry 4.0 and warehouse management to achieve Sustainable Development Goals (SDGs). *Cleaner Logistics and Supply Chain*, *5*, 100072. https://doi.org/10.1016/j.clscn.2022.100072

Arifin Siti Roshaidai (2018) 'Ethical Considerations in Qualitative Study', *International Journal of Care Scholars*, 1(2), pp. 30–33.

Aryal, A. *et al.* (2020) 'The emerging big data analytics and IoT in supply chain management: a systematic review', *Supply Chain Management*, 25(2), pp. 141–156. Available at: https://doi.org/10.1108/SCM-03-2018-0149.

Awa, H.O., Ojiabo, O.U. and Orokor, L.E. (2017) 'Integrated technology-organization-environment (T-O-E) taxonomies for technology adoption', *Journal of Enterprise Information Management*, 30(6), pp. 893–921. Available at: https://doi.org/10.1108/JEIM-03-2016-0079.

Awa, H.O., Ukoha, O. and Igwe, S.R. (2017) 'Revisiting technology-organization-environment (T-O-E) theory for enriched applicability', *Bottom Line*, 30(1), pp. 2–22. Available at: https://doi.org/10.1108/BL-12-2016-0044.

Badi, S. *et al.* (2021) 'Technological, organisational and environmental determinants of smart contracts adoption: UK construction sector viewpoint', *Construction Management and Economics*, 39(1), pp. 36–54. Available at: https://doi.org/10.1080/01446193.2020.1819549.

Bahrin, M.A.K. et al. (2016) 'Industry 4.0: A review on industrial automation and robotic', Jurnal Teknologi. Penerbit UTM Press, pp. 137–143. Available at: https://doi.org/10.11113/jt.v78.9285.

Baker, J. (2012). *The Technology–Organization–Environment Framework* (pp. 231–245). https://doi.org/10.1007/978-1-4419-6108-2_12

Banoo, S. (2022). *Automation: Plugging the warehousing gap*. The Edge Markets. https://www.theedgemarkets.com/article/automation-plugging-warehousing-gap

Barbalho, S. C. M., & Dantas, R. de F. (2021). The effect of islands of improvement on the maturity models for industry 4.0: The implementation of an inventory management system in a beverage factory1,2. *Brazilian Journal of Operations and Production Management*, *18*(3). https://doi.org/10.14488/BJOPM.2021.011

Bazen, A., Barg, F.K. and Takeshita, J. (2021) 'Research Techniques Made Simple: An Introduction to Qualitative Research', *Journal of Investigative Dermatology*, 141(2), pp. 241-247.e1. Available at: https://doi.org/10.1016/j.jid.2020.11.029.

Bernadette DIERCKX dE CASTERLé, Kristel DE VLIEGHER1, Chris GASTMANS, E.M. (2021) 'Complex qualitative data analysis : lessons learned from the experiences with the Qualitative Analysis Guide of Leuven Abstract In this article , the authors discuss critical factors to be considered when analyzing complex', 32(0).

Bhattacharya, M. and Wamba, S.F. (2018) 'A Conceptual Framework of RFID Adoption in Retail Using TOE Framework', *International Journal of Technology Diffusion*, 6(1), pp. 1–32. Available at: https://doi.org/10.4018/ijtd.2015010101.

Buntak, K., Kovačić, M. and Mutavdžija, M. (2019) 'Internet of things and smart warehouses as the future of logistics', *Tehnički glasnik*, 13(3), pp. 248–253. Available at: https://doi.org/10.31803/tg-20190215200430.

Castleberry, A. and Nolen, A. (2018) 'Thematic analysis of qualitative research data: Is it as easy as it sounds?', *Currents in Pharmacy Teaching and Learning*, 10(6), pp. 807–815. Available at: https://doi.org/10.1016/j.cptl.2018.03.019.

Chahar, B., Hatwal, V. and Sen, S. (2019) 'Employees training and its impact on learning and creativity: Moderating effect of organizational climate', *Problems and Perspectives in Management*, 17(2), pp. 430–439. Available at: https://doi.org/10.21511/ppm.17(2).2019.33.

Chandra, S. and Kumar, K.N. (2018) 'Exploring factors influencing organizational adoption of augmented reality in e-commerce: Empirical analysis using technology-organization-environment model', *Journal of Electronic Commerce Research*, 19(3), pp. 237–265.

Chiu, C.-Y., Chen, S. and Chen, C.-L. (2017) 'An Integrated Perspective of TOE Framework and Innovation Diffusion in Broadband Mobile Applications Adoption by Enterprises', *Economics and Social Sciences (IJMESS) (IJMESS)*, 6(1), pp. 14–39. Available at: http://hdl.handle.net/10419/157921http://creativecommons.org/licenses/by-nc/3.0/www.econstor.euhttp://www.ijmess.com.

Chong, J.L.L. and Olesen, K. (2017) 'A Technology-Organization-Environment Perspective on Eco-effectiveness : A Meta-analysis', 21, pp. 1–26.

Cruz-Jesus, F., Pinheiro, A. and Oliveira, T. (2019) 'Understanding CRM adoption stages: empirical analysis building on the TOE framework', *Computers in Industry*, 109, pp. 1–13. Available at: https://doi.org/10.1016/j.compind.2019.03.007.

Cross, N. J. (2019). *The Impact of Executing a Warehouse Management System The Impact of Executing a Warehouse Management System Change: A Case Study Change: A Case Study*. https://digitalcommons.wku.edu/theses

Cynthia Garlick (2019) 'An analysis of the economic effects of improper electronic data interchange methods at a small company', pp. 9–25.

Cypress, B.S. (2017) 'Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations', *Dimensions of Critical Care Nursing*, 36(4), pp. 253–263. Available at: https://doi.org/10.1097/DCC.0000000000000253.

Damoulakis, N. (2023) *Warehouse management systems: The key to improving efficiency*, *Orases*. Available at: https://orases.com/wms-improving-operational-efficiency-customer-experience/ (Accessed: April 19, 2023).

Devi Prasad, Bammidi (2019). Qualitative Content Analysis: Why is it Still a Path Less Taken? [41 paragraphs]. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 20(3), Art. 36, http://dx.doi.org/10.17169/fqs-20.3.3392.

Electric forklifts gain ground in warehouses, manufacturing facilities. (2021). Supply Chain Dive. Retrieved from https://www.supplychaindive.com/news/electric-forklifts-material-handling-warehouse/606823/

Ellitan, L. (2022). *Factor Influencing The Success of Technology Adoption: A Case Study of Indonesian Manufacturing Firms (Lena Ellitan) Factors Influencing The Success Of Technology Adoption: A Case Study Of Indonesian Manufacturing Firms*. http://puslit.petra.ac.id/journals/management/

Farrington, J., Kontsevaya, A., Dombrovskiy, V., Small, R., Rinaldi, C., Kulikov, A., & Yegeubayeva, S. (2019) 'Prevention and control of noncommunicable diseases in Kazakhstan: the case for investment.', *World Health*, (May), pp. 2–4.

Freund, D. and Launberg, A. (2020) 'The modern-day warehouse employee Title: The modern-day warehouse employee', (June), pp. 1–52.

Gamal, M. *et al.* (2019) 'Osmotic Bio-Inspired Load Balancing Algorithm in Cloud Computing', *IEEE Access*, 7, pp. 42735–42744. Available at: https://doi.org/10.1109/ACCESS.2019.2907615.

Gunawan, J., Marzilli, C. and Aungsuroch, Y. (2022) 'Online " chatting " interviews : An acceptable method for qualitative data collection', 8(4), pp. 277–279.

Gutierrez, A., Boukrami, E., & Lumsden, R. (2015). Technological, organisational and environmental factors influencing managers' decision to adopt cloud computing in the UK. *Journal of Enterprise Information Management, 28*(6), 788–807.

Hafizan, F.R.M. (2021) 'MJIT 2021 Malaysian Journal of Industrial Technology THE DEVELOPMENT OF HALAL LOGISTICS WAREHOUSE : A STUDY AT MASKARGO SDN BHD', 5(5), pp. 45–51.

Halawa, F., Dauod, H., Lee, I. G., Li, Y., Yoon, S. W., & Chung, S. H. (2020). Introduction of a real time location system to enhance the warehouse safety and operational efficiency. *International Journal of Production Economics*, *224*, 107541. https://doi.org/10.1016/j.ijpe.2019.107541

Hanum, B., Haekal, J. and Prasetio, D.E. (2020) 'The Analysis of Implementation of Enterprise Resource Planning in the Warehouse Division of Trading and Service Companies, Indonesia', *International Journal of Engineering Research and Advanced Technology*, 06(07), pp. 37–50. Available at: https://doi.org/10.31695/ijerat.2020.3621.

Hao, J. *et al.* (2020) 'Adoption of automatic warehousing systems in logistics firms: A technology-organization-environment framework', *Sustainability (Switzerland)*, 12(12). Available at: https://doi.org/10.3390/su12125185.

Hao, J., Shi, H., Shi, V., & Yang, C. (2020). Adoption of automatic warehousing systems in logistics firms: A technology-organization-environment framework. *Sustainability (Switzerland)*, *12*(12). https://doi.org/10.3390/su12125185

Hsu, H.Y. *et al.* (2019) 'Openness of technology adoption, top management support and service innovation: a social innovation perspective', *Journal of Business and Industrial Marketing*, 34(3), pp. 575–590. Available at: https://doi.org/10.1108/JBIM-03-2017-0068.

Indrawati, S. *et al.* (2018) 'Model of Warehouse Performance Measurement Based on Sustainable Warehouse Design', (August). Available at: https://doi.org/10.1109/ICSTC.2018.8528712.
International Trade Administration U.S. Department of Commerce. (n.d.). *Impact of COVID Pandemic on eCommerce*. International Trade Administration | Trade.gov. Retrieved April 16, 2023, from https://www.trade.gov/impact-covid-pandemic-ecommerce

Ishak, F. (2021) 'A Study On The Effectiveness Of Automation Manufacturing Warehouses', (December). Available at: https://www.researchgate.net/publication/357352347.

Jia, Q., Guo, Y. and Barnes, S.J. (2017) 'Enterprise 2.0 post-adoption: Extending the information system continuance model based on the technology-Organization-environment framework', *Computers in Human Behavior*, 67, pp. 95–105. Available at: https://doi.org/10.1016/j.chb.2016.10.022.

Kadwe, R., & Saha, A. (2018). *The Study of Efficiency and Effectiveness of Warehouse Management in the Context of Supply Chain Management* (Vol. 5). www.jetir.org

Kamali, A. (2019) 'Smart Warehouse vs. Traditional Warehouse', *International Journal of Automation and Automous Systems*, 11(1), pp. 9–16. Available at: https://www.myecole.it/biblio/wp-content/uploads/2020/11/10_SW_Smart_Warehouse_vs_Traditional_Warehouse.pdf.

Karunarathna, N., Vidanagamachchi, K. and Wickramarachchi, R. (2020) 'A Calibrated Model of Critical Success Factors for Industry 4.0 Warehousing Performance Improvement: Insights from Multiple Case Studies An LMS Usage Assessment Among Students in Blended Learning Environment View project Simulation View project A Calibrat', *International Journal of Multidisciplinary Sciences and Advanced Technology ISSN xxxx-xxx*, 1(2), pp. 100–126. Available at: https://www.researchgate.net/publication/340261507.

Kembro, J. and Norrman, A. (2022) 'The transformation from manual to smart warehousing: an exploratory study with Swedish retailers', *The International Journal of Logistics Management*, 33(5), pp. 107–135. Available at: https://doi.org/10.1108/ijlm-11-2021-0525.

Khan, M. G., Ul Huda, N., & Uz Zaman, U. K. (2022). Smart Warehouse Management System: Architecture, Real-Time Implementation and Prototype Design. *Machines*, *10*(2). https://doi.org/10.3390/machines10020150

Khan, M.G., Ul Huda, N. and Uz Zaman, U.K. (2022) 'Smart Warehouse Management System: Architecture, Real-Time Implementation and Prototype Design', *Machines*, 10(2), pp. 1–21. Available at: https://doi.org/10.3390/machines10020150.

Kiger, M.E. and Varpio, L. (2020) 'Thematic analysis of qualitative data: AMEE Guide No. 131', *Medical Teacher*, 42(8), pp. 846–854. Available at: https://doi.org/10.1080/0142159X.2020.1755030.

Kihn, L.A. and Ihantola, E.M. (2015) 'Approaches to validation and evaluation in qualitative studies of management accounting', *Qualitative Research in Accounting and Management*, 12(3), pp. 230–255. Available at: https://doi.org/10.1108/QRAM-03-2013-0012.

Klopper, H. (2008) 'The qualitative research proposal.', *Curationis*, 31(4), pp. 62–72. Available at: https://doi.org/10.4102/curationis.v31i4.1062.

Kneale, D. *et al.* (2019) 'How can additional secondary data analysis of observational data enhance the generalisability of meta-analytic evidence for local public health decision making?', *Research Synthesis Methods*, 10(1), pp. 44–56. Available at: https://doi.org/10.1002/jrsm.1320.

Krizanova, A. *et al.* (2019) 'The effectiveness of marketing communication and importance of its evaluation in an online environment', *Sustainability (Switzerland)*, 11(24), pp. 1–19. Available at: https://doi.org/10.3390/su11247016.

Kusrini, E., Novendri, F. and Helia, V.N. (2018) 'Determining key performance indicators for warehouse performance measurement - A case study in construction materials warehouse', *MATEC Web of Conferences*, 154, pp. 6–9. Available at: https://doi.org/10.1051/matecconf/201815401058.

Laber, J., Thamma, R. and Kirby, E.D. (2020) *The Impact of Warehouse Automation in Amazon's Success*, *IJISET-International Journal of Innovative Science, Engineering & Technology*. Available at: www.ijiset.com.

Lebied, M. (2022, September 2). *How To Calculate The IT ROI For Your Projects | datapine*. BI Blog | Data Visualization & Analytics Blog | Datapine. https://www.datapine.com/blog/how-to-calculate-it-roi/

Lester, J.N., Cho, Y. and Lochmiller, C.R. (2020) 'Learning to Do Qualitative Data Analysis: A Starting Point', *Human Resource Development Review*, 19(1), pp. 94–106. Available at: https://doi.org/10.1177/1534484320903890.

Lewczuk, K. (2021) 'The study on the automated storage and retrieval system dependability', 23(4), pp. 709–718.

Lin, B. *et al.* (2019) 'A Time-Driven Data Placement Strategy for a Scientific Workflow Combining Edge Computing and Cloud Computing', *IEEE Transactions on Industrial Informatics*, 15(7), pp. 4254–4265. Available at: https://doi.org/10.1109/TII.2019.2905659.

Lowe, A. *et al.* (2018) 'Quantifying Thematic Saturation in Qualitative Data Analysis', *Field Methods*, 30(3), pp. 191–207. Available at: https://doi.org/10.1177/1525822X17749386.

LUBIS, P.D.K. *et al.* (2021) 'Management Process Administration in Enterprise Resources Planning (ERP) Systems Applications and Products in Data Processing (SAP) in PTPN III SEI Dadap', *Ecoforum Journal*, 10(1). Available at: http://www.ecoforumjournal.ro/index.php/eco/article/view/1204.

Lunga, D. (2021) 'Benefits and challenges of cloud-based enterprise resource planning : a case of bank of abyssinia'.

Malinowska, M., Rzeczycki, A. and Sowa, M. (2018) 'Roadmap to sustainable warehouse', *SHS Web of Conferences*, 57, p. 01028. Available at: https://doi.org/10.1051/shsconf/20185701028. *Management United Kingdom, 7*(5).

Maroufkhani, P. *et al.* (2020) 'Big data analytics adoption: Determinants and performances among small to medium-sized enterprises', *International Journal of Information Management*, 54(2020). Available at: https://doi.org/10.1016/j.ijinfomgt.2020.102190.

Martins, F.S., Cunha, J.A.C. da and Serra, F.A.R. (2018) 'Secondary Data in Research – Uses and Opportunities', *PODIUM Sport, Leisure and Tourism Review*, 7(3), pp. I–IV. Available at: https://doi.org/10.5585/podium.v7i3.316.

Matikiti, R., Mpinganjira, M. and Roberts-Lombard, M. (2018) 'Application of the Technology Acceptance Model and the Technology–Organisation–Environment Model to examine social media marketing use in the South African tourism industry', *SA Journal of Information Management*, 20(1), pp. 1–12. Available at: https://doi.org/10.4102/sajim.v20i1.790.

Mikkonen, K. (2020) *The Application of Content Analysis in Nursing Science Research*, *The Application of Content Analysis in Nursing Science Research*. Available at: https://doi.org/10.1007/978-3-030-30199-6.

Mohamed, M. (2019) 'Smart Warehouse Management using Hybrid Architecture of Neural Network with Barcode Reader 1D / 2D Vision Technology', *International Journal of Intelligent Systems and Applications*, 11(11), pp. 16–24. Available at: https://doi.org/10.5815/ijisa.2019.11.02.

Mostafa, N. A., Hamdy, W., Mostafa, N., & Elawady, H. (2018). *Towards a Smart Warehouse Management System Logistics of waste management View project Waste Management in MENA Regions, edited by Abdelazim Negm and Noama Shareef View project Towards a Smart Warehouse Management System.* https://www.researchgate.net/publication/328007244

Mostafa, N., Hamdy, W. and Elawady, H. (2020) 'An Intelligent Warehouse Management System Using the Internet of Things', *Egyptian Journal for Engineering Sciences and Technology*, 32(1), pp. 59–65. Available at: https://doi.org/10.21608/eijest.2020.42338.1009.

Mostafa, N.A. *et al.* (2018) 'Towards a Smart Warehouse Management System History of Science View project Towards a Smart Warehouse Management System', *Proceedings of the International Conference on Industrial Engineering and Operations Management*, (September), pp. 2555–2563. Available at: https://www.researchgate.net/publication/328007244.

MR.DIY. (2022). *MR.DIY Launches E-Commerce Robotic Warehouse in Malaysia! | Mr D.I.Y. Group (M) Berhad*. Retrieved April 7, 2023, from https://www.mrdiy.com/mrdiy-launches-e-commerce-robotic-warehouse-in-malaysia#:~:text=DIY%20has%20officially%20launched%20the,a%20200%25%20increase%20in%20efficiency!

Nasim, R., Ullah, H., Rizvi, S.S., Abbasi, A., Khan, S., Riaz, R. and Paul, A., 2020. A cloud-based enterprise resource planning architecture for women's education in remote areas. *Electronics*, *9*(11), p.1758.

Nettsträter, A., Geißen, T., Witthaut, M., Ebel, D. and Schoneboom, J., 2015. Logistics software systems and functions: an overview of ERP, WMS, TMS and SCM systems. *Cloud computing for logistics*, pp.1-11.

Ngozwana, N. (2018) 'Ethical Dilemmas in Qualitative Research Methodology: Researcher's Reflections', *International Journal of Educational Methodology*, 4(1), pp. 19–28. Available at: https://doi.org/10.12973/ijem.4.1.19.

Nguyen, T. H., Le, X. C., & Vu, T. H. L. (2022). An Extended Technology-Organization-Environment (TOE) Framework for Online Retailing Utilization in Digital Transformation: Empirical Evidence from Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(4). https://doi.org/10.3390/joitmc8040200

Nur, S., Binti Shabudin, A., Yazid, M., & Taib, M. (2021). *MJIT 2021 A STUDY OF SMART WAREHOUSE EFFICIENCY IN SHORUBBER (M) SDN. BHD.* www.mitec.unikl.edu.my/mjit

Pane, S.F., Awangga, R.M. and Azhari, B.R. (2018) 'Qualitative evaluation of RFID implementation on warehouse management system', *Telkomnika (Telecommunication Computing Electronics and Control)*, 16(3), pp. 1303–1308. Available at: https://doi.org/10.12928/TELKOMNIKA.v16i3.8400.

Pingale, M.S. and Kulkarni, H.H. (2019) 'Design and development of automated storage and retrieval system (ASRS) for warehouse using iot and wireless communication', *International Journal of Scientific and Technology Research*, 8(9), pp. 105–108.

Premchandra Patil, L. (2021). *SIGNIFICANCE OF WAREHOUSING IN SUPPLY CHAIN MANAGEMENT**. https://www.researchgate.net/publication/356987256

Rashid, A. and Chaturvedi, A. (2019) 'Cloud Computing Characteristics and Services A Brief Review', *International Journal of Computer Sciences and Engineering*, 7(2), pp. 421–426. Available at: https://doi.org/10.26438/ijcse/v7i2.421426.

Raskind, I.G. *et al.* (2019) 'A Review of Qualitative Data Analysis Practices in Health Education and Health Behavior Research', *Health Education and Behavior*, 46(1), pp. 32–39. Available at: https://doi.org/10.1177/1090198118795019.

Ronzani, C.M. (2020) 'Qualitative methods of analysis: an example of atlas.ti[TM] software usage análise qualitatica: um exemplo do uso do s oftware atlas.ti[TM] análisis cualitativo: un ejemplo de uso del s oftware atlas.ti [TM]', pp. 284–311.

Salleh, M. (2022, May 8). *Warehousing: No better time to automate*. The Edge Markets. https://www.theedgemarkets.com/article/warehousing-no-better-time-automate

Samir Yerpude, D.T.K.S. (2018) 'SMART Warehouse with Internet of Things supported Inventory Management SMART Warehouse with Internet of Things supported Inventory Management System', *International Journal of Pure and Applied Mathematics*, 118(24), pp. 1–16.

Sandu, R. and Gide, E. (2018) 'Technological, Organisational and Environmental (TOE) Factors that Influence the Adoption of Cloud Based Service SMEs in India', *IEEE International Conference on Cloud Computing, CLOUD*, 2018-July(July), pp. 866–870. Available at: https://doi.org/10.1109/CLOUD.2018.00123.

Schmitt, G. *et al.* (2019) 'Smart contracts and internet of things: A qualitative content analysis using the technology-organization-environment framework to identify key-determinants', *Procedia Computer Science*, 160, pp. 189–196. Available at: https://doi.org/10.1016/j.procs.2019.09.460.

Schuurman, B. (2020) 'Research on Terrorism, 2007–2016: A Review of Data, Methods, and Authorship', *Terrorism and Political Violence*, 32(5), pp. 1011–1026. Available at: https://doi.org/10.1080/09546553.2018.1439023.

Schwank, J. (2021) 'Interactive Visualization of Complex Data Concepts , Designs and Evaluations for Uncertain and Large Data Applications'.

Seng, L.C. and Yew, D.L.K. (2019) 'RFID Technology Adoption Rate in Warehousing: A Study of Manufacturing Companies in Johor', *International Journal of Trend in Scientific Research and Development*, Volume-3(Issue-3), pp. 144–153. Available at: https://doi.org/10.31142/ijtsrd21681.

Sim, S.Y. *et al.* (2020) 'Return on investment from immunization against 10 pathogens in 94 low-and middle-income countries, 2011–30', *Health Affairs*, 39(8), pp. 1343–1353. Available at: https://doi.org/10.1377/hlthaff.2020.00103.

Smart Warehousing Market Size, Share & Forecast to 2022-2028. (2022). KBV Research. Retrieved April 16, 2023, from https://www.kbvresearch.com/smart-warehousing-market/

Storkholm, M.H. *et al.* (2018) 'Assessing the reliability and validity of the Danish version of Organizational Readiness for Implementing Change (ORIC)', *Implementation Science*, 13(1), pp. 1–7. Available at: https://doi.org/10.1186/s13012-018-0769-y.

Supply Chain Dive. (2021). *Electric forklifts gain ground in warehouses, manufacturing facilities.* Available at: https://www.supplychaindive.com/news/electric-forklifts-material-handling-warehouse/606823/.
Taherdoost, H. (2020) 'Different Types of Data Analysis ; Data Analysis Methods and Techniques in Research Projects', *International Journal of Academic Research in Management (IJARM)*, 9(May 2020), p. 10.

Taherdoost, H. (2021) 'Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects', *International Journal of Academic Research in Management (IJARM)*, 10(1), pp. 1–38.

Tamsir, A. (2021) 'Development of Automatic Storage Retrieval System for Variable Loads', *Jurnal Sains, Teknologi dan Industri*, 18(1), p. 99. Available at: https://doi.org/10.24014/sitekin.v18i1.11587.

Tan, Z. (2022, March 29). *Cover Story: Plugging the logistics gap*. The Edge Markets. https://www.theedgemarkets.com/article/cover-story-plugging-logistics-gap

Tang, Y.-M. *et al.* (2022) 'Integrated Smart Warehouse and Manufacturing Management with Demand Forecasting in Small-Scale Cyclical Industries', *Machines*, 10(6), p. 472. Available at: https://doi.org/10.3390/machines10060472.

Taylor, P. (2019). *International Journal of Economics, Commerce and Management United Kingdom Licensed under Creative Common INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ADOPTION BY SMALL AND MEDIUM ENTERPRISES IN DEVELOPING COUNTRIES: THE EFFECTS OF LEADER, ORGANIZATIONAL AND MARKET ENVIRONMENT FACTORS: Vol. VII*. http://ijecm.co.uk/

Udom Phunlarp, P.P. (2019) 'SOLUTIONS TO SOLVE PROBLEMS AND INCREASING EFFICIENCY WAREHOUSE A CASE STUDY OF XYZ COMPANY LIMITED.', *Paper Knowledge . Toward a Media History of Documents*, 7(1), pp. 1–33. Available at: https://www.bertelsmannstiftung.de/fileadmin/files/BSt/Publikationen/GraueP ublikationen/MT_Globalization_Report_2018.pdf%0Ahttp://eprints.lse.ac.uk/4 3447/1/India_globalisation%2C society and inequalities%28lsero%29.pdf%0Ahttps://www.quora.com/What-is-the.

Wang, T., Olivier, D.F. and Chen, P. (2020) 'Creating individual and organizational readiness for change: conceptualization of system readiness for change in school education', *International Journal of Leadership in Education*, 00(00), pp. 1–25. Available at: https://doi.org/10.1080/13603124.2020.1818131.

Windle, J. and Silke, A. (2019) 'Is drawing from the state "state of the art"?: a review of organised crime research data collection and analysis, 2004–2018', *Trends in Organized Crime*, 22(4), pp. 394–413. Available at: https://doi.org/10.1007/s12117-018-9356-5.

Witron. (2017). *The Warehouse of the Future: WITRON's OPM Technology at Meijer*. Food Logistics. https://www.foodlogistics.com/software-technology/video/20986094/witron-integrated-logistics-the-warehouse-of-the-future-witrons-opm-technology-at-meijer-in-wisconsin

Wutich, A. *et al.* (2021) 'Metatheme Analysis: A Qualitative Method for Cross-Cultural Research', *International Journal of Qualitative Methods*, 20, pp. 1–11. Available at: https://doi.org/10.1177/16094069211019907.

Yaseen, H.K. and Obaid, A.M. (2020) 'Big Data: Definition, Architecture & Applications', 4, pp. 45–51.

Yetkin Ekren, B. (2021). A multi-objective optimisation study for the design of an AVS/RS warehouse. *International Journal of Production Research*, *59*(4), 1107–1126. https://doi.org/10.1080/00207543.2020.1720927

YI, T.C. (2020) 'MAKER'S INVENTORY SYSTEM: A LOGICAL-BIN STORAGE APPROACH', *Konstruksi Pemberitaan Stigma Anti-China pada Kasus Covid-19 di Kompas.com*, 68(1), pp. 1–12. Available at: http://dx.doi.org/10.1016/j.ndteint.2014.07.001%0Ahttps://doi.org/10.1016/j.ndteint.2017.12.003%0Ahttp://dx.doi.org/10.1016/j.matdes.2017.02.024.

Zhen, L., & Li, H. (2022). A literature review of smart warehouse operations management. *Frontiers of Engineering Management*, *9*(1), 31–55. https://doi.org/10.1007/s42524-021-0178-9

Zheng, T., Ardolino, M., Bacchetti, A., & Perona, M. (2021). The applications of Industry 4.0 technologies in manufacturing context: a systematic literature review. In *International Journal of Production Research* (Vol. 59, Issue 6, pp. 1922–1954). Taylor and Francis Ltd. https://doi.org/10.1080/00207543.2020.1824085

Zou, T., & Cheshmehzangi, A. (2022). ICT Adoption and Booming E-Commerce Usage in the COVID-19 Era. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.916843

Żuchowski, W. (2022) 'THE SMART WAREHOUSE TREND: ACTUAL LEVEL OF TECHNOLOGY AVAILABILITY', 18(2), pp. 227–235.

Zunic, E. *et al.* (2018) 'Smart Warehouse Management System Concept with Implementation', *2018 14th Symposium on Neural Networks and Applications, NEUREL 2018* [Preprint], (November). Available at: https://doi.org/10.1109/NEUREL.2018.8587004.

Appendix A Interview Questions

PART A: DEMOGRAPIC BACKGROUND

Q1. What is your position in the warehouse?

Q2. How many years of experience you have in the field of warehouse operation?

PART B: TECHNOLOGY

RO 1: To evaluate the current technologies implemented in warehouses in Shah Alam that can be associated with smart warehouse.

Q3. Is your warehouse considered as a smart warehouse?

Q4. What is the current technology advancement and operations practice in your warehouse?

Q5. What future technology implementation is being consider by your warehouse?

Q6. How would you describe the reliability of the current technology implemented?

Q7. How the current technology does implemented help in the performance of the warehouse?

Q8. What are the benefits that the current technology brings to your warehouse?

PART C: ORGANIZATIONAL READINESS

RO 2: To identify the influences of organizational readiness towards smart warehousing.

Q9. Do you agree that the top management does influences the organizational readiness towards smart warehousing?

Q10. Do you feel that the organizational readiness towards smart warehousing impact the human resources?

Q11. Do you agree that the organizational readiness towards smart warehousing influences the organizational culture?

Q12. Do you believe cost and return of investment play a factor in organizational readiness towards smart warehousing?

PART D: EXTERNAL ENVIRONMENT FACTORS

RO 3: To understand the external environment factors that could support the implementation of smart warehouse.

Q13. Do you agree that competition is one of the factors that influence companies to implement the technology?

Q14. How does customer influence the implementation technology in your warehouse?

Q15. Do you agree that the client/vendor/supplier is one of the external environment factors that impact the companies to adopt the smart warehouse?

Q16. Do you agree that the government support may be one of the external environment factors that influence the companies to adopt the smart warehouse?

Q17. What incentives should the Malaysian government provide for the implementation of smart warehouses?

Jia Xiang: Today we are going to conduct an interview. So, before we start the interview, I'd like to extend my sincere gratitude for accepting our interview session. I know that your time is really packed so our interview session is for our research paper purpose, which is to identify the factor that influence. The adoption of smell smart warehousing in the Klang Valley. So, our research will have a few objectives, the first one being that to access the current technology being implemented in warehouses in Klang Valley. And the second objective is to identify the organizational readiness towards smart warehousing as well as external factors that can affect warehouse to adopt smart warehousing.

Interviewee 1: Is this your final year project paper?

Jia Xiang: Uh, yeah.

Zi Xuan: Yes, yes.

Jia Xiang: So, our interview session will be free flow section, meaning that there are not too strict, so you can take turns to answer our questions.

Interviewee 2: Okay we do our best.

Interviewee 1: And also, we also need to some of the questions we need to we need you guys to clarify that, but later when come to that we will need further elaboration from your side.

Jia Xiang: OK, sure.

Interviewee 1: OK. Yeah, let's start.

Jia Xiang: OK, so before I begin the interview session, can you briefly introduce yourself what your work and what position you are currently working at and for how many years and what's your experience in terms of warehousing operations?

Interviewee 1: Sally you want to start first?

Interviewee 2: John, you can start? Yeah. OK. My name is Sally Chong. In the warehouse, I'm the head of logistics. About experience in the warehouse operation is about 10 years altogether. I'm already have 18 years' experience with GDEX, eight years on the distribution, last month distribution. Then I moved to logistics site is about 10 years lah. John.

Interviewee 1: Yeah. Oh, yeah, it's for me. I'm the I'm not in warehouse operation. I'm the at the GDEX Berhad at the parent company of Sally is with GD logistic who's doing the warehouse operation. So, the parent company is GDEX Berhad. So, I'm the chief sustainability and strategy officer of GDEX Berhad. So I'm here, I think, for about four year, four years in logistics business. Before that I was the fund manager, in the investment industry, fund investment industry lah. Yeah. So, at GDEX, at the parent company level. So, we look at everything, not only warehouse even the express delivery and some other investments and also under GDEX Berhad.

Jia Xiang: So, as I previously mentioned, our research is regarding smart warehouse in the Shah Alam. So, before I asked in depth, are you guys familiar with the term smart warehousing?

Interviewee 1: So, the question most of the question I would like Sally to handle because it's all in warehouse created, but certain I will also add on to it if needed, right, is that OK? Yeah.Yeah. So, you're saying, uh, smart warehouse? Yes. Yes, we are aware of the this the term smart warehouse, yeah.

Jia Xiang: You're familiar with the term small housing? Do you consider your warehouses smart warehouse?

Interviewee 1: Sally. OK, maybe I start first, then Sally can add on to it lah. I wouldn't say I was is very smart. I would say maybe semi or partly smart, right? Because if you are talking about smart warehouse, you're talking about a lot of Internet of Things that there are a lot of robotics, RFID. And you know what else are the AI or this kind of thing then only you can consider yourself as a smart warehouse. So, ours, some of the things that we don't have yet so. Currently if I'm wrong, Sally, if I call a warehouse, maybe semi- smart warehouse or because we have some system, some automation, some simple automation in our operations, yeah.

Interviewee 2: Yeah. WMS.

Interviewee 1: Oh, by the way, before that in your research paper, will you call our company's name in you? Ah, OK.

Jia Xiang: All the interviewees information is not going to be displayed in the paper.

Interviewee 1: OK. Thank you for your clarification. Yes, Sally.

Interviewee 2: Yeah, we are. We are a modern warehouse, yes. So, we actually it's only like two, one is the system. One is the conveyor. That's all we have. So, are we considered as a smart warehouse? We need you to judge us, but we are not lah actually. We are not yet to there.

Jia Xiang: Is there any like advanced technology besides the conveyor and WMS they're using? Like besides related operation maybe can like sensor like the light sensor LED light censoring that automatically on when they send movements or other system that we that is inside the computer?

Interviewee 1: That's ready in the WMS, right? Right.

Interviewee 2: Yeah. Yeah. Yeah, we do have a pick to light, but it's not picked by robot, so it's just picked by human via light system. We're talking about, let's say, because we had a fulfilment centre. So, we pick orders using the light this directed by light.

Jia Xiang: Your current practice in your warehouse is like semi rely on technology semi on humans?

Interviewee 2: Yeah, if we can rely on technology, we will do our best to rely on technology. Other than that, we'll use manual way, yes.

Jia Xiang: So, there are no other types of technology currently implemented beside like WMS.

Interviewee 1: Yeah.

Interviewee 2: Conveyor loh.

Interviewee 1: All the sensors are on the lights are all actually it's part of the conveyor system, part of the WMS system.

Interviewee 2: OK. Yeah.

Interviewee 1: Yeah. And what about? Sally, what about the one in our temperature control room? The regulator or those things do you call it as advanced technology or?

Interviewee 2: Facility wise. Yeah. In facility wise is a smart warehouse, but not in the WMS operation. So, if the facility wise is example like if there's a fire, all the lower shuttle will shut down automatically or the air con were off and all the damper were open to suck out the smoke. So that kind of technology of a modern warehouse, yes. But if on the operation side, we haven't gone into 100% automation lah.

Jia Xiang: Uh, so? Can I ask why and you guys not like looking forward to implementing more advanced like automation technology? Is it because your operation doesn't require it or the current implemented system and technology in place is already efficient enough for you guys?

Interviewee 2: Oh no, automation is always something that we were want to go for it. But automations take a lot of time to ensures that whatever we do right is done correctly, yeah, because there's a lot of . Erm, how to call that ah. You have to do a lot of analyse ah.

Jia Xiang: Pre-planning?

Interviewee 1: We have conducted the facility study.

Interviewee 2: Yes.

Interviewee 1: You know to find out the cost benefit.

Interviewee 2: Yeah. You need to do a lot of good planning to ensure the integration. Yeah. And all those strategies adopted with suitable technologies solutions, because this thing is the ongoing thing. It's a continuous improvement to us lah.

Jia Xiang: So, in your sense, you guys are looking into it, but the challenge is that the planning require and the cost of it?

Interviewee 2: You can say that, yes.

Interviewee 1: Yes, we can't also do in a big way because it will affect our operation. You know you will disrupt our operations. So, you want any automation to be do could be done batch by batch, yeah. So, Sally, our temperature control room, is there any anything interesting to highlight there?

Interviewee 2: Ohh not the not the quorum we talking about sustainability. The Go green is the ventilations of the ambient air. Yeah. So that is not calls smart warehouse. It's just part of a green practice that we converting. If the items can be stored at 32 degrees, we're converting the ambient temperature to lower down the ambient temperature which is currently 33 or 34 in Malaysia weather.

Jia Xiang: So, it's, self-regulated, it's so it's it changed the temperature by itself depending on the.

Interviewee 2: Uh, yes, yes, that is, uh is because this is something like. Fresh egg comes in. Make the air ventilations move and then you are hot air going out and then if let says the temperature is achieved it will auto cut and if that's a rain it will auto close the gap so that you don't you know suck in the together with the rain, so this these are some kinds of a smart technology, but it's not to the practice of the warehouse fulfilment Centre for orders.

Jia Xiang: So, I gave back to the operation site. You say you're using like WMS, pick to light and conveyor system. In your experience, does this type of technology is reliable in your warehouse in terms of its lifespan, the turnover rate, the down time of the system? Is it reliable in terms of like the accuracy of the information as such?

Interviewee 2: Of course. The WMS actually managed the whole movement of the item from inside the warehouse right from in until out, so the accuracy and the inventory are always there and if we need to do like before like 4 before you know all this is managed by WMS. If it's by manual you have to really look into each location which will expire first. So, all these needs technology which. What is the WMS is doing now? Yeah, WMS is a very strong automation. That first thing we need in the warehouse.

Jia Xiang: So, do you experience any challenges when implementing technology or using this type of technology? Maybe like the cost of implementing just now you already said maybe like human knowledge of operating your system, people not following SOP when using this kind of system, any challenges?

Interviewee 2: When you use automations right, it's like the process is like we can say that it's actually very suitable for those especially now that we employ foreign workers also. So, it's something like idiot proof you must do step one, you must press this before you can go to next step. So, you will never miss out any process any

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steps in order to get to the end result so the accuracy is always traceable and is some the movement is can able to track who goes wrong and who which user actually use the devices to up to stock count you know so WMS is a must before any automation started.

Jia Xiang: So, do you face any challenges when the technology is implemented?

Interviewee 2: Uh, when, of course the manual way is the flexible way. So, when we actually implement this WMS, everybody has to get used to it. Once you use the WMS, you wouldn't want to go back to the manual way so we don't face big challenges in this lah.

Jia Xiang: oh, so not like uh, system downtime or Internet problems connections?

Interviewee 2: Our WMS actually already done it until network, so it that's a WMS disruption, it doesn't affect us. If you're saying it, whether it's a WMS downtime we always have back up. Since we started with the manual, we always know how to use a manual way. But there are things that may not have. They may not able to go back to the manual way because the orders are all under API. So, if we don't have the WMS means that we may have to stop, interrupt, stop the operation for a while. Yeah, but we do.

Jia Xiang: So, I so you said if the WMS went down, you will stop operation some of the operation lah, does this type of down time occur frequently?

Interviewee 2: No, no, no. If it's occurring frequently, we wouldn't want to invest in this WMS.

Jia Xiang: Yeah. Uh, so, uh, with the current WS implemented, how would it help in your performance?

Interviewee 2: Oh, it can measure the KPI, key performance index, how fast we from pick until pack until outbound so we can see that some of

the processes we don't really require many manpower. Yeah, we can reduce some cost on the manpower and also, we don't have to write and keep the record manually like the papers. So, all these is actually you know the lean management. You can practice that also. Yeah, yeah.

Jia Xiang: So, it improves your operation speed as well as help to reduce your manpower.

Interviewee 2: Yes. Yes, yes.

Interviewee 1: Also, the productivity of the workers lah. Productivity, right? Umm.

Interviewee 2: Yeah, yeah, the productivity everything is increased lah. You can, you know, even the customers service. Because of the using the system. But we call it what ah, the error is less so customers do not complain, so it's is actually increased the customers' experience lah.

Interviewee 1: Because we keep on improving our system. Before this we use different type of WMS so only in recent years, we upgraded to this current one so that it follows the latest technology. So, we have been in this warehouse for since the two how many years are in Warehouse?

Interviewee 2: Yeah. So, we used a very old.

Interviewee 1: Sorry, go ahead, go.

Interviewee 2: Yeah, yeah, we upgraded as what John mentioned we previously we're using the WMS is called Manhattan and before we upgrade to Honeywell, the reason is because now that with the recent customers, demand is good to have a system that can be easily operate user friendly and it's in the Google. As you know website rather than Crystal report you know you can't do a lot of things with the crystal report, yeah. So, this is ongoing, of course.

Jia Xiang: But with your WMS Link to Google, won't there be like Internet disruptions? Or do your company have your own? A network system?

Interviewee 2: Yes, we have an in-House ID. I think phrased it from me. It's not Google. It's a what do you call that ah John?

Interviewee 1: Windows ah? Windows space, is it?

Interviewee 2:   Ah Windows right! Having those windows space and then. Most crystal report you know, but like for example the WMS can link into the customers information system so they can actually also know what is happening to their life. Inventory, yeah.

Interviewee 1:   Yeah, we provide real time information to them and real time data.

Interviewee 2: Correct. Yeah.

Jia Xiang: You say that you only just upgraded your WMS a few years back, so currently are you like looking into any new advanced technology to implement or you do you think that the new the new implemented WMS is sufficient for now and you're not looking for any like implementation?

Interviewee 1: That's only on WMS, in the warehouse you're. So yeah, other areas, so many areas where we can explore. So, I think for now the WMS.

Interviewee 2: Yeah.

Interviewee 1:   We are still new, so at the moment WMS we don't have plan to not to upgrade to another version but for other areas we can look into that for example robotics, you know or RFID know this area we can also explore. Umm.

Interviewee 2:   The warehouse is always constantly ongoing continuous improvement we said.

Interviewee 1: Umm.

Interviewee 2: Because today's trend may not be the same as tomorrow's trend, so we just have to keep on upgrading. If we needed, yeah.

Jia Xiang: So, in both of your opinions, what's your view on Malaysia warehousing, implementing smart warehousing? Is it like a necessity or we or it's like based on the warehouse you're operating like distribution last mile or so on?

Interviewee 2: Automation in the world now is no matter what, whether you want or don't want is going to happen, it's only takes time only year, right? So, if you're talking about Malaysian market now that fully automated one also not many due to Malaysia customer. Does not want to pay a lot for, you know, for one order to process. Like for example if let's say if it's talking about let's say just one order, even if it's more than five ringgits, they may not want it, you know. So that's why it takes time now. But if everybody is going towards automation in order to have the market share, we have to means we have to. We also have to do go up. But yet, like what we mentioned just now, it needs a lot of planning and a good planning.

Interviewee 1: Compared to China, we are still many years behind as compared to China.

Interviewee 2: Yeah, yeah, yeah. Yeah. Right. Yeah, yeah. It can be 20 to 30 years behind.

Jia Xiang: So, in your view is the Malaysian warehouse is it moving in a positive way or negative way, meaning that positive, meaning that they are slowly adapting and implementing this type of automation and advanced technology, negative way means that they are still stuck to the old ways of how to manage their warehouse?

Interviewee 2: I would say that it's positive where, because even now when we have any new customers, we always ask them to, you know, do

not e-mail to us manual orders. We will prefer API rather than the previous is FTP you know by batch. So, it's better that it goes live. Even the customers when they opening a tender, they were asked us whether we have this type of pick of that type of systems, you know, in order that to qualified their needs. So, I would say it's positive.

Interviewee 1: Some of the warehouses, the big boss lah, some they already implemented the ASRS automated storage and retailer system. So, there's also something new but for now I think we are not looking into that because at the moment we don't need that kind of the system yet.

Interviewee 2: Yeah, yeah.

Interviewee 1: Yeah. So, you look at people like Tiong Nam or Tasco going to implement some bigger player does on warehouse one. They invested into this ASRS. That one definitely you reduce a lot of manpower because it's all racking and the whole warehouse all racking, all controlled by a panel in front of the wrecking that just press what you want and then the whole pallet will come to come to you.

Interviewee 2: Hmm. Yeah, you need to do a lot. A lot of planning because the whole entire warehouse, if you go automation you have to change entirely.

Interviewee 1: Yeah.

Interviewee 2: As what John mentioned just now, we will continue to look into this but is batch by batch which is more important now first.

Jia Xiang: So, between sustainability and automation, which more you are like looking into a?

Interviewee 2: John this I give it to you lah.

Interviewee 1: Automation is actually part of the sustainability in your sustainability. When talk about stability initiative,

digitalization. Now there's a technology or automation. So yeah, they are two different things, you know, so. You need to have when come to automation. It can be one of the key areas for one company and to ensure that company can continue to sustain. So, the automation is actually supporting the sustainability journey of the company.

Jia Xiang: So now I'm going to move on to the organizational readiness.

Interviewee 1: Ok, before that, we like to understand more about this organizational readiness. Can you clarify what do you mean by this? Because almost every question you have all this readiness?

Jia Xiang: Readiness means that how does the company and its top management readies its workers and employees to use the technology being that before the implementation of certain technology like the management will provide like resources for training so that the workers are well ready for the implementation when the technology come in or the top management has being a task force to better study the technology before bringing it in or the management allocate resources to bring in this type of technology. So, this is the meaning of the organization readiness to use and implement the technology.

Interviewee 1: So, to know whether we are ready or not to go ahead with this automation thing?

Jia Xiang: Yeah, something like that.

Interviewee 1: OK. Yes.

Jia Xiang: OK. So, the first question is, do you agree that top management place an important role in implementing of new technology? If so why and how? Why you think that top management is important when it comes to implementation of technology?

Interviewee 1: Well. Although the directive will come from form top management, but we still need the input from the people on the

ground, but for example. Sally, we also provide input or feedback to the management that this is viable this is feasible to do all this smart warehouses or automation. So, the end of the day, so you will still depend on the feasibility, the outcome of the feasibility of the study, right? Whether this is smart warehouse? Is viable or not. So, it's both way la, I would say the feedback will come from those people on the ground or operation site and then the top management also equally important to drive to massage the direction for the warehouse whether continue to be old school type or want to be a warehouse with a state of art technology. Yeah. So, I would say no, the commitment not from the management is also quite important.

Jia Xiang: In your opinion, how does your company stock management influence your organization readiness towards smart warehousing? Like your company provides a suitable training before they bring in technology or they inform you beforehand and let you guys familiar with the technology before bringing in.

Interviewee 1: Training is constant you know, it's not only technology that brings in that required training. Even if a new customer comes in, a new packing method or for the assisting customers is everyday training you know, is every day training and ready training and ready agree or not?

Interviewee 2: Yeah. On the job training. It's not only when there is a new automations that we are only going for training, even if driving a lift truck also needs training. So training is like a development of our people. So, I believe training is very, I mean, even terms of management, they are very supportive.

Jia Xiang: They provide like sufficient training for your workers?

Interviewee 2: Yeah. Whatever trainings that we needed. So, let say the internal don't have this skill, then we outsourced to external trainer, both side la.

Interviewee 1: Did you mean that better management influence the decision making or influence the whole company, everyone in the company, whether to make sure they are ready to know for the adoption of technology?

Jia Xiang: Decision making.

Interviewee 1: Well, for decision making.

Interviewee 2: Decision making, that is management la. Decision making is whether we want to go for new technologies, is it?

Jia Xiang: Yaya

Interviewee 1: But before the management made any decision, we need to gather feedback from people on the ground.

Interviewee 2: Yeah, agree with John, actually we will be the one who proposed and we need to tell the management why we need to. We must have some figures for them, all those presentation works la. As I told you let's say if they said they decided then we will start planning. That's why I said good planning must have. But whatever, whoever started first is like what John mentioned is from the ground people. Yeah.

Jia Xiang: So, your warehouse in implementing technology is more on top management driving you guys to implement this type of technology or the ground people suggesting certain types of energy to be implemented to the top management?

Interviewee 2: Both ways.

Interviewee 1: I would say way. It cannot be one way is the both ways communication.

Interviewee 2: Yeah.

Interviewee 1: The certain area that the people on the ground they overlook then the management has seen it can also ask the people on the ground to look into it la. So is the both ways study la.

Interviewee 2: Yeah

Jia Xiang: So, the top management plays important role because they approve or deny your proposal and also, they drive how your company is going to move forward and certain type of technology going to be use, right?

Interviewee 2: Of course, they also have to pay for it, right? So, if there's no approval from the management, we can't run also.

Jia Xiang: After the organization readiness towards smart warehousing, how does this impact your human resource department? Maybe like they need to create a new SOP for the technology use or increase their training for new technology or hired new expert who are well equipped to use this type of technology? How does it impact?

Interviewee 2: It depends on the technology that is going to be used if you're saying, let's say we always start with semi automation before you go on full automation, you're asking us whether do you need so many manpower? I would say you even need more because when we say technology right, is from this A to B, if it is all fully automated A to B then you may not require the manpower. What if it's a semi auto? When you put in the A who's going to put A to B? There will be certain areas where we need more manpower to check due to the process. If it's fully automated, you don't have to check through the process because the system checking. But halfway, halfway, let's say the segment consists of 6 and it's a semi-automated, so you may add people to in for more checking. So, it depends la, but if you are saying whether the SOP will be changed, of course it will. If the process is changed, we will change our SOP, definitely

will one, it is continuous one. We cannot be using the new technology, but the SOP is still the old technology.

Interviewee 1: When you say impact on human resources, did you mean a post adoption of pre-adoption of the new technology?

Jia Xiang: Both.

Interviewee 1: Both arh?

Jia Xiang: Ya, both. Like meaning before implementing, they need to like to prepare sufficient training. After the implementation they maybe need increase their hirings or more workers to suit the use of the technology. So, both ways la.

Interviewee 1: Ya, but of course the training is important. Other than that, we will also have to let them know why we need to change la, not only for the sake of changing to a new system, but tell them this system is so good, and then it will help us to make us more efficient. So why we will explain to them la, on top of the training before that, tell them why, why we need this. That only when we implement then the training will keep in.

Interviewee 2: Yeah. The training can be a hot training where you need to do some a lot of allocative la before you go live. Those will be considered as training also.

Jia Xiang: So, the next one is going to be related to like costing. So, do you believe that return of investment place important role in organization readiness towards smart warehousing? Meaning that before you guys implement this type of technology, you normally will look into ROI la. So how important is ROI?

Interviewee 1: Yeah, it's definitely very important if you look at the ROI. If you give us a negative return, then it's no point of implementing this new technology. So, of course, when come with technology like what you say involve a lot of costs, companies need to have

some financial master, good financial position to go for all this technology.

Jia Xiang: So in terms of ROI, usually what is a good ROI in your year? Like maybe one to three years or five years which one do you guys prefer?

Interviewee 1: You mean the payback return?

Jia Xiang: Yeah.

Interviewee 1: Not so short one, this one is the long-term investment. You go in, because the payback is huge, in the short term, you won't see your payback will definitely be and also quite difficult to get, unlike certain project where you can meet you put in every month, you have a consistent cash flow come in, then you can calculate the payback period. But for this one is more for the improvement in terms of efficiency. A lot of things very sometimes can be very subjective. But you want to quantify it, to give you a numbers, quite challenging la I would say.

Jia Xiang: So, the ROI long or short is not important, only the positive or negative return la.

Interviewee 1: Yeah, definitely it would be positive, but it won't be a short term. It has to be a medium or long term.

Jia Xiang: I see. I'm going to move on to the last one, which is the external environment factor that cause adoption of smart warehousing. Environment factors ae meaning that outside, like your suppliers, your customers, the government. So the first questions is asked, do you agree that your competition around you is the one of the factors that influence your company to implement technologies and smart warehousing?

Interviewee 2: I would say yes. Because as I mentioned just now, if everybody is doing let's say JIT method, so we have to do the JIT. Because competition in a business if we don't have it, it may decrease

our company market share and then they streamed down our customer base. But if we also move forward towards automation seem like others, then we can keep up. So of course, competitors do influence this. If let's say DHL supply chain international player, they are all everything automated with the current local price. So anyhow, we must try to match it back.

Interviewee 1: And sometimes we also want to win in the batter field, you need to be ahead of your peers, your competitors, right so we may want to know, go ahead of our peers. You may not follow but we go one step further than our peer so that this is also to impress our customers when they see, wow, only GDEX has this kind of technology then you'll be very impressed and then business will come to GDEX.

Jia Xiang: So, your point is that, the competitors can pressure you guys to keep up with them. So to implement and sometimes you want to stay ahead your competition, you also implement so that you can attrack your customers.

Interviewee 1: Ya, in other words, we call this a peer pressure. It's like you study in your university when you see your peer result is so good, so you also markup then want to study hard, the beat la.

Interviewee 2: Yeah. You always want to be better than them. Our company always depends smart better la, like international players.

Jia Xiang: So always standing in front of the competitors la.

Interviewee 2: We do our best la.

Interviewee 1: Yeah, we try la.

Jia Xiang: OK. the next question is regarding your customer's factor. So how does your customer influence your company in implementing technology in your warehouse? Like do your customer come up to you say I want to upgrade our system or sometimes they say my company is using this type of

technology, I hope your company is also using this type of technology, so that is more integrated.

Interviewee 2:   Yes, customers do really have a lot of suggestions and actually what they want is how to turn around their item faster, speed it up you know. Like I ordered today, less than two hours you can go out already, you know the orders. So, the customers will of course they love this kind of trend. Let's say if we do have automated warehouse, you can gain the market share and gain the customer service experience la we would say.

Interviewee 1:   Ya you're absolutely right because it also depends on customers' requirements and needs. So, if they have a technology, they want to integrate with us, but we don't have, so we will also try to accommodate that and hence also upgrade our system to integrate with them. So, because different customer, we have different requirements. Some to them a simple one will do, some the one more sophisticated one. So, we have to try to accommodate this kind of customers.

Interviewee 2:   Ya, just like old times, we have server, FTP folder, now it's going to SFTP more secure way. So, if customers say we are going for the SFTP, are we going to upgrade our self because I need to get orders from them, so we have to do. This is just a example la, like last time is EDI, now is talking about API all the way you know. But if we have API but the customer doesn't have API, we have to take their file, convert it into API and then we convert it back to non-API EDI for that. So that's why we always move forward.

Jia Xiang: I see. So, you say customer influence your implementation of technology, so does this also apply to your like vendors and suppliers? Also, same concept it is?

Interviewee 2:   Don't understand. Is the supplier?

Jia Xiang: Like do your warehouse have vendors and suppliers?

Interviewee 2: You mean our that our supplier? Supply equipment to us.

Jia Xiang: Yes, equipment, pallets, sometimes like your wish truck those suppliers. Just now I say like customers influence your company in adopting certain technology. Then how does your suppliers help you to like implement this technology like maybe your supplier is the wish truck company, they adopt a system where they have keep track of their vehicles maintenance date. So, in order to better run their business, they suggest you to implement the same system so they are more integrated like this la a example.

Interviewee 2: Oh, not really, vendor no la, is we will push them. Not they will push us. It's the other way around. Let's say fleet management, vendor is only like when we are adopting this kind of new technology, we may need to find a vehicle that can suit to this new technology? Yes. We will ask the vendor for any new updates of their wish truck. For example, right now my wish truck is able only go up to height to, let's say 6 meters. So, I need a height that can go up to 8.5 then you need to send me a new one and train us, something like that. But you are talking about fleet management, ya, currently we also have fleet management, we are using system also. We are using our system call Ifleet. So, it's kind of recording only that we have all these when is the service it can alert you, the preventive maintenance la. Usually, vendor factor is very affected them.

Interviewee 1: Just add on to that, as compared to customers, I would say the impact of customer they are more influential as compared to the vendor or suppliers. The customer influence is much bigger than the vendor. But then vendor at the end of the day we still have to a feasibility study of the solution or the technology that we have, the smart warehouse solution they have.

Jia Xiang: I see. So last factor is a government. So do you agree that government interventions like maybe reduction in taxes,

reduction in regulation may influence you guys in adopting smart warehouse?

Interviewee 1:   Ya, you're absolutely right again. The government grant the incentive or even maybe a pioneer status for a company to investing into all these advanced technology for smart warehousing. It is definitely important. And also on top of that, the approvals or the permit, from the local authority, that one also so quite important for us to implement something. Sometimes if we need to get approval or permit then if they are not **relatives** at the government side or the local Council site then they may slow down the whole process. So the support from local and sent to the federal government are quite important to encourage companies to adopt this smart warehouse or technology.

Jia Xiang: So, in your opinion, what type of incentive should the Malaysian Government provide currently for warehouses to increase their implementation of advanced technology and the adoption of smart warehouse, like what types of incentive will wish that the government can implement so that more people are willing to step into the smart warehouse area?

Interviewee 1: That way we mentioned the tax incentive.

Interviewee 2: Yeah. Tax.

Interviewee 1: Tax, this most important thing and pioneer status maybe. And also, maybe some incentive for our people. For example, if we need to implement this smart warehouse you need to send our people to go for training and then if it would be good if government can provide some support incentive to send our people to go to learn all smart warehouses technology.

Jia Xiang: The learned from overseas la, so give incentive la.

Interviewee 1: If you hire someone who's an expert in this smart technology, maybe the employee will get certain incentive also maybe, you

know, from the government. Or if he or she is an expert from other countries in the area of smart warehouse, that will be helpful also to attract talents. If you can't find talents in Malaysia and to attract, find talents those are expert in smart warehouse and then the tax incentive for these people are also welcome.

Jia Xiang: Can you more elaborate on more on the like tax cut reduction? How does the reduce in tax and levy can help the implementation of smart warehouse?

Interviewee 1:   For example, usually the **CapEx** is tax deductible under the **IPA** tax allowance. If for this smart warehouse government can give double tax deduction like what government is giving for green technology. If you install solar for example, solar panel, you go into green technology, all these are considered as **Quebec** and company can claim a tax reduction, but government is giving you double tax deduction. So similarly for this smart warehouse. government can also not provide this. I'm not sure currently government is giving any, you have to check on that la Google, on the smart warehouse, any double tax deduction from the government yet? Maybe you can do some research on that, especially for MIDA. All these incentives are coming from MIDA.

Jia Xiang: OK, to recap, my last question is, in both of your opinion, is it important for Malaysia warehouse to implement smart technology and smart warehousing into their operation? If no, why? If yes, why? Like for example to keep up with demands or customer preferences or to have a advantage in the operation field. Or maybe no because the current demands is not that overwhelming or Malaysia warehouse market currently does not require that much automation or technology.

Interviewee 1:   Maybe Sally can answer this because you talk to customers most of the time, you know their needs, you know their expectation.

Interviewee 2: Technology implementation is a must la. If you are asking us, right, if, let's say for our current warehouse, so the next technology, what do you want to look for? So, we were thinking of example for example only, example here like RFID technology, with this RFID technology it optimizes the pick and pack processes, it can count the inventory fasters and it can reduce error. In fact, if an item comes into the warehouse, it automatically tells you how many quantities rather than you count manually. So all this is ongoing if you see.

Interviewee 1: Sorry Sally we lost you. Can you hear me?

Jia Xiang: Ya, only Ms Sally cannot hear. Maybe is connection problem.

Interviewee 1: OK. maybe I take over from Sally. Yes. Definitely the demand is growing for smart warehouses, but company or warehouse operator like us we don't jump to the pentagon that everyone is doing, we also do. But feasibility study is quite important. You need to evaluate.

Interviewee 2: Sorry, my line cut off.

Interviewee 1:   I was telling them, yes, the demand for all this smart warehousing is growing but warehouse operator will not jump into the pentagon simply because people are doing. Feasibility studies is very important whether the customer are willing to pay or not for this kind of warehouses or not. There are many types of warehouses, so you have old school one, you have a smart one. So old school of course the prices are much cheaper. So smart one whether the customers are ready to pay or not. Sally, you want to add on anything?

Interviewee 2: But gradually it will go. I was saying just now I was on the line and suddenly my line cut off. Do I need to change my mobile

immediately or my data immediately. These are some of the things that we need to consider like what John mentioned we really need a feasibility study and the current needs of the customers at this stage. If you're staying in future, of course, in future, everybody want to move forward. Even now last time we're driving the manual car now everybody driving the automated car is nobody know how to drive manual car. So it's something like this.

Jia Xiang: So in in your what is it like it is a must, but gradually.

Interviewee 2: Yes, yes, gradually.

Jia Xiang: I think with that I concluded my interview questions. So before we go, maybe we can take a group photos.

Interviewee 1: Ok.

Jia Xiang: Thank you Mr John and Ms Sally.

Interviewee 1: Right, all the best to you, byebye.

Jia Xiang: Bye by

Appendix C: Original Transcript of Interview Session with P Company

(Informant 2)

Jia Xiang: Hi Sir.

Interviewee: Hi there.

Xiao Tong: Hi sir.

Zi Xuan: Hi sir

Interviewee: Ok my apologies to be late.

Jia Xiang: Nevermine sir. It's okay. So, I will go ahead and start the interview ah sir.

Interviewee: Yup yup we can start.

Jia Xiang: A very good afternoon, sir, my name is Ooi Jia Xiang, the others two members are Teng Zi Xuan and Pang Xiao Tong, my groupmates for the research paper lah.

Jia Xiang: So before we start our interview, I would like to extend my sincere gratitude to you for accepting our interview session lah.

Interviewee: No problem.

Jia Xiang: I know your time is very precious, so I will make the interview quite clear and fast, as well as free flow lah, so it's not too strict.

Interviewee: Yep, sure.

Jia Xiang: And for your information, the interview will be recorded for our evidence purposes.

Interviewee: hmm hmm.

Jia Xiang: OK, so uh, so before our interview start, can you briefly explain your role in the warehouse as well as your experience, how many years of experience do you have in the field of your operation?

Interviewee: OK, my name is Logendran ah ok you can call me Logen. OK, I've been in warehousing for the past 13 years. But in the different company lah it's already 3 company have changed past my experience lah. OK. So currently, I'm working in PKT. In PKT is have already eight years here I join as an assistant manager and I'm now a senior manager already. OK. I've been managing few accounts lah because different account I got a different operation.

Jia Xiang: Uh, so uh, where are you mainly station at Sir. Because I know that PKT has many warehouses throughout the Klang Valley right?

Interviewee: Alright, my station in Shah Alam lah, in the HQ.

Jia Xiang: HQ. So, what type of warehouse do you operate like there are different types of warehouses.

Interviewee: OK, my one is MBN warehouse.

Jia Xiang: MBN warehouse... Can you further elaborate?

Interviewee: MBN, OK, warehouse is divided into two this. If you have freezer, you have cold product where we store. MBN is just a basic warehouse lah where you store your stock under the room temperature.

Jia Xiang: Oh OK. So, our research paper is regarding smart warehouse. The adoption of smart warehouse within the Klang Valley. Sir, are you familiar with the term of smart warehousing?

Interviewee: Yes, yes. Yeah, this is a current lah. I think most of the warehouse is moving towards that lah.

Jia Xiang: So, in your opinion, is PKT as a whole started to implement smart warehouse throughout their operation?

Interviewee: Yes, I will say yes.

Jia Xiang: Can you provide some examples of technologies that are utilized by PKT?

Interviewee: Ok currently we are using the system that's the most important one, that means that the background of the warehouse, the system, we call it WMS. Where we are, we manage the inventory, the operation. We use the system WMS system. OK, not only that our currently we already started with RPA also.

Jia Xiang: Ohh it. RPA ah.

Interviewee: Yes. RPA is stand for Robotic Process Automation.

Jia Xiang: Uh, what it helps in the warehouse. What is the like? Job scope of the RPA.

Interviewee: RPA is depend on us lah.How you want the RPA to work lah. RPA means it's a robot where he will work at the background.

OK for example you have admin staff which need to key in for example she needs to do some data entry work now daily she need to key in 1000-line item or for example 1000 line item. OK so when we bring in this RPA, this RPA will be doing her job. So, this will reduce her workload. Ah, that's the function of RPA. But RPA you can design. Uh, how you want it to behave lah. I mean, how you want it to support you in your daily task, but this you need your IT or you need if your IT is very good in engineering the RPA and then you can save cost there lah. But if you need a third-party company, who are you know expert in you know developing RPA then there will incur some cost lah for it to for you to get them to set up for you the RPA.

Jia Xiang: So, RPA can be anything lah only that what do you want the robot to do be settings.

Interviewee: Correct, correct.

Jia Xiang: So currently…

Interviewee: It's not….

Jia Xiang: Ah sorry sir you can further explain sir haha.

Interviewee: Yeah, RPA is not cheap at anyway, but if you have your in house, you know staff who can develop RPA, then there will really cost saving.

Jia Xiang: So currently PKT are using RPA as for basic data entry only, or there's other things they are programmed to do.

Interviewee: Yep, currently we are using for order processing. OK, what this RPA doing is for example we have order which sent by the customer. They normally send through e-mail. So, this order will keep on coming in only you know one day you're 500 to 900 emails that you need to read and process the order. So, what the admin will do they read the e-mail they take out the excel

you know they download the Excel they need to you know convert the Excel. Uh then upload into WMS. OK, so when the RPA come in so the RPA will be reading your e-mail, the RPA will pick the e-mail which I have ordered the RPA will convert the file and upload it to the WMS. Uh, so you can see that RP is doing the background job so the admin need to focus on the order, the order will be done by the RPA so the admin can do other job which should much more value added. Uh, so these RPA is very, very helpful for a daily activity lah in warehouse. Then it's all depends on how you want to design the RPA so yeah; this does some brains for me. You know need to understand the concept and then you can know how to fit the RPA into your daily workload.

Jia Xiang: So, RPA is software lah?

Interviewee: Yes, you're right.

Jia Xiang: OK, OK. So are there other types of technology being in the, uh, implemented like physical technology like Sensors and RFID as such.

Interviewee: Yeah, we have RF scanner. We are using our RF scanner lah. For example, you know the RF to scan the QR code, the barcode. Uh to support an operation.

Jia Xiang: So, with this much of technology in your warehouse, does the company have any future technology that had in mind to implement? Considering any types of other future technology to implement.

Interviewee: Yes, if you ask me. Yes, we have. But it all depends on the on the operation needs. Does this technology really help or doesn't it really necessary for the time? It all depends and the costing as well because some operation you don't need too much technology is just a very simple operation so it can be done by manually. But some operation yes you need this technology to

be in. That's where your cost factor all this you need to do the study lah but there's a lot of technology outside where now you can see that they have automated uh racking system, you know uhh, ASRS? uh forgot the name.

Jia Xiang: Auto Storing and Receiving one?

Interviewee: Uh, ARAS? … I forgot alamak

Jia Xiang: Yeah, I think it's ARAS.

Interviewee: Ah It's something like that lah later you can Google lah. Most of the electronic warehouses are using this right now. Depends on what product are. If all standardized boxes, then you can use this automation. It all depends on the operation needs.

Jia Xiang: OK, so do you have any technology in mind that you are thinking to bring in into your warehouse?

Interviewee: Robotic. Uh How do I can elaborate…hmm forklift you know forklift is now driven by human? They are forklift which is robotic forklift.

Jia Xiang: Yeah.

Interviewee: Where it used sensor to move one location to another location, all this will be very supportive for the heavy operation lah, depends on which operation lah.

Jia Xiang: With technology, we know that sometimes it's not that reliable. Do you think that the technology that is implemented in your warehouse currently is reliable?

Interviewee: Yes, I will say yes. For example, the WMS system is very helpful for the inventory, accuracy. You know it helps on the efficiency as well. WMS not only managed the inventory of the warehouse; it does support the operation flow as well. How do you scan, you know how you do the receiving all the checkpoint. Previously we have excel to write down all the numbers. You know, but now the system capture everything is

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all stored in the system and its very user friendly and you can get the information at any time whenever you want it. Now it's not that you have to go back to search back all the documents a few years back transaction and now we see with a single click you can check two years back transaction 3 years back transaction you know to track back your movement if there's stock missing or whatever.

Jia Xiang: So, it's basically are in your fingertips like the information.

Interviewee: Correct. The way it's very good luck to have this technology of WMS in the warehouse rather than managing manual ways using excel.

Jia Xiang: So how does the technology help to improve your performance just now you have briefly touched on like it helps to like process a ton of orders through e-mail. Then are there any other performance improvement?

Interviewee: Oh for example in a warehouse when you do outbound activity OK when the operator goes to the location, they pick the stocks. If we have technology there, we just use the RF scanner. We scan the location, we can the part we confirm. That means it's confirmed pick for example. OK so there you simplify the process, once you bring the curtain out, you need to send to another department where the colleague, the checking and the console department. OK, since we have a technology there, so you can keep the checking department because when you pick, you reconfirm you pick the right stock. If you pick the wrong stock when you scan the barcode, you will not accept. That's mean from there you only do two jobs at one time. You already confirm you pick the right item, then you already did the checking as well which is done by the system is not human, so the human will confirm whether the part is correctly picked or not. OK, so you keep one department, but if you do this in manual. You need the checking department because you don't

know whether Picker picked the wrong or correct curtain at the right location because there's no confirmation over there. Uh. See this technology? You keep one. You can save your cost there for that account.

Jia Xiang: Ohh, as well as eliminating the error of picking the wrong curtains.

Interviewee: Alright. The system would be very helpful.

Jia Xiang: And I'm very familiar with this because I used to work at Schenker, so I know the picking process for almost similar.

Interviewee: Yeah.

Jia Xiang: What other benefits do you see with the implementation of technology will bring to your warehouse?

Interviewee: Hmm. Cost saving lah, you reduce overtime. You know you save costs, then you save a lot of time. Some more what. Then when you touch on environment when you use for example forklift which is operated by electric, we got a current one where using the battery water OK the new technology is the MHE batteries are electric batteries. Which is last longer working hours compared to the classic forklift which using the water battery. That mean the moment the water battery dry you have to park the machine you have to service. You will take another one or two hours or three hours for example. Half day to recharge back the battery, but for electric.

Jia Xiang: So, uh, back to the reliability question, do you have a?

Interviewee: You line breaking?

Jia Xiang: Sorry Sir. Sorry for the interruption. Back to the reliability questions. Is that do you have any like? A distant downtimes problems like breakdowns or such. Is it frequent like the system breakdown?

Interviewee: Uh. The current one is much more reliable because we are using the cloud. OK, as long you have Internet you can access the cloud anywhere, anytime, but the classic system they use server the moment the server jam or overloaded or you know it crash. Then you cannot use the system. The system will be down. There will be a down a major downtime. But now the system more is all linked to the cloud. So if your device doesn't work, it's OK you can use another device and connect to the cloud and it's always there. The system is always there.

Jia Xiang: Uh, So, the company is currently using WMS. Are they thinking of upgrading to SAP?

Interviewee: OK. So, it depend on the customer requirements. That's mean for the operation needs some customer. Yes, we have some customer using SAP because they feel the SAP much more user friendly for their business because SAP system is like overall it's not only the warehouse, it linked to the finance, it linked to the HR. It linked to the marketing. It's all linked. SAP system that's especially SAP system. Some company SAP is not cheap anyway, some company they're willing to spend to get the system. Then they prefer to use that system, whereas for WMS is only focusing on warehouse, it's much more detail and you can you can modify the system according to your needs but SAP no because SAP is interlinked with other other department finance. You know the moment you do some fabrication or whatever in the SAP. It's you need to do a major change.

Interviewee: Ooi is missing.

Jia Xiang: Sorry sir. technical error today my hostel is down for maintenance. Bad timing for me.

Interviewee: Where are you all staying? UTAR where PJ or?

Jia Xiang: Uh. Kampar, Kampar, Kampar.

Interviewee: Ohh you all from Perak. Okayy.

Jia Xiang: So just now you said that, uh, the companies using cloud computing are for storing their information. So, do you guys ever face any like Internet instability problems?

Interviewee: OK, well. OK. OK, that is so depends on the customer as well. Some customer they willing to pay their own dedicated Internet line. Some customer did not willing to spend because if you want have a dedicated line, if you got time can Google Dome "D O M E" DM does provide this facility for customer who willing to have their dedicated line then no one can interfere their line, their line is only for them the one the rental per month is from RM5000 per month. Just for Internet only you know.

Jia Xiang: Wahhh..

Interviewee: You know some customer they willing to pay, they want to be secured. They don't and they want to, you know, to transfer us or you know. Uh grabbed the data or whatever, so they're willing to spend on that. But some customers, they not willing to spend that much per month, so they use the normal UNIFI service. So, UNIFI is depends is TM down, then we are down.

Jia Xiang: So, stop the whole entire operation lah?

Interviewee: Uh, that's why we need to have a backup plan. If the system is down, we go back to manual. That's always the business contigency plan lah.

Jia Xiang: Contingency plan?

Interviewee: Uh contingency plan yes.

Jia Xiang: OK.

Interviewee: It depends. Uh. On the customer itself lah. Some customers they don't mind. OK, system down. OK, all done. Wait until the system is up. But some no the business need to run. So, we have this big PCP process.

Jia Xiang: Uh, so with I think the company has implemented these types of technology for many years really. So, have you face any challenges during the installation period and after the installation period?

Interviewee: Yes, there's always will have challenges when you installing a new system. Because they need to fine tune to the current operation. Uh, so there will be a challenge, but now I see the recently we had the migration system migration, it was quite smooth because all of them they know already what challenges and what, what trouble that they were you know they know how to troubleshoot so. Be implement what they can eliminate lah the downtime.

Jia Xiang: Oh so if you are implementing unfamiliar technology there will be like a trial period that allows the employees to get familiarized with the new technology, especially the IT department, correct?

Interviewee: Yes, you're right. Normally. For example, if you're gonna implement a new system, so what we do, we create a task force, OK? It's gonna be a workshop for maybe a month OK, before we implement the system. OK. In this this process where we study where IT, the operation team, we involve them, we go process by process to understand then from there we will share this to the IT department. Then we ask them to fabricate or redesign the system to suit their operation. Because different operation at different requirement. So, the IT which means the software developer have to create a system which is suited to their operation.

Jia Xiang: OK.

Interviewee: Some operation required checking some operation don't require checking something that depends on the requirement of the operation.

Jia Xiang: Ok, in your opinion, what's your view on Malaysia's warehouse implementing smart warehousing and smart technology? Is it in a positive way like meaning Malaysia is slowly implementing this type of technology into their warehouse operation or is in a negative sense, meaning that warehouse are stubborn and they are still sticking to the traditional way of operating their warehouse?

Interviewee: OK, it all depends. Uh, you know it all will come back to the costing. If the customer willing to spend that much, then they willing to develop that much. It's all depend on the customer requirement and it's OK if the customer willing to spend they bring all the technology in OK for the customer there, there will be a competition for choosing a warehouse, OK. They will see which warehouse able to support them with technology you know to make sure they are stocks in a safe condition and you know smooth delivery，they no downtime, no failure of delivery. So, all this will come into consideration when a customer wanna make addition to choose a warehouse. If the warehouse doesn't want to grow, they just want to maintain a classic way or managing the warehouse, sure the customer won't go after them. They won't go to their warehouse should they look for a warehouse which have technology you know which have. Uh area of improvement. You know they want to develop, you know, took it all depends on a customer. There's no use we have all these technologies, but we don't have the customer willing to pay. So, it's a loss for a, for a warehouse also. Because we are in the service line, so we serve the customer.

Jia Xiang: Is it a positive sign? Meaning that the company are willing to implement this technology as long as the clients are willing to support the installation?

Interviewee: Yes, you're right. It all depends on our customers.

Jia Xiang: Then, the next question will revolve around organizational factors. So, do you think our top management of a company plays an important role in the implementation of new technology in warehouse?

Interviewee: Yes, I would agree. Yes, they should lead, they should encourage, you know, they should have more training or more exposure to the staff on hold this technology. Like in PKT we have this, we have briefing on what technology that have in the market. We get our stuff to involve in this briefing. So, they can understand where we are right now and what is happening outside world. So, when we want to implement this, they won't be shocked, what boss what you bring in. We prefer the classic way of managing the warehouse. Why suddenly you making this change? This is difficult. You asked me to use the phone kind of RF, you know, Android to scan item which they're not familiar with. So, when we start this in the early stage, when we bring the technology in, they won't be surprised. They can adopt. So, the top management plays a very important role for this, yes.

Jia Xiang: So, the top management do support the adoption of new technologies by like allocating resources to provide training for the workers to familiarize with the technology before bringing it in as well as having workers to recognize new technologies that are in the market.

Interviewee: Yes, true.

Jia Xiang: So, do you agree that top management influence the organization readiness towards smart warehousing? So, do you think your top management is the one who gets ready the organization for the bringing in of new technologies?

Interviewee: Yes, I'll say yes.

Jia Xiang: So with the organization readiness, meaning that the organization is ready for new implementation of technology, how does this readiness impact your human resources? Maybe that like they need to increase their training or hire people with specific expertise on those technologies.

Interviewee: Yes, for example, this will impact the IT department. All this new technology is all computer related cloud. So, we need a someone who really expertise and have advanced knowledge on IT to be part of the organization. Then he can spread the information, spread the knowledge about all this information.

Jia Xiang: So normally is the IT department who like, create the step by step process of how to use the technology and share with the entire organization. Is it?

Interviewee: Yes, because they need to do the study first. Whether they work to bring in or not. So, there must be some decision making there.

Jia Xiang: So, the task force usually revolve are involves your top management as well IT department together to figure out if the technology is viable or not viable in your warehouse, correct?

Interviewee: You're right. So, in this task force you have various department like finance, management, operation, marketing team, where they brain storm and they see where this thing reliable or not.

Jia Xiang: So, usually, how long does the task force conduct this type of operation?

Interviewee: Only one month.

Jia Xiang: One-month ya? Ok.

Interviewee: One month, ya.

Jia Xiang: So, with the organization readiness to bring new technology, does this affect your company culture in terms of how they conduct their daily operation?

Interviewee: Ya there will be a drastic change there. That's why we need to expose everyone on this new technology. Let them get the knowledge. Then they are ready. They just waiting when we want to implement. If we have this, we easy the job, we will fasten the process, the much more accuracy. So, the culture needs to be start earlier before we start implementing.

Jia Xiang: So, in terms of cost, when you're considering in implementing this type of technology, how big of a role does the return of investment play in your organization readiness towards smart warehousing?

Interviewee: That's why when we set the task force the finance will be there to make the decision whether the ROI is there or not. So, it's very important the task force. So, need to convince the finance la. Bring this we can get more business? You can recover back within how many years? So, all this negotiation and discussion need to be done.

Jia Xiang: Usually which level of ROI will approve like 3 years or maybe 5 to 10 years? Which one is more likable by the finance department to approve this technology?

Interviewee: For finance the shorter is better for them. For finance they prefer the shorter because they want to get back the return before the customer leave us. Because when you sign a contract with the with the client, normally is two plus one, two years or three years. Normally they won't go to five or six years because they also want an option. If this this warehouse is not improving, they have chance to jump to another warehouse where it is much more advance or much Value added. So, it all depends on how long is the contract between the warehouse and the client. If they have very long term business relation, they'll be with the warehouse for many years. So, the ROI can be much longer because the confidence level is always there and the

customer is happy with us also. So, it all depends la. The shorter, better la.

Jia Xiang: Ok. Next, we are going to move on to external factors. So, just now you did mention that, sometimes customer will look at companies which are having more fluent operation using technology, maybe they will choose companies that have more advanced technology that suit their needs. So, with that in mind, I would like to ask that do you agree that market competition is one of the factors that influence your company to adopt a certain type of technology so that you can keep up with your competitors.

Interviewee: Yes, I would agree that. That's why we always must be up to date with the current market and see what technology they have in the market right now and what are the warehouse and we are not using it and what benefit they do they gain by using that technology because a lot of technology in the market right now. So, and it all come back to the customer as well, whether we will bring this technology, will this help the customer to improve their business or not, improve on the delivery, the stock accuracy. If that really helps, then we bring it in, then we implement then we share to the customer then the customer will be happy. So, it all depends on the client la actually. Some clients did not prefer in technology like classic client, they prefer with the current operation and they say it's ok, no need to waste money on technology, try to maintain the cost within the range, don't over spend.

Jia Xiang: Yeah, somethings that not broken no need to be fixed la.

Interviewee: Correct, but some customer which is like for example like Volvo, they prefer us to be up to global level because they are global right? So, they expect that Malaysia also up to that standard. If something happening in Sweden, they expect Malaysia are able to cope with the system or the advanced level which Sweden is

going through. So, the warehouse might be able to accept that changes la. It depends on the client anyway.

Jia Xiang: With our conversation, I noticed that you said the client is the very important factor in implementing the warehouse. So, I would like to ask how usually the customer come forward to you to ask to implement certain technology or is your companies own initiative to bring the technology to the customer and ask their opinions?

Interviewee: OK, there's two ways. If the customer is a global customer, like Mazda, like Pijo, Kia, all these are from overseas. So, when they come in, they have something in their mind. So, they are expecting Malaysia warehouse to have that standard. So, they will bring that technology and ask us, ok, we have all this, do you can have it in your warehouse or not. So, we have to change according to their requirement. No. 2 is Malaysia based customer. Malaysia based customer they only know what's happening in Malaysia. So, they don't know what technology is there in the market in front from the customer point of view. They don't know what happening outside. So, when we bring a technology to them, they'll be very happy. Wow, you all have this. OK, what will be the cost? How this thing going to help the operation? How this thing can save my money. So, there's two different clients that we need to look into.

Jia Xiang: Besides customers, do you sometimes consider your suppliers and vendors on adoption of this type of technologies?

Interviewee: What is that? Sorry?

Jia Xiang: Customer is one of the factors that influence your company to adopt certain types of technology. But at the same time, does your vendors and suppliers also affect your company to adopt technology as well?

Interviewee: You say client, vendor, the IT vendor is that? All the vendor that supporting the warehouse it's?

Jia Xiang: Suppliers and vendors meaning like, for Schenker, they are warehouse, their suppliers are like DHL, Excel, those who help them to deliver the things like the suppliers.

Interviewee: OK understand. Yes, I agree. So, when we grow, we are expecting them also to come up to our standard. Because if we have all the technology but they don't have, they still will fail us anyway. So normally what we do, we have the technology we call them for a meeting, we share to them, OK, we have all the system now. So, we want to implement the system in your place. So we all can link together. Then we have live information, rather than using all the documentation for example DO, delivery order. OK, you see the future warehouse, there won't be any documentation, it's all on your phone. It's a Android device. So when you do delivery, you can see on Lazada, right? Most of Lazada they start using Android already. The moment they delivered, they just take a picture, they confirm, confirm send. Then you have a live update. You can track your shipment. So, all these are technologies. So, if the technology is only at the warehouse, but we are vendor, that means your vendor or client doesn't have these, so it still fails you anyway. So normally what we do we call them, we encourage them to have these changes now. But some vendor will say why should I take up this cost? I have no budget or sometime the warehouse had to take up the cost la just to maintain the standard and the level of service.

Jia Xiang: Basically, it's like the company influence your supplier to keep up with your own operation?

Interviewee: Alright, no choice la, we have to, because when they fit the information and they will automatically link to the system. If they're gonna give us a manual deal then anyway, we will not

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come back on a expect in everything back, put it back in the system, double work actually.

Jia Xiang: So besides are like customers and competitors, how does the government play a role in your company adoptions of technologies? Does the government's regulation or policy play a factor in you guys implementing technologies? Because sometimes the government will have a regulation or policies that control warehouse output of electricity causing warehouse to implement sensor type LED lighting for example.

Interviewee: Yes. If you see the current government right now, they are just pressuring all the business to cope with this smart. Not only smart warehouse and only smart business la. For we in the warehouse, we already start following the government regulation and they already set up already. So, we have these ROB came in after this government encouraged la. I think there's few program that government set up. I forgot the name la. It's a term. If you Google, you can find out. Government encourages logistic to have technology in their business. They promote. Even they give you some subsidized if you can implement all this robotic thing. Government encourages you to do that, but I forgot the term, you can Google you can get it, or later I text to you. I forgot already because we joined few programs with Polytech students to support their education where the student will come up with a project which encourage by the government. So, the project was sponsored by the government for all these robotic things. PKT got involved in a lot of in education this thing, but I can't remember right now, but later I can text you about what we did so you can put it in.

Jia Xiang: So, the last question for the external factors. In your opinion, what type of incentive should the Malaysia Government provide for the implementation of smart warehousing like you just mentioned, the government have programs that encourage

warehouses like what other incentive you think the government should provide so that more warehouses can like implement different types of technology in their operation?

Interviewee: If you ask me, the incentive is already there. I think the business unit they know some. Some I don't think so they know about the incentive, but like for us in PKT, we make use of the incentive that the government providing right now with all this implementation of the technology. So, there are in a lot of incentive right now. They're quite a lot, but you need time now to go and look for it in the government webpage la. They are there.

Jia Xiang: So, the PKT is like using what incentive the government gives la.

Interviewee: Yes, correct.

Jia Xiang: So, in your words that the Malaysia Government is giving a lot of incentive already. So, the only thing the government can do is like make the incentive more aware to the warehouses so that they can start to implement this type of technology. Am I correct?

Interviewee: Yes, you are right. I don't know other warehouse they aware about this or not but PKT yes, because we are also in education line, so we have all this information. We work together with the Government of Malaysia. There is a lot of projects I join so with Polytech, UUM, USM, UPM on the logistic department la. We come up with the project which is sponsored by the government but not easy to get a government sponsored la. They have to prepare the project and present to them, convince them if they are happy, then they start giving you the budget. It's not cheap also, quite a lot of money.

Jia Xiang: OK, so my last question for today's interview is that what's your take on the RFID because just now you said that your company

is using RF scanner. How about RFID? Are you guys thinking of implementing this new technology?

Interviewee: I think it's already in the market. It's already in some of the warehouse. Mostly if you want to see technology is in the electronic warehouse. We have warehouse in Penang, where our customers are mostly from electronic. There we are using robotic robotics for example, forklift, we already using robot where you will move the stop for one location to another location. That's mean the pallet from the warehouse the robot will pull the pallet and place it in the production line. We have the technology there in Penang. Most of electronic company they already start implementing this. The RFID also they are using the moment the pallet passed by the scanner, you will capture the barcode. So, you don't need the human to stand there to scan every single pellet, so the scanner is already there it just the code to be placed on the pellet and then the moment the pellet passed by the scanner, will auto capture. So, the technology is already there.

Jia Xiang: OK, so I think with that we conclude our interview session. It's quite a very informative session with you, sir.

Interviewee: Hopefully, but later I text you la. Some of the information I couldn't provide you right now. I cannot remember everything after so long.

Jia Xiang: Sir if we got any further question, can we like to contact you?

Interviewee: Yes, please. You give me a call then let me refresh back my mind. Sometime after meeting you know, blur blur like that. Actually, I got a lot I wanted to share but I can't remember few terms. But later on, I tried to text you. If you have any question, you just WhatsApp me, then I reply to you. No worries. Because this is not my first time with students, there's a lot of programs we did with Polytechnic and all these things.

Jia Xiang: Yeah. Really appreciate the time you have given to us.

Interviewee: No problem, no problem. All the best in your project paper.

Jia Xiang: OK, Thank you Sir.

Interviewee: Take care, bye bye.

Jia Xiang: Bye bye.

Jia Xiang: OK. OK. So very good afternoon. My name is Ooi Jia Xiang and two of my group research partners are Teng Zi Xuan & Pang Xiao Tong. And so, before we start our interview, I'd like to extend my sincere gratitude for you for accepting my interview session as well as the thanks to the human resource department for arranging this meeting. So, I know your time is very packed, so I'll keep this interview session clear and fast as well as small easy going like a normal sharing session? So, before we begin, can you guys introduce yourself, what's your position in the warehouse and how many years of experience you have in the field of warehousing operations? Sir, I said I think your mic's off.

Interviewee 1:   OK, sorry. OK. So let me start first. OK. OK. My name is Tan Teng Hooi. I'm basically waiting the TASCO for about 15 years, so based in the Shah Alam OK because of our TASCO where many warehouses, I was based in the station near Shah Alam that handle for a few warehouses and also the main task is to handle the warehouse operation and the current position is the branches in the Shah Alam warehouse. OK. Yeah. So, I think another person, I think this is our HR head, OK, Encik Zaki. So yeah.

Interviewee 2:   Hey. Good afternoon, everyone. I'm Zaki here from Richard Department. Uh. Thank you very much for approaching us for this interview. Perhaps we can gather a very kind of informative so-called feedback from our warehouse manager, Mr. Tan. Uh. The whole idea is for that perhaps we can become closer to each other industry and the student, industries and the student. Our main intention is that come please explore the

logistic explore the real logistic after completing your academics. Yeah, not only Utar. We encourage others university who has a kind of feel of studies in this area, Logistic. For your information, we have a collaborate with a few other universities such as a TAR College. Uh UniTen? ITM and so on that they are coming from a few backgrounds not really limited to operation they may come from come from a FAB financial business, alright. The accounting IT our platform is very huge for you all to explore. OK. Our platform is a huge enough for you all to explore. Perhaps with this interview we can attract you all and vice versa. It can be useful for you all to gain more experience. Alright, so I hope not only three of you please share the information to all your colleague to all your classmate or course mate. We are ready to accept you all the number one as an internship. Practical as and when your academic reach the syllabus and number two we are ready to hire you immediately after completion of your intern. That is our objectives. Perhaps we can also listen to every one of you what is your background, yeah perhaps. Go ahead.

Jia Xiang: So, I will start first my names. Jia Xiang. uh. I'm uh, final year student in Utar. I'm currently studying a bachelors in science logistics and international shipping. Yeah, and I'm based in Penang.

Zi Xuan: So, I'm from Ipoh. Also, a Y3S3 student, and our course is same logistic and international shipping. Yeah.

Interviewee 2: Logistics and international shipping? That's good. That's good.

Zi Xuan: Yes.

Xiao Tong: I'm Pang Xiao Tong and I'm also a final year student then we are three also in the same course, logistics and international shipping, I'm also from Ipoh.

Interviewee 2: All final year students?

Jia Xiang: Yeah, yeah.

Interviewee 2: All from Ipoh?

Zi Xuan: Ooi Jia Xiang from Penang.

Interviewee 2: You are from Penang.

Jia Xiang: Yes, I'm from Penang.

Xiao Tong: Yep.

Interviewee 2: Jia Xiang from Penang. Two of you from Ipoh.Y eah. Where is your preferred location to start your career?

Jia Xiang: I think prefer career start close to home initially lah.

Interviewee 2:   Close to home. OK, OK. Penang we have in Juru we have in Bayan Lepas.

Jia Xiang: Yeah, I live near Bayan Lepas very near only.

Interviewee 2: OK. Close to you. OK. Ipoh is at Persiaran Klebang.

Xiao Tong: Klebang?

Interviewee 2: Our Ipoh branches in Persiaran Klebang, right? So perhaps, yeah. Let's see how the after completion of your course, please tender your resume. Let's let's take a look of the opportunity. Right.

Jia Xiang: OK.

Interviewee 2: OK, today, today we will try to confine for this interview first.

Jia Xiang: OK, sure.

Interviewee 2: Alright, go ahead and proceed.

Jia Xiang: So, as you know from the e-mail, my interview question will revolve around my research paper, which is the factors that affect adoption of smart warehouse in Malaysia. So, the first sector of question that I'm going to ask is revolve around technology. So, before I ask indeed ask further question, I need

to ask are you guys familiar with the concept of smart warehousing?

Interviewee 1: I yeah.

Interviewee 2: Ok Tan, alright warehouse expertise.

Interviewee 1: OK. Yeah, basically, I think, uh, I would interpret the this a smart warehouse, something like will be automated or maybe equip some the high technology and also some this. Tools that could be helped in our operation day-to-day operation, but basically for TASCO, we are not into that level. Because we are handling a variety of the customer and industry example, we handle for the ENE product OK because we as a service provider, OK, we have the so-called many of the customer OK in the this. Yeah. ENE and some retail and also some are narrow space also we have. And furthermore some.

Interviewee 2: What... Tan Tan, what is ENE? I think they are don't know what is ENE.

Interviewee 1: Yeah. yeah. Yes, please. Uh Electrical and Electronic example in the market you can see some the Panasonic, Sony, NEC. OK all this. Uh. At least I've been.

Interviewee 2: You know the TV? the aircon.

Interviewee 1: Yes.

Interviewee 2: Audio video product finish good that is called ENE, including the instrumental is ENE Yamaha? Tan?

Interviewee 1: Yes, correct. Yeah. Yeah. OK. Yeah, yeah, some others. Like we do have this musical instrument example Yamaha and also the Roller also is one of our major customers. OK, so for TASCO. We don't. Uh, categorize as smart warehouse. OK, we are still. A lot of these are manpower doing the things by the barehand and some also still doing the manual job.

Jia Xiang: So TASCO currently is not considered as smart warehouse, but are you guys using any advanced technology like WMS, SAP, battery powered, forklifts, sensor, LED lights?

Interviewee 1: Yes, yes. Yeah, I think all the dimension earlier example MHG WMS is a fundamental for running a warehousing like OK, we do have our own this WMS is developed and also modified by our ice cube. OK, basically we have two to three types of this WMS to suit the customer requirement and also coming to the MHG, I think it's a MHG like you say it's a forklift. Uh pallet power truck or some others. Uh is the risk taker or even this order picker. OK, this thing actually I apply in our operation day-to-day operation. Uh, subject to the customer product and also the this how we handle or secure the customer good at keeping in our warehouse?

Jia Xiang: So, the technology being implemented currently is only at base level are only like system and some electronics only.

Interviewee 1: Yes, yes, yes, yeah. To the day-to-day that sorry day-to-day that we use for this operation, something like the RF scanner, OK. Some lah not all this operation we are using the scanning OK and then some is using the conveyor also we have. But definitely not the conveyor. Like you can see in this factory, it's just a certain area that we use a conveyor to smooth the this the processing, yeah.

Jia Xiang: With the technology you have currently at your warehouse, are they considered reliable in the sense that are they data accurate? Does the system breakdown often or is the system sustainable have a longer life spend?

Interviewee 1: I would say this system is actually very helpful for our operation example. Previously we don't have any scanning for certain operation, but after that we have studied our IT and also our team to have some brainstorming section. We come up with the scanning process. This is to improve our accuracy of our

inventory and also picking and packing. Yeah, I think for TASCO I think the first thing we commit to the customer is our accuracy of the inventory. Certain with my head up to the 100%. Yeah.

Jia Xiang: So, in your experience, how does the implementation of this type of scanners and WMS help to improve your performance in the warehouse?

Interviewee 1: OK, example for the scanning. OK, before we do have the scanning process, many of the wrong product picked by the this our workers operator but after that we implement a scanning with the barcode system. It could be eliminating all the errors or the mistake happened in day-to-day operation. Yeah, beside that also I think customer also would like to see some of this live information, OK. So, when we scan the product, OK into our system, they could have the so-called and life result to see how many quantities or the output very completed as of the that time.

Jia Xiang: So, with the technology implemented in your warehouse, it benefits your warehouse in terms of easier to reach information at your fingertips concept as well as reduce in human error and provide customer with real time information. Am I correct?

Interviewee 1: Yes.Yeah, yeah, yeah, correct

Jia Xiang: So, with all those benefits and increase performance, what are the challenges that you face after implementing this technology?

Interviewee 1: Uh, OK, uh, some of the challenges we're facing, I think first is regarding the. consistency of our network or our in-house system because sometimes we do face some of the network issue. Uh, because in the Shah Alam warehouse I give an example for the Shah Alam warehouse. We do have the multi-level; we call it a mezzanine storage. So, some of the area is not connected or maybe have the poor connection. So sometimes

the IT could be having some the lost connection to our system, OK and also some wrong data transfer OK, but this is not happened frequently. I would say maybe once a month or so we can be rectified in the half an hour only. When we detected the issue, we are immediately reported to our IT or this Adams team. They will trigger. I mean they will be trigger and they solved in the probably half an hour to the one-hour time.

Jia Xiang: So OK, with the current technology implemented in your warehouse, in your opinion, is it sufficient enough for your warehouse operation to always hit a target performance or above 90 or is your warehouse looking into other technologies to implement into warehouse to help boost the performance of your operations?

Interviewee 1: Definitely, because I think for TASCO we are good with the current the technology and also the this processes that we implement to our operation, but we do have the least Kaizen culture, that mean we will have some section with the customer to discuss to how to improve the current processors or how to cut short the lead time, OK to have the better result. OK. So, we are looking for some the supplier or the partner to propose to us any new technology can be implemented in our warehouse. Uh, so this one of these is something like we can have the this is semi-auto definitely we cannot be implemented 100% fully automated but we are looking for some supplier to propose us lah actually. Yeah

Jia Xiang: Uh, so currently your warehouse operation is not looking into any technology to implement lah?

Interviewee 1: Currently no, but in future we might have because we are going for the new warehouse coming in the early or next year, probably some of the new technology, new technology will be in place, I mean.

Jia Xiang: So, in your opinion, what's your view on Malaysia's warehouse implementing smart warehousing like in the positive sense or negative sense? Positive sense meaning that the warehouses in Malaysia are moving forward more on the latest technology, the negative sign is that more warehouses are sticking to the traditional way of operating a warehouse and less implementing any types of technology.

Interviewee 1: Are definitely. I think there's will be uh Pros and Cons lah. OK example, if you're going to, uh, implement of this smart warehouse, first thing is improving our productivity. I mean eliminate the errors, OK and some others unnecessary mistake. OK, from our operation and also can get our customer to be confident with TASCO. OK, but I think another way was because we couldn't be 100% implement it because of we still have some the other the challenges need to be solved. Example, the warehouse design. OK, it cannot be compared with this technology because limitation and also the this decision by our internal I mean some of the management, OK. And also some of the this IT yeah because we are not collaborate with the some other external party yeah so this is some of the challenges we're facing now.

Jia Xiang: So, what's your view on the Malaysia warehouse scene ah? Is it in a positive or negative sense?

Interviewee 1: There is a positive, I think the demand of this warehousing is getting higher example for TASCO so. We have the high demand on our customer for because I think everyone also looking for expanding. So, they are looking for more space to bring in some the stock from oversea or even the local supplier. Uh, that's why we going to build our new warehouse to fulfil our customer requirement actually.

Jia Xiang: So, I will move on to the second question is revolving around organizational readiness. So, the first question is do you agree

that top management play an important role in implementing new technology and if so, why?

Interviewee 1:   I think this topic for this question I think yes because I think management is play an important role on this technology or even towards the smart warehouse they going to implement. I think everything that we will come out a proposal to management but again it would take some time for the management to review and also discuss internally before we can implement in our warehouse. Ya.

Jia Xiang: If there is a proposal went through, it's there any support from the top management in adopting new technology like for example providing sufficient training before the technology is implemented or allocate resources for the implementation?

Interviewee 1: I think this is the sure. I think we do have the experience to work with our supplier. For example, they going to bring some new technology definitely we need to send it our people for training for example for 3 months to 6 months, to help to adopt to the situation. Ya. Because currently we are still not to say in the traditional, but because some of the style there will be the confirm with the current processors definitely, they need to be sent it to the training.

Jia Xiang: So, with the organization readiness towards the smart warehousing, how does this readiness towards new technology impacts the human resources department? Meanings that human resource department has to increase their training for employees to keep up with the technology or hire people in expertise in such technology.

Interviewee 1: Ok, I think from the HR side, definitely we do have the yearly program to conduct the training to our staff. If we going to implement this thing, definitely there is the planning from the

Jia Xiang: warehouse side, I mean from the HR side to collaborate with some other training center, or with the others vendor to arrange for the training.

Jia Xiang: So, with the organization readiness towards the smart warehousing, how does this influence your organization culture?

Interviewee 1: Sorry come again, I cannot get your question.

Jia Xiang: So, do you agree that organization readiness towards the smart warehousing can influence your organization culture meaning how you guys operate after implementing the technology, does it change your culture in your daily operation?

Interviewee 1: I don't think so, because even we implement with the new technology, we still can maintain the manpower that we do have. Because as I said for Tasco, we don't know about the future, we still can maintain the same account, but probably we allocate to other division. Because for Tasco we do have a lot of services that we providing to the customer. Besides the warehouse, we also have other like trucking, ocean freight, or even so other services.

Jia Xiang: So, besides top management, playing a role in organization readiness towards smart warehousing, do you agree that cost and return of investment play a factor in organizational readiness towards smart warehousing?

Interviewee 1: I think this is the definitely because the wide able the technology or the new things that we going to bring in is related to our customer. So, the cost is one of the major to be consider by the management because we do have the assessment, we need to be gone on before we have to implement. For example, the customer didn't sign the contract with Tasco for the long

term for example 5 years or 10 years, it could be affected the our timeline to implement this technology.

Jia Xiang: So, the cost when implementing a technology, the cost of return usually you guys look at more long term or short-term ROI? More preferable.

Interviewee 1: Usually shorter is the better.

Jia Xiang: So, shorter is the better and also based on the contract with your client, is it?

Interviewee 1: Ya, correct. Because once we implement this technology, it could be only applied for this particular client, because we will modify or maybe design only for their product, with the contract for example after 2 years or 3 years, we might need to have the tough time to get back the similar customer. Ya.

Jia Xiang: So, if the client wants to implement this type of technology but the ROI is beyond the contract, what will your warehouse do?

Interviewee 1: Come again, sorry.

Jia Xiang: If the implemented technology ROI is well over the contracts deals with your client, will you still implement the technology?

Interviewee 1: Yes, probably yes, because we could introduce the technology to some other customer, or maybe we can approach this same customer to improve this process also.

Jia Xiang: Ok, understood. So now I am going to move on to the external factors. So, do you agree that competition in the market of warehouse operation is one of the factors that influence companies to implement new technology to keep up with the competition?

Interviewee 1:   Yes, I think the market is very challenging especially for us, the logistic, there is so many players in the market. Definitely

one of the challenges is in term of the rate and also the services that we providing to our customer. So, some customer they may look for the lower rate with the better services.

Jia Xiang: So, the rate you mention is turnover rate it is?

Interviewee 1: Something like the charges or the things that you charged back to our customer.

Jia Xiang: Do you agree that with implementation of new technology can help to boost your competition standing in the market? Meanings that you are more stand out in the rest of market.

Interviewee 1: Yaya, I think this thing is the sure because this is the something like new thing to our customer, then we can introduce to our customer. For example, we had this kind of advanced technology, then it could be help in our productivity or improve our services, so I think definitely customer would also like to see it.

Jia Xiang: So, which one do you consider more important factors that influence your company in implementing advanced technology? It is influence by the customer, clients, vendor or your supplier?

Interviewee 1: Actually, you mean client and vendor?

Jia Xiang: Client and vendor is the same thing la, I am mistake, sorry.

Interviewee 1: Ok that's why we do have the globing with some vendor to propose to us some new product or new technology, and of course the same thing also we might introduce to our client, for example we do have, sorry can you hear me?

Jia Xiang: Yes, yes.

Interviewee 1: Ok, so I think both also important for us because something is a chain, because we do need the vendor to propose the good thing, then only we can introduce to our customer, this is our

Jia Xiang: So, usually is the vendor approach you for idea on implementing this type of technology or often time you will approach the vendor or it goes both ways?

Interviewee 1: It go both ways. Because sometimes we need to exploit ourselves, example, we need to visit to some other area for example in the counterpart in the Thailand, or Singapore, or some other outstation in some other customer premises, ok, to see the technology. Then we saw this thing in place, we will pay in touch with some other vendor to know the details, how we going to have this thing in our place.

Jia Xiang: Then, for instance, how does your customer influence your implementation of technology. Does your customer are often come out to you and say, my company is currently using this technology, and I wish that your company can also implement this technology so that it would be compatible with our company.

Interviewee 1: Yes, there is some customers have such of this idea. But again, we need to check on our policy because some of the system we need to have interpretation so we take some time and also some costing will be incurred, so we will come with the discussion with customer to probably sharing the cost 50% 50% before we implemented.

Jia Xiang: So, besides your customers and your vendors, do you agree that government also plays a role in affecting your companies in implementing advanced technology?

Interviewee 1: I think yes, government also plays the part of it. Of course, we are the private sector, but definitely we do look for the government can provide us some subsidies or even some of

program that we can attend for example some of organization in the government, they will have some program for the logistics members to attend. If we do have the chances then we will send our people to attend the training or course.

Jia Xiang: In your opinion, what incentive should the government are provided so that it can increase the number of warehouses in Malaysia to implement smart warehousing and advanced technology? What type of incentive.

Interviewee 1:   I think first is training, I think to adopt to the situation and also the technology, we need to have the training for our staff, and not only for the technology, for example, some of the MHE also we need to arrange the training for our staff to operate. Besides, probably some of the technology at the oversea we bring in then we can apply with the government for the exempted for the duty to lower our cost. Because this thing is going to implement to the warehouse to boost the economy. So, possible we can appeal with the government to give us some duty exemption for the system or the technology that we bring in form the oversea.

Jia Xiang: I think with that I can conclude my interview section. That's all my question for today, very thanks to your insightful answering, Sir. But before you leave, later on I got any question regarding my research paper, can I send you an email of the question?

Interviewee 1:   Can can, no issue, I think you have our email address, we are always welcome student to join us actually, some like inquiry we are willing to answer.

Jia Xiang: Thank you sir. Bye bye!

Interviewee 1:   Bye bye.

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