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**OMNI-CHANNEL LOGISTICS CHAIN:**

**THE INFLUENCE OF REVERSE LOGISTICS FACTORS ON OMNICHANNEL FIRM PERFORMANCE**

**Doctor of Philosophy**
**(Technology, Operations & Logistics Management)**
**UNIVERSITI UTARA MALAYSIA**
**MARCH 2020**

**OMNI-CHANNEL LOGISTICS:**

**THE INFLUENCE OF REVERSE LOGISTICS MANAGEMENT ON OMNICHANNEL FIRM PERFORMANCE**

**By**

**Yee Jing Foo**

UNIVERSITI UTARA MALAYSIA
ILMU BUDI BAKTI
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Universiti Utara Malaysia

**Thesis Submitted to**
**Othman Yeop Abdullah Graduate School of Business,**
**Universiti Utara Malaysia,**
**in Partial Fulfillment of the Requirement for the Degree of Doctor of Philosophy**

**Kolej Perniagaan**
*(College of Business)*
**Universiti Utara Malaysia**

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Tajuk Tesis / Disertasi *(Title of the Thesis / Dissertation)* : **Omni – Channel Logistics Chain: The Influence Of Reverse Logistics Factors On Omnichannel Firm Performance**

Program Pengajian *(Programme of Study)* : **Doctor of Philosophy**

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# ABSTRACT

This study aims to investigate the reverse logistics system of companies in the omnichannel context. This study is derived from the concept of reverse logistics, and focuses on company practices in the omnichannel ecosystem. Current business environments are stepping into the omnichannel era, but the topic has received a lack of attention within the reverse logistics management area. In particular, a high volume of returns has enlightened the need of research to inspire the business benefits from reverse logistics, in order to potentially improve firm performance through effective and efficient reverse logistics management. This study aims to explore the abilities of reverse logistics systems, and their capabilities to conform external influences, which is represented by firm and task environment factors. A mixed methodology approach was utilized to explore the omnichannel reverse logistics system through Sequential Explanatory Design, which uses a mixed methods concept (Qual-Quan-Qual). The population of this study was retrieved from omnichannel companies which are grouped by retailers, manufacturers and service providers. Stratified random sampling was applied to ensure all categories of omnichannel companies could be included in this study. The outcomes from different stages were consistent and uniform, showing that firm and task environment factors within reverse logistics management improve omnichannel firm performance. A robust theoretical framework was developed, which may be used in future studies, including both firm and task environment factors within omnichannel reverse logistics system to boost firm performance. The results also demonstrate that flexibility, collaboration, customer, and supplier play a direct causal relationship with omnichannel firm performance. Hence, both firm and task environment factors were important in omnichannel reverse logistics to impact firm performance. This study has significantly contributed to understanding omnichannel reverse logistics implementation. This research also provides empirical evidence that both firm and task environment factors are significant in reverse logistics.



Keywords: Reverse logistics, omnichannel, firm factors, task environment factors, firm performance



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# ABSTRAK

Penyelidikan ini bertujuan untuk mengkaji sistem logistik terbalik syarikat dalam konteks omnichannel. Kajian ini berasal daripada konsep logistik terbalik dan memberi tumpuan kepada amalan syarikat dalam ekosistem omnichannel. Persekitaran perniagaan semasa sedang melangkah ke era omnichannel, namun topik ini tidak mendapat tumpuan yang sepatutnya dalam bidang pengurusan logistik terbalik. Jumlah pulangan yang tinggi telah menyedarkan keperluan penyelidikan untuk meninggikan keuntungan perniagaan dari aspek logistik terbalik yang berpotensi meningkatkan prestasi syarikat melalui pengurusan logistik terbalik yang berkesan dan cekap. Kajian ini bertujuan untuk menerokai kebolehan sistem logistik terbalik, dan kemampuan mereka untuk mengatasi pengaruh pihak luar yang diwakili oleh faktor persekitaran tugas dan syarikat. Metodologi campuran digunakan untuk meneroka sistem logistik terbalik omnichannel melalui "*Sequential Explanatory Design*" yang menggunakan konsep kaedah campuran (*Qual-Quan-Qual*). Populasi penyelidikan ini terdiri daripada kumpulan syarikat omnichannel yang yang dikelompokkan kepada peruncit, pengilang, dan penyedia perkhidmatan. Persampelan rawak berstrata digunakan untuk memastikan semua kategori syarikat omnichannel dapat dimasukkan ke dalam kajian ini. Keputusan daripada peringkat yang berbeza adalah konsisten dan seragam yang menunjukkan bahawa faktor persekitaran tugas dan syarikat dalam pengurusan logistik terbalik meningkatkan prestasi syarikat omnichannel. Kerangka teori yang kuat telah dibangunkan boleh digunakan untuk kajian masa depan termasuk faktor persekitaran tugas dan syarikat dalam sistem logistik terbalik omnichannel untuk meningkatkan prestasi firma. Keputusan penyelidikan juga menunjukkan bahawa fleksibiliti, kerjasama, pelanggan, dan pembekal memainkan hubungan sebab akibat langsung dengan prestasi syarikat omnichannel. Oleh itu, kedua-dua faktor persekitaran tugas dan syarikat adalah penting dalam logistik terbalik omnichannel untuk memberi kesan kepada prestasi firma. Kajian ini telah menyumbang dalam memahami pelaksanaan logistik terbalik omnichannel. Penyelidikan ini juga menerangkan bukti empirikal bahawa faktor persekitaran tugas dan syarikat adalah penting dalam logistik terbalik.

Kata Kunci: Logistik Terbalik, omnichannel, faktor syarikat, faktor persekitaran, prestasi syarikat omnichannel

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## Acknowledge

This research project has been studied successfully with the support and collaboration of different authorities. So, I would like to express my sincere appreciation to the people that had helped and guided me during the journey of study.

First, I would like to express our sincere gratitude to University Utara Malaysia (UUM) for provide me opportunity to get involved in the study. I had gained a lot of experience and knowledge which cannot be learnt in book through this study.

Secondary, I would like to express my special thanks of gratitude to my supervisor, Dr. Emy Ezura A. Jalil who had guided me through the study. Dr. Emy Ezura guidance helped me a lot to make this study become better and useful. Her patient and advice ensured this study to be on the right track and proceed smoothly. I sincerely appreciate what she had done to guide me.

In addition, I am very grateful to the respondents who willing to spend their precious time to assist in my study including interview and questionnaire. Finally, a warm appreciation to my family members and friends who had supported me to the end of this study. I would like to express my appreciation to my centre of the universe, my beloved, Xenia. Without you, this PhD journey would not be possible. Words cannot express how grateful I am to my beloved for all the accompany along the journey.

Lastly, I would like to deliver my appreciation to numerous proof-readers on improving this thesis grammatically. They were the professional which I thank for their tedious workmanship.


UUM Universiti Utara Malaysia

# Table of Contents



Universiti Utara Malaysia

Universiti Utara Malaysia

Universiti Utara Malaysia

Universiti Utara Malaysia

## List of Figures



Universiti Utara Malaysia

Universiti Utara Malaysia

Universiti Utara Malaysia

## List of Tables



Universiti Utara Malaysia

Universiti Utara Malaysia

# CHAPTER ONE: THE BACKGROUND OF STUDY

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## Introduction

The trend of omnichannel shopping is growing globally due to advancements in technology. This trend has been found to significantly impact companies and customers alike, particularly customers who utilize multiple online and offline channels for shopping. According to a report by PwC (2019), current customers enthusiastically use various channels in their shopping journey to purchase products or services. Statistics have shown that more than 60% of customer purchases occur through digital channels, and this percentage continues to increase every year, as shown in Figure 1.1. Besides that, customers also utilize different channels, such as physical stores and online web shops. The number of customers using digital channels such as computers, tablets, and mobile phones has increased every year, indicating that customers are using more channels in their shopping journey, as shown in Figure 1.2. This situation drives the trend of omnichannel shopping, which is defined as an 'integration of channels that allow customers to combine different channels throughout their shopping journey and use these channels simultaneously and interchangeably' (Rai et al., 2019).

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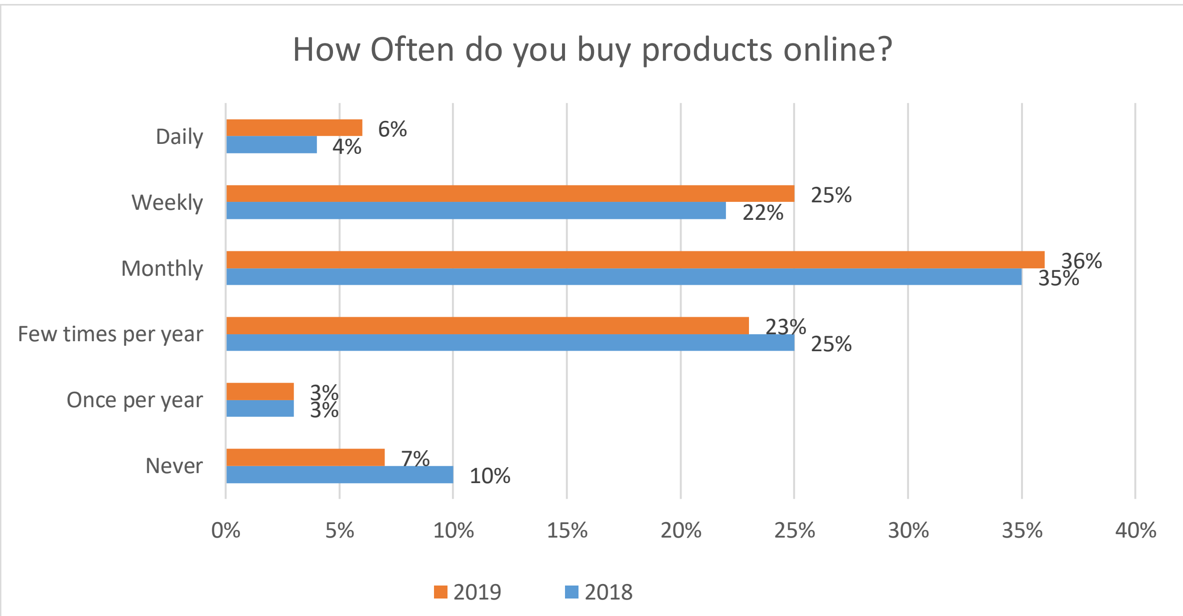


*Figure 1.1 Shopping Online Trends*
*Source:* PwC (2019)

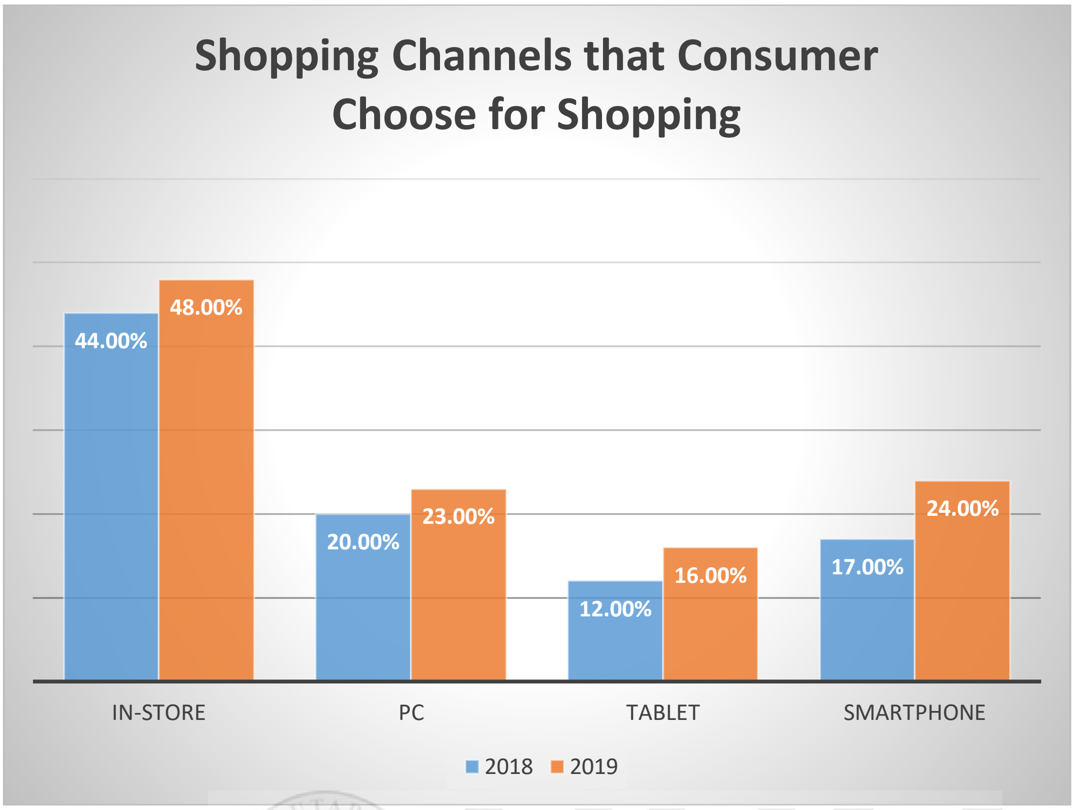


*Figure 1.2 Shopping Channels that Consumers Choose for Shopping*
*Source:* PwC (2018; 2019)

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To maximise the omnichannel shopping trend, companies need to operate on both online and offline channels. Accordingly, traditional retailers have gained entry into digital channels, while at the same time, e-commerce retailers have started operating new brick-and-mortar stores (Hübner et al., 2016; Rai et al., 2019). Furthermore, companies need to integrate both offline and online channels to improve the customer shopping experience. Online retailers are considered the pioneers in the omnichannel system. For instance, Amazon distributes their products via both online and offline channels (Simone & Sabbadin, 2018). Lazada in Malaysia has established several collection points in Klang Valley for customers to pick up their orders (Natasha, 2019).

In Malaysia, it is common for customers to shop through digital channels (Figure 1.3), with 80% of users between the ages of 16 and 64 purchasing goods and services online. Malaysians purchase different kinds of goods and services online; in 2018, the total amount spent was more than 6 billion dollars, with particular interests in fashion & beauty products

($771 million), electronic and physical media ($851 million) and travel, including accommodation ($2.759 billion), as shown in Figure 1.4. These statistics signal to enterprises that customers are increasingly making purchases through digital channels (Hootsuite & We Are Social, 2019).

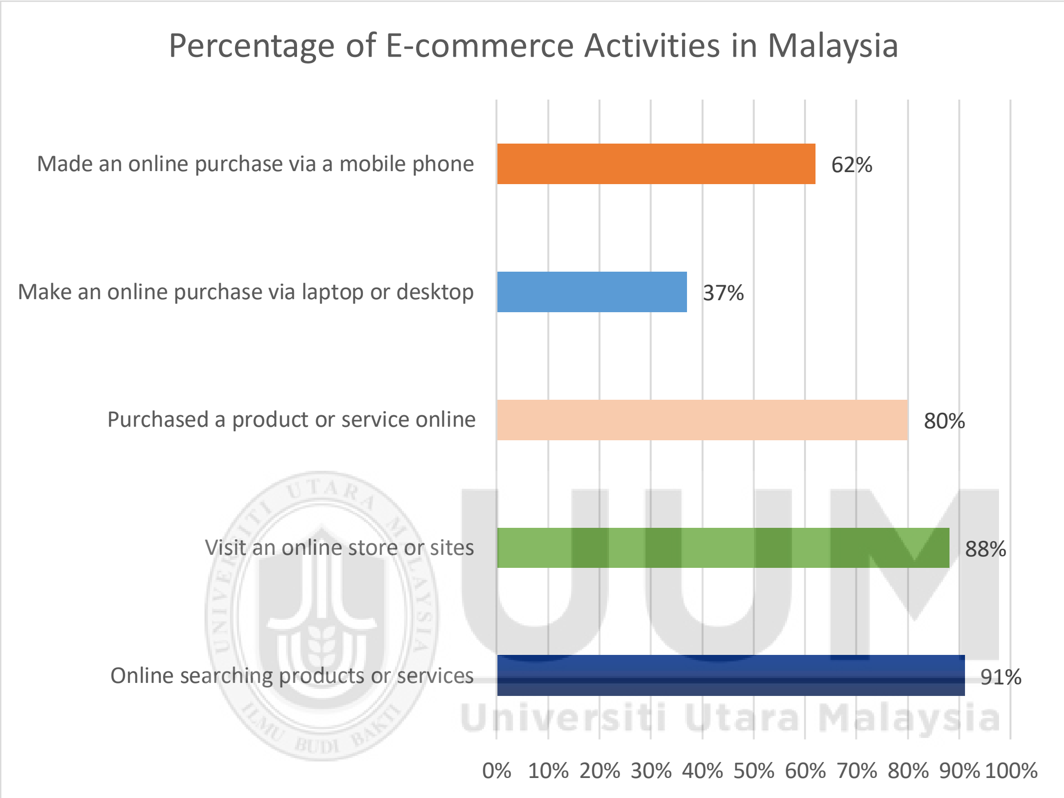


*Figure 1.3*
*E-commerce Activities in Malaysia in 2019*
Source: Hootsuite & We Are Social, 2019

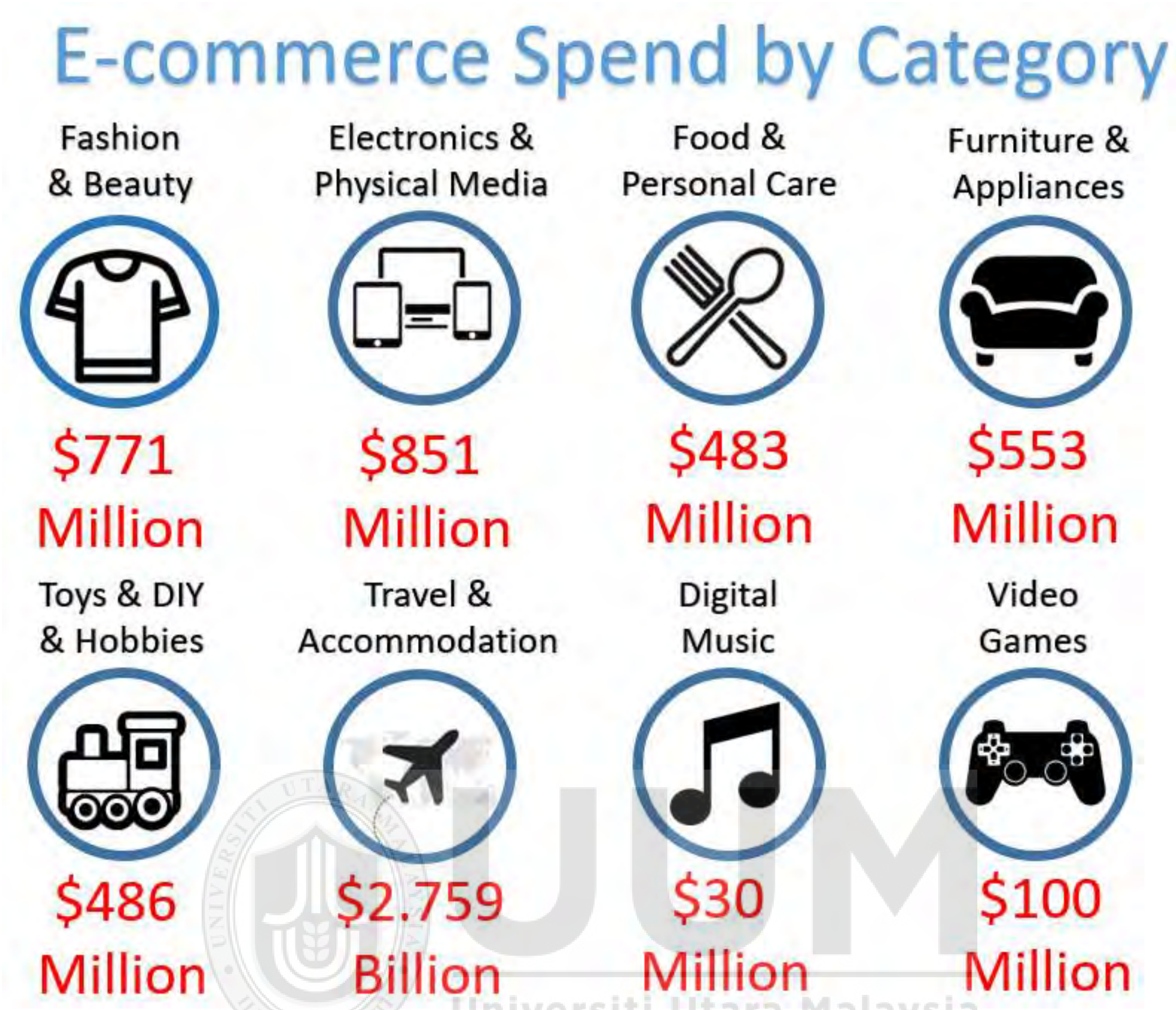


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*Figure 1.4*
*E-commerce Spending by Category in 2018*
Source: Hootsuite & We Are Social, 2019

In Malaysia, the government and Malaysian Digital Economy Corporation (MDEC) encourage entrepreneurs to participate in the development of omnichannel shopping. The Managing Director of Retail Group Malaysia, Mr. Tan Hai Hsin, emphasized that e-commerce would not be replacing physical stores anytime in the near future, but that both digital and physical channels are crossing each other's boundaries and would probably continue to rise in necessity (Kaur et al., 2019). The government has encouraged small and medium enterprises (SMEs) to participate in the omnichannel business environment. However, they may face obstacles as the trend may still be unfamiliar to them. Some studies have also anticipated the adoption of the omnichannel structure among companies in Malaysia (Kaur et al., 2019; Mahusni & Abdul Ghafar, 2018).

Hence, managers need to develop a new business logistics model to support the operations of omnichannel companies. As companies venture into omnichannel business, issues in supply chain management, such as managing inventory, returns, and fulfilment in the omnichannel companies, need to be addressed (Marchet et al., 2018; Piotrowicz & Cuthbertson, 2014).

Various research has studied the omnichannel in different disciplinary approaches. For instance, studies have been conducted from the marketing perspective (Cook, 2014; Weiland, 2016), e-commerce (Park et al., 2017), and logistics (Hübner et al., 2016; Kembro et al., 2018). From a theoretical perspective, omnichannel is still in its infancy stage. Therefore, the trend of omnichannel needs extensive research as it increases rapidly, especially in the reverse logistics sector (Hübner et al., 2016). Saghiri et al. (2017) also emphasized that reverse logistics is a critical dimension of omnichannel companies.

Customers' growing attention to after-sales services such as returns, complaints and warranties has motivated companies to focus on improving return strategies for competitive advantages (Choudhary et al., 2011; De Brito, 2004). When customers make a purchase decision, one of the primary considerations is a good return policy which includes free returns, as shown in Figure 1.5 (Birtwhistle, 2017). A report from Walker Sands (Figure 1.6) mentioned that more customers are likely to purchase online due to the availability of free returns and the ease of online returns (Jordan, 2018). Accordingly, as certain companies offer some of the most liberal customer return policies to improve sales, they also need an effective reverse logistics system (Bernon et al., 2016).

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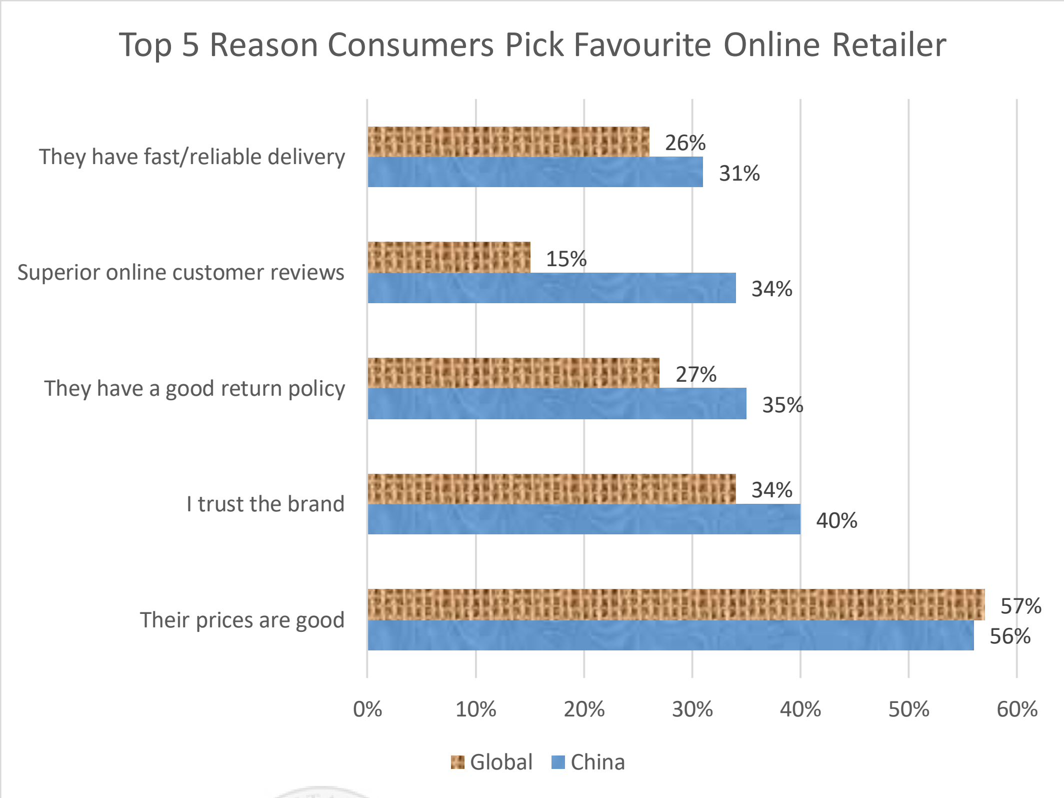


*Figure 1.5*
*Reason For Choosing A Favourite Online Retailer*
*Source:* Birtwhistle (2017)

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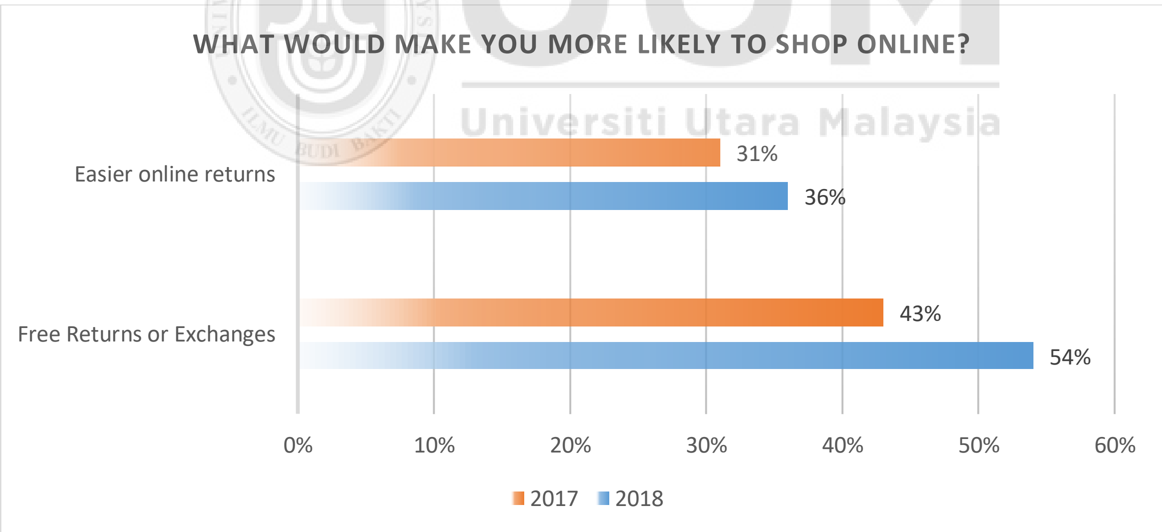


*Figure 1.6*
*Reasons Of Customers Likely To Shop Online*
*Source: Walker Sands (2018)*

Moreover, customers' behavior have changed because of liberal return policies. Many customers have adopted intentional return behaviours, including purchasing several variations of one product (for example, different colours and sizes) and returning those unwanted products. There is statistical evidence supporting the trend of intentional returning; 41% of customers have bought multiple items with the intention of returning some of the items (Return Magic, 2018). The intentional return behaviour has significantly impacted the volume of returned products and the reverse logistics processes.

Besides that, reverse logistics in companies play a critical role in enhancing customer retention. A good returns process encourages customer loyalty and improves customer relationships with the company. Based on the Narvar Consumer Report (2018), 96% of customers choose to come back to the same companies due to the excellent return experience. Effective planning in return management aims to provide a convenient and simple return journey to customers.

In reality, many companies do not consider reverse logistics a critical component of their business strategy (Petersen & Kumar, 2009; Vaz et al., 2013). They view product returns processes as a burden to the business, which reduces revenue. Hence, many companies do not have proper processes for handling returned products due to the costs and complexity of reverse logistics processes. For instance, in the United Kingdom, over four billion pounds of returned apparel were sent by companies to landfills due to difficulties in handling the returned products (Ladd, 2018). Consequently, this causes pollution and harms the environment. However, appropriate disposal strategies and returns routing may transform a cost center into a revenue source (Agrawal, 2012).

Appropriate reverse logistics strategies can help companies improve their business performance. However, improper reverse logistics activities may worsen existing performance, causing a reduction in sales and a boycott by the public (Abdullah & Yaakub, 2015). For instance, Burberry had burnt about thirty-seven million dollars of returned clothes and cosmetics, prompting fierce public criticism. To protect the company's reputation, Burberry ceased such practices and promised to design a suitable reverse logistics program to handle the returned products (Paton, 2018).

To increase their competitive edge, omnichannel companies need to adopt strategies that facilitate smooth and efficient reverse logistics processes. However, one under-investigated area in reverse logistics is the effective management of reverse flows. Dias et al. (2019) also mentioned that the concept of reverse logistics has still not matured, although some researchers are contributing to companies' implementation of return management.

As many companies do not always understand well the impact of reverse logistics, there is a need for studies to be done by researchers to investigate it further. This research proposes that implementing effective reverse logistics programs can elevate company performance by improving profit, reducing cost, enhancing customer relationships, and minimizing the environmental impact. However, omnichannel companies have faced barriers in implementing and managing reverse logistics efficiently and effectively, as discussed in the next section.

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## Problem statement

As customer expectations increase and intense competition rises, companies must simultaneously cut costs and improve customer relationships to increase performance. Over the past decade, many companies have focused on forward logistics to achieve both goals. Nowadays, certain companies have turned their attention to similar opportunities in reverse logistics by participating in omnichannel operations and extracting more value from the returned products.

As e-commerce rises, online sales have increased rapidly and at the same time, returns volume has also increased significantly. In fact, the National Retail Federation estimated that a total of four hundred billion dollars in goods and products were returned to retailers in 2018

(Ladd, 2018). Hence, reverse logistics are no longer optional in omnichannel companies. Returning purchased items has become a normal part of the shopping journey for customers. In a survey by Return Magic (2018), 81% of consumers have returned an online purchase in the last three years. The return rates of e-commerce businesses (20%) are higher than brick and mortar businesses (10%), especially during the holiday period (30%) (Garcia, 2018; Kopun, 2017). Certain product categories, such as apparel, have higher return rates than others. Moreover, the return rates of luxury goods have been found to be more than 50%, as shown in Figure 1.7 (Narvar, 2018).

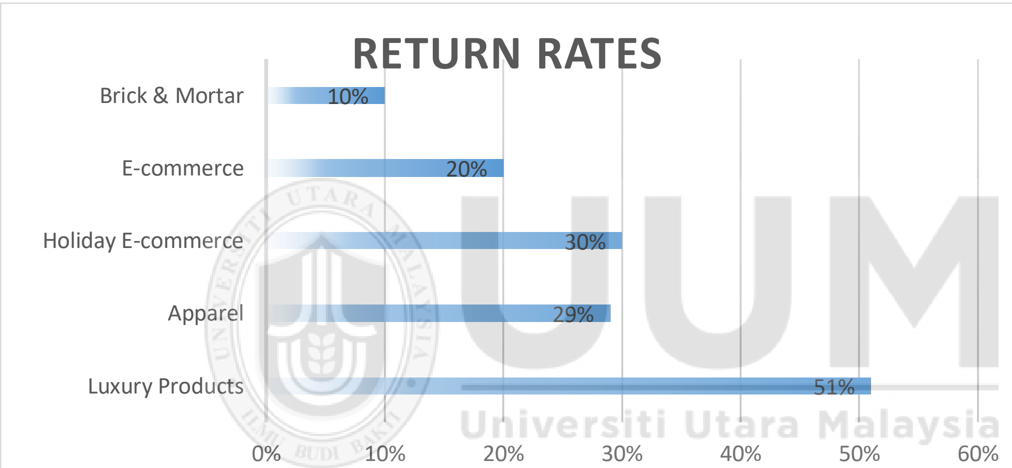


*Figure 1.7*
*Return Rates*
*Source: The Narvar (2018), The Star (2017), Emarketer (2018)*

Accordingly, omnichannel companies need an effective reverse logistics system to handle the increasing volume of returns. However, reverse logistics is still a puzzle for omnichannel companies as they are still struggling to plan efficient reverse logistics programs. Effective logistics systems designed by companies may work well in the forward distribution direction but become problematic after shifting to reverse flow (Ang & Tan, 2018). Accordingly, five billion pounds of waste is generated through omnichannel returns due to difficulties in reverse logistics (Constable, 2019).

The planning of reverse logistics programs is a highly complex and challenging task. For this reason, companies have traditionally viewed reverse logistics as a necessary evil rather than an opportunity for improved performance (Genchev et al., 2011). Companies implement basic reverse logistics systems, but still lack interest in improving reverse logistics. Due to the difficulties, omnichannel companies may be aware of the advantages of effective reverse logistics programs but still do not participate in developing reverse logistics (Vaz et al., 2013). Hence, managers need to manipulate firm factors to reduce the complexity of reverse logistics (Han & Cueto, 2016; Huscroft, 2010).

One of the issues omnichannel companies face in managing reverse flow is the difficulty in reducing the cost of reverse processes. Nowadays, companies are focusing on reducing costs to achieve competitive advantages. The primary motivator of companies is boosting forward sales, and they do not expect the need for reverse logistics (Agrawal, 2012). Therefore, scant attention has been given to managing the reverse logistics processes. The increasing return volume has significantly increased the costs of handling returns and furthermore, requires the involvement of managers in cost management. The increasing return cost can result in higher operation costs and lower profit margins. At the same time, the cost of reverse logistics is complicated and often hidden due to the uncertainty and complexity of reverse logistics (Bai & Sarkis, 2013). A survey by Ames (2017) showed most omnichannel companies lack insight into their reverse logistics cost. The cost of reverse flow may even be double or triple the cost of traditional flow (Badenhorst, 2013; Ellahi et al., 2022). Nevertheless, companies that invest in improving their reverse logistics systems could minimize these costs (Bernon et al., 2016).

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Besides that, the lack of appropriate information systems in omnichannel companies is another barrier to the successful management and planning of reverse flow. Many information systems such as enterprise resource planning (ERP), customer relationship management (CRM) and warehouse management systems (WMS) have been established in forward flow, but these systems cannot efficiently handle returned products. Many companies are still using labor-intensive strategies and manually managing reverse flow. These labor-intensive reverse logistics flows are slow and costly, which damage the company's performance. Only a small number of omnichannel companies have proper automated information systems in the return processes. An effective information system would improve the process of handling returns (Huscroft et al., 2013; Mahindroo et al., 2018a).

Despite growing awareness of reverse logistics, many omnichannel companies are not prepared to handle the challenges of handling returns. The significant increase in the returned products often exceeds the abilities of the company to effectively manage the reverse flow of rejected products originating from the market. Ultimately, most of the products may be sent to landfills, which is a waste for the company and the environment (Schoolov, 2022). Due to the uncertainties of reverse logistics, the processes of reverse logistics program planning and implementation are complex and complicated (Genchev et al., 2011). Hence, managers need to better understand the design of reverse logistics programs that could improve company performance.

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The design of reverse logistics programs needs to be adapted to complex and dynamic environmental factors to determine competitive advantages (Huang et al., 2015). Logistics managers cannot control the external environment's influence but must respond to change if required. Companies may suffer from loss from reputation and profit if they cannot adapt to changes in the environment. For instance, forty-two companies were apprehended since 2018 with compounds amounting to almost RM430,000 for the illegal dumping at Selangor, Malaysia (Shah & Iskandar, 2023). Thus, omnichannel companies need to design reverse logistics programs that can recognize and adapt to the external environment (Ye et al., 2013).

Until recently, only a few companies have been willing to manage reverse logistics effectively and efficiently, although the majority of companies are aware of the importance of reverse logistics and return processes (Škapa & Klapalová, 2019a). Omnichannel companies that are unable to handle their reverse logistics properly suffer from financial distress (Ames, 2017; Greve, 2014). Furthermore, omnichannel companies may also face losing their company's reputation. From the viewpoint of competitiveness in the business world, undertaking actions in reverse logistics is essential, but the difficulties involved have slowed down or even blocked the development of omnichannel companies in managing reverse flow. Hence, this study aims to explore and examine the factors that could assist companies to manage reverse logistics system in the omnichannel environment.

### Theoretical Gap

Investigating the relationship between reverse logistics and omnichannel companies may lead to understanding the strategic and operational planning in reverse logistics within the omnichannel business environment. This study focuses on the factors affecting reverse logistics and its effects on improving omnichannel company performance.

Figure 1.8 illustrates a four-year projection review article found from a search on Scopus (www.scopus.com) and Ebscohost (www.ebsco.com) for omnichannel in the marketing and supply chain fields. Many researchers have examined omnichannel from the marketing perspective, but there is a lack of studies investigating the supply chain in an omnichannel context. Based on the studies of the omnichannel supply chain, few researchers have discussed reverse logistics. Still, they have emphasized the importance of reverse logistics in an omnichannel environment (Hübner et al., 2016; Saghiri et al., 2017).

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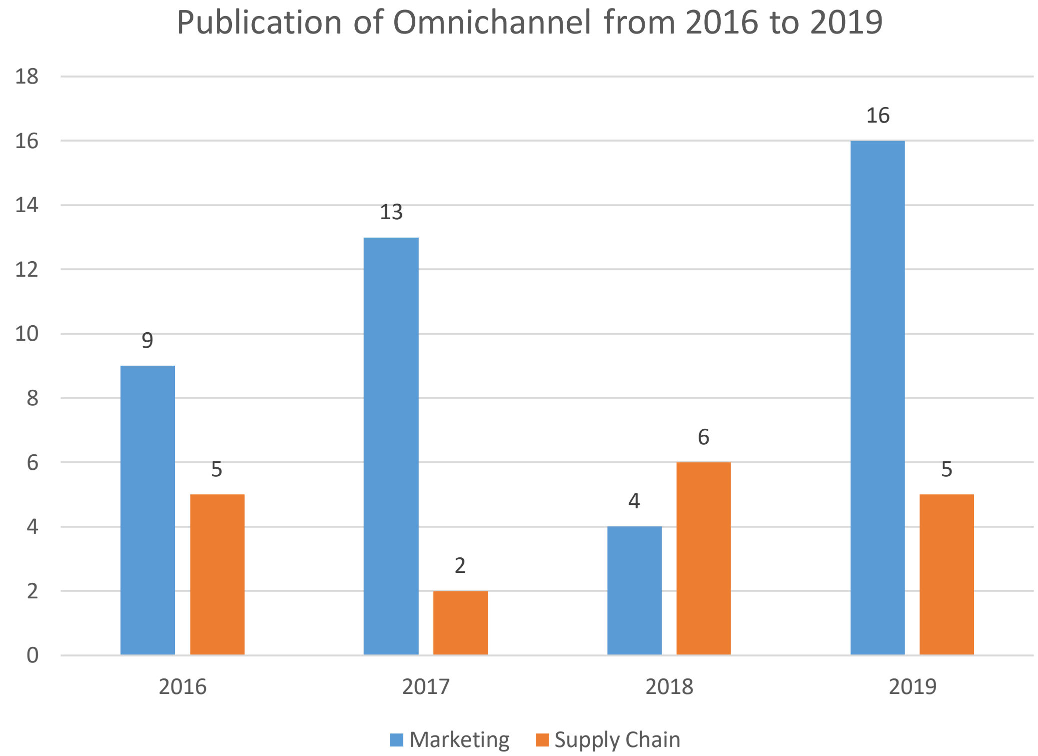


*Figure 1.8*
*Publication of Omnichannel from 2016 to 2019*
*Source: Author illustration*

Due to the competitive and dynamic aspects of the omnichannel environment, the development of an effective and efficient logistics system is more complex (Beck & Rygl, 2015). In particular, understanding reverse logistics systems in omnichannel environment is becoming more important as the reverse flow increases (Bernon et al., 2016; Hübner et al., 2016). One of the major challenges from an omnichannel context is establishing a strategy to handle the reverse flow from different channels effectively.

Despite the variety of theoretical approaches used in reverse logistics, limited attention has been paid to the theorization of reverse logistics in omnichannel environment (Bernon et al., 2016; Hübner et al., 2016). Furthermore, reverse logistics underpinnings and knowledge lenses (Carter & Ellram, 1998) are still ambiguous regarding how reverse logistics adapts in an omnichannel context. In order to provide a holistic view of reverse logistics in the omnichannel environment, there is a need to retrieve insights from other literature for each factor (Dowlatshahi, 2000). The factors proposed in this study need to be understood through various conceptual lenses and an interdisciplinary technique (Carter & Ellram, 1998).

In reverse logistics, various factors such as collaboration, information systems, resources commitment, and strategic planning (Bai & Sarkis, 2018; Genchev, 2009; Ho et al., 2012; Huscroft et al., 2013; Mai et al., 2012; Morgan et al., 2016) represent firm factors and have been identified as determinants for effective reverse logistics. The literature on logistics refers to these capability aspects or factors inside a company as 'firm factors' (Carter & Ellram, 1998; Vlachos, 2016). Prior research discovered firm factors have a significant impact on company performance (Vlachos, 2016). Facilitation of reverse logistics systems in a company, such as improved information systems, top management support, and collaboration, tends to elevate company performance (Huscroft et al., 2013; Mai et al., 2012; Ye et al., 2013). Some firm factors, such as flexibility, were not supported in previous studies by conclusive empirical findings with regard to company performance (Mishra & Napier, 2014). In previous studies, these firm factors were found to be strong predictors for reverse logistics but have not been examined from an omnichannel context.

The rise of omnichannel trend has impacted the management of companies in strategic planning for reverse logistics. Omnichannel companies are creating new operations and logistics models in reverse logistics that aim to handle returns more effectively. The operations of reverse logistics have to be integrated with comprehensively conflated backend systems (Ang & Tan, 2018; Hübner et al., 2016). The necessity of firm factors such as collaboration between different individual departments and information systems is needed to support an omnichannel business structure. In contrast, the facilitation of a reverse logistics system is related to the firm factors, which could lead to enhanced omnichannel performance. By understanding such relationships, issues of effective reverse logistics may be identified,

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and company performance can be enhanced by cultivating a more aggressive attitude towards improving company operations and strategic planning.

Besides that, the importance of task environment factors in reverse logistics also cannot be neglected. Customer, suppliers, competitors, and regulators influence task environment factors in reverse logistics systems (Carter & Ellram, 1998). Previous studies have demonstrated that task environment factors such as regulatory pressure, customer pressure, and competitor tend to influence reverse logistics implementation (Ye et al., 2013). The degree of conformity with task environment factors in reverse logistics will impact the company's performance (Huang et al., 2015; Vlachos, 2016). However, these studies somewhat neglect the potential of the influence of omnichannel in both firm and task environment factors.

Besides that, Škapa & Klapalová (2019) also mentioned that the broader concept of reverse logistics should include the entire management towards the internal and external factors, types of reverse flows and the sustainable outcome of the whole business. Thus, gaining an understanding of the holistic view in reverse logistics may provide new opportunities for researchers to identify the best managerial factors that lead to superior company performance. As the number of empirical findings that demonstrate the relationship between the involvement of RL planning and omnichannel company performance remains limited, the relevance of this managerial factor is unclear and insufficiently supported (Ang & Tan, 2018; Bernon et al., 2016; Borba et al., 2020; Hübner et al., 2016; Shih et al., 2021).

The existing literature has discussed the existence of firm and task environment factors to raise company performance (Mahadevan, 2019; Škapa & Klapalová, 2019b; Vlachos, 2016; Zhang et al., 2019). However, none of these studies tested the impact of firm and task environment factors on a company in the omnichannel environment. Furthermore, most researchers did not include both firm and task environment factors in the reverse logistic studies. Many researchers highlighted that the existence of both firm and task environment factors is important in the reverse logistics system (Carter & Ellram, 1998; Dowlatshahi, 2000; Goedhart et al., 2023; Plaza-Úbeda et al., 2021).

Hence, this thesis aims to fortify the theoretical structure in the reverse logistics field, which still needs to be explored and examined (Carter & Ellram, 1998). This study's original contribution is to evaluate the impact of reverse logistics factors in an omnichannel company and fortify reverse logistics as a critical element of omnichannel supply chain. The theoretical aim of this study is to contribute to the rise of omnichannel study in reverse logistics and determine the key firm and task environment factors that influence the omnichannel company performance. This study also provides insights beyond current multi-disciplinary studies that have only investigated such factors individually. To obtain a robust understanding of a certain phenomenon in supply chain management, especially reverse logistics, various theories from multiple fields of knowledge must be fused and further discussed (Halldórsson et al., 2015).

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## Theoretical Foundation

As a research topic, reverse logistics has gained significant interest from companies, professionals, and academia. This field has been consistently investigated over the last twenty years since the late nineties. The concept of reverse logistics rapidly gained prominence in academia after research by Carter and Ellram (1998) and Rogers and Tibben-Lembke (1998). In particular, the business community is attracted to reverse logistics, with numerous studies on business functions in the reverse logistics area, such as information technology, warehousing, operations and environmental sustainability (Dowlatshahi, 2000, 2012; Fleischmann, 2000; Mahindroo et al., 2018; Stock et al., 2006). As omnichannel shopping evolves, reverse logistics remains a critical position in the company structure (Saghiri et al., 2017). Several researchers have studied reverse logistics in omnichannel companies through tactical and operational aspects (Ang & Tan, 2018; Bernon et al., 2016; Hübner et al., 2016; Kembro et al., 2018), but the strategic issues still lack research.

The success of reverse logistics management is dependent on the companies' reverse logistics programs and the extent to which the reverse logistics system design is equipped with high accessibility and low costs. Accordingly, the reverse logistics system should have the capacity to handle returns involving different nodes for customers to return items and sort and dispose of the returned products (Bernon et al., 2016; Hübner et al., 2016; Kembro et al., 2018).

The strategic process of reverse logistics system planning is essential to improve omnichannel company performance. However, there is limited research to date regarding this phenomenon and the factors that influence the tactical operation of reverse logistics. Even though the situation is quite ambiguous, reverse channels' priority is evolving to meet omnichannel expectations (Morgan et al., 2016). An interdisciplinary study proposed the use of the empirical approach to understand the factors affecting effective reverse logistics systems, namely firm and task environment factors in the omnichannel context (Prahinski & Kocabasoglu, 2006) in order to improve company performance by having an effective reverse logistics system (Huang & Yang, 2014; Vlachos, 2016).

A more comprehensive literature review was performed to identify research gaps and establish a robust model to replicate or extend the proposed conceptual framework. The research question has to address reverse logistics in an omnichannel context. Therefore, the proposed framework is a model that has to include many theories to produce more updated and enriching knowledge through diverse theoretical angles (Alvesson & Sandberg, 2011; Vansteenkiste & Mouratidis, 2016). Initially, the model applies the reverse logistics framework (Carter & Ellram, 1998), which is a seminal paper that is critical to reverse logistics theory. It states that firm and task environment factors influence the reverse logistics systems. The theory explains that both firm and task environment factors act together to influence reverse logistics activities. However, the existing theory lacks a discussion on its influence on company performance, particularly within the omnichannel context. Saghiri et al. (2017) and Goedhart et al. (2023)indicated that reverse logistics is a critical element for companies in the omnichannel business environment, and managing reverse logistics may influence a company's performance.

To strengthen this study's theoretical foundation, several theoretical lenses were included, such as a resources-based view, institutional theory and task environment theory. Accordingly, this study applies a resources-based view (Wernerfelt, 1984) to explain that firm factors are resources owned by a company to achieve superior performance. Reverse logistics competencies in the firm factors, such as flexibility in the company, are essential to enhance company performance. Conversely, task environment aspects were not found to influence company performance. Therefore, the institutional theory (DiMaggio & Powell, 1983) is applied in this study to explain the external influences that are recognized and conformed by companies. According to this theory, the companies' strategy is influenced by the other organizations in the social system. However, the theory tends to focus on the degree of isomorphisms but neglects the effort to outperform other external influences. Therefore, the task environment theory (Dill, 1958) is utilized in the study to explain how company performance can be influenced by the degree of a company effort to conform to the task environment. The combination of both theories (Dill, 1958; DiMaggio & Powell, 1983) would allow the construction of a comprehensive conceptual model in an organizational study, but they are inadequate for this particular research. Both theories have often been utilized in reverse logistics studies, such as (Huang et al., 2015; Ye et al., 2013), to explain

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the external influences of the environment on the company, but the importance of firm factors cannot be neglected.

Hence, as both factors are crucial in the reverse logistics system, the reverse logistics framework (Carter & Ellram, 1998) is to be used as the fundamental nexus to develop a framework for connecting theories with both firm and task environment factors to the omnichannel company. The reverse logistics framework on its own may be insufficient to explain the holistic view of reverse logistics in omnichannel companies from an organizational perspective. However, researches in supply chain management are switching to integrate multiple perspectives in order to understand the various sustainable issues in the supply chain management area and reverse logistics (Carter & Easton, 2011).

The framework developed for this research applies an interdisciplinary approach as suggested by (Carter & Ellram, 1998) to address the reverse logistics issues and gain a holistic view of understanding. The reverse logistics issues are the factors that affect the implementation and management of reverse logistics systems (De Brito & Dekker, 2004). The framework is utilized to explore the role of omnichannel companies in achieving superior performance through reverse logistics systems.

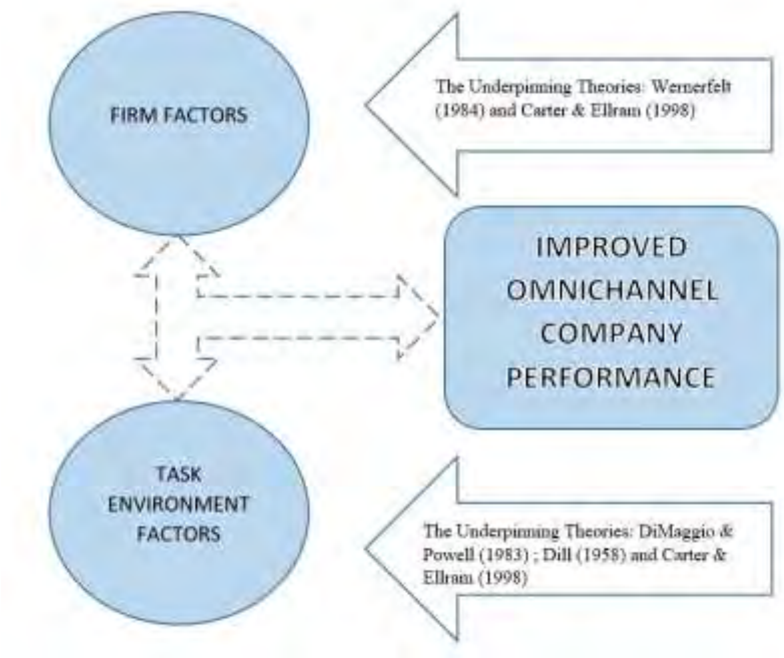


*Figure 1.9 Proposed theoretical framework*
*Source: Author Conceptualization*

The framework proposes that firm and task environment factors impact omnichannel company performance, as shown by the dotted arrow in Figure 1.9. Apart from that, it demonstrates that firm factors influence omnichannel company performance with the existence of task environment factors. At the same time, task environment factors influence omnichannel company performance with the influence of firm factors. The output of improved omnichannel company performance depends on the degree of effective firm factors and the degree of conformity with task environment factors.

Multiple underpinning theories were used to develop a theoretical framework for addressing the academic gap and current ambiguities in reverse logistics in an omnichannel context. Using numerous underpinning theories provides a more comprehensive understanding of the research subject (Nilsen, 2015). Alvesson & Sandberg (2011) also indicated that integrating multiple theories may address interesting and meaningful research questions and achieve research objectives more effectively.

Universiti Utara Malaysia

This research focuses on the vague strategic aspects of reverse logistics systems in omnichannel companies. It aims to identify the pertinent strategic factors rather than the operational and tactical aspects. In summary, this study includes the reverse logistics framework and three other major theories that have significantly contributed to understanding reverse logistics implementation in an omnichannel company. Therefore, these theories are equally important and were utilized equally to construct this conceptual framework.

### Development of Research Objectives and Research Questions

Since the rise of omnichannel supply chain, present research on reverse logistics is slightly outdated; the changes in strategies and companies have not been adequately captured. Consequently, omnichannel companies cannot manage their reverse logistics flows effectively and efficiently, resulting in poor performance (Ames, 2017; Škapa & Klapalová, 2019b). This gap needs to be addressed by appropriate research over a period of time (Bernon et al., 2016). Accordingly, this study investigates the reverse logistics systems in an omnichannel context by examining the influence of reverse logistics factors on omnichannel firm performance. To comprehensively understand reverse logistics in omnichannel companies, the study suggests firm and task environment factors as a presupposition stage to indicate the effectiveness of the reverse logistics system and thus improve omnichannel company performance. The study also intends to develop a conceptual framework of a reverse logistics system that incorporates the task environment and firm factors with the aim of improving omnichannel firm performance.

Carter and Ellram (1998) recommended using an interdisciplinary approach to investigate the reverse distribution of omnichannel companies. Thus, the study has incorporated numerous overlapping theoretical and empirical constructs from within and beyond the scope of reverse logistics, including materials from social science literature as well as strategic management. In an omnichannel context, the reverse logistics systems will impact firm performance

(Huang et al., 2015; Ye et al., 2013). Nevertheless, it is vital for researchers to understand how reverse logistics influence omnichannel firm performance. At the same time, the reverse logistics system of companies is affected by firm factors, while the task environment factors drive the advance of reverse logistics. In order to explore the reverse logistics factors in an omnichannel company, the study recommends evaluating both firm and task environment factors regarding the effectiveness of company performance in the omnichannel business environment. Hence, the research questions are as below:

RQ1: What are the different factors associated with RL that influence omnichannel firm performance?

RQ2: What are the relationships between firm and task environment factors with the omnichannel firm performance?

RQ3: What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance?

Therefore, the thesis aims to justify the suggested firm and task environment factors in the reverse logistics system. A clearer understanding of this influence may shed light on the contribution of a successful reverse logistics system to omnichannel company performance. Therefore, the purpose of the study is achieved with four objectives and three fundamental research questions. To address the research questions listed above, the following research objectives are raised:

RO1: To explore the reverse logistics factors that affect omnichannel firm performance.

RO2: To examine the relationship between the firm and task environment factors with firm performance in the omnichannel context.

RO3: To explain the relationship between the firm and task environment factors with firm performance in the omnichannel context

RO4: To develop a framework for omnichannel reverse logistics

The proposed conceptual framework may provide answers and justifications as ROs and RQs through an interdisciplinary approach in this study. The study could explain and clarify the interactions between reverse logistics and omnichannel. This can contribute to developing theories within the supply chain management discipline (Carter & Easton, 2011; Carter et al., 2015).

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## Research Scope

This research studied the reverse logistics system of companies that operate in an omnichannel business environment. Hence, this study focused on the companies in the return phase of the value-adding journey, including manufacturers, retailers, and service providers (Saghiri et al., 2017). The value-adding journey in an omnichannel reverse supply chain includes gatekeeping, collection, sortation, and disposal (Lambert et al., 2011; Muntaka et al., 2017). All these supply chain actors are essential in the implementation of the reverse logistics system. So, an effort was made to take in multiple roles of supply chain actors such as manufacturers, retailers, and logistics service providers to generalize the findings for the companies in an omnichannel environment. Some of the researchers may conduct the research on a specific domain, such as manufacturing (Abdullah & Yaakub, 2015), retail (Huang et al., 2015; Jack et al., 2010) and service providers (Bai & Sarkis, 2013). However, some studies gathered data across different supply chain actors' roles to reveal findings applicable to different domains (Ho et al., 2012; Huscroft, 2010; Janse et al., 2010; Mahindroo et al., 2018b; Starostka-patyk et al., 2013).

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Reverse logistics are now becoming a fact of life for manufacturers, retailers, and logistics service providers and are bound to increase in importance over time. Within this omnichannel business environment, many companies are now aware that a reverse logistics system can be used to secure a competitive advantage (Bernon et al., 2016; Stock et al., 2006; Stock & Mulki, 2009). Furthermore, some researchers have encouraged studies to collect data along all tiers of the reverse supply chain to explain the current business environment and managerial behaviours (Prahinski & Kocabasoglu, 2006). Hence, it is vital to conduct research that could contribute to developing reverse logistics across different roles of supply chain actors. The study obtained 448 respondents from 521,455 establishments, allowing the outcomes to be generalized to the population. Those omnichannel companies without reverse flow were excluded from the analyses. The duration for data collection in this study was short, ranging from six to 10 months.

Additionally, the organization as the unit of analysis in this study is all the omnichannel companies that had registered with Suruhanjaya Syarikat Malaysia, grouping by manufacturer, retailer, and logistics service provider. Hence, the research population of this study is the omnichannel companies that operate in Malaysia, as both consumers and enterprises have recognized the omnichannel trend. The government of Malaysia has encouraged the participation of more enterprises in the omnichannel system, thus motivating the execution of this study (Kaur et al., 2019). Initially, this research assumed that certified companies own their reverse logistics system to achieve competitive advantages. Their companies' reverse logistics systems may differ across industries due to distinct product and service characteristics. Lastly, the categories of returns included all backward-moving types of logistics, which comprise all manner of products that go back to sellers, manufacturers or places of disposal. The following section discusses the research significance that underlines the importance of this research.

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## Research Significance

This study contributes primarily to scholars and participating managers in reverse logistics and supply chain management, especially in the omnichannel context. A study on the reverse logistics factors in omnichannel companies partly implies empirical research in the field of reverse logistics. The outcome of this study is vital in the field of returns management to help managers and practitioners tasked with designing reverse logistics programs in omnichannel companies. As the reverse flow in omnichannel is complex, an effective reverse logistics system must be designed to handle the returned products (Hübner et al., 2016).

In previous studies, many researchers mentioned that supply chain management has become inadequate for business models in the omnichannel context, and that the existing reverse logistics systems do not fulfil the requirement of omnichannel business (Montreuil, 2016; Yadav et al., 2017). However, emerging research is capturing the trend of omnichannel in supply chain management. By using an interdisciplinary method, this study addresses strategic issues in the omnichannel context and contributes a new perspective to the reverse logistics literature.

From an academic perspective, this research fortifies the previous reverse logistics research findings by integrating the omnichannel situation with the reverse logistics system (firm and task environment factors) to elucidate the advancement of reverse logistics and more accurately ascertain the influence of reverse logistics in omnichannel environment. From this perspective, omnichannel performance is affected by reverse logistics factors, namely firm and task environment factors. According to the literature on reverse logistics, most studies evaluated the operational side of the backward flow (Bernon et al., 2011), and a similar approach was utilized in studies on reverse logistics in an omnichannel context (Bernon et al., 2016; Hübner et al., 2016). Many studies discuss the management aspect of reverse logistics but not in an omnichannel business environment. Hence, this study investigates the relationship between reverse logistics and omnichannel companies as it remains understudied.

Moreover, this study contributes to managers and practitioners who might decide to apply omnichannel strategies in their companies. When companies move towards an omnichannel strategy, organizational changes and the evolution of the supply chain, including reverse logistics, are involved. Even though the increasing returns further highlight the need for an effective reverse logistics system in omnichannel companies, some companies still maintain the same reverse logistics systems (Bernon et al., 2016). Current reverse logistics systems might not be able to handle the evolution of reverse channels such as the return of stock and online returns. Reverse logistics programs need to be redesigned to satisfy the requirement of the omnichannel business environment (Morgan et al., 2016). Therefore, the management of reverse logistics in omnichannel requires a change of perceptive by looking at both firm and task environment factors for managing reverse flow effectively while retaining a superior performance from the process.

## Summary

This study was conducted based on the hypothetico-deductive method, as suggested by Sekaran & Bougie (2016). The hypothetico-deductive method is an effective approach to developing knowledge to solve problems in business science. The details of each section are recorded in each chapter of this thesis report. Currently, this research proposal is divided into three chapters, and a concise synopsis of the chapters is presented in Figure 1.10.


*Figure 1.10*
*Hypothetic-deductive Method*
*Source:* Sekaran & Bougie (2016)

Chapter 1 describes the overview of the study's background. This chapter includes the introduction, problem statement, theoretical gap, theoretical foundation, and development of the research objectives and questions. These subsections provide insight into the study's problems. Besides that, chapter 1 also highlights the importance of this study and explains its research significance.

Chapter 2 explains the research background of the study in the area of reverse logistics. Previous studies were applied to fortify the understanding of the research. The first part of the chapter discusses the trend of reverse logistics in the business field, including its definition, drivers and activities. Furthermore, this chapter also discusses the application of omnichannel in the business field especially supply chain management, including the drivers and uncertainty in reverse logistics. In particular, the implication of reverse logistics factors on omnichannel firm performance is elaborated to address the research questions. Previous study findings are captured from high-impact journals and online databases such as Web of Science, Emerald, Elsevier and others. The literature review included multidisciplinary areas such as logistics, supply chain management, marketing, and organizational behavior. By reviewing numerous studies, knowledge from interdisciplinary methods has allowed the conceptual framework in this study to answer the research questions.

Chapter 3 elaborates on this study's research methodology, including philosophical worldviews, research design, research method and approach. The choice of research methodology was determined based on preceding studies and theories. The chosen quantitative research approach for answering the research questions is suitable in this study as it encloses the relationship between reverse logistics and omnichannel companies. The unit of analysis is also clearly defined in this chapter. Furthermore, the data collection and analysis methods are described along with justification from previous studies. Moreover, the issues of reliability and validity in this study are addressed, and appropriate measures were taken to increase the credibility of this study.

Chapter 4 comprises two parts. The first explains the analysis of qualitative research. The application of thematic analysis was used to analyze and present the findings. The demographic information of the interviewees is also presented to outline the relevance of the results. The thematic analysis reveals the firm and task environment factors in the reverse logistics system from an omnichannel context. The findings were robust enough to support the development of the quantitative questionnaire to collect reliable data from omnichannel companies.

The second part of Chapter 4 demonstrates the process of the quantitative analyses undertaken. Descriptive statistics are presented to show the demographics of the respondents. Correlation was exercised to investigate the interaction of all variables associated with omnichannel firm performance. PLS-SEM analysis was applied to examine the relationship between firm and task environment factors, to influence omnichannel firm performance.

Chapter 5 also consists of two parts. The first part focuses on the discussion of the triangulation phase. The triangulation approach was applied to verify the prior findings from both the qualitative and quantitative phases. The outcomes were also useful in explaining both firm and task environment factors in the omnichannel reverse logistics system. The factors discussed in the initial phase were chosen as themes for debate in a focus group. Hence, the demographic analysis of the focus group is outlined and discussed.

The second part of Chapter 5 focuses on discussing the qualitative and quantitative outcomes. The discussion starts with a reflection and discussions from both stages on the outcomes, and verifies the findings of the triangulation stage. The presentation of outcomes was cross-examined with previous empirical findings and a theoretical lens. The conclusion presents the summary of the findings from different stages and ensures its reliability and validity.

The final chapter of this research report includes essential reflections on several key elements emphasized in this study. This chapter also outlines and demonstrates the study's contribution, limitations, and future implications. This chapter illustrates a comprehensive review of the primary research outcomes. In order to answer the research questions, some additional comments and suggestions are presented that would advance the output in related fields.

## Definition of Key terms

To make understanding this thesis easier, the key terms are defined as follows:

| | |
|---|---|
| Omnichannel firms | : Agents of omnichannel systems such as manufactures, retailers and logistics service providers. They are not static and their roles are interrelated in the system (Saghiri et al., 2017). |
| Omnichannel logistics | : The integration of physical channels and virtual channels from the aspect of order management, fulfilment and logistics processes (Ishfaq et al., 2016; Sumrit & Sowijit, 2023). |
| RL system | : A reverse logistics system can be defined as a supply chain that has been recalibrated to manage the flow of products for reusing, recycling or disposal (Knemeyer et al., 2002; Mo et al., 2022). |
| RL management | : Effective process of planning, implementing and controlling backward flows of raw materials, in-process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal that enables identification of productivity improvement opportunities and achieves competitive advantage (De Brito, 2004) |
| RL factors | : Reverse logistics capabilities to reduce costs and maximise their value offer, including internal capabilities and processes that a company deploys and conformity capability to external stakeholders (Vlachos, 2016). |

Universiti Utara Malaysia

# Chapter TWO: LITERATURE REVIEW

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## Introduction

This literature review encompasses reviews of both empirical and theoretical prior studies related to reverse logistics and omnichannel. At the beginning of this chapter, the definitions and opinions of reverse logistics from previous studies are introduced. The literature review on reverse logistics includes definitions, drivers, and activities to provide a more comprehensive understanding of the reverse logistics field. After that, the discussion focuses on the omnichannel, which includes the definition and perceptions of omnichannel. Besides that, this chapter also discusses the fusion of reverse logistics and omnichannel. The concept of omnichannel reverse logistics and its emergence, as well as how reverse logistics can improve omnichannel firm performances, are discussed. Research studies from different disciplines covering strategic management, logistics and supply chain management are reviewed to support the contemporary reverse logistics system. Hence, the confluence of reviews from various studies is impactful in constructing the notion that these reverse logistics factors influence omnichannel firm performance.

Universiti Utara Malaysia

## Reverse Logistics

Logistics management is the overall process of the movement of products or services and related information in both backward or forward directions in the supply chain context, as defined by the Council of Supply Chain Management Professionals (2013). The concept of both forward and backward flows can be seen in Figure 2.1. Forward logistics is 'the process of planning, implementing, and controlling procedures for efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements' (Council of Supply Chain Management Professionals, 2013). However, goods or services not only flow in the forward direction, but goods or services may also flow backwards in the supply chain context. Reverse logistics is not similar to forward flow because of its complexity (Tibben-Lembke & Rogers, 2002).

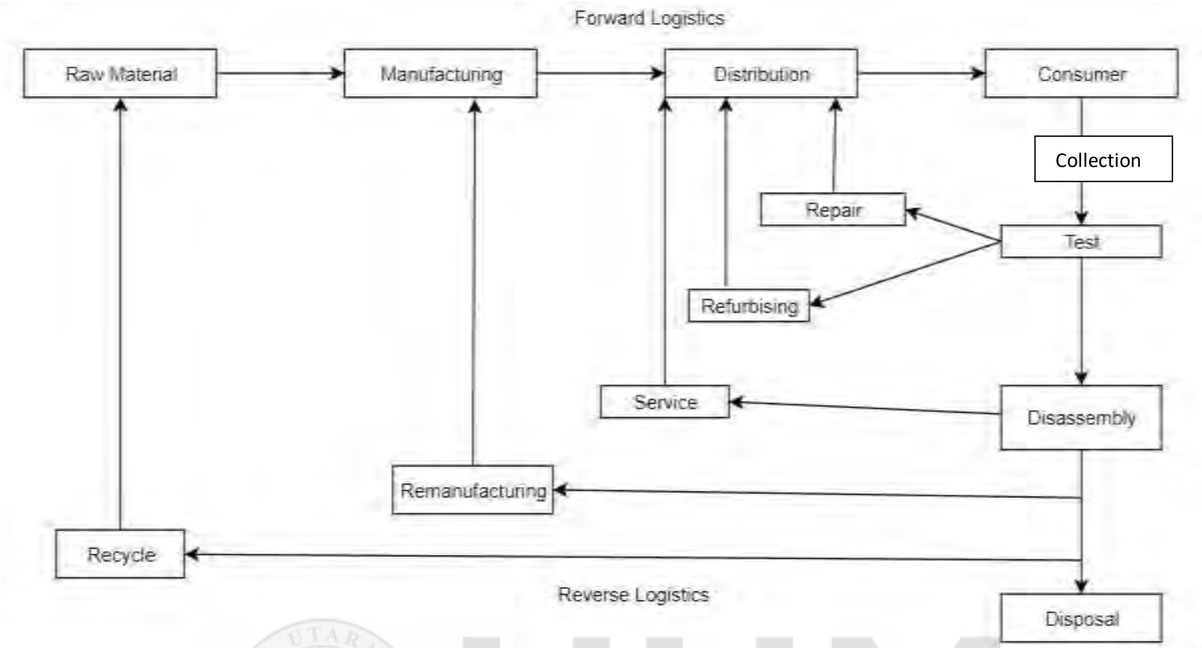


*Figure 2.1*
*Forward and Reverse Logistics*
*Source:* (De Brito, 2004)

As shown in the figure above, reverse logistics covers all the processes of moving goods and information from the point of consumption to the place that can recapture value or proper disposal (Srivastava, 2008; Tibben-Lembke & Rogers, 2002). Logistics do not end with the arrival of the products to the customers, but also refers to the probability of the product being returned to suppliers (Ritchie et al., 2000). In the 1980s, Murphy and Poist (1989) described reverse logistics as the movement of products from the consumer back to the producer in the distribution channels. However, Pohlen and Farris (1992) highlighted that reverse logistics flow could be different from the same channel. Accordingly, these researchers pointed out that the direction of products flows backwards through different channels. Reverse logistics consists of logistics activity and reverse process concepts. It manages the physical and information flow from the market to the production site, and at the same time, it is a

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distribution channel in which the physical flow moves in the opposite direction, unlike traditional supply chains (Gandolfo & Sbrana, 2008).

During the 1990s, most research focused on the narrow aspects of reverse logistics, such as recycling (Carter & Ellram, 1998). After that, some studies adopted a broader view of reverse logistics, such as Carter and Ellram (1998) and Rogers and Tibben-Lembke (1998). Carter and Ellram (1998) conducted an interdisciplinary study on the concept of reverse logistics and the efficiency of reverse flow. A more holistic view of reverse logistics describes that through the process, the company can become more environmentally sound and efficient by reusing, recycling and reducing waste (Carter & Ellram, 1998). Their study also developed propositions and a model of internal and external drivers for the reverse logistics system. A reverse logistics system can be defined as a supply chain that has been recalibrated to manage the flow of products for reusing, recycling or disposal (Knemeyer et al., 2002).

From an organizational perspective, reverse logistics is needed to handle unwanted products that can be reused or recycled (Ritchie et al., 2000). Fleischmann (2000) also underlined the importance of reverse logistics as the process of planning, implementing, and controlling an efficient and effective inbound flow and storage of secondary goods in the opposite direction from the normal method for recapturing value. The return of unwanted goods has been treated as secondary resources or raw materials in the material management to satisfy consumer demand. Reverse logistics implies the execution of the process of retrieving value from products efficiently, including collection and product recovery (Hillegersberg et al., 2001). Some researchers also argued that reverse logistics is a process that can reduce manufacturing costs and environmental pressure by remanufacturing or manufacturing in reverse (Alnoor et al., 2019). Overall, the concept of reverse logistics has changed over time.

Therefore, according to the Council of Logistics Management's definition of logistics, reverse logistics in this study is defined as:

> "The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing or creating value or proper disposal" (Rogers & Tibben-Lembke 1999:2)

This perspective on reverse logistics is suggestive of return flow back to the place of origin, but backflow may also include the return to other places for recovery. Hence, this study uses the following definition of reverse logistics from the European Working Group (De Brito & Dekker, 2004):

> "The process of planning, implementing and controlling backward flows of raw materials, in process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal."

The concept of reverse direction is emphasized through the term "backward flow" to exclude the consideration of forward recovery. Generally, the concept of reverse logistics represents an essential component of effective supply chain management. To provide a clear understanding of the role of reverse logistics in companies, the following section discusses the driving forces pushing companies to implement reverse logistics.

### Drivers for companies to implement Reverse Logistics

There are three drivers that encourage the involvement of companies in reverse logistics. These are economics, legislation, and corporate citizenship. In other words, companies practice reverse logistics because they want to gain profit from it (economics), they are compelled to (legislation), or they feel a responsibility to do it (corporate citizenship) (De Brito & Dekker, 2004). Stakeholders expect companies to achieve sustainability by accomplishing performance inclusion of all three dimensions (Ali et al., 2018).

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### Economics

A survey by Rogers & Tibben-Lembke (2001) indicated that economics was the first motivation for companies to take part in reverse logistics. Companies can gain direct benefits through reverse logistics programs. For example, reductions in the cost of raw materials would result in increased profits and revenue (Keh et al., 2012). Accordingly, it encourages companies to incorporate reverse logistics activities for profitability. For example, certain companies are willing to earn revenue by collecting and selling metal for steel production to help manufacturers reduce their production costs. The direct gain profit offers an opportunity for enterprises to be involved in the reverse logistics industry, especially since the cost of new production is higher than recovery (Akdoğan & Coşkun, 2012). Companies can also reduce operation costs, including transportation and storage costs, by applying an effective reverse logistics system. The returned products can be channeled back to forward distribution, allowing companies to generate additional income and reduce the operating costs of disposal. When customers return defective products, companies can recapture the value of the products through reuse and recycling, thus generating a revenue enhancement opportunity (Meade & Sarkis, 2002).

However, even without direct gain profitability, a company could still be involved in reverse logistics. Companies can gain competitive advantages such as anticipating government incentives and corporate reputation by implementing reverse logistics (Jayaraman et al., 2007). When companies practice reverse logistics activities such as recycling and remanufacturing, their image among customers will also improve as an environmentally sustainable brand (Agrawal et al., 2016). Customers will likely choose an eco-friendly company over companies that do not practice reverse logistics. Besides that, companies also can gain incentives from regulators, such as tax exemptions or investment allowances (Abdullah & Yaakub, 2015). For example, the Malaysian government has offered capital

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rebates of up to 50% on the purchase of recycling equipment as well as import duties and sales tax for such machines used in reverse logistics programs (Eltayeb & Zailani, 2011).

### Legislation

A legislation driver refers to any jurisdiction that mentions that a company should recover its products or take them back. Customers are legally entitled to return the ordered merchandise in many countries (De Brito & Dekker, 2004). For example, under the Consumer Protection Act 1999, online shoppers in Malaysia are allowed to return goods if customers are dissatisfied (Amin & Nor, 2013). Besides that, many countries are aware of the importance of legislation related to environmental issues. It has become common for regulators to enforce extended producer responsibility laws on companies. In Europe, the automobile industries are regulated by regulations such as End-of-life Vehicles Directive (ELV), Waste Electrical and Electronic Equipment Directive (WEEE) and Restriction of Use of Certain Hazardous Substances Directive (RoHS) to reduce waste and encourage companies to conduct product recovery management strategies (Akdoğan & Coşkun, 2012). Therefore, companies have to practice reverse logistics programs to avoid prosecution. Manufacturers in Malaysia are also subject to such environmental legislation for proper waste management. The Malaysian Environmental Quality Act 1974 has stated the responsibilities that companies need to accept before they are allowed to operate in Malaysia (Abdullah & Yaakub, 2015).

Universiti Utara Malaysia

### Corporate Citizenship

A corporate citizenship driver refers to a company's internal sense of responsibility towards society. Companies engage with reverse logistics due to values or principles supporting their role and obligations (De Brito & Dekker, 2004). Companies often have ambitions to create a high-standard lifestyle in the society in which they run their business. As awareness of social responsibility increases, customers, investors and employees will avoid companies that do not meet their social expectations (Eltayeb & Zailani, 2011). They may boycott a company if it is involved in negative corporate social responsibility (Beleya et al., 2017). Customers are more willing to purchase merchandise from a company that prioritizes corporate social responsibility in its dealings (Sharma et al., 2018). Therefore, the practice of reverse logistics in companies could increase their public image and simultaneously improve customer loyalty. Besides that, Keh et al. (2012) found that implementing reverse logistics could result in more job opportunities for locals. In Malaysia, many companies have corporate social responsibility as their objective to encourage environmental protection and involvement in eco-friendly production. Generally, the drivers of economics, legislation and corporate citizenship have motivated companies to opt in for reverse logistics programs.

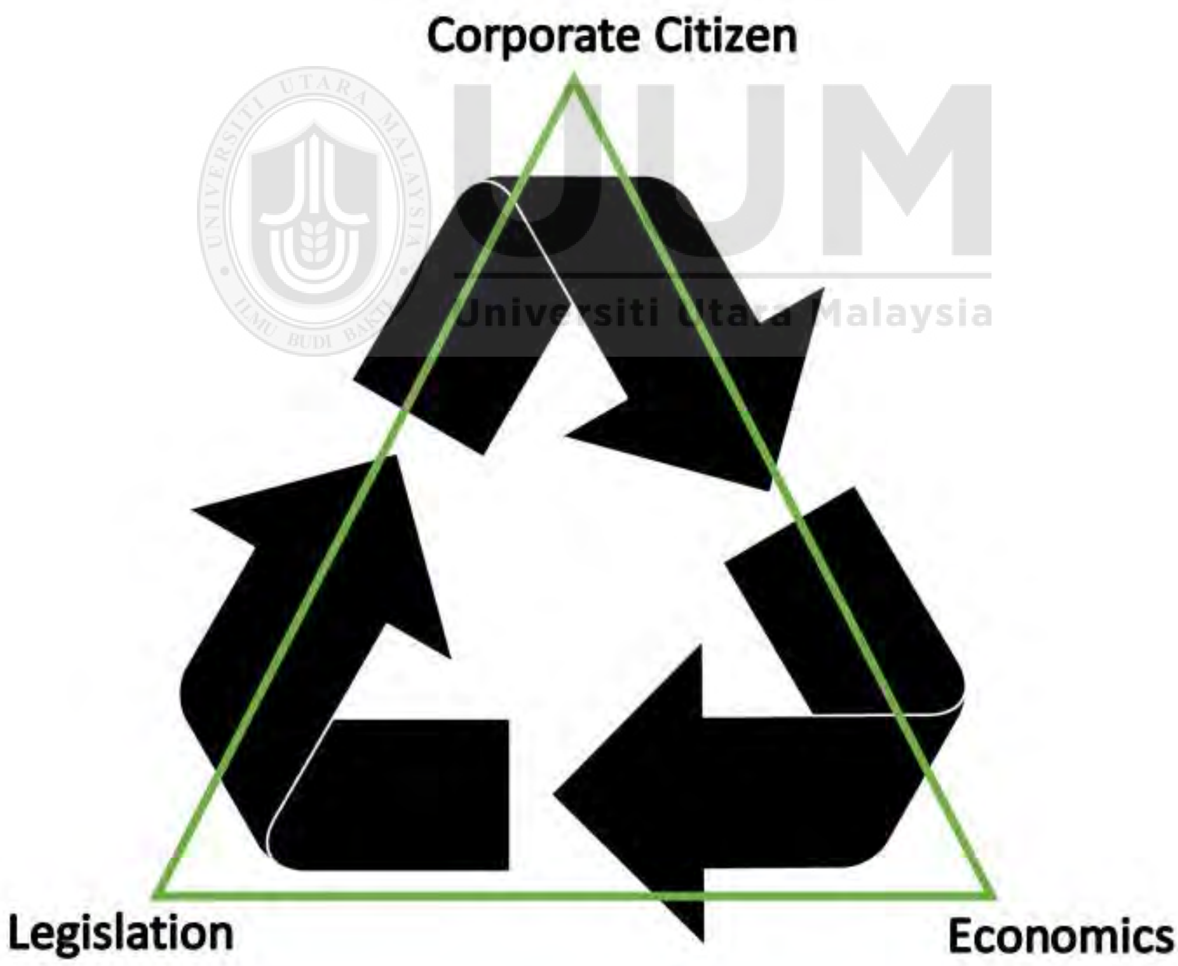


*Figure 2.2*
*Driving Triangle for Reverse Logistics*
*Source:* De Brito & Dekker(2004)

In general, companies are implementing reverse logistics programs due to these three main drivers: economics, legislation and corporate citizenship (Figure 2.2). Therefore, companies need to identify reverse logistics activities that enable them to take action.

### Reverse Logistics Activities

There are four common steps in reverse logistics programs, as discussed by most authors, including Meade and Sarkis (2002), Lambert, Riopel, and Abdul-Kader (2011) and Biswas and Abdul-Kader (2018). They agreed that every reverse logistics flow should include the steps of gatekeeping, collection, sortation, and disposition. According to Rogers & Tibben-Lembke (1998), the steps are defined below in Figure 2.3.

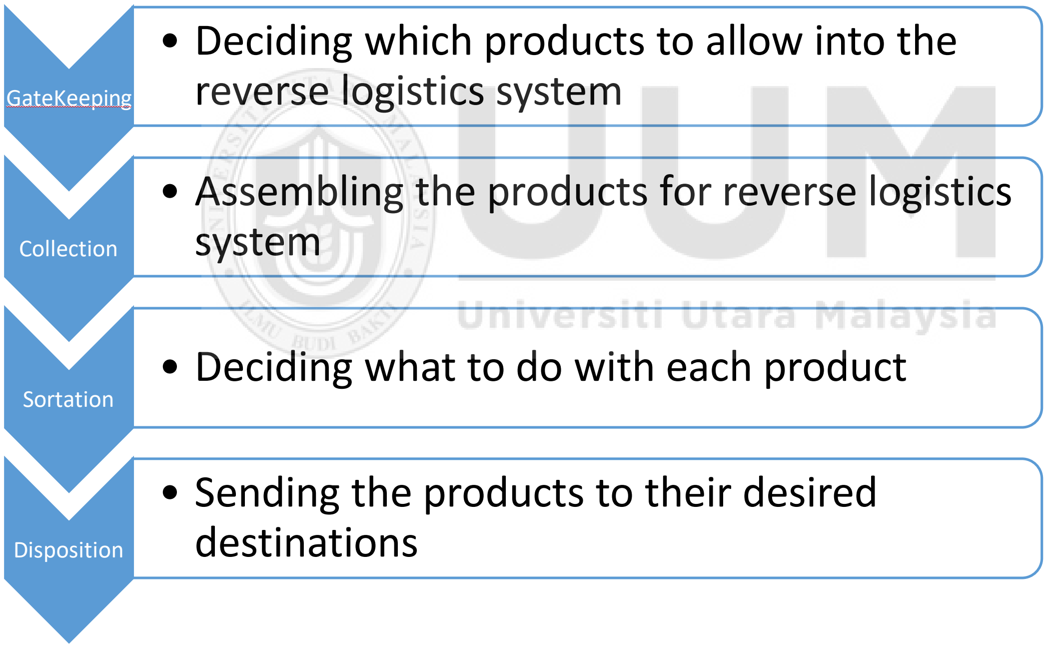


*Figure 2.3*
*Reverse logistics activities*
*Source:* Rogers & Tibben-Lembke (1998)

Gatekeeping is the first step of reverse logistics that covers screening return requests and products. Gatekeeping ensures that the product is accepted for return and will guide the product flow through the correct points (Lambert et al., 2011; Rogers & Tibben-Lembke, 1998). Collection in reverse logistics describes the movement of unwanted products from

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customers to other places for specific treatment (De Brito & Dekker, 2004). According to Bernon et al. (2016), two common collection modes are applied by omnichannel companies, namely bring-in and pick-up systems. Bring-in systems can refer to return in drop point, return in-store, or send in by courier service. In other alternative pick-up systems, companies often use their own transportation or third-party logistics service providers to pick up the returned goods from customers (Andersson & Wictor, 2018). After that, in the sortation step, companies inspect the returned products and the products are routed to the suitable recovery methods. If the quality of returned products is as good as new, the products are directed for recovery to the supply chain to reuse, resell and redistribute (De Brito & Dekker, 2004). The defective products then go through reprocessing methods such as repair, refurbishing, remanufacturing, retrieval and recycling. The outcome of the reprocessing steps aims to convert the returned product to a usable product, and it is moved back to the supply chain distribution. For example, the raw materials that are retrieved through recycling are stored and used for production (Ang & Tan, 2018; Gandolfo & Sbrana, 2008). Figure 2.4 illustrates the recovery options sorted by the required level of reprocessing in the form of an inverted pyramid.

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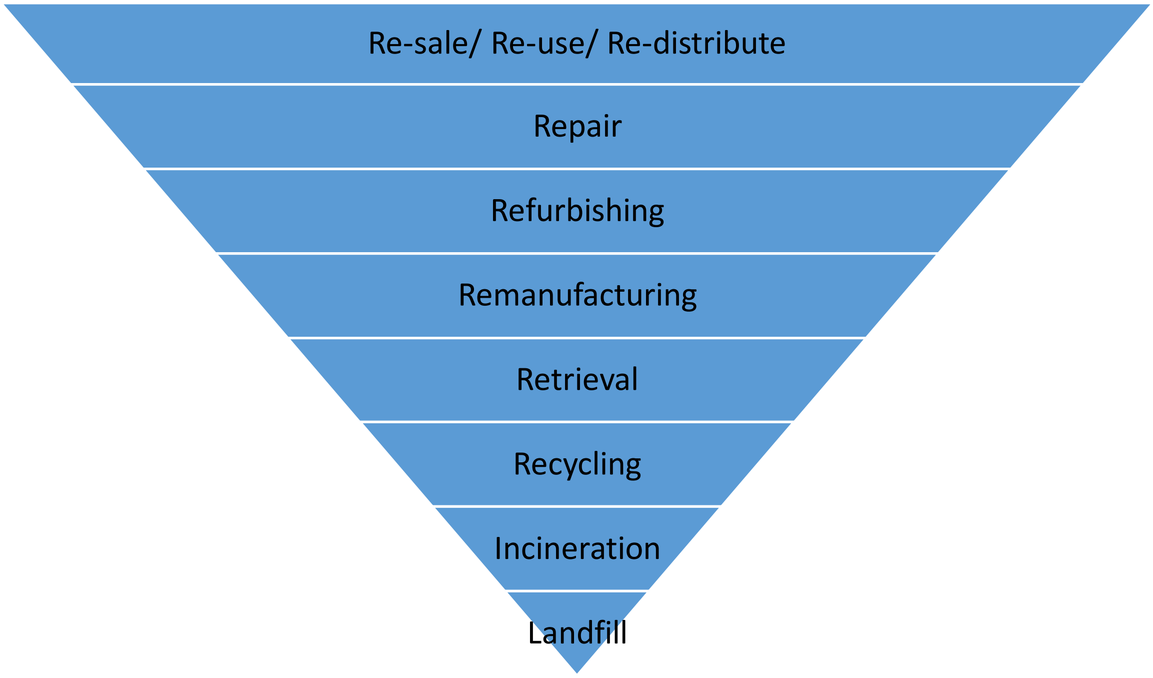


*Figure 2.4*
*Recovery Option Inverted Pyramid*
*Source:* De Brito & Dekker(2004)

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At the top of the pyramid, the outcomes of the recovery options are more likely to become usable products and modules, while the products directed to the bottom of the pyramid are likely to become material and energy. It also indicates that returns from different stages of the supply chain, such as manufacturers, distributors and customers, can decide on recovery choices based on the options in the inverted pyramid. After discussing reverse logistics, the next part investigates omnichannel to understand the changes in business management.

## Omnichannel

### Evolution

'Omnis' in Latin refers to 'all' or 'universal', and 'channel' indicates both offline channels (brick & mortar) and online channels (e-commerce). Therefore, omnichannel means all channels together (Hendriyani & Chan, 2018). The concept of omnichannel originates from business practitioners; it was initiated in 2003 as a customer-concentric idea. Best Buy, a retailer in the U.S., introduced and applied the concept when they competed with another retailer, Walmart. Best Buy offered customers the opportunity to choose their own path of purchase, from product research to post-sales service and support. At that time, Best Buy referred to the approach as ‘co-creation’ or ‘assembled commerce’ (Baird, 2015). After that, Rigby (2011) was the first to discuss ‘omnichannel’ in academic literature by studying the research of retailing. According to Rigby (2011), omnichannel enables organizations to interact with customers through countless channels that combine the benefits of offline channels and online channels for information and experience (Kim et al., 2019; Rigby, 2011). Besides that, scholars argued that omnichannel appeared from the concept of ‘click and mortar’ (Lazaris & Vrechopoulos, 2014). It indicates that Internet techniques combined with traditional physical facilities can increase customer values.

### From Single channel to Omnichannel

The progressive shift of the distribution channel started from a single channel. Before the mid-20$^{th}$ century, most firms sold their products through only brick & mortar channels such as stores or warehouses (Liu et al., 2018; Weiland, 2016). From a logistics perspective, a single channel indicates that the company only deals with one sales channel with a logistics system specially designed for this channel (Hübner et al., 2016).

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From the mid-20$^{th}$ century until the 21$^{st}$ century, online channels gained increasingly more attention due to the commercialization of the Internet. The increasing number of users able to access the internet resulted in a growing number of potential customers. Firms realized the unexploited potential of online channels such as websites and telephone ordering systems to gain more audience, greater profits and increase their brand's visibility (Liu et al., 2018; Verhoef et al., 2015; Weiland, 2016). Therefore, the commercialization of the Internet stimulated the rise of multichannel from a single channel. Multichannel can be defined as the distribution of commodities through more than one channel or all widespread channels in a different way compared with a single channel (Beck & Rygl, 2015). Höcker, Sturén, and

Troedsson (2018) also mentioned that brick & mortar businesses obtained the opportunity to establish additional channels for distribution as the online shopping phenomenon gained popularity. Primarily, the use of multichannel indicates that a company has multiple channels, such as physical stores, online websites and direct marketing or catalogues, to distribute their merchandise (Verhoef et al., 2015; Ye et al., 2018).

In view of multichannel logistics, a company can operate numerous channels but manage aspects of the logistics system separately (Hübner et al., 2016). For example, a brick & mortar firm can operate an online shop without operational coordination between the physical and online shops. In addition, Neslin et al. (2006) defined multichannel as 'the design, deployment, coordination and evaluation of channels to enhance customer value through effective customer acquisition, retention and development'. It is believed that companies wish to ensure their accessibility and availability for customers by utilizing the multichannel strategy. As channels and market digitalization increase, the multichannel is necessary for companies to survive (Verhoef et al., 2015). However, the challenge is not whether multiple channels should be used, but how to implement multichannel efficiently (Hübner et al., 2016; Melacini et al., 2018).

From a customer's perspective, customers require all the advantages companies offer through all channels, including offline and online channels (Park et al., 2017). Customers can gain more product information, read customer reviews and access alternative products through the company's online channels. Furthermore, they can improve their shopping experience by touching products and utilizing the personal service provided in physical stores. As customers demand all benefits simultaneously, the evolution of distribution channels is accelerated. Therefore, many scholars have argued that the transition from multichannel to omnichannel is driven by the customers (Berg & Tornblad, 2017; Liu et al., 2018; Park et al., 2017). However, the advantages obtained by companies are undeniable. Companies can achieve economies of scale through the potential sales increase and cost reduction through sharing resources across channels (Mladenow et al., 2018). Besides that, companies can enhance customer value and create strong brand reputation via omnichannel (Lazaris et al., 2015; Park et al., 2017). Hence, driving forces from both customers and companies give impetus to the evolution of distribution channels. Essentially, companies step into the omnichannel era for the benefits of economies of scale, channel conflict reduction, price consistency, improved integration within the company and quality improvement. At the same time, customers can enjoy improved flexibility, availability and convenience from omnichannel companies (Park et al., 2017).

Omnichannel has evolved from multichannel over the last few years across multiple industries (Berg & Tornblad, 2017; Hübner et al., 2016). In contrast with multichannel, omnichannel requires companies to manage across the channels as a cohesive whole instead of as separate components (Höcker et al., 2018). Although the transition is complicated and time-consuming, successive channel integration would help companies reduce operating costs and labour (Weiland, 2016). From a logistics perspective, omnichannel indicates that the customers and companies can no longer make distinctions between different channels, as shown in Figure 2.5. One interface enables communication between company and customer for information and operations across channels such as brick & mortar, e-commerce, m-commerce, catalogue, and social media (Hübner et al., 2016).

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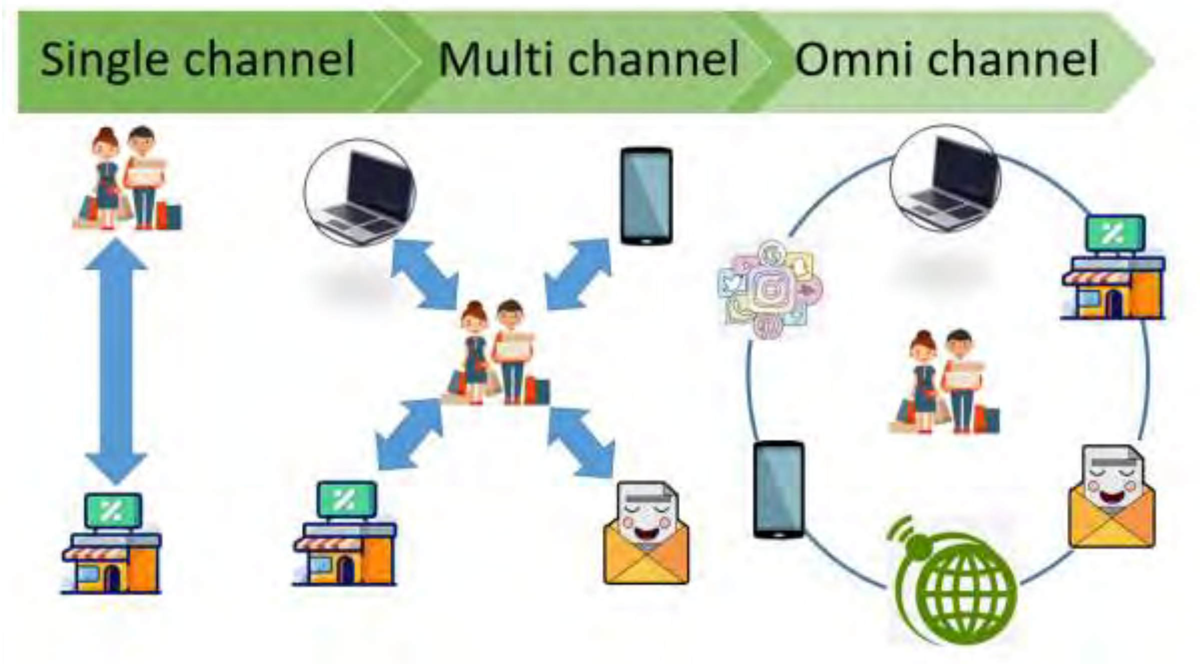


*Figure 2.5*
*Overview of differences between Single, Multi-,Omni- Channel*
*Source:* Weiland(2016)

Nowadays, omnichannel strategies are becoming increasingly important for businesses due to the growing number of channels in companies (Freitag, 2016). Numerous scholars have frequently mentioned that the omnichannel phenomenon is impacting the operations of the logistics system of the related company. Melacini et al. (2018) and Wollenburg et al. (2018) discussed the critical importance of redesigning fulfilment strategies in order to satisfy the omnichannel customer. Fulfilment strategies in terms of the delivery network, inventory management, and delivery planning differ between multichannel and omnichannel. Similarly, Kembro et al. (2018) discussed the influence of the omnichannel phenomenon on warehouse operations and warehouse design. They identified a warehouse's role and key activities in an omnichannel environment by intercepting the warehouse operation and design. Hübner et al. (2016) also discussed the distribution system in omnichannel by using a qualitative research strategy. They evaluated the distribution process between suppliers and consumers from the aspect of forward and backward logistics. Many studies have discussed the forward distribution strategy, but very few scholars have looked into the backward distribution aspect of the supply chain. Ang and Tan (2018) investigated the operation of reverse logistics by design of a decision-making framework for reverse logistics network according to the reverse logistics activities. They compared the reverse logistics activities of two companies in an omnichannel environment. It is obvious that the omnichannel phenomenon had an impact on the logistics system but there are only a few studies that have discussed the reverse logistics in omnichannel. Hence, there is a need to develop a better framework for reverse logistics in omnichannel. This study aims to gain an understanding of the influence of reverse logistics on the performance of omnichannel firms.

## Definition

For this study, the definition of omnichannel is adopted from the Council of Supply Chain Management Professionals (2013), as defined below.

> "The distribution strategy includes numerous medium of capture and delivery of freight to customers. The channels in the supply chain include distribution in a distribution center, retail store and direct to customers with instruction coming by physical purchase orders, electronic data interchange (EDI), website and mobile."

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Research on omnichannel has been extensively conducted across different industries over several years (Rigby, 2011; Park et al., 2017). The definition of omnichannel somewhat varies from one scholar to another. From the firm's perspective, omnichannel can be defined (Verhoef et al., 2015) as the synergetic management of channels that optimize customer experience and performance across channels. Similarly, Beck & Rygl (2015) mentioned that omnichannel is when a company offers services and products across all channels while customers can interact with the company across all channels. From a firm's perspective, neither customer nor company can differentiate between the channels anymore (Hübner et al., 2016; Piotrowicz & Cuthbertson, 2014). Additionally, Brynjolfsson et al. (2013) also mentioned that the differences between physical and digital channels are removed by combining the experience of sense and touch with information. Researchers commonly agree that omnichannel requires the company to manage across channels seamlessly to satisfy the demands of the customer Table 2.1.

*Table 2.1 Definition of Omnichannel*

| Concept | Authors |
|---|---|
| Firm view of Omnichannel | |
| Synergetic management of channels that enable customer experience and performance to be optimized across the channel. | Verhoef et al. (2015) |
| Omnichannel is when a company offers services and products across all channels while customers can interact with the company across all channels. | Beck & Rygl (2015) |
| Neither customer nor company can differentiate between channels anymore. | Hübner et al. (2016) |
| The line between physical and digital channels disappears as technology advancement and customer requirements increase. | Piotrowicz & Cuthbertson (2014) |
| Omnichannel merges the sense of touch and feel in physical channels with online information. | Brynjolfsson et al. (2013) |
| Demand view of Omnichannel | |
| Omnichannel customers can enjoy e-commerce benefits and advantages of physical stores. | Rigby (2011) |
| Customers get the same promotion and same prices across all the channels. | Cook (2014) |
| Besides the purchasing process, customers can use all channels for product exchange, product return, and information research. | Rai et al. (2019) |
| Omnichannel is providing a more unrestrained environment for customers to shop. | Lee (2016) |
| Supply view of Omnichannel | |
| Omnichannel is the inventory, personnel and fulfilment assets that are flexibly shared to fulfil any combination of channels with respect order origination and order receipt. | Taylor et al. (2019) |
| The integration of physical retailers with e-commerce capabilities for supply chain efficiency and transparency. | Hübner et al. (2016) |
| Omnichannel combines inventories and order fulfilment across channels. | Kembro et al. (2018) |
| Omnichannel is the way to minimize customer effort and maximize customer experience by combining channel advantages. | Park et al. (2017) |
| Integration of channels to provide information availability and convenience to reduce loss of sales. | Gao & Su (2017) |
| Inventory of online and offline channels managed together to provide stock availability and information accuracy. | Wollenburg et al. (2018) |
| Integration of physical channels and virtual channels from the aspect of order management, fulfilment and logistics processes. | Ishfaq et al.(2016) |
| Different departments of the company managed together for process, information, inventory, and performance system. | Ang & Tan (2018) |
| Logistics process for different channels to provide availability of cross channels to customers. | Liu et al. (2018) |
| Integration of online and offline channels to ensure smooth | Fairchild (2016) |

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| | |
|---|---|
| physical and information flow as well as application of decisions within the supply chain. | |

Source: Adapting From Previous Studies

Much research has been done from the demand perspective of omnichannel, most of which originates from marketing-based researchers, as shown in Table 2.1. Rigby (2011) found that omnichannel customers can enjoy both e-commerce benefits and the advantages of physical stores. Scholars have argued that customers desire to move freely across channels while shopping. During shopping, customers can access the same promotions and prices across all channels (Cook, 2014). Product exchange and refunds are available everywhere. Besides that, customers can search for product information and availability across different channels (Rai et al., 2019). Omnichannel provides a more unrestrained environment for customers to do their shopping (Lee, 2016). In summary, marketing literature generally describes the omnichannel as providing a seamless shopping environment across brick and mortar and online channels. However, the perspective of the supply chain should also be studied to provide a comprehensive view of omnichannel.

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There are some studies evaluating the omnichannel in supply chain management to provide a holistic view of the influence of omnichannel (Hübner et al., 2016; Kembro et al., 2018; Park et al., 2017). Regarding the logistics system, omnichannel studies should be reviewed to understand the definition of omnichannel (Taylor et al., 2019). This review is important because if the scope and features of omnichannel are understood and organized properly, it can contribute to a broader theory of supply chain management. Omnichannel indicates the need for using information technology that allows companies to interact with their customers without boundaries. The customer experience can be maximized by omnichannel (Park et al., 2017). Research studies have broadly discussed the role of information technology in omnichannel from the aspects of customer and company (Brynjolfsson et al., 2013; Park et al., 2017). In the retail industry, omnichannel is viewed as the integration of channels to provide information availability and convenience and reduce the risk of sales loss (Gao & Su, 2017). In parallel, some researchers have indicated that omnichannel is about managing inventories online and offline for stock availability and information accuracy (Wollenburg et al., 2018).

In fulfilment operation, omnichannel represents the integration of physical and virtual channels for order management, fulfillment and logistics processes (Ishfaq et al., 2016; Kembro & Norrman, 2019). Companies have the ability to fulfill customer orders by utilizing any combination of channels from the aspects of purchase intention and purchase receipt (Taylor et al., 2019). Some researchers have argued that the traditional structure of the logistics system is insufficient to support the transformation to omnichannel. The logistics process from different channels should be integrated to provide the availability of cross-channel processes to fulfill customer requirements (Liu et al., 2018). Hübner et al. (2016) mentioned omnichannel as the integration between supplier and retailer channels in the distribution center to fulfill purchase orders from customers. Overall, omnichannel is the integration of online and offline logistics channels to maximize availability and efficiency. The integration includes approaches to ensure smooth physical and information flow, availability of information, and application of decisions within the supply chain (Fairchild, 2016). Concerning the reverse logistics system, omnichannel requires different departments in the company to be managed together to integrate all processes, information, inventory and performance systems (Ang & Tan, 2018; Hübner et al., 2016). Verhoef et al. (2015) indicated that the rise of omnichannel should be conceptualized with a structural view of omnichannel systems.

The impact of omnichannel on the logistics process of companies, including reverse logistics, is unquestionable. Given this, academic scholars and practitioners have called for more research in this field (Hübner et al., 2016; Piotrowicz & Cuthbertson, 2014; Saghiri et al., 2017). There are many existing studies on the forward supply chain in omnichannel such as

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Ishfaq et al. (2016), Kembro et al. (2018) and Park et al. (2017). However, there is still a lack of studies investigating reverse logistics in the omnichannel context.

As the prominence of omnichannel rises, supply chain management in companies are faced with certain challenges to adapt to the new business environment. Therefore, the next section discusses the drivers of omnichannel and its impact on reverse logistics.

### Drivers for companies to implement omnichannel strategy

The advancement of technology has diminished the distinctions between physical and digital channels in the customer shopping journey. Companies are taking advantage of this situation by adopting omnichannel strategies (Marchet et al., 2018). Many studies have discussed the reasons for companies to practice an omnichannel strategy. Overall, it can be summarized that companies adopt omnichannel strategies due to drivers associated with the market, supply chain and logistics, as well as organization management (Ye et al., 2018).

In relation to market-related drivers, companies apply omnichannel strategies to improve the customer shopping experience by interacting with customers through different channels (Marchet et al., 2018). It combines the advantages of physical and digital channels to enrich the customer experience through product by touch and sense in the physical channels and the availability of information in the digital channels (Chopra, 2016). Advancements in technology also help companies access various markets through multiple contact points such as phones, smartphones and other electronic devices. Therefore, companies could conquer new markets by applying the omnichannel strategy (Avery et al., 2013; Brynjolfsson et al., 2013). Omnichannel strategies such as the the application of social media and big data analytics could allow customers to gain information from various channels. At the same time, companies can collect data from their potential customers in order to design more specialized

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and user-friendly shopping experiences for their customers (Brynjolfsson et al., 2013; Simone & Sabbadin, 2018).

Besides that, customers can obtain accurate information about product quality, prices, and availability from omnichannel companies, thus enabling them to make better choices (Brynjolfsson et al., 2013; Yadav et al., 2017). Some studies have also indicated that developing an omnichannel strategy can assist in building stronger brand recognition (Avery et al., 2013; Bell et al., 2014). Companies have attempted to leverage various branding strategies via different channels in order to promote brand reputation (Ye et al., 2018). For example, the usage of social media channels to provide variety and serve sporadic needs as well as physical channels used to fulfill frequent and predictable demands. Moreover, companies are gaining brand awareness by advertising and promoting products in digital channels such as social media networks (Avery et al., 2013).

The incorporation of omnichannel strategy is not only driven by market-related enablers but also supply chain and logistics-related enablers. Some researchers have found that the development of an omnichannel strategy can achieve supply chain efficiency and reduce operational costs (Bernon et al., 2016; Ishfaq et al., 2016; Yadav et al., 2017). Some companies have redesigned the distribution process structure to include forward and reverse flow in an omnichannel context with the aim of promoting a more efficient delivery process (Hübneret al., 2016). By switching to an omnichannel strategy, companies could achieve reduced lead times with more convenient delivery and return options for customers (Kembro & Norrman, 2019). Omnichannel transformation also occurs in the process of internal resource acquisition, which could assist in maintaining low operational costs (Cao, 2014). Apart from that, the omnichannel strategy allows companies and customers to improve their supply chain traceability by using an information technology platform to monitor the status of inventories (Cook, 2014). Integrated channel supply chain processes and systems, such as integrated distribution and warehouse management systems, could significantly optimize fulfilling customer orders (Bernon et al., 2016; Ishfaq et al., 2016; Larke et al., 2018).

Besides that, omnichannel companies could break the traditional organizational structure that segregates different entities in the supply chain, such as suppliers and retailers (Ye et al., 2018). Information technology has played a critical role in fostering a closer relationship between different supply chain entities and improving transparency (Brynjolfsson et al., 2013). Omnichannel shortens the distance of supply chain links connecting manufacturers and retailers; this shortened distance makes effective information transfer from customers to manufacturers possible (Larke et al., 2018). Knowledge sharing enables each supply chain entity to further innovate and personalize their services and products (Brynjolfsson et al., 2013). For example, manufacturers could analyze and research based on collected data and design niche products accordingly. Innovative services and products can improve a company's ability to compete with its competitors (Lee, 2016). Hence, companies implement omnichannel strategies to obtain better firm performance. However, the impact of omnichannel towards reverse supply chain is still ambiguous and will be discussed in next section.

### Omnichannel companies in Reverse Supply Chain

Overall, this study looked into omnichannel companies managing reverse supply chains in order to obtain superior performance. Omnichannel companies refer to the entities that manage different types of channel (digital and physical) in various stages of the return process. Some examples of omnichannel companies that are often discussed include manufacturers, digital retailers, physical retailers, and logistics service providers (Saghiri et al., 2017). The reverse logistics system is important in return processes because it provides omnichannel companies an advantage in the aspects of customer satisfaction and cost optimization. In order to gain am understanding of the changes in reverse flow in

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omnichannel, this section further discusses the reverse distribution process. Hübner, Holzapfel and other colleagues (2016) conducted exploratory research on the distribution systems in omnichannel. A distribution system is characterized by its sources and destination of delivery. The following framework, constructed based on expert opinion, provides a comprehensive understanding of the physical flow in omnichannel distribution.

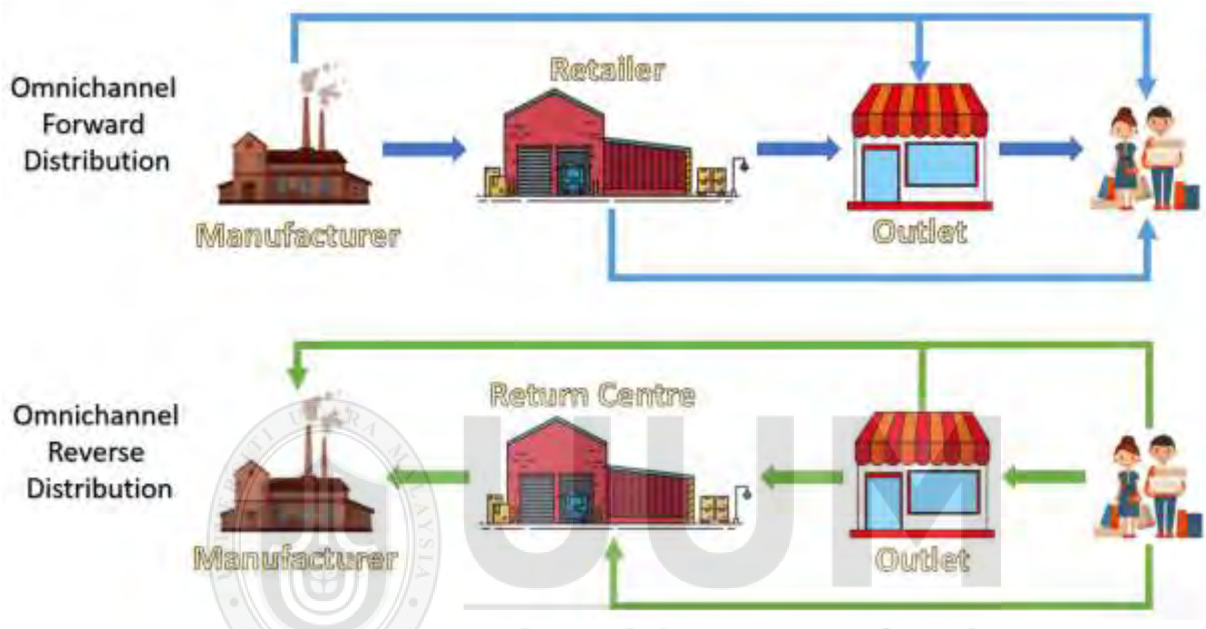


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*Figure 2.6*
*Distribution System in Omnichannel*
*Source: Illustration by Author based on* Hübner et al. (2016)

As shown in Figure 2.6, omnichannel companies have more options for product delivery and collection. In forward distribution, customers can receive products directly from manufacturers or retailers through a courier service. Companies can utilize distribution centers to fulfil online orders from web shops and mobile applications. Besides that, customers can choose to purchase directly in-store or buy online and pick up in-store. While looking back at the backward flow, reverse logistics in omnichannel indicates that different stages and channels are linked together to perform the return activities. Therefore, information in reverse flow will be retrievable, traceable and changeable (Saghiri et al., 2017). The integration of information increases visibility for a company to decide the most suitable process for collected materials, whether to recycle or redistribute. In omnichannel backward distribution, companies offer different return methods for customers, such as return in-store, drop point, and courier service (Bernon et al., 2016). From a logistics perspective, reverse logistics has become more complex as the number of channels increase. The reverse logistics process is no longer linear; it indicates that collection through brick & mortar increasingly overlaps with collection by courier service (Hübner et al., 2016).

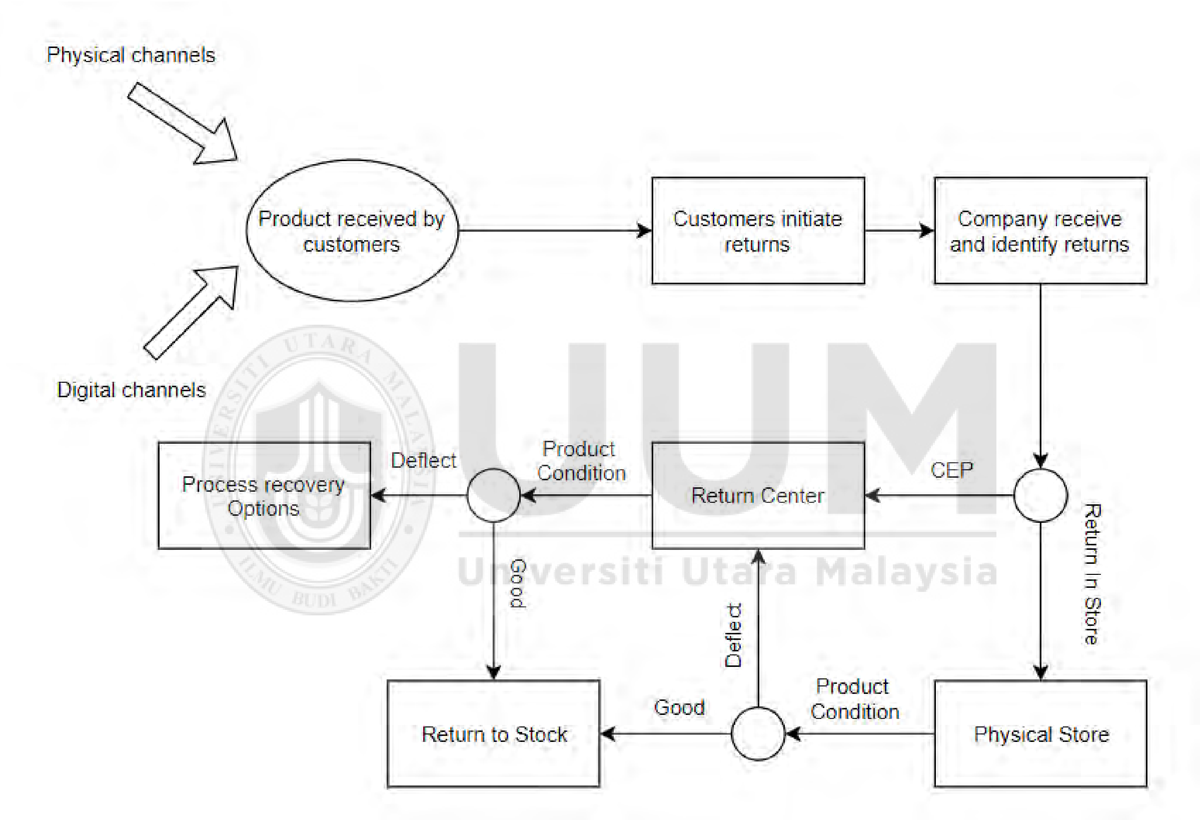


*Figure 2.7*
*Reverse Distribution in Omnichannel*
*Source: Illustration by the author based on* Bernon et al.(2016) and Hübner et al.(2016)

In the omnichannel context, the company integrates the physical store with the digital channel (Figure 2.7). Accordingly, the company enables its customers to use any channel to return products purchased from either offline or online channels. Customers can use a courier service for returns or drop-off at the retail store. The company can use a courier service to collect returns from customers and deliver the returned products to a distribution center or a specialized returns center to retrieve value. The company will then check the condition of the products received in the physical store. If the product received from the customer is as good as new, the product returned in-store will be directly reprocessed or reworked and redistributed as the store's inventory. However, if the product is in unsatisfactory condition and needs further processing, such as recycling or remanufacturing, it is delivered back to the distribution center or return center. At the return center, the product is assessed and its destination is decided based on its condition. For example, broken laptops may be sent for repair, while laptops that cannot be repaired may be sent for recycling or material retrieval. Companies typically prefer the return through courier service because the process is less complex and simpler. However, companies often allow customers to return in-store as a marketing strategy to increase customer satisfaction. It is more convenient for customers to return in-store and immediately gain credit for returns. However, physical stores need to have procedures, processes and system capabilities to handle the return in-store (Bernon et al., 2016; Hübner et al., 2016). As an omnichannel company provides a wider range of return options, handling reverse flow is more complex. Therefore, omnichannel companies need to have effective and efficient reverse logistics systems to handle the reverse supply chain.

Researchers have also highlighted the need for quantitative-based research to model the influencing factors and support reverse logistics decisions (Hübner et al., 2016). Hence, research in this field needs to involve researchers from multiple disciplines to include both strategy and organizational behavior. Due to the complexity of reverse logistics, more studies need to be done on the reverse logistics system in omnichannel to further understand the relationship (Bernon et al., 2016).

### Reverse Logistics Uncertainty and Complexity

Over the past decades, reverse logistics has been discussed as a strategy to improve company performance from the aspects of cost reduction, customer satisfaction, and others (Jeszka,



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2014; Morgan et al., 2016; Richey et al., 2005; Ritchie et al., 2000; Ye et al., 2013; Yu et al., 2018). Reverse flow is not merely changing the direction of forward flow, as reverse logistics is a different concept from normal logistics (Meade et al., 2007). The reverse flow is difficult to manage due to its characteristics that are hard to predict (Škapa, 2012). Similarly, there are more challenges and opportunities in reverse logistics that do not exist with forward logistics (Tibben-Lembke & Rogers, 2002). Jayaraman et al. (1999) also indicated that most logistics systems do not have the ability to handle reverse logistics activities because the returned products cannot always be managed in the same approach as in the traditional forward supply chain. Most companies, including excellent logistics service providers, are unable to manage their reverse logistics flows efficiently and effectively (Bai & Sarkis, 2013). Many companies often believe that reverse flow can be handled in the same manner as forward logistics, akin to driving a truck the opposite way.

The need for reverse logistics can be triggered by planned or unplanned incidents. Companies may try to avoid unplanned transactions, but planned transactions are expenditures that must be incurred. For instance, planned expenditures would be the expiration of a leasing operation equipment, while the return of defective products would be unplanned (Meade et al., 2007). Consequently, there are different reasons for returns, such as recall, deflect, and end-of-life returns. Before entering the omnichannel era, companies mainly dealt with the returns of defective or rejected goods (Hübner et al., 2016), making it much simpler for companies to make disposal decisions for returned products.

The emergence of e-commerce has shown a significant increase in returns, including different kinds of returns, especially intentional returns (Bernon et al., 2016). Intentionally returned products may be as good as new ones, and companies could directly recover the value of those items. In particular, companies need to accelerate the return processes for seasonal products to avoid loss of value (Bijmolt et al., 2019). These factors further increase the complexity of reverse logistics planning. The different types of returns flow backwards for different reasons, and the related parties need to handle it with suitable approaches (Brito & Dekker, 2004). Hence, omnichannel companies are facing increasingly complicated situations in designing different systems and strategies when dealing with different kinds of returns (Olariu, 2013).

Additionally, only limited information exists about the quantity and quality of returned goods, making reverse logistics even harder to predict and plan (Srivastava, 2008). For instance, the condition of returned goods is unknown until the goods have been received at the return center. If the products are returned from the retailer, some of the packaging may be broken due to damage during handling or if opened by the customer to examine the product. The possibility of incomplete packaging among returned products has lead to complexities in handling, such as damages in transit making it difficult for companies to identify the type of product (Tibben-Lembke & Rogers, 2002). Accordingly, the routing of reverse flows is not as clear as the forward distribution, which has the name and location of destination stated.

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Before the existence of omnichannel, customers could return products in the same place where it was purchased (Hübner et al., 2016). In omnichannel reverse distribution, customers have different channels for returns, such as retail stores, drop points, parcel carriers, and the postal service (Bernon et al., 2016). In terms of location, omnichannel companies need to manage returns for all the channels (Bijmolt et al., 2019). Based on the customer perspective, customers want to choose the return option most appropriate for them from a list of return choices. Due to the multiple return options, companies must redesign their reverse logistics systems to comprise all return channels by adjusting in-store processes and sharing information across channels (Hübner et al., 2016). The increasing number of return channels has increased the complexity of planning from a logistics point of view (Bernon et al., 2016; Hübner et al., 2016).

Besides that, the management of reverse logistics processes often includes a multi-echelon of supply chains, such as suppliers, manufacturers, distributors, retailers, and end customers (Olorunniwo & Li, 2010). This has resulted in the need for coordination between companies and more information support for decision-making. Moreover, logistics service providers are often included in many reverse logistics processes, especially in the collection step. Accordingly, the process coordination between individual companies and multiple stakeholders implies more complex management and system requirements (Álvarez-Gil et al., 2007; Meade et al., 2007).

In the omnichannel context, reverse logistics management consists of more players in the processes as the movements are not confined to a single conduit. Previously, customers may return the items to the same place where the items were bought. However, this has changed, and there are now multiple return options available for customers to choose from (Ames, 2017). Customers may choose to return by drop off at collection points, return in-store or even pick up by courier. These options involving different parties, such as in-store employees and carriers, need to be included in the reverse logistics planning (Hübner et al., 2016). In particular, the roles of logistics service providers are becoming more important in the collection stage. Logistics service providers may need to retrieve customer information for routing arrangements and monitor drop-off points closely at the same time (Woensel & Broft, 2016). As the number of players grows, so does the likelihood of complications.

*Table 2.2 Complexity of Reverse Logistics in single-channel and omnichannel*

| | Single Channel | Omnichannel |
|---|---|---|
| Returns Information | Qualities and quantities | Qualities, quantities and channels |
| Returns Type | Mostly defective goods | Different kinds of returns, especially intentional returns |
| Parties involved | Many parties are involved in return processes | More parties are involved in the reverse logistics system |

*Source: Author illustration*

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Overall, the reverse flow is more complex and difficult to predict than forward logistics, as shown in Table 2.2. This complexity and unpredictability of reverse logistics leads to higher costs than traditional logistics services in terms of transportation, handling, and sorting (Vahabzadeh & Yusuff, 2015). Simultaneously, Huscroft (2010) also mentioned that uncertainty is one of the critical reasons behind the high costs of the reverse logistics process. Thus, it is evident that reverse logistics is a complex process, but the omnichannel unfortunately adds another layer of complexity to the reverse logistics processes (Bijmolt et al., 2019; Hübner et al., 2016). Bernon et al. (2016) found evidence of some companies that did not recognize omnichannel consideration in reverse logistics management for handling the return process. For example, inefficient fulfilment processes and return management necessitated surplus resources to complete return requests. Besides that, companies have applied separate return channel processes that are ineffective, and inventory cannot be returned to stock level as the operation team needs extra work to deal with the returned products.

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Therefore, a well-organized reverse logistics system is needed to handle these complexities and uncertainties (Bernon et al., 2016; Tibben-Lembke & Rogers, 2002). An effective reverse logistics system should have top management support, information system, collaboration, flexibility, and formalization (Bai & Sarkis, 2013; García-Sánchez et al., 2018; Genchev et al., 2011; Ho et al., 2012; Morgan et al., 2016). Besides that, top managers should design suitable reverse logistics systems that match task environment factors to achieve superior performance (Huang et al., 2015). Accordingly, an effective reverse logistics system will improve company performance in terms of economics, social responsibility, and environmental sustainability (García-Sánchez et al., 2018). Overall, reverse logistics help companies to save costs, increase profits and improve customer service (Elmas & Erdoğmuş, 2011). In the next section, the research gap is discussed to understand the deficiency of existing studies in omnichannel reverse logistics.

## Research Gap

Several papers have previously investigated the effect of firm factors and their influence on company performance, as proposed by this study. Firm factors such as top management support, flexibility, collaboration, information system, and formalization have a positive impact on company performance (Bai & Sarkis, 2013; Carter & Ellram, 1998; Daugherty et al., 2005; Han & Cueto, 2016; Huscroft et al., 2013; Jeszka, 2014; Morgan et al., 2016; Shafiq & Naqvi, 2013; Škapa, 2014; Vlachos, 2016). The resource-based theory provides a helpful lens to investigate the impact of specific firm factors on company performance (Morgan et al., 2016; Richey et al., 2005; Vlachos, 2016). However, it was found that the impact of firm factors in company performance in the context of the evolution of omnichannel had been neglected.

Thus far, only a few researchers have roughly discussed the firm factors in the omnichannel business environment. For instance, Lau & Wang (2009) noticed some companies offering different channels for reverse flow in the electronic industry, such as drop off points and door-to-door collection. By using a qualitative approach, they indicated the demand for firm factors such as collaboration and information systems to support the implementation of reverse logistics. Besides that, formalization was discussed in the condition of omnichannel reverse flow, such as rules and procedures explained before selecting different channels to return. Formalization in reverse logistics processes can increase customer satisfaction by assisting customers in choosing their preferred return channel (Genchev et al., 2011). In the omnichannel context, Bai & Sarkis (2013) tried to understand the application of flexibility in reverse logistics, such as handling returns from different channels. All research suggested that

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reverse logistics had an impact on omnichannel companies; however the notion of omnichannel has not been further discussed in academia.

Researchers also underlined the importance of task environment factors when investigating reverse logistics with company performance (Bai & Sarkis, 2018). Similarly, numerous studies also argued that task environment factors influences company performance (Abdullah & Yaakub, 2015; Huang et al., 2015, 2014; Vlachos, 2016; Ye et al., 2013). Influence from external environments such as suppliers, customers, regulators, and competitors can pressure companies to perform reverse logistics effectively. Top management could improve company performance by attending to the concerns of task environments through appropriately focusing on reverse logistics practices (Abdullah & Yaakub, 2015; Huang et al., 2015; Ye et al., 2013).

However, fewer studies have investigated the connection between company performance and both firm factors and task environment factors. Carter and Ellram (1998) mentioned that reverse logistics programs would be affected by internal (factors inside the firm) and external factors (external organizations that will influence the company). Some researchers also emphasized that external factors' influence should not be neglected when looking into the performance of reverse logistics practices (García-Sánchez et al., 2018). For example, Bai and Sarkis (2013) suggested that the relationship between flexibility and task environment factors, as well as outcomes, need to be investigated. Therefore, this study needs to incorporate both firm and task environment factors when examining the influence of reverse logistics on omnichannel companies.

As discussed before, the concept of omnichannel is just emerging in the 21st century. Therefore, the consideration of omnichannel is not frequently taken into account in research. All current research view reverse flow as a linear and singular phenomenon. The factors that influence reverse logistics within omnichannel business environments, in which customers have multiple methods to return purchases, has not been discussed. As the popularity of omnichannel rises, the same approach may no longer apply in the traditional business environment. From the logistics perspective, the growing number of channels is blurring the role of the supply chain actors (Hübner et al., 2016). Furthermore, the frequency of returns has significantly increased due to the evolution of omnichannel.

Therefore, omnichannel companies need an effective reverse logistics system to handle returns. In a study by Bernon et al. (2016), they discussed the network design to handle the reverse flow, but the factors that influence the reverse logistics were not discussed in detail. Using previous research, researchers argued that firm factors and task environment factors are necessary to improve company performance. Accordingly, more empirical evidence is required to support the role of reverse logistics in the omnichannel context . Besides that, Morgan et al. (2016) also encouraged investigators to focus future research on reverse logistics in an omnichannel context as the channels are evolving to meet customer expectations.

Hence, there is a need to reexamine the reverse logistics factors in an omnichannel context in order to provide a holistic view of the application of reverse logistics in omnichannel companies. The lack of an appropriate model to examine both firm and task environment factors in an omnichannel context has encouraged new research to develop a more comprehensive model by appropriation of theories. Hence, this study needs to further absorb theories from other studies to fortify the development of the conceptual framework.

## Relevant framework and models

The relevant frameworks and models that juxtapose the impact of reverse logistics between firm and task environment factors are described in this section to develop a robust framework.

### Reverse Logistics Framework

The study by Carter and Ellram (1998) developed a framework that focuses on reverse flow by abstracting the literature reviews and propositions for future research. They concluded that the study of reverse logistics is interdisciplinary in nature. In their study, a framework was constructed as a guideline when developing conceptual or theoretical frameworks for future studies. This framework was widely utilized in reverse logistics studies, but none of them applied the theory within an omnichannel environment (Huang et al., 2016; Mahadevan, 2019; Vlachos, 2016). The framework suggested that reverse logistics is influenced by internal factors (company factors) and external factors (task environment), as shown in Figure 2.8. They also suggested that further investigation is required to examine internal and external factors empirically.

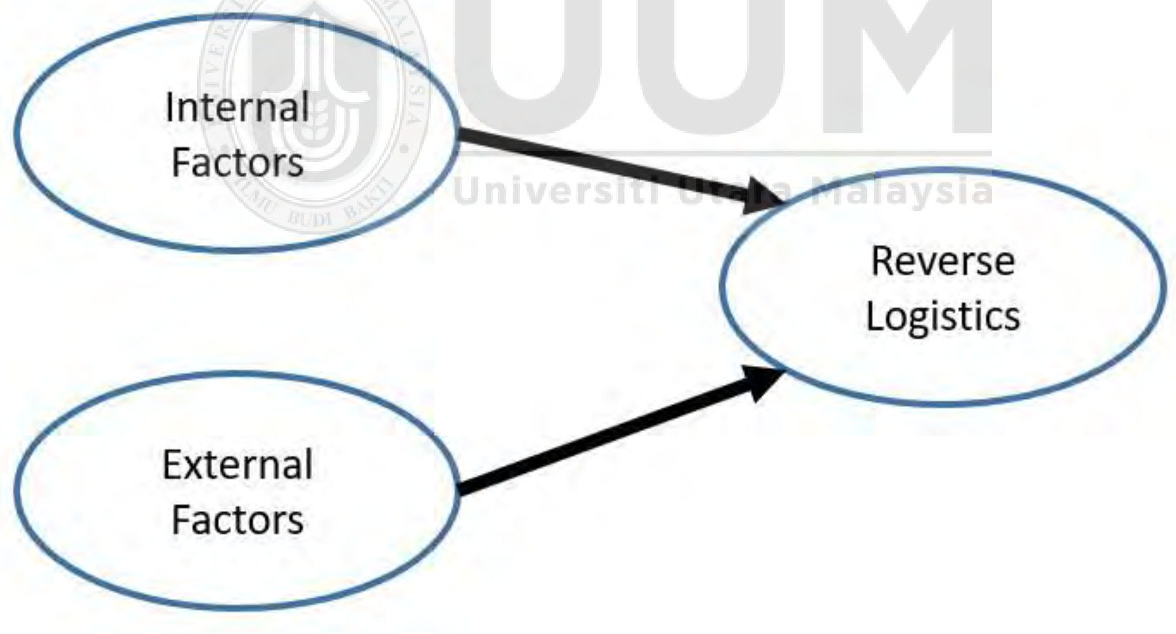


*Figure 2.8*
*Determinants of Reverse Logistics Activities*
*Source:* Carter & Ellram (1998)

Besides that, they also focused their approach on internal and external factor drives and constraints in reverse logistics activities. Companies can achieve superior performance only if the company's strategy can react to the signals found in the external environment. The study also suggested that the external factors influencing company strategy, especially regulatory and customer factors, significantly influence reverse logistics activities. Furthermore, the need for vertical coordination with suppliers increased reverse logistics activities due to uncertainties in the input sector. As discussed previously, improvements in the company's strategy are also needed to improve performance, as the importance of internal factors cannot be neglected. Both internal and external factors work together to stimulate reverse logistics activities. Without internal factors such as top management support, the company may not be recognized and react negatively to external pressures resulting in losses to the company (Ye et al., 2013).

For instance, a policy entrepreneur may receive pressure from external actors (government, competitors, customers, suppliers) to implement reverse logistics practices. However, the policy entrepreneur needs top management support in terms of resource commitment, including technological and financial resources, to implement reverse logistics practices. Implementing reverse logistics could improve company performance (Huang et al., 2012; Ye et al., 2013). Thus, the investigation of reverse logistics needs to include internal and external factors to obtain a holistic picture of reverse logistics (Lau & Wang, 2009).

Universiti Utara Malaysia

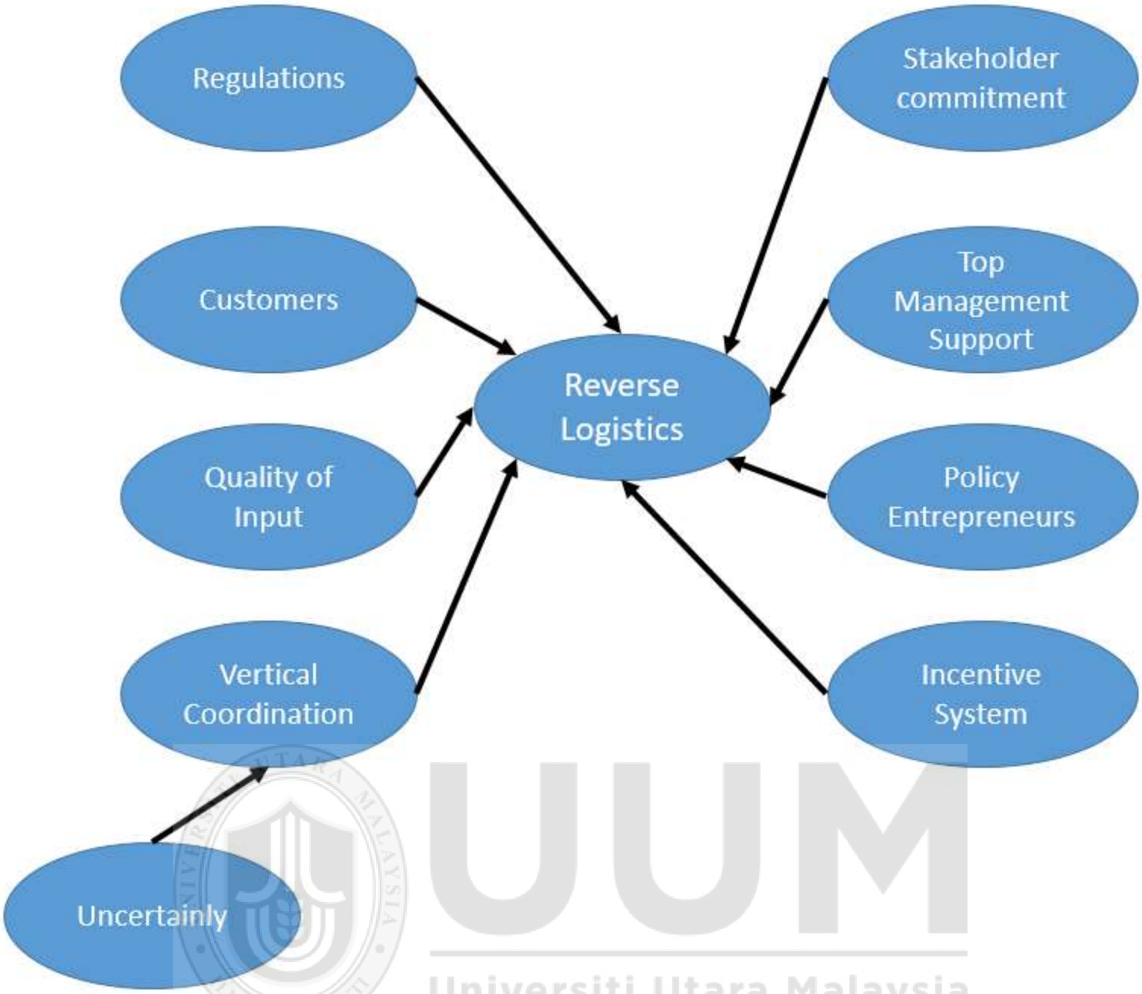


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*Figure 2.9*
*Drivers and Constraints of Reverse Logistics*
*Source:* Carter & Ellram (1998)

Overall, they also constructed a framework that identified the actors or drivers, including internal and external factors that influence reverse logistics. The framework by Carter and Ellram (1998) has shed some light on conceptual development in Figure 2.9. However, more reviews from other studies or theories are needed to produce a robust and concise framework.

### Resources Based View

Wernerfelt (1984) introduced a resource-based view of firms that states that companies can generate profits through the endowment of resources, as depicted in Figure 2.10. A resource-based perspective has always been related to the study of reverse logistics, such as in Huang and Yang (2014), Lau and Wang (2009), Mahadevan (2019) and Morgan et al. (2016). Resources refer to anything which could be a strength or weakness of a particular company as instilled in tangible assets (Peteraf, 1993). Barney (1991) defined resources to include all assets, capabilities, organizational processes, and firm attributes a company controls to improve effectiveness and efficiency. Barney's study (1991) was conducted from the perspective of resources rather than the role of managers in competitive advantages. It indicated that as resources are valuable, rare, and non-substitutable, managers need to understand the potential performance of resources.

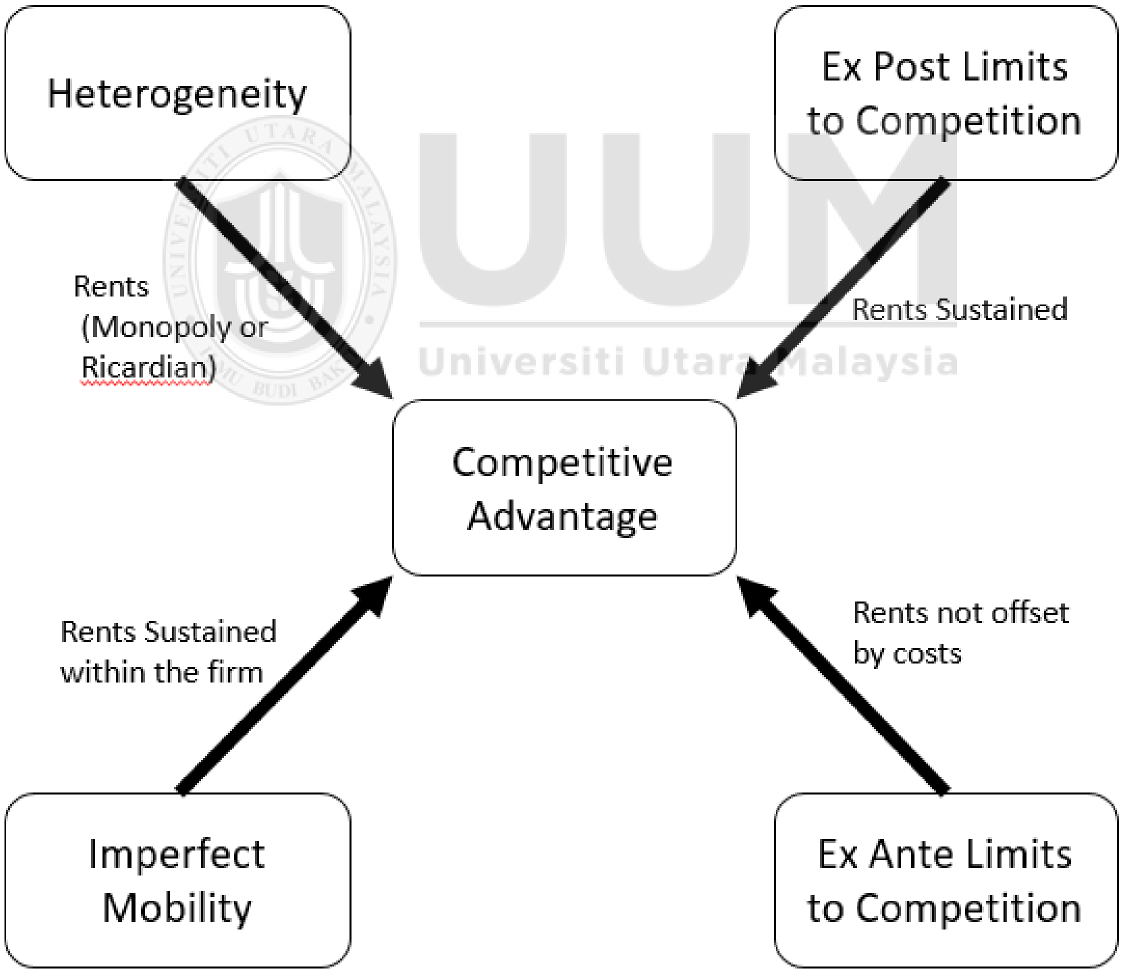


*Figure 2.10*
*The Cornerstones of Competitive Advantage*
*Source:* Peteraf (1993)

The endowment of resources had to be done with heterogeneity to achieve competitive advantages (Peteraf, 1993). The company with superior resources often stays, but the company with inferior resources is likely to leave the industry. Companies gain competitive advantages by differentiating groups of firms from one another. For instance, advancing information systems in reverse logistics processes would help reduce the cost and improve the process effectively (Huscroft et al., 2013). A company that uses innovative information systems can gain a competitive advantage over other competitors.

According to the resource-based theory, resources and capabilities determine company performance and provide a sustainable competitive advantage (Peteraf, 1993). Hence, this study recognizes firm factors as the resources and capabilities of a company to achieve competitive advantages (Vlachos, 2016). Therefore, companies should develop their firm factors to implement reverse logistics effectively in order to achieve sustainability. Nevertheless, Hart (1995) argued that the internal perspective of resources might be inadequate for competitive success because of the effects of external environmental factors. To identify the external factors, the study assessed institutional theory as the theory had links to the resources-based view (Huang & Yang, 2014). Thus, it is necessary to include another theoretical framework to examine external stakeholders' influence in reverse logistics.

Universiti Utara Malaysia

### Institutional Theory

In order to construct a comprehensive research framework, the institutional theory by DiMaggio & Powell (1983) was reviewed to understand the influence of external factors on an organization. External influence originated from the organizational field, which includes organizations that constitute a recognized area of institutional life, such as suppliers, consumers, regulatory bodies, competitors and social systems. Due to those influences, organisations with a similar structure have instilled the need to become efficient. Some researchers have explained the variation among organizations in structure and behavior by the isomorphism of coercive, normative and mimetic. For example, Ye et al. (2013) determined the influence on managers by institutional theory, which includes coercive pressure (from government regulations), normative pressure (from customers) and mimetic pressure (from competitors). Companies need to recognize and react to the signals from the institutional environment to survive and compete. This means that external stakeholders have different claims that companies can fulfill through reverse logistics. For example, customers may want fast returns processing, thus inducing companies to implement return management effectively (Bernon et al., 2016). Studies have shown that a company that can conform to requirements from the external environment tend to outperform less adaptive companies (Reeves & Deimler, 2011).

The theory can also be applied to explain how external pressures affect organizations to implement environmental strategies (Jennings & Zandbergen, 1995). Accordingly, researchers argued that stakeholders have the ability to affect top management strategy in implementing reverse logistics (Carter & Ellram, 1998; Meade et al., 2007). Besides that, the importance of the institutional theory was confirmed by investigating the relationship between managerial decisions and organizational performance with the different types of thermal institutional pressures (Huang & Yang, 2014). External influences such as competitors, regulators, and customers were found to significantly impact company performance through the implementation of effective and efficient reverse logistics. However, institutional theory may be inadequate to examine the effects of external influence on omnichannel firm performance because institutional theory may be more closely related to the industry's demographics (Carroll & Huo, 1986). In the next section, the influence of external factors on companies through the lens of the task environment theory is discussed.

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### Task Environment Theory

The institutional theory refers to the external pressures that motivate it to conform or become isomorphic with social and regulatory expectations. However, the concept of task environment tends to concentrate on the competitive environment that stimulates organizations to enhance the efficiencies and effectiveness of their processes (Oliver, 1997). Hence, the task environment theory is critical in this study as it may help to make a comprehensive and meaningful comparison of external influences in different companies. Task environment can be defined as external factors potentially relevant to "goal setting and goal attainment" (Dill, 1958). By receiving information from external sources, companies could formulate objectives and restrict what is known as a "task" for companies to fulfill. To survive in the competitive market, organizations establish effective task environment relationships to obtain input critical in the production processes (Scott, 2003). Accordingly, companies need to adapt to the external environment in order to survive or grow (Castrogiovanni, 1991). Before matching the external influences, companies must first have a deep understanding of the external forces that interact with organizations (Carter & Ellram, 1998; Castrogiovanni, 1991). The study by Dill (1958) also points out that the composition of the task environment includes the people and institutions with active or potential interest in companies, which consist of customers, suppliers, competitors, and regulatory bodies.

Furthermore, studies have shown that task environment factors are critical determinants in measuring company performance (Andrews, 2009). The degree to which the manager makes an effort to align their internal elements with the external circumstances influences performance. For instance, companies could increase performance by ensuring that the supply chain strategy is appropriately aligned with the corporate environment strategy (Wu et al., 2014). While researching reverse logistics, Huang et al. (2015) emphasized that task environment factors are significant influencers of company performance. In other words,



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companies that match appropriately with the saliency of the task environment are likely to achieve superior performance. Hence, the study indicated the importance of identifying task environment factors for a company's strategic planning.

Compared with the institutional theory, task environment conceptions tend to focus on the competitive pressures in an organization's environment that motivate organizations to enhance their efficiency and control. On the other hand, institutional environment conceptions distinguish between coercive, mimetic and normative pressures in an organization's environment that motivate it to conform to or become isomorphic with social and regulatory expectations (Oliver, 1997). As the impact of institutional theory is often vague, most organizations tend to devote more attention to the task environment. Therefore, this study utilized variables in the task environment theory rather than the institutional theory (Carroll & Huo, 1986; Huang et al., 2015).

This study incorporated relevant models and theories to construct a more concise and robust framework. Furthermore, Carter and Easton (2011) indicated that more theoretical lenses are needed to understand the different assumptions regarding research in the logistics field and, particularly in this study, the influence of reverse logistics in omnichannel. In the following section, the influence of reverse logistics factors on omnichannel firm performance is discussed to understand how reverse logistics systems could impact omnichannel firm performance.

## Factors of Reverse Logistics System

This section discusses two important factors in reverse logistics systems that influence omnichannel performance. Before that, previous research was reviewed to identify the factors that influence company performance (refer to Appendix A for summary table). However, none of the research discussed these factors in the omnichannel environment. Hence, this study will explore and examine these factors within an omnichannel environment. According to previous studies, reverse logistics factors refer to the internal capabilities and processes that a company deploys and conformity capability to external stakeholders to reduce costs and maximise their value offer (Huang et al., 2016; Škapa & Klapalová, 2019b; Vlachos, 2016). The first part discusses the firm factors that promote an effective reverse logistics system to handle the reverse supply chain. Task environment factors are discussed in the second part of this section.

### Firm Factors

Omnichannel companies use reverse logistics systems to handle the reverse process flow of the returned products for process effectiveness and cost-efficiency. Reverse logistics systems incorporate many firm factors that may provide advantages for a company.

#### *Top Management Support*

The success or failure of supply chain management depends on the degree of support from top management (Hariharan et al., 2019). Simultaneously, the effectiveness of reverse logistics is also influenced by top management. Carter and Ellram (1998) also mentioned that top management support is an essential element in firm factors for the continuing success of reverse logistics programs. Sharma et al. (2011) further emphasized that lack of support from top management is one of the factors for failure in reverse logistics. Mai et al. (2012) believed that senior management directly influences the strategic planning and implementation in reverse logistics if they believe that it is important. For example, increasingly, more companies are aware of reverse logistics and can gain competitive advantages through implementing reverse logistics programs (Janse et al., 2010). When top management realizes the importance of reverse logistics, they may be motivated to develop and improve their systems to handle reverse flow effectively. The manager's support in reverse logistics is needed for defining objectives, guidelines, roles of employees, continuous improvement, vertical collaboration and resource commitment for the effectiveness of the reverse logistics system (Huscroft, 2010; Ngesa & Shale, 2017; Shafiq & Naqvi, 2012). Top management plays an essential role as the decision-maker when dealing with the complexity of reverse logistics activities such as process routing and planning (Janse et al., 2010). As reverse logistics differs from the traditional forward supply chain, additional attention is needed to design an efficient operation (Richey et al., 2005).

Besides that, it is a necessity for senior management to have a positive outlook and take the initiative to increase the effectiveness of the reverse logistics system. Managers who are conscious of the complexity and uncertainty in reverse logistics activities and who are willing to commit resources such as technology are essential for the effectiveness of reverse logistics systems, which could reduce cost (García-Sánchez et al., 2018). Keh et al. (2012) also proved that suitable resources could increase reverse logistics performance. Resource commitment from the aspect of managerial, financial and technology by senior management results in efficient and effective reverse logistics programs, which enable companies to perform better (Richey et al., 2005). However, the resources in a firm are limited and constrained. Therefore, support from senior management is critical to ensure sufficient resources are invested in reverse logistics programs (Huscroft et al., 2013). Generally, top management support for effective reverse logistics tends to increase omnichannel firm performance by enhancing its profitability and cost reduction (Ye et al., 2013).

Universiti Utara Malaysia

### *Formalization*

In today's omnichannel environment, the dramatic increase in return rates has expedited the attempts of many companies to formalize their logistics processes as well as other activities in reverse distribution (Bernon et al., 2016; Huscroft, 2010; Huscroft et al., 2013). In this context, system or process formalization refers to the level to which rules, procedures, instructions, and communications are written so that all involved parties are aware of their roles (Pugh et al., 1968).

Furthermore, formalization plays an important role in minimizing and streamlining the complexity of the business system by reducing confusion and conflict (Genchev, 2009; Huang & Yang, 2014). The firm can properly manage the reverse logistics activities according to stakeholders' expectations by having formalization and standardization procedures (Huscroft, 2010). For example, formalized procedures in firm factors can be established to identify the best reprocessing method for returned products, whether the products should be resold, reused, repaired, refurbished, remanufactured, retrieved or recycled. Overall, formalization in firm factors could entail positive outcomes such as minimized cost, simplified operations and improved efficiency and effectiveness (Dahlstrom et al., 1996; Škapa, 2014; Tiwari, 2013a).

Therefore, formalization has been found to be a crucial factor in an effective reverse logistics system (Genchev et al., 2011). The production of an effective reverse logistics system due to formalization eliminates the need to treat every incident as a new issue (Tiwari, 2013a). Genchev et al. (2011) defined formalization in reverse logistics processes as clear instructions and definitions of reverse logistics activities and responsibilities for control and practices. Moreover, formalization has also been described as the rules about the codified job and portion of responsibility (Hall & Johnson, 2016). Accordingly, formalization has been applied in firm factors regarding reverse logistics activities such as gatekeeping, collection, sortation and disposition. For example, Xeptron defined return policies and procedures to handle returned spare parts in late 2000 (Tan et al., 2003).

Correspondingly, formalization can be applied to reverse logistics activities through specific instruments such as written policies, job descriptions and roles, organizational responsibility charts, strategic and operational plans, objective setting systems, standardization of processes, and formalized communications system (Dahlstrom et al., 1996; Dahlstrom & Nygaard, 1999; Hall & Johnson, 2016; John & Martin, 1984; Kraus et al., 2006). Tiwari (2013) also mentioned that highly formalized firm often has standard operating procedures for reverse logistics activities, such as cost of return, how to return, and other conditions (Han & Cueto, 2016). The formalization drives stakeholders to deal systematically with the goals and strategies set by the firm. As stated earlier, having a standardized process can provide positive benefits when dealing with external environment actors such as customers. For example, a clear and detailed return policy can help to improve customer relationships, as customers understand the procedure involved in raising a return (Han & Cueto, 2016).

There are also a lot of research studies discussing formalization as a component of monitoring system performance (Genchev et al., 2011; Huscroft, 2010). Formalized procedures may assist in the development and growth of incentive systems. For instance, employees that understand the process could work more efficiently and an appropriate incentive system will motivate employees to achieve reverse logistics goals (Tiwari, 2013a). Therefore, formalized performance metrics can improve the efficiency of the reverse logistics system by identifying weaknesses and taking corrective action. Better formalized reverse logistics programs can empower company performance, as identified in a past study (Huscroft et al., 2013). Thus, this research proposes that the formalization of firm factors would empower omnichannel firm performance.

*Flexibility*

Flexibility has always been a determinant of company performance, especially in the supply chain (Muntaka et al., 2017; Stevenson & Spring, 2009; Tummala et al., 2006). Due to the increase in competition and the dynamic market, companies need to be ready to face higher risks and uncertainty through a more flexible approach. In an omnichannel environment, products returned from various channels may differ in their condition and volume. The reverse logistics system must have flexible capabilities to handle such uncertainties (Bokade & Raut, 2014). Those companies with flexibility limitations are considered to have poor practices (Slack, 2005). Hence, flexibility is a firm factor that influences omnichannel firm performance. Therefore, omnichannel companies can identify different flexibility factors within the reverse supply chain to improve their performance. However, the obligation within the company and across the supply chain to manage these flexibilities is not always self-evident.

Flexibility can be defined as the capacity of a system to successfully fit dynamic environmental conditions and transform product and process requirements (Swamidass, 2000). Slack (2005) also argued that flexibility is the ability to change from one state to another, which enhances competitiveness. Overall, flexibility in firm factors occupies an important position in how operations can efficiently respond to the complexities and uncertainties of reverse logistics (Bai & Sarkis, 2013). For instance, Pohlen and Farris (1992) emphasized the need to develop flexibility in collection activities for an effective reverse logistics system.

Companies should have the flexibility to design an organizational structure and network that can adapt to the dynamic environment. The flexibility capability could maximize the efficiency and effectiveness in reverse flow handling. Furthermore, companies that are equipped with operational flexibility could ensure the smooth movement of reverse logistics activities such as gatekeeping, collection, sortation, and disposition (Tombido et al., 2018). Besides that, flexibility allows a company the capacity to react to unexpected incidents and figure out innovative solutions (Dahlstrom et al., 1996). Achieving flexibility in firm factors requires cooperation from multiple managerial levels within and across organizations. Bai and Sarkis (2013) showed the dimension of operational flexibility through reverse logistics activities. The categories of operational flexibility are divided into product, volume, equipment, labour, channel, and scheduling, as shown in Table 2.3.

*Table 2.3 Flexibility in Reverse logistics Activities*

| | **Flexibility Category** | | | | | |
|---|---|---|---|---|---|---|
| **RL Activities** | Product | Volume | Equipment | Labour | Channel | Scheduling |
| Gatekeeping | Able to manage various product return requests | Ability to handle small and large numbers of products requests | Ability to manage the same product return requests in different ways | Labour Flexibility | Able to utilize various channels for gatekeeping | Ability to have variety and reschedule separation/inspection |
| Collection | Range of products can be collected | Ease of changing collection capacity | Flexibility of equipment to handle various materials | Labour Flexibility | Options of collection channels | Ability to have collection schedules changed |
| Sortation | Ability to deal with various products of different types and specifications | Capability to economically deal with products returned in smaller and larger lots. | Ability to deal with different products in different ways | Labour Flexibility | Ability to deal with the different products in different ways | Ability to get reprocessing schedules and routing changed |
| Disposition | Ability to manage various types of products toward different usage | Ability to handle different products in smaller and larger lots | Flexibility of equipment to handle various materials | Labour Flexibility | Ability to locate and contract with various vendors | Ability to reschedule for disposition |

*Source:* Bai & Sarkis(2013)

Managers can identify the weakness of flexibility in firm factors based on the dimensions. Recognizing the flexibility dimensions could help managers to identify specific areas of improvement by investing suitable resources (Bai & Sarkis, 2018). Higher flexibility indicates that the capability of the system to deal with the incident will be more robust, and the responses to orders will be faster. Accordingly, flexibility in firm factors is important for omnichannel companies to supply the best service to their customers against the uncertainties of reverse logistics. Therefore, a higher degree of flexibility would enhance omnichannel firm performance.

### *Information System*

Information systems have become a necessary firm factor to manage return flow effectively (Daugherty et al., 2005; Huscroft, 2010; Huscroft et al., 2013; Mahadevan, 2019; Mahindroo et al., 2018; Morgan et al., 2016). Rogers and Tibben-Lembke (1998) mentioned that companies could be facing problems in reverse logistics because of the lack of a sound

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information system. Using information systems in reverse logistics may improve firm performance from the aspect of cost, inventory management and customer relationship management (Huscroft, 2010).

Besides that, Mahindroo et al. (2018) developed a framework that describes the dimension of information systems to improve reverse logistics effectiveness. The capability of information systems to enhance reverse supply chain performance lies through planning, development, process coordination and operations. Information systems need to be compatible with the firm's information requirements. All functional departments must be capable of providing accurate and timely details to each other. Accordingly, the information could help omnichannel companies deal with infrequent and unstable demands in the reverse supply chain (Huscroft et al., 2013). Uncertainties such as quantities, qualities, and channels can be tracked using the information system (Olorunniwo & Li, 2010).

Information systems also can support reverse logistics to enable and fulfill the requirements necessary for its operations, such as gatekeeping, collection, sortation and disposition (Mahindroo et al., 2018b; Vaz et al., 2013). Logistics managers can effectively manage and control the routing of products in operation through information systems (Gunasekaran & Ngai, 2004). Companies need to utilize information systems in reverse logistics operations to handle the complexity and increase the speed of process flow (García-Sánchez et al., 2018). For example, a company can plan a reverse logistics operation based on predictions of the type and volume of returns in historical database.

Besides that, the information system also assists in improving communication between the members of the supply chain. The integration of information technology into the supply chain enables members to access the product details such as the location and condition, leading to improved responsiveness (Daugherty et al., 1995; Mahadevan, 2019). For instance,

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information technology that works with reverse logistics activities might include automated material handling equipment, electronic data interchange, radio frequency equipment, and computerized merchandise tracking and entry. Effective information system use between supply chain members could enhance information exchange and promote trust in each other (García-Sánchez et al., 2018).

Moreover, information systems also assist in improving customer service in reverse supply chain handling (Mahindroo et al., 2018b). The transaction and process of reverse logistics become more fluid, and visibility increases customer satisfaction (Daugherty et al., 2005). Morgan et al. (2016) also clarified the importance of the information system as the center of supply chain management because it plays a role as the facilitator of communication between firms, customers, and suppliers. Essentially, the information system is a part of the firm factors that can improve omnichannel company performance.

### *Collaboration*

Collaboration has been recognized as an intangible firm ability that can positively influence company performance. This is because collaboration is a type of mechanism embedded in a firm that stimulates the effective alignment of resources in the supply chain (Morgan et al., 2016). Many researchers have studied the benefits of collaboration in the supply chain, including reverse logistics (Mahadevan, 2019; Mai et al., 2012; Mollenkopf et al., 2011; Stank et al., 1999). Numerous researchers have argued that strong collaboration in reverse logistics systems could help to reduce costs, increase customer service, increase reputation, and ensure effective processes (Chen et al., 2009; Mahadevan, 2019; Mai et al., 2012; Morgan et al., 2016).

Collaboration was defined by Mai et al. (2012) as a synergistically shared process within a firm where two or more departments display mutual understanding and a shared vision and work closely together to achieve collective goals. Collaboration involves two important dimensions, namely, information sharing and process coordination. As mentioned earlier, handling reverse logistics activities is complex and uncertain. Research by Hernández et al. (2011) emphasized the importance of information sharing to manage the complexity of planning in reverse flow, such as collection channels. Moreover, uncertainty in the quantity and quality of returned products also interferes with decision-making in reverse logistics activities, such as the accidental collection of the wrong unit due to the absence of information. Under these circumstances, information sharing among different departments is vital. Information from other departments could assist managers in making the correct decision.

At the same time, process coordination is an important aspect of collaboration in firm factors. A research study found that poor collaboration may result in poor reverse logistics operations and thus influence customer service (Bernon et al., 2016). For example, poor coordination between the logistics and marketing departments can result in poor customer service (Mollenkopf et al., 2007; Stank et al., 1999). Hence, the existence of effective coordination among relevant internal departments can assist managers with different knowledge and expertise to address these issues together as a team and establish joint cross-functional decision-making. Chen et al. (2009) discussed a company that used cross-functional teams synergy to manage all functional activities and processes in order to respond to a dynamic market rather than managing it independently. García-Sánchez et al. (2018) also emphasized that reverse logistics is more effective if different departments know and trust each other. Interdepartmental activities, including meetings and information exchange, enhance the relationship between departments to ground strong collaboration for effective reverse logistics activities (Huang & Yang, 2014).

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Process coordination among functional areas within a firm could become a competitive advantage as the complexity of collaboration makes it valuable, rare, hard to imitate, and irreplaceable (Morgan et al., 2016). As the return rates are high in the omnichannel context, process coordination across multi-functional departments is required to handle returns effectively (Bernon et al., 2016). Collaboration among multi-functional departments in reverse logistics may also enhance value by better aligning corporate resources to handle the return process (Morgan et al., 2016). Therefore, a high degree of collaboration among multiple departments is likely to increase omnichannel company performance.

### Task Environment Factors

Numerous research studies have discussed the influence of the task environment (Figure 2.11) on organization management (Carroll & Huo, 1986; DiMaggio & Powell, 1983). In order to survive in the competitive market, companies need to conform to certain conditions as required by external environment actors (DiMaggio & Powell, 1983; Huang et al., 2015). Researchers have also indicated that the task environment factors influence supply chain management, including reverse logistics, thus affecting company performance (Abdullah & Yaakub, 2015; Carter & Ellram, 1998; Huang et al., 2016; Mills, 2007; Ye et al., 2013). As Carter and Ellram (1998) mentioned, four task environment actors directly or indirectly impact reverse logistics. These are suppliers, customers, competitors, and regulators (Lau & Wang, 2009). The company that has the capability to recognize and react to signals from the external environment have a competitive advantage over companies that are absent in flexibility and agility (Huang & Yang, 2014).

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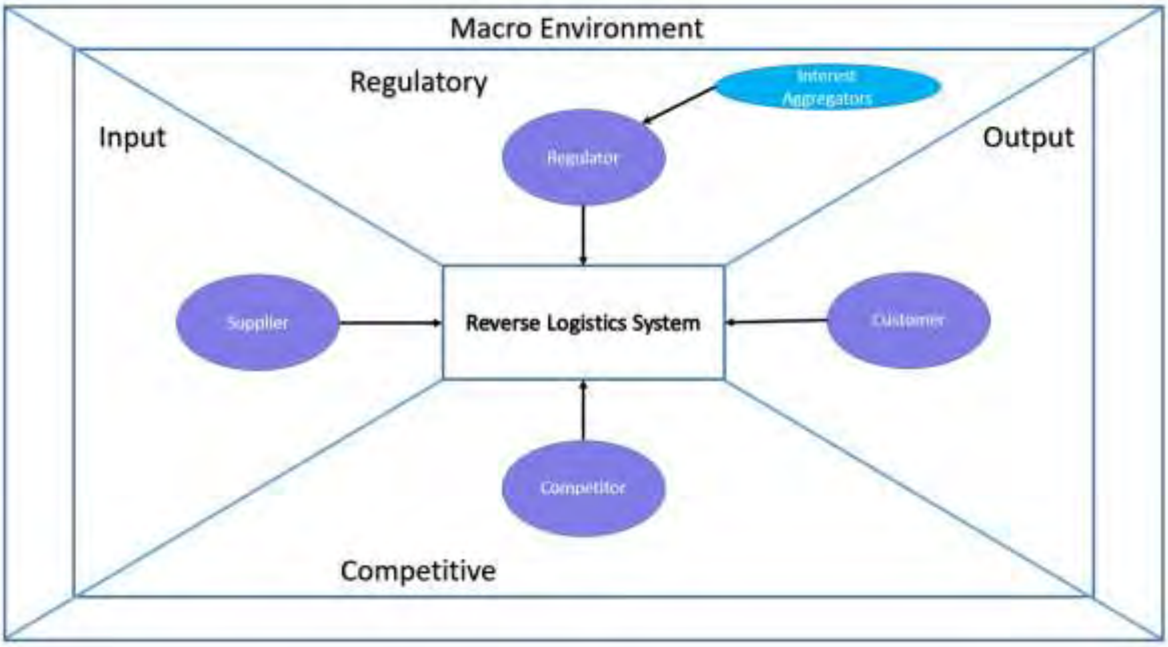


*Figure 2.11*
*Reverse Logistics Framework*
*Source:* Carter & Ellram (1998)

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### *Supplier*

One of the constituents of task environment factors is the supplier. Numerous studies indicate the importance of suppliers in company performance through effective reverse logistics (Huang et al., 2012, 2015, 2016; Lau & Wang, 2009; Vlachos, 2016). Suppliers pressure companies to implement reverse logistics practices to achieve their governing objective, whether to comply with regulations or recover costs. For instance, as a supplier of mobile phones, Nokia has introduced recycling and reusing used mobile phones into other products such as calculators, cameras, and personal data assistants. This ability has influenced other companies to take back used mobile phones through effective reverse logistics (Canning, 2006).

Besides that, a generous return policy from suppliers also encourages companies to implement reverse logistics practices, as suppliers are willing to accept returns from end-user. By using the return policy, company risk can be reduced with an increase in potential sales

(Padmanabhan & Png, 1995; Ye et al., 2013). Suppliers may also invest in specific assets to opt-in reverse logistics operations, which minimizes uncertainty for companies (Vlachos, 2016). For example, IBM developed IBM Sterling RL, which enhanced IBM's retailer supply chain visibility through the reverse logistics process. The automated processes and tracking ability improved customer satisfaction, eliminated inventory buffer stocks and reduced the cost of manual processes (Huang et al., 2015).

Hence, companies that coordinate and integrate with suppliers in implementing reverse logistics, whether intra- or inter-organization processes, can improve performance through better partner relationships (Vlachos, 2016). Companies that integrate with suppliers could reduce the bullwhip effect that leads to improper planning and inefficient resource allocation. The bullwhip effect occurs when the information on customer demand becomes misrepresented when passing through the supply chain backwards (Danese, 2013).

Moreover, they found there to be different governing mechanisms used to achieve coordination between suppliers and companies, such as contracts and partnership agreements (Vlachos, 2016). Contractual arrangements between a supplier and companies help to promote common goals and, at the same time, outline the responsibilities and benefits of participating in reverse logistics programs (Jack et al., 2010). They also emphasized the need for governance mechanisms to reinforce the relationship between a company and its key supplier. Furthermore, contractual agreements could assist in improving process alignment by confirming that each related function pursues the same objective instead of seeking to maximize self-benefits (Niemann et al., 2017).

Morgan et al. (2016) argued that integration between supplier and company could benefit the company through increased supply chain visibility, expanded profitability, and improved customer satisfaction. The connection developed between the supplier and the company can promote information sharing during joint planning (Li & Olorunniwo, 2008). Companies could obtain proprietary information from suppliers to avoid the common corporate pitfall of hoarding knowledge. Cooperation with suppliers could encourage information exchange in production planning, inventory status, sales data and collection information (Jeszka, 2014). Morgan et al. (2016) also indicated that effective relationships with suppliers provide companies with enhanced advantages such as increased flexibility and responsiveness to customer requirements (Lee et al., 2009). Hence, this study proposes that recognising and reacting to the influence of the supplier improves omnichannel firm performance.

#### *Customer*

Previous researchers have argued that companies need to understand and fulfill the request of the customer through effective reverse logistics in order to achieve competitive advantages (Abdullah & Yaakub, 2015; Álvarez-Gil et al., 2007; Huang et al., 2012, 2015; Jack et al., 2010; Jayaraman et al., 2007; Mollenkopf et al., 2011; Ye et al., 2013). In other words, a company that can recognize and react to customers' demands is better able to survive in the competitive market (Vlachos, 2016). Moreover, Ye et al. (2013) also indicated that paying attention to the customer has always been an important criterion of business. They suggested that the customer is always right and the company should consider customer opinions when handling returned, used and defective products instead of simply replacing them. As reverse logistics becomes a more common practice, Chinese companies will practice product return and product recovery strategies to meet customers' requirements within their specific industries. Companies could increase the satisfaction of customers by figuring out and meeting their real needs. Therefore, customers are likely to repurchase from the same company and are willing to recommend it to their friends (Stock et al., 2006). Besides that, the relationship between the company and customer is further enhanced by satisfying the customers.

The type of return policy, especially fully refunded policies or free returns, has a significant effect on motivating customers to purchase (Janakiraman et al., 2016). For instance, a company can create value for the customer by developing a customer-driven returns policy (Jack et al., 2010). Furthermore, there is customer demand for a liberal return policy where returns of products are allowed for any reason (Abdullah & Yaakub, 2015; Huscroft, 2010; Mollenkopf et al., 2007). Hence, omnichannel companies could possibly increase firm performance by offering customers a preferable return policy.

Besides that, customers often request the company to provide effective reverse logistics programs for them to return defective products within the warranty period. Stock et al. (2006) argued that product return is a necessary and unavoidable process. As long as products are sold, returns will always be incurred. Accordingly, customers tend to consider return options when making a purchase decision (Mollenkopf et al., 2011). Simply put, customers expect to be able to return defective or unwanted products smoothly and swiftly and receive a refund and replacement quickly and inexpensively (Huscroft, 2010). Nowadays, customers can easily switch between different companies and prices are easily compared. Therefore, companies need to improve their service level, such as warranty liability, to secure customer loyalty.

Companies need to have an effective reverse logistics process to handle returns in a timely manner to maintain customer satisfaction and increase the probability of repurchasing (Srivastava & Srivastava, 2006). For example, omnichannel companies have offered returns in-store for the convenience of customers to return unwanted products. Ineffective reverse logistics can lead to disastrous consequences and threaten the business relationship. Customers may even change to competitors that offer better after-sales service (Abdullah & Yaakub, 2015). In an effort to improve the online customer buying experience, companies have to design an approach that facilitates smooth and efficient returns services.

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As consumers become more alert about environmental issues, they are pressuring companies to incorporate environmentally friendly practices (Dowlatshahi, 2000). Customers are more likely to purchase from a more environmentally friendly company. Therefore, companies need to engage with an efficient and effective reverse logistics system. Customers are capable of exerting significant influence on companies to be more aware of environmental concerns by confirming that they and their business partners meet environmental protection requirements (Huang et al., 2015). If the company fails to comply with customers' requirements, customers may use their personal power to punish the company. For example, the customer will boycott a company with improper reverse logistics activities. Customers are willing to pay a higher price for environmentally friendly products. Abdullah and Yaakub (2015) indicated that companies should view consumer environmentalism as an opportunity instead of a threat. Companies that practice reverse logistics could enhance their reputation as eco-friendly companies. Therefore, a company that realizes the importance of reverse logistics strategy to the customer can enjoy increased profit, reduce cost, and enhance customer service (Huscroft, 2010).

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#### *Regulator*

There have been numerous studies indicating that regulators can influence companies to be a part of sustainable practices, especially with regard to reverse logistics (Carter & Ellram, 1998; Huang et al., 2010, 2012, 2015; Murphy & Poist, 2003; Rahman & Subramanian, 2012; Ye et al., 2013). Accordingly, some studies have mentioned that the regulator is the most significant impact on task environment factors in a company's reverse logistics practices (Carter & Ellram, 1998). The regulator can control and formulate laws and regulations to influence an organization's policies and strategies (Huang & Yang, 2014; Lau & Wang, 2009). Martin (2002) defined laws and regulations as tools to govern company practices in the virtual matrix in order to enhance social and environmental responsibility. Global regulators, especially in developing countries, have increasing concerns about environmental and human protection (Huang & Yang, 2014; Ye et al., 2013).

Therefore, many government bodies have established policies that compel and promote the efficient use of resources through reverse logistics. For example, Taiwanese regulators have formulated laws and regulations that coerce manufacturers and importers to collect back their products (Huang et al., 2012). Next, Daugherty et al. (2002) mentioned that implementing reverse logistics among companies is reactive through the influence of regulators or environmental groups rather than a proactive attempt to gain added value. Consequently, the implementation of reverse logistics in China was significantly impacted by the influence of regulations (Ye et al., 2013). They also highlighted that companies in China might not be involved in reverse logistics practices in the absence of government legislation. If a governmental regulatory body requests, a company is more willing to get involved in environmentally friendly programs and establish an efficient and effective reverse logistics system (Rahman & Subramanian, 2012).

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Besides that, regulators in many countries have started to become alert to the rise of e-commerce and the protection of consumer rights through e-commerce. Therefore, many countries have standardized the terms regarding the return and cancellation of products by indicating that e-commerce sites must have a return policy (Lianos et al., 2019). Consumers are entitled by regulation to incur a return process within a specific timeframe and conditions. Such regulatory changes have effectively impacted the ability of omnichannel companies to handle returns (Mollenkopf et al., 2011). For instance, the European Commission formulated regulations to protect consumer rights; consumers are allowed to return purchases within fourteen calendar days, and the company needs to refund consumers within fourteen calendar days (European Commission, 2017).

Consumers in Malaysia have the right to cancel orders above RM300 within a 10-day cooling-off period under the Direct Sales and Anti-Pyramid Scheme Act 1993. During this period, the consumer has the right to cancel for any reason by notifying the seller (Amin & Nor, 2013). Hence, the company needs to have an effective reverse logistics program for handling returns. Companies are trying to reduce their losses due to the potential costs and legal liabilities by anticipating reverse logistics (Clemens & Douglas, 2006). Companies need to implement reverse logistics effectively to comply with regulations inside the country or in other countries, and the company may benefit from sustainable practices (Eltayeb & Zailani, 2011).

#### Competitor

Besides that, the ability to recognize the influence of competitors in reverse logistics also impacts a company's performance. In a social network, a company may unconsciously imitate other network members' practices (Ye et al., 2013). A company will imitate another that they perceive as the winner in their industry. Companies may copy reverse logistics strategies from other more successful competitors (Huang & Yang, 2014). Companies aim to increase their value by imitating other competitors, especially when facing highly uncertain situations (DiMaggio & Powell, 1983). As discussed before, reverse logistics operations are complex and have a high degree of uncertainty. A previous study found that managers were not confident in designing reverse logistics programs and that companies could learn about and respond to the issue from other firms, including competitors (Huang & Yang, 2014).

By imitating targeted and possible competitors, companies can utilize substantial approaches to defeat rivals as well as gain sustainable competitive advantages (Hilman & Kaliappen, 2014; Olson et al., 2005). For example, some companies offer liberal return policies which pressure other companies to follow suit in order to develop a service-based competitive advantage. If a pioneer proved that reverse logistics implementation can increase competitive advantages and enhance customer relationships, other companies in the industry would also implement reverse logistics (Ye et al., 2013). Besides that, Canning (2006) also indicated that cooperation between competitors is necessary for an effective reverse logistics system. For instance, HP, Sony, Braun, and Electrolux established a private European Recycling Platform to collect e-waste in order to respond to the Waste Electrical and Electronic Equipment Directive. This program helped the founders increase their revenue and reputation, thus attracting other companies in the electronic industry to join the innovative program. Accordingly, by 2007, more than one thousand companies had joined this platform (Huang et al., 2015). It is also indicated that companies should also pay attention to the strategies of other companies in the same industry for competitive advantages.

Due to the intense competition caused by globalization and technological advancement, omnichannel companies must reconsider and make an effort to increase efficiency in their supply chain (Ma, 2017). Companies improving efficiency in reverse logistics processes by enabling recovery of the returned products or disposal of end-of-life products is one of the ways to maintain and increase competitiveness and market share (Huscroft, 2010). Tang and Tang (2016) argued that the competitor is an essential factor that influences company engagement in environmental practice. Intense competition may motivate a company to participate in supply chain management to differentiate itself from its rivals. Hence, effective reverse logistics management is becoming a critical aspect of making a difference and a chance to build competitive advantage (Rogers & Tibben-Lembke, 1998). For example, online retailers that offer liberal return policies mitigate consumers' risk and thus increase their sales due to consumers' willingness to purchase (Zhang et al., 2019).

The study by Ye et al. (2013) indicated that competition in China is intense due to decreasing trade barriers and increasing foreign competition. Hence, companies in China feel pressured to implement environmental protection practices, including reverse logistics. Reverse logistics practices have become a necessary standard for companies in China, and thus the companies support and maintain these competitive practices. Overall, omnichannel companies that recognize and react to the influence of competitors in reverse logistics are more likely to have better performance. In the next section, hypothesis development is discussed to understand how hypotheses are developed based on previous studies.

## Hypothesis Development

Based on the review of previous studies, it can be summarized that there are two determinants in predicting omnichannel firm performance: firm and task environment factors. Previous subsections have shown that firm factors (top management support, formalization, flexibility, information system and collaboration) and task environment (suppliers, customers, regulators, and competitors) impact firm performance. Hence, the following hypotheses were developed:

### *Firm Factor*

$H_{1(a)}$: Top management support significantly and positively affects omnichannel firm performance.

$H_{1(b)}$: Formalization significantly and positively affects omnichannel firm performance.

$H_{1(c)}$: Flexibility significantly and positively affects omnichannel firm performance.

$H_{1(d)}$: Information systems significantly and positively affect omnichannel firm performance.

$H_{1(e)}$: Collaboration significantly and positively affects omnichannel firm performance.

### *Task Environment*

$H_{2(a)}$: Suppliers significantly and positively affect omnichannel firm performance.

$H_{2(b)}$: Customers significantly and positively affect omnichannel firm performance.

$H_{2(c)}$: Regulators significantly and positively affect omnichannel firm performance.

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$H_{2(d)}$: Competitors significantly and positively affect omnichannel firm performance.

According to the suggested hypothesis, a conceptual framework was conceptualized to provide a holistic view of reverse logistics management in an omnichannel environment.

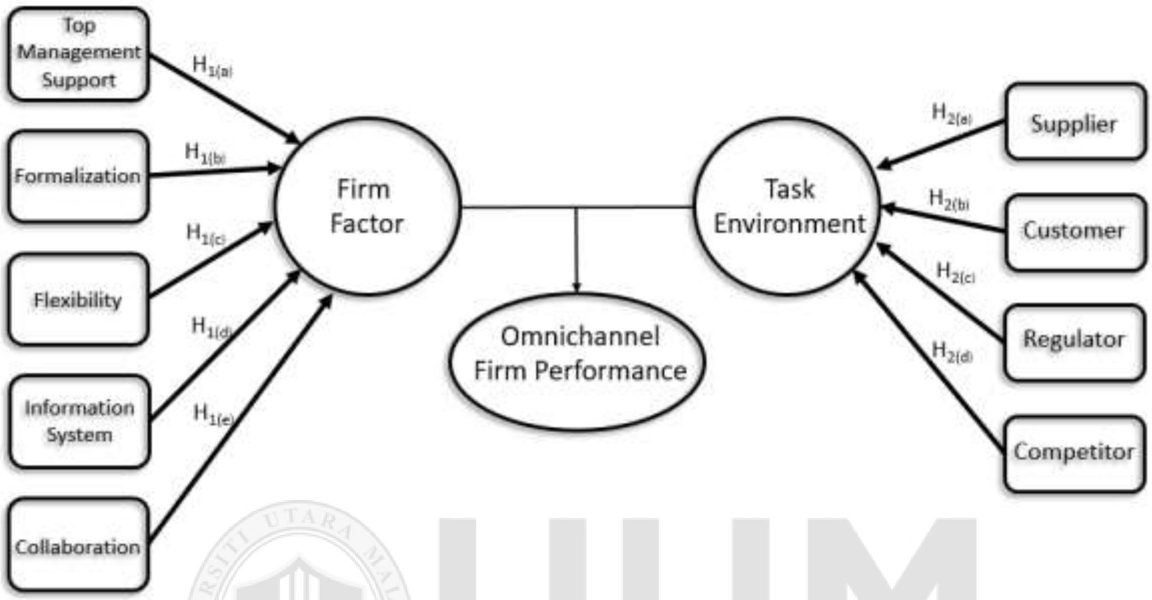


*Figure 2.12*
*Conceptual framework for omnichannel reverse logistics management*
*Source: Author illustration*

According to the conceptual framework (Figure 2.12), the research gap will discuss how the current gap can be addressed in the next section.

## The development of Research Questions & Research Objectives

This study aims to examine the reverse logistics factors (firm and task environment factors) affecting omnichannel firm performance, as well as to understand the relationship between reverse logistics and omnichannel. In terms of reverse logistics systems, the impact of the different factors, such as top management support, formalization, flexibility, information system, collaboration, customer, supplier, competitor and regulator on omnichannel companies, are determined and elaborated. Moreover, this study also investigates the relationship between firm and task environment factors and their influence on omnichannel firm performance.

Reverse logistics has been recognized as one of the critical elements in omnichannel (Saghiri et al., 2017). Studies have indicated that reverse logistics needs to integrate with other functions such as order fulfilment, transaction, customer service, product information, pricing, and promotion to ensure the sustainable success of omnichannel. Reverse logistics is an important part of omnichannel as it provides accurate and timely information in the business processes. Apart from that, omnichannel has been defined as a complex system in which there is interaction between elements full of uncertainties and changing dynamics (Saghiri et al., 2017). Hence, the complexity of omnichannel may be reduced by establishing the relationship between reverse logistics and omnichannel in this study.

With the growth of digital retailing, companies have begun to apply the omnichannel concept in their business model by integrating the business processes, including product returns. A study by Bernon et al. (2016) described the characteristics of reverse logistics practices in omnichannel companies. The situation of return processes has become more complex, including an increase in the variety of return channel options such as retail stores, drop points, parcel carriers, and postage services. Accordingly, these have underlined the importance of an effective reverse logistics system handling returned products. They also emphasized that product return processes need to include two considerations: processing speed and integration for sustainable company performance. In the past, omnichannel companies struggled with both considerations when handling return processing (Ames, 2017). However, both considerations are critical in reverse logistics to improve operational performance and customer service. Thus, this study provides a robust framework that effectively improves omnichannel firm performance by managing reverse logistics.

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Numerous studies have discussed the best network design for reverse logistics in an omnichannel context (Ang & Tan, 2018; Hübner et al., 2016; Xiao Yan et al., 2012). For instance, Hübner et al. (2016) clarified the different return channels for companies to collect customer returns. In conjunction, the study by Bernon et al. (2016) and the exploratory study by Hübner et al. (2016) further emphasized the importance of processing speed and processing service level in the reverse flow. Additionally, Ang and Tan (2018) indicated that elements of efficiency are crucial in return management from an operational point of view. To compete with other companies in the same industries, companies must make optimal decisions based on key factors influencing reverse logistics practices. Therefore, further quantitative-based stream studies need to focus on modeling approaches to support the reverse flow decisions of companies (Hübner et al., 2016).

Researchers have indicated that reverse logistics is influenced by different factors such as collaboration, formalization, flexibility, information systems, top management support, suppliers, customers, regulators, and competitors. Due to certain limitations, most research studies only examine certain reverse logistics factors. For example, Mahadevan (2019) investigated the impact of collaboration in reverse logistics operations, while Richey et al. (2005) studied the influence of top management support on reverse logistics. However, they also emphasized the need to investigate other factors to comprehensively understand reverse logistics (García-Sánchez et al., 2018; Jack et al., 2010).

Task environment factors have been recognized as important factors that influence reverse logistics (Carter & Ellram, 1998). However, most studies have emphasized internal factors such as information systems and collaboration (Morgan et al., 2016). Next, a few studies have indicated that companies that can recognize and react to the task environment will achieve superior performance (Huang et al., 2015). An excellent company should pay close attention to the external environment that it interacts with directly or indirectly (Huang et al., 2015).

Therefore, it is crucial to explore the influence of task environment factors on omnichannel firm performance.

Among the researched firm factors that influence reverse logistics, researchers have suggested that flexibility and formalization would improve reverse logistics through conceptual study (Bai & Sarkis, 2013; Genchev et al., 2011). The provided frameworks in their studies contained guidelines explaining how both factors enhance reverse logistics practices. Further studies are needed to examine the effects of both firm factors. Besides that, other firm factors such as collaboration, top management support, and information system are considered critical factors to manifest effective reverse logistics. Nonetheless, the exact impact of these firm factors on omnichannel firm performance is unclear.

Furthermore, studies on reverse logistics should incorporate both internal and external factors, as supported by Carter and Ellram (1998). In reality, successful companies need to have the ability to understand the external environment and deploy resources based on the external environment. In other words, companies have to be capable of identifying opportunities and detecting threats in order to sustain themselves in a competitive market (Huang et al., 2012). Thus far, Huang et al. (2016) included top management support with task environment factors in the investigation of reverse logistics. However, the inclusion of other firm factors is also crucial in reverse logistics practices (Huang et al., 2015). The gap can be closed by including both firm and task environment factors in an interdisciplinary approach, according to the nature of reverse logistics, as suggested by Carter and Ellram (1998) and Dowlatshahi (2012).

In conclusion, numerous articles have confirmed that reverse logistics improve company performance via cost reduction, improve customer satisfaction and increase revenue (Huang & Yang, 2014; Jack et al., 2010; Mai et al., 2012; Vlachos, 2016; Ye et al., 2013). However, there is a lack of research that discusses the effect of reverse logistics on company performance based on channel type, especially omnichannel.

To address the above gap, this study aims to find out whether reverse logistics factors have an impact. Therefore, there is a need to investigate the impact of both firm and task environment factors. This study proposes that firm and task environment factors do influence omnichannel firm performance. Based on the above rationale, the objective of this study is to explore and explain the relationship between reverse logistics and omnichannel.

## Summary

In general, the discussion centred around both reverse logistics and omnichannel in order to understand the application of reverse logistics system in an omnichannel context. The reverse logistics system can improve omnichannel firm performance. In reality, the limited research investigation about this relationship has resulted in obstacles for omnichannel firms. By summarizing knowledge from multiple previous studies, the research progress in this study is strengthened. The next chapter discusses the research methodology applied in this study to understand the influence of firm and task environment factors on omnichannel firm performance.

# CHAPTER 3: RESEARCH METHODOLOGY

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## Introduction

The previous chapter has provided a basic understanding of the theoretical lens used to develop the research frameworks and assumptions. Hence, this chapter discusses this study's research design, which comprises the selected research design and the reason for the chosen selection.

This study aims to construct a robust conceptual model relevant to interdisciplinary studies by including multiple theoretical lenses and frameworks (Zscheischler et al., 2014). Similarly, Lang et al. (2012) emphasized incorporating all the related disciplines as inputs in researching complex sustainability problems. As stated in chapter two, this study considers various theories to understand the relationship between reverse logistics and omnichannel companies. For an interdisciplinary review of multidisciplinary literature, it is critical to interpret multifaceted views holistically in order to contribute to theoretical and practical knowledge (Wallis, 2014).

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Hence, this chapter expands on the previous chapter by further defining the research design. It underlines the importance of the chosen frame of methodology and research design in answering the research questions. Thereafter, the subsections in this chapter discuss the important elements involved in conducting this research.

## Methodology and Research Approach

Past literature has shown that reverse logistics factors (firm and task environment factors) influence firm performance (Abdullah & Yaakub, 2015; Huang et al., 2015; Huang & Yang, 2014; Škapa, 2012; Vlachos, 2016; Ye et al., 2013). However, they have not been discussed within the omnichannel context. Reverse logistics is a pivotal element of omnichannel companies (Saghiri et al., 2017). Therefore, Morgan et al. (2016) suggested that reverse logistics needs to be examined in the omnichannel context.

This study will identify the reverse logistics factors that influence firm performance in an omnichannel context. Due to a lack of supporting literature, the researcher needs to gain in-depth insight into omnichannel companies to gain an understanding of how reverse logistics influence firm performance.

Besides that, this study also analyses the relationship between reverse logistics and omnichannel companies. Firm and task environment factors are determinant variables, whereas omnichannel firm performance is analysed as the outcome variable. Apart from those mentioned above, this study also examines the elements of firm and task environment factors on omnichannel firm performance.

Creswell (2014) indicated that the selection of a suitable research approach is made based on the nature of the research questions. Therefore, a study with a postpositivist and constructivist paradigm would be favourable for a mixed methodology approach (Ågerfalk, 2013; Castro et al., 2014; Mertens & Hesse-Biber, 2013). A postpositivist paradigm refers to the need to identify and evaluate the causes that affect consequences. Meanwhile, the constructivist paradigm refers to the need to seek cognition of a situation, which points to omnichannel in this study.

The application of a mixed methodology approach is perfect for this study to address research questions as the subject matter using a quantitative method to present an objective explanation of the worldviews or a qualitative method to understand the meaning of the worldviews (Creswell, 2014; Matthews & Ross, 2010; Sekaran & Bougie, 2016).

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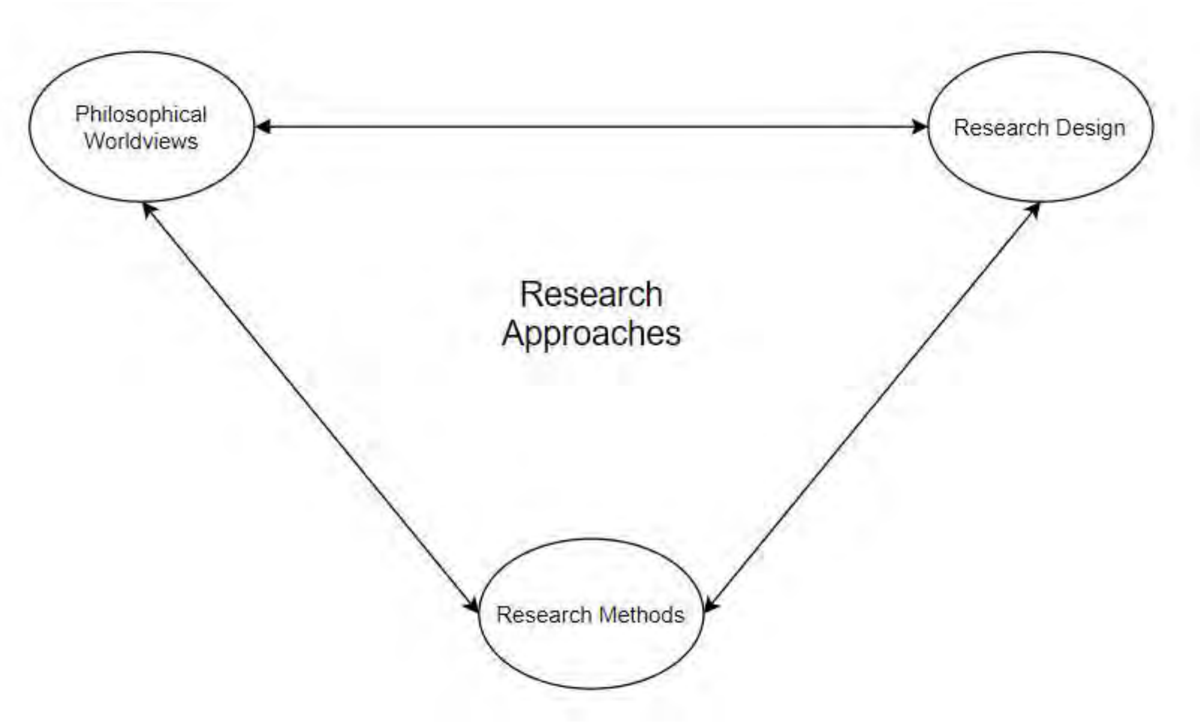


*Figure 3.1 Research Approaches Selection*
*Source: Creswell (2014)*

This study used a mixed methodology approach (Figure 3.1) that did not threaten the philosophical stance, but showed the direction of data collection and analysis in research design which was determined by the research questions. The rigors and authenticity of this research were improved by using this approach. Quantitative and qualitative approach defines the data collection method and how the data is analyze in this study. Thus, it enabled the researcher to utilize research questions as a root of the mixed methodology approach rather than to approach the study from a paradigm stance.

## Research Design

The core aspect to be considered when selecting a research design relates to research questions and research objectives (Edmonds & Kennedy, 2017; Matthews & Ross, 2010; Sekaran & Bougie, 2016). The research objectives and questions are the overall study's doctrines that address the two critical reverse logistics determinants (firm and task environment) in omnichannel firm performance from the body of knowledge. This study intends to explain the influences of reverse logistics factors, namely firm and task environment factors, on omnichannel firms, in order to attain competitive advantages within the scope of omnichannel logistics.

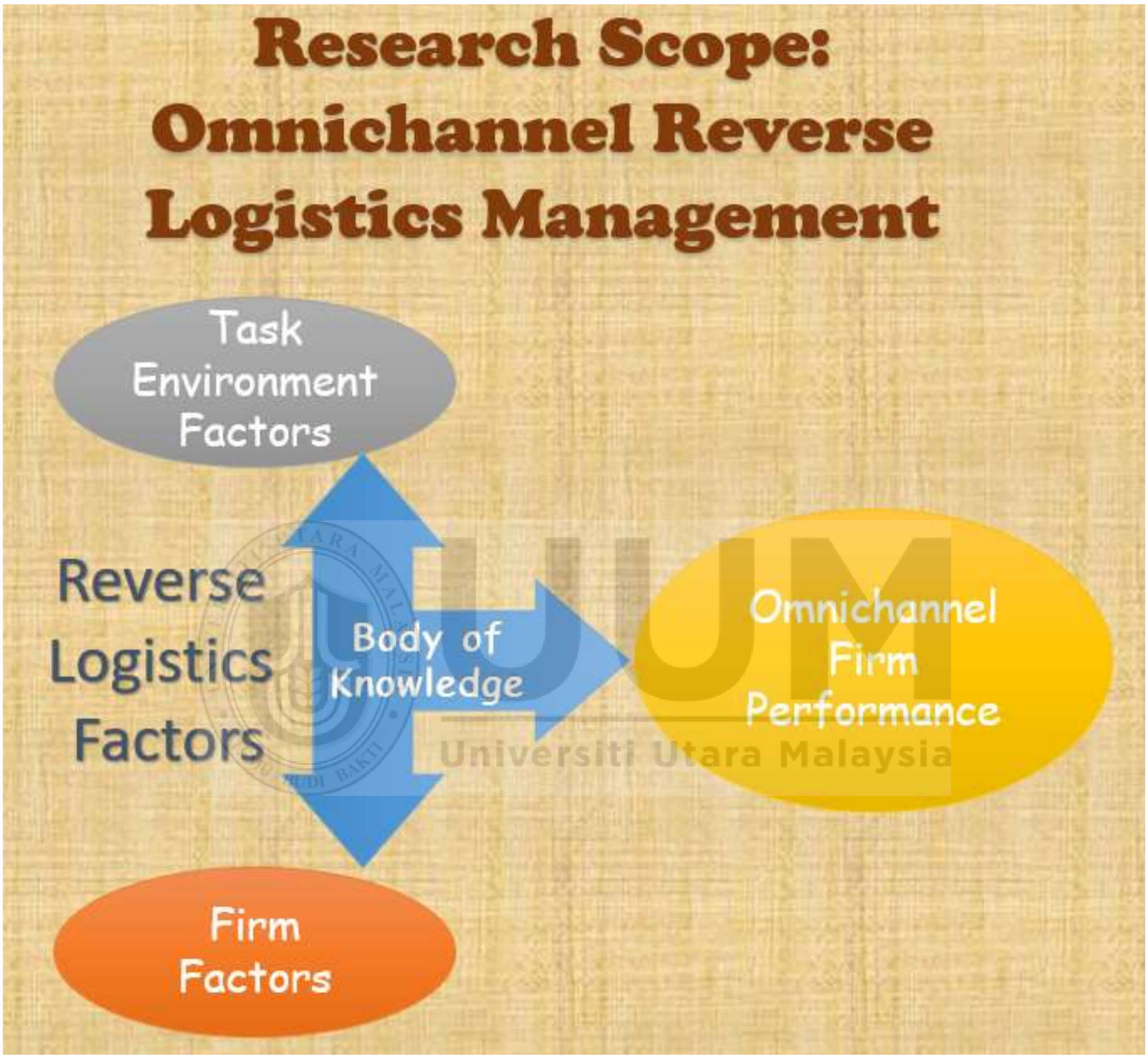


*Figure 3.2 The understanding of the reverse logistics effect in omnichannel firms within the scope of omnichannel reverse logistics management*
*Source: Author illustration*

The development of the research objectives with relevant research questions became the root of this research design, as shown in Figure 3.2. From the research questions and objectives, it is abundantly clear that a descriptive and exploratory study on omnichannel companies and recognizing reverse logistics factors is bound to generate desirable business advantages.

Table 3.1 RQs & Approaches

| Research Questions | Objectives | Qualitative Approach | Quantitative Approach |
|---|---|---|---|
| 1. What are the different factors associated with RL that influence omnichannel firm performance? | • To explore the reverse logistics factors that affect the omnichannel firm performance | Interviews and Focus group | Survey |
| 2. What are the relationships between firm and task environment factors with the omnichannel firm performance? | • To examine the relationship between the firm and task environment factors with firm performance in the omnichannel context | Interviews and Focus group | Survey |
| 3. What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance? | • To explain the relationship between the firm and task environment factors with firm performance in the omnichannel context | Focus group | Survey |

In summary, a mixed methodology approach was considered the most ideal for solving the above-mentioned research questions in Table 3.1. SED that combines qualitative and quantitative approaches were adapted to identify the research process, such as data analysis

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and data collection. The research questions and objectives were the guidelines in determining the SED process.

### Sequential Explanatory Design (SED)

Sequential Explanatory Design (SED) is a mixed-method design that compromises quantitative and qualitative approaches in the research journey. SED is a sequential approach that includes multiple stages to address research questions arranged in order by quantitative or qualitative approaches (Ivankova et al., 2006).

Primarily, using the SED method is suitable for research design to achieve the research objectives by cross-checking two types of data: interviews and questionnaires. It can produce a comprehensive understanding of two variables (firm and task environment) with firm performance in an omnichannel context. It also enhances the credibility of the overall results by using qualitative data to support or explain quantitative analysis findings. SED also improves methodological precision by accessing and examining the database generated by qualitative and quantitative analysis for consistency and transferability. So, the application of mixed methods can strongly enhance the elaboration of reverse logistics in omnichannel companies. Firstly, combining a priori themes and cross-checking during semi-structured interviews, then constructing a quantitative approach to seek generalization of the themes. Lastly, the focus group was organized to confirm the impact of the reverse logistics effect, as shown in Figure 3.3.

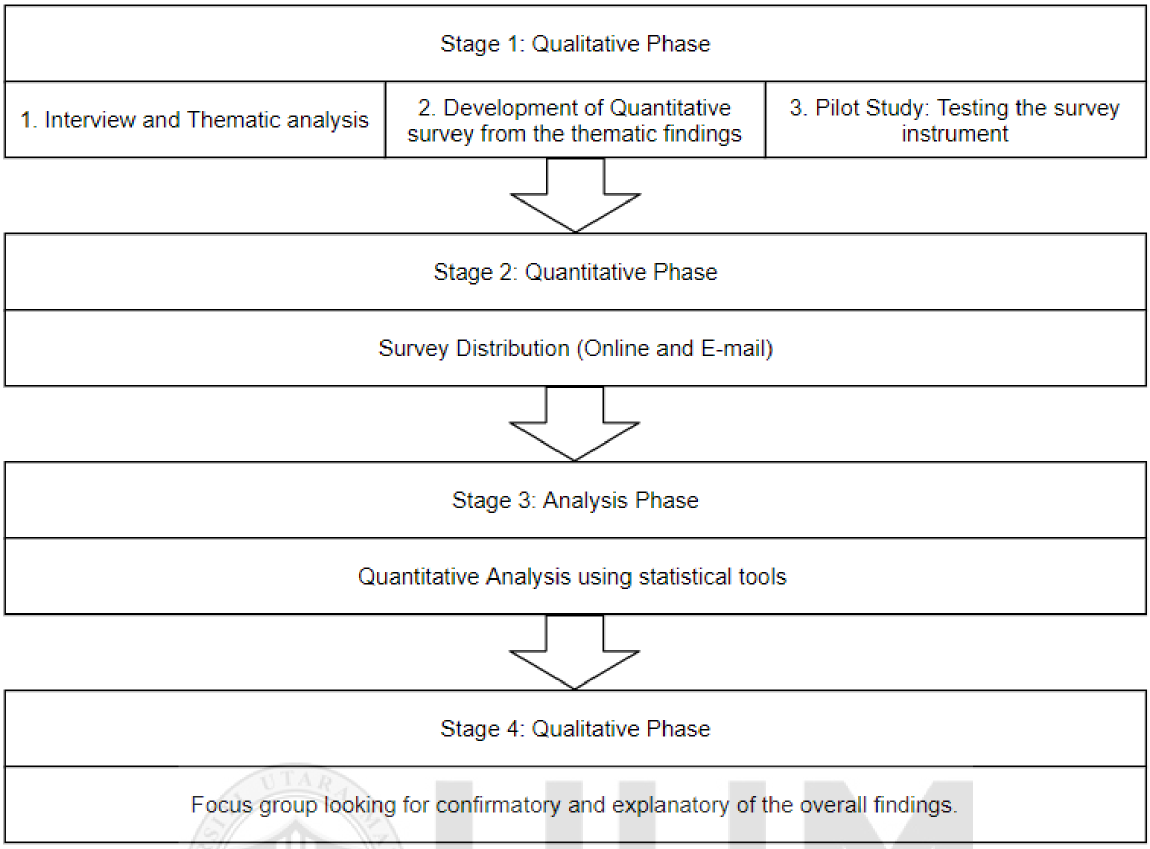


*Figure 3.3 SED Research Design*
*Sources:* (Creswell, 2014; Teddlie & Tashakkori, 2009)

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After that, the unit of analysis needs to be determined before further discussing the phase of SED. The following sections will discuss the unit of analysis for this study prior to the phase undertaken in the SED.

## Unit of Analysis

As this study was conducted to investigate reverse logistics in an omnichannel context, the unit of analysis is the omnichannel company. Hence, this study further identifies omnichannel companies in the business environment. Saghiri et al. (2017) developed a three-dimensional framework for omnichannel systems that provide a more comprehensive understanding of this concept. The dimension of omnichannel systems can be differentiated into channel stage, channel type, and channel agents, as described in Table 3.2. Based on Figure 3.4, omnichannel companies offer and manage various channels in all the different channel stages, including product returns.

*Table 3.2 Definition of the terms in the omnichannel system*

| Dimension | Definition |
|---|---|
| Channel stage | Refers to the phase of value-adding journey such as pre-purchase, payment, delivery, return |
| Channel type | Refers to the medium or method in each stage |
| Channel agent | Refers to the firms that manage the channel type in each channel stage |

*Source:* Saghiri et al. (2017)

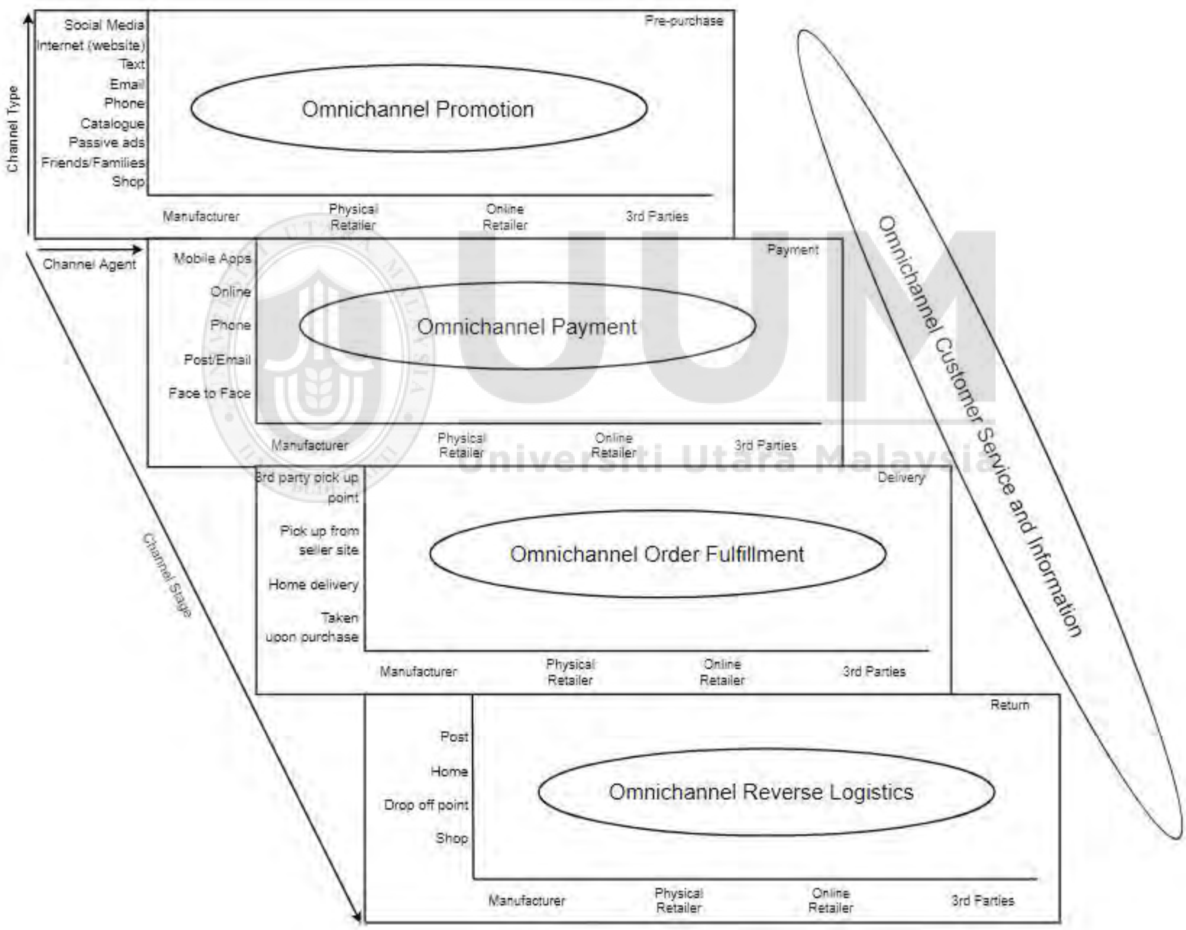


*Figure 3.4*
*Omnichannel Dimension from the view of stage, type and agent*
*Source:* Saghiri et al. (2017)

As this study focuses on reverse logistics in the omnichannel context, it looks into the improvement of the reverse logistics function to improve firm performance, as shown in

Figure 3.5. For instance, online retailers can integrate with physical retailers to enable customers to return products in-store. Retailers can integrate with logistics service providers to handle the return orders through channel pick-up, both at home and at drop-off points (Bernon et al., 2016; Hübner et al., 2016). From the manufacturer's perspective, they can acknowledge the reasons behind the returns in order to improve their products. Furthermore, they can also receive returns from retailers that need indirect recovery (De Brito & Dekker, 2004).

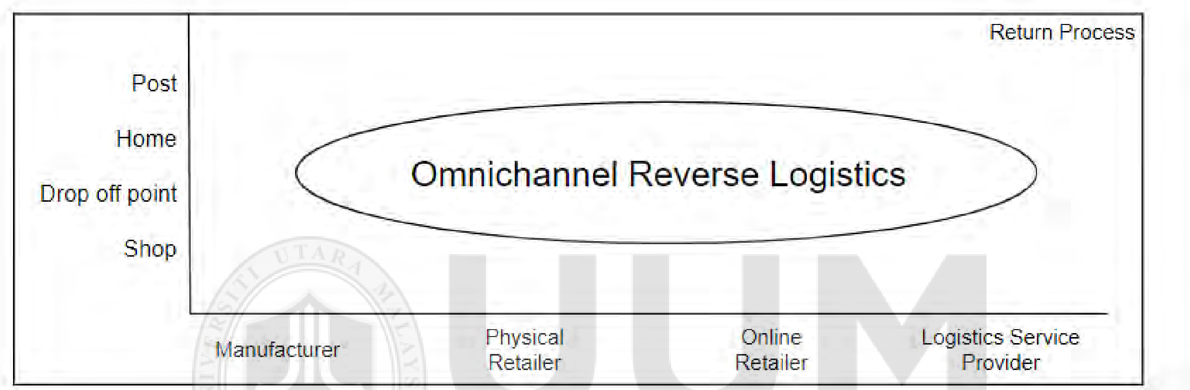


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*Figure 3.5*
*The link between the firm and channel type in omnichannel reverse logistics*
*Source:* Saghiri et al. (2017)

According to Saghiri et al. (2017), omnichannel firms at the stage of reverse logistics can be differentiated into manufacturers, digital retailers, physical retailers, and logistics service providers. The examples of omnichannel firms are shown in Figure 3.6. For example, online retailers such as Zalora sell fashion apparel through online channels, while Shopee and Lazada sell different types of products through mobile applications as well as online websites. The core function of Padini is to sell fashion apparel through retail stores, but they have also started to operate an online store. This situation also happens with Tesco and Giant, which mainly sell different types of products through physical stores and are also involved in digital channels. In the omnichannel business environment, logistics service providers such as POS, Ninja Van, and DHL Express provide order fulfilment and collection for companies. The core function of manufacturers mainly revolves around the production of goods such as Top Glove (rubber gloves), Acson (home appliances), and Wasaniaga (furniture).

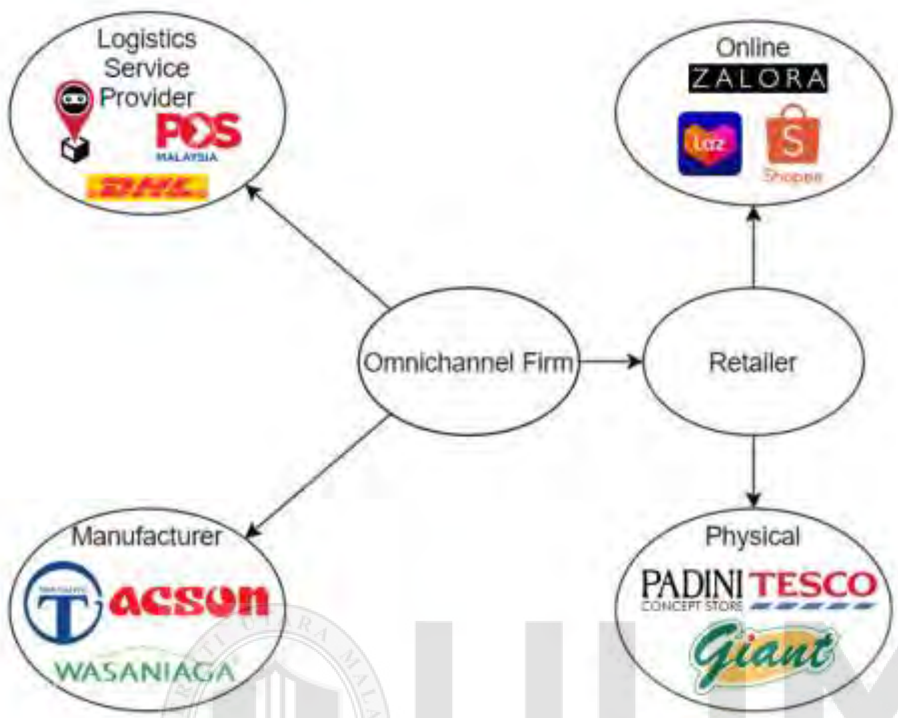


*Figure 3.6*
*Type of Omnichannel Firms*
*Source: Author Illustration*

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These omnichannel companies play different roles in managing various reverse logistics functions. Besides that, they are not isolated; their roles involve connecting with other omnichannel companies, especially logistics service providers and various channels for managing reverse logistics functions. For example, retailers integrate with logistics service providers to collect customer returns through their courier services.

Since the rise of omnichannel, both digital retailers and physical retailers have been placed on the front line. This is because they need to offer various options for finding, buying, and returning goods across brick-and-mortar stores and web shops (Hübner et al., 2016). Among the omnichannel companies, retailers have been recognized as possessing strong power to manage some aspects of their omnichannel strategy (Saghiri et al., 2017). Thus, this research can investigate the outcome of effective reverse logistics by observing how retailers manipulate reverse logistics systems to improve firm performance. According to Hübner et al. (2016), retailers are recognized as an omnichannel if they have both distance sales channels and bricks-and-mortar outlets.

Manufacturers are also dedicatedly involved in the omnichannel system to fulfil customer and retailer demands. Manufacturers can develop different channels, such as websites, to provide information to customers (Saghiri et al., 2017). Besides that, manufacturers can integrate with retailers and logistics service providers in order fulfilment and return handling to achieve efficient and effective processes (Bernon et al., 2013; Chopra, 2003). Thus, manufacturers in an omnichannel context empower the primary function of manufacturing, but attempt to link with customers directly through different channels (Saghiri et al., 2017).

Logistics service providers need to improve their services by integrating physical channels with online channels. So, the logistics service providers are involved in the omnichannel business environment, especially in the forward and backwards distribution stages. Logistics service providers in an omnichannel environment offer services to fulfil e-commerce orders, including return processes (Rai et al., 2018). Logistics service providers need to offer collection from drop-off points and collection from home in the return processes (Hübner et al., 2016). Logistics service providers can be recognized as omnichannel companies which assist retailers in managing distance channels (Saghiri et al., 2017).

Hence, it is suitable to collect data from manufacturers, digital retailers, physical retailers, and logistics service providers representing omnichannel companies to observe reverse logistics implementation in the omnichannel business environment and analyze the outcomes of their reverse logistics systems.

## Research Population and sampling

As discussed, omnichannel companies are used as the unit of analysis in this study. Therefore, the research population of this study is the omnichannel companies that operate in Malaysia, as both consumers and enterprises have recognized the omnichannel trend. The population refers to the entire group of people that this study intends to investigate (Sekaran & Bougie, 2016). The Malaysian government has encouraged the participation of more enterprises in the omnichannel system, thus motivating the execution of this study. The following sections justify the reasons for the chosen population and sampling method.

### Target Population

The chosen population for this study consists of omnichannel companies in Malaysia due to the following reasons below:

I. Malaysia leads in the ranking of omnichannel developmental progress among Asian countries. The ranking evaluates four dimensions: the degree of digitization for retail sales, omnichannel potential, consumer behaviour, and technology infrastructure. Malaysia placed at number four, thus indicating that Malaysia is embracing an omnichannel strategy and working toward sustainable growth in digital infrastructure. Malaysia also has a positive level of consumer demand for omnichannel retailing (Figure 3.7).

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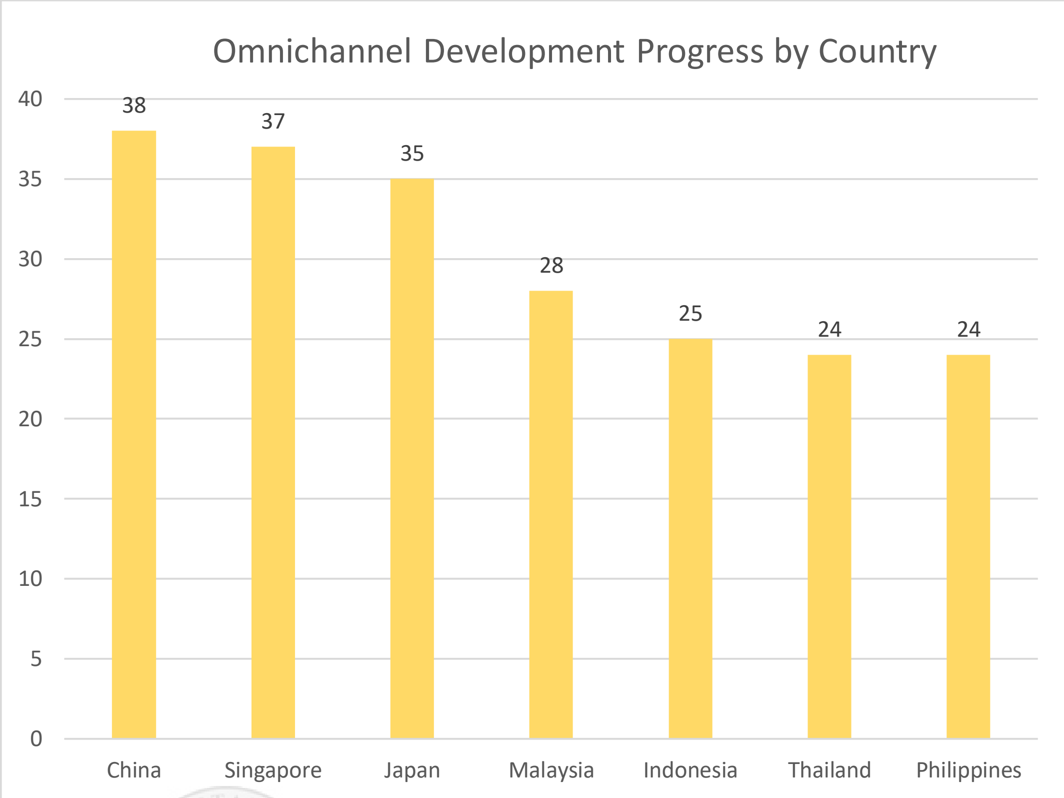


*Figure 3.7*
*Omnichannel Development Progress by Country*
*Source:* PwC (2017)

II. Malaysia has recorded retail e-commerce sales growth levels above the worldwide average (Figure 3.8). The retail sales growth of Malaysia is 22.4%, which is higher than the worldwide sales growth of 20.7%. This indicates that Malaysia is entering a more mature omnichannel context (Lipsman, 2019).

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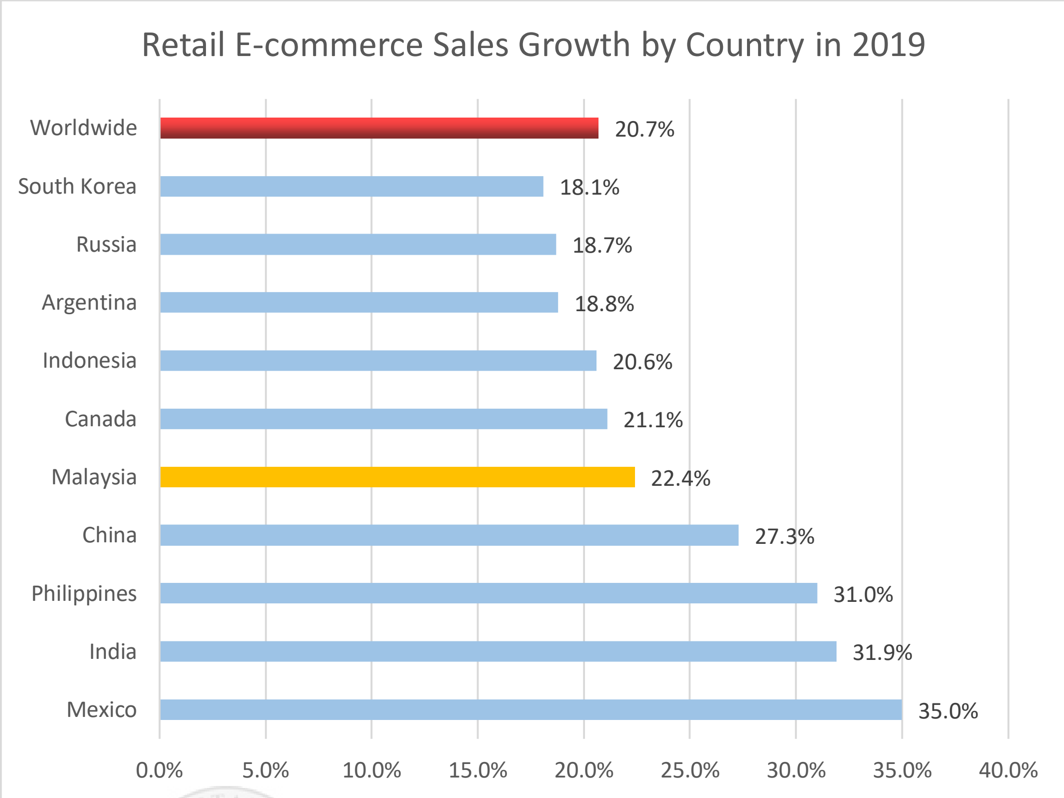


*Figure 3.8*
*Retail E-commerce Sales Growth by Country in 2019*
*Source:* Lipsman (2019)

III. Value-added e-commerce in Malaysia has demonstrated a steady climbing trend over the years, from RM89.1 billion in 2015 to RM115.5 billion in 2018 (Figure 3.9). Besides that, the contribution of information and communication technology, including service, trade and manufacturing, to the economy was 18.% or RM267.7 billion in 2018 (Department of Statistics Malaysia, 2018). This situation is also encouraged by the Malaysian government, which shows an aggressive interest in developing an omnichannel strategy such as the Digital Free Trade Zone (DFTZ), which aims to increase the involvement of local businesses in digital channels (Kaur et al., 2019).

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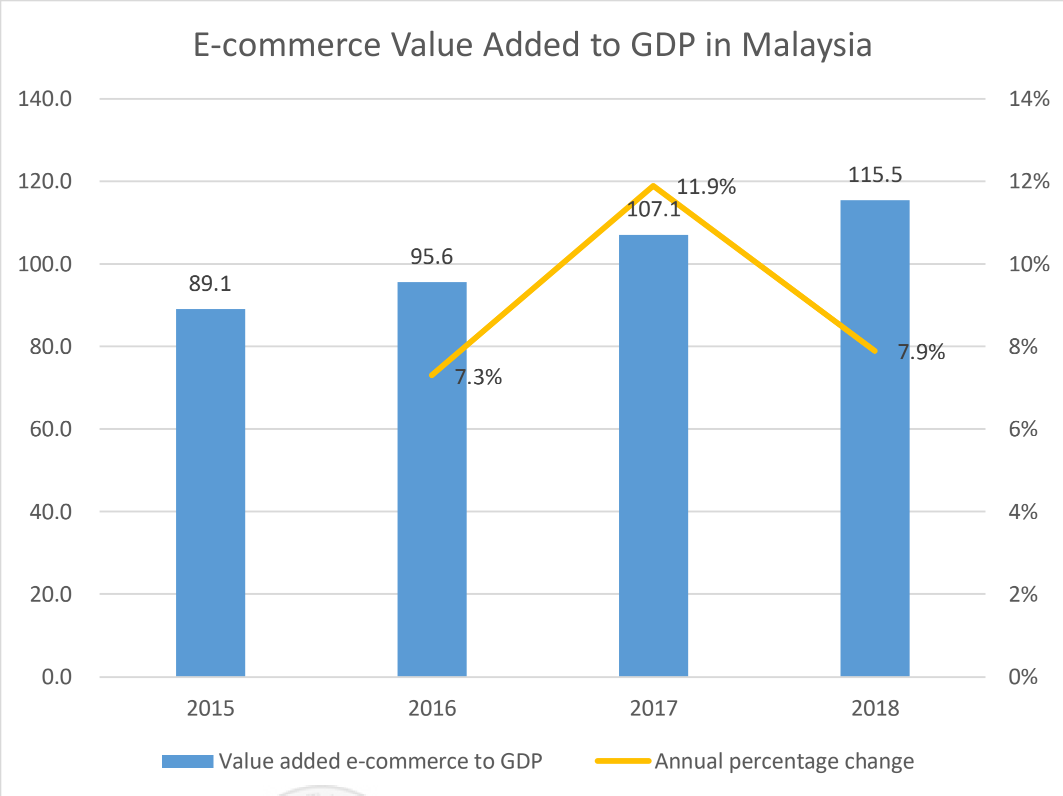


*Figure 3.9*
*E-commerce Value Added to GDP in Malaysia*
*Source:* Department of Statistics Malaysia (2018)

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IV. Malaysia was an accessible choice as a population parameter that allowed the researcher to conduct fieldwork with fewer research capacity obstacles.

## Sampling Size & Strategy

As discussed, omnichannel companies in Malaysia can be differentiated into manufacturers, retailers and logistics service providers. However, this study cannot analyse all populations due to the limited resources available. The sampling process was able to represent the population by using a small number of elements from the whole population (Kotzab, 2005). Hence, an appropriate sampling technique is needed to reduce the number of data while ensuring the generalization of the results (Sekaran & Bougie, 2016; Taherdoost, 2016).

Therefore, the sample frame of this study was determined by the population, which includes approximately 49,101 manufacturers, 418,569 retailers and 53,785 logistics service providers

(Department of Statistics Malaysia, 2017). The total population of omnichannel companies in Malaysia is 521,455 establishments. According to the Sekaran and Bougie (2016) 'rule of thumb', a sampling size of 95% confidence level is suitable for the total population of a minimum of 384 sample size as the baseline by referring to the table by Krejcie and Morgan (1970). The study obtained at least 384 respondents from 521,455 establishments which allowed the outcomes to be generalized to the population. Nevertheless, the additional respondents were contacted to improve response rates and increase the universality of survey results.

There are two types of sampling designs, namely probability sampling and nonprobability sampling. In this study, the probability sampling design is suitable as the elements in the population have a known and nonzero opportunity of being selected as respondents. Among the probability sampling techniques, this study applies a stratified random sampling strategy in which the questionnaire is distributed to different defined groups in the population (Kumar, 2011; Sekaran & Bougie, 2016; Ward, 2022). This sampling strategy could ensure that all categories are included in the study rather than only collecting data from certain types of omnichannel companies. Using a stratified random sampling strategy could minimize bias in representing the population of this study (Neuman, 2002). Besides that, the stratified random sampling strategy can be differentiated into proportionate and disproportionate stratified random sampling. This study agrees with the suitability of disproportionate stratified random sampling as some of the groups in the population are too small such as manufacturers and logistics service providers (Sekaran & Bougie, 2016). Hence, this study used a disproportionate stratified random sampling strategy which included 1000 questionnaires from the group of retailers and 500 questionnaires from each of the groups of manufacturers and logistics service providers.

### Population Profile

The research population in this study were omnichannel companies in Malaysia. With the rise of the Internet and e-commerce, establishments in Malaysia are adapting information and communication technology to their businesses. For instance, a report produced by the Department of Statistics Malaysia (2018) showed significant growth in establishments using information and communication technology. Based on the report, the overall establishments that apply information and communication technology had risen from 73.5% in 2015 to 78.9% in 2017. In particular, logistics service providers showed a significant increase from 33.7% to 46.4%. Figure 3.10 shows that companies in Malaysia are increasing the application of information and communication technology, including omnichannel firms.

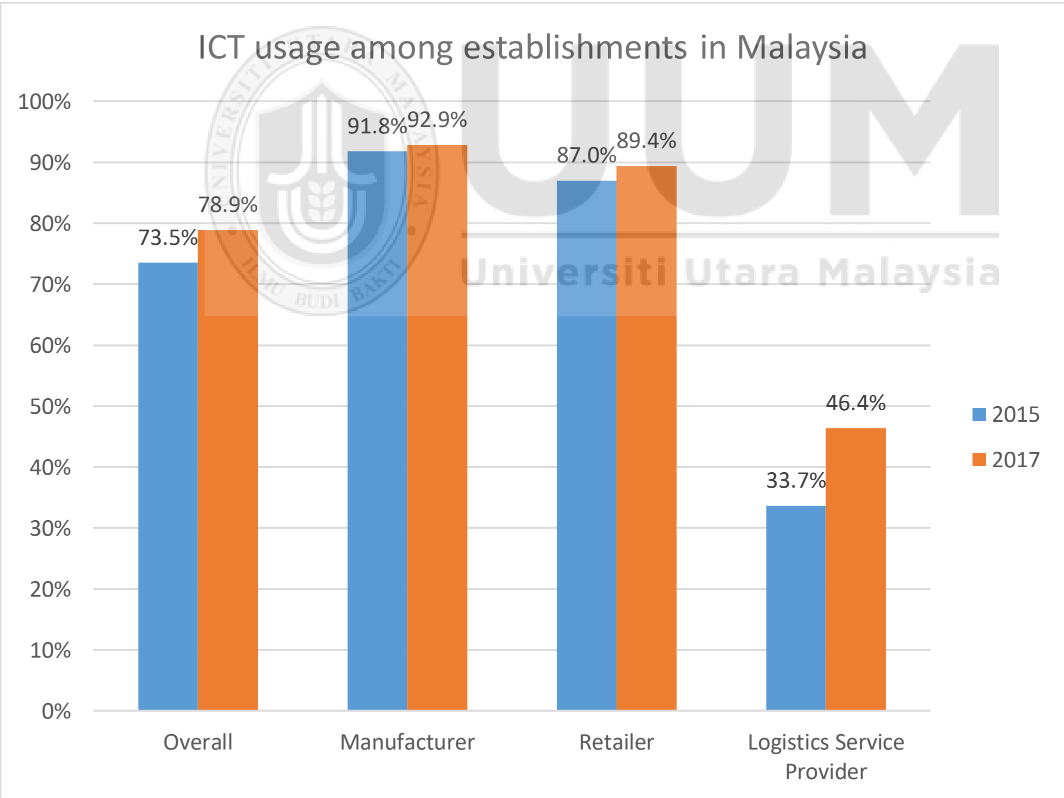


*Figure 3.10*
*ICT Usage among Establishments in Malaysia*
*Source:* Department of Statistics Malaysia (2018)

Simultaneously, a trend shows that establishments in Malaysia are going online (Figure 3.11). The usage of the Internet among establishments had risen from 11.8% to 73.3% in 2017 from

61.5% in 2015. All omnichannel firms are utilizing the Internet to conduct their business, as shown in the figure above. Manufacturers, retailers, and logistics service providers are taking advantage of the Internet to interact with other parties, communicate with customers and suppliers, and engage in employee recruitment.

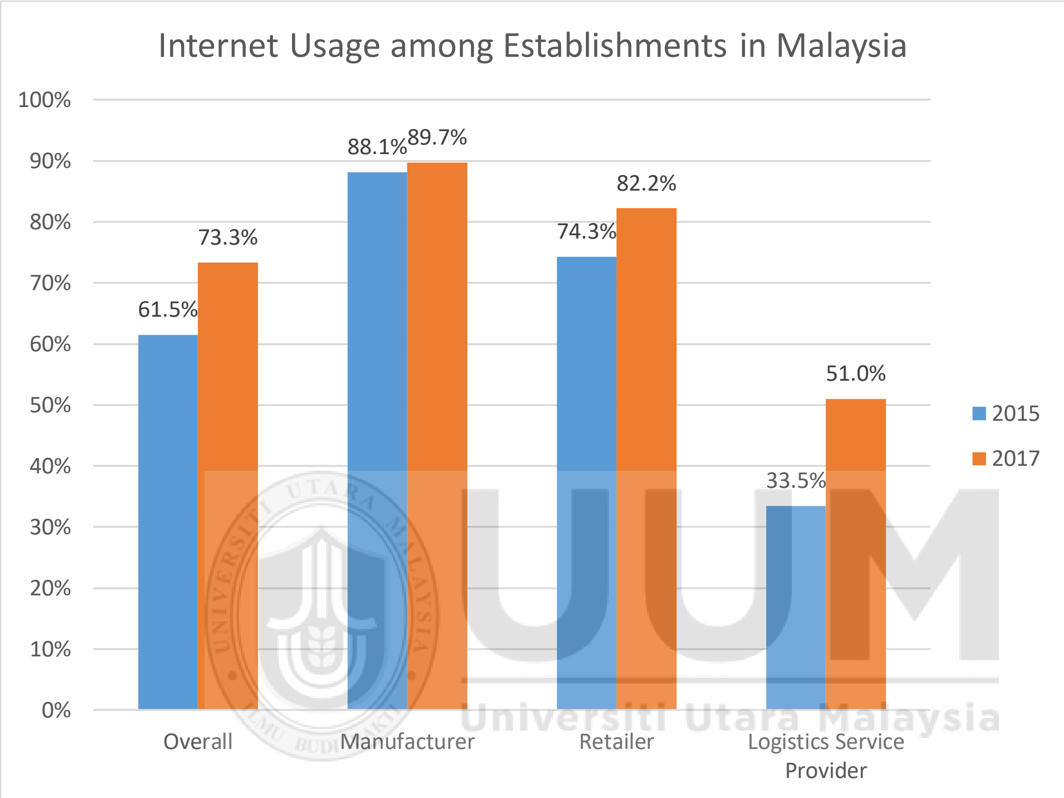


*Figure 3.11*
*Internet Usage among Establishments in Malaysia*
*Source:* Department of Statistics Malaysia (2018)

By using the Internet, companies in Malaysia are promoting themselves on online networks. The establishments had shown critical attention to using web presence in their business; the use of websites rose to 37.8% in 2017 from 28.4% in 2015. Omnichannel firms are grabbing the opportunity to promote their brand through online networks, especially manufacturers, which rose from 16.6% to 26.5%, as shown in Figure 3.12.

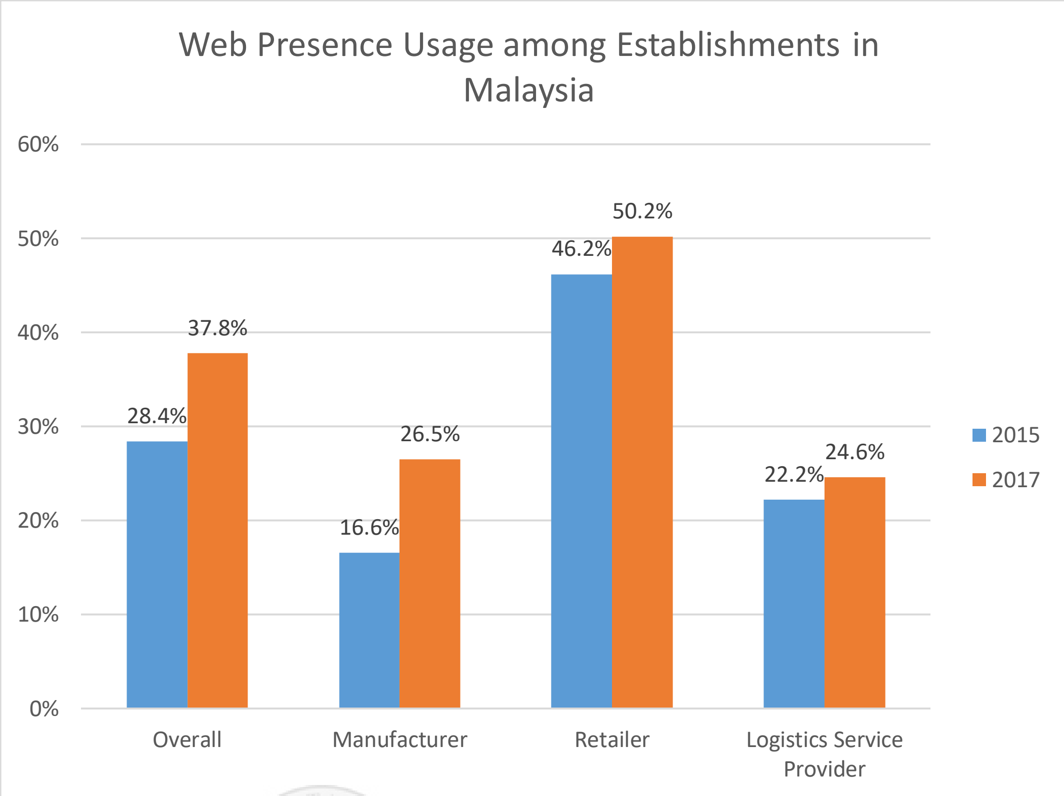


*Figure 3.12*
*Web Presence Usage among Establishments in Malaysia*
*Source:* Department of Statistics Malaysia (2018)

Three options exist for these omnichannel firms to use the Internet to interact with potential customers (Figure 3.13). These are self-owned websites, other-party websites and social media. Most omnichannel firms possess their own website to advertise and provide information for manufacturers (19.9%), retailers (44.1%), and logistics service providers (26.9%). Secondly, 27% of omnichannel firms use social media such as Facebook and Instagram to promote themselves. Only 9.7% of omnichannel firms, including 12.6% of retailers and 14.7% of logistics service providers, use other entities' websites for advertising themselves.

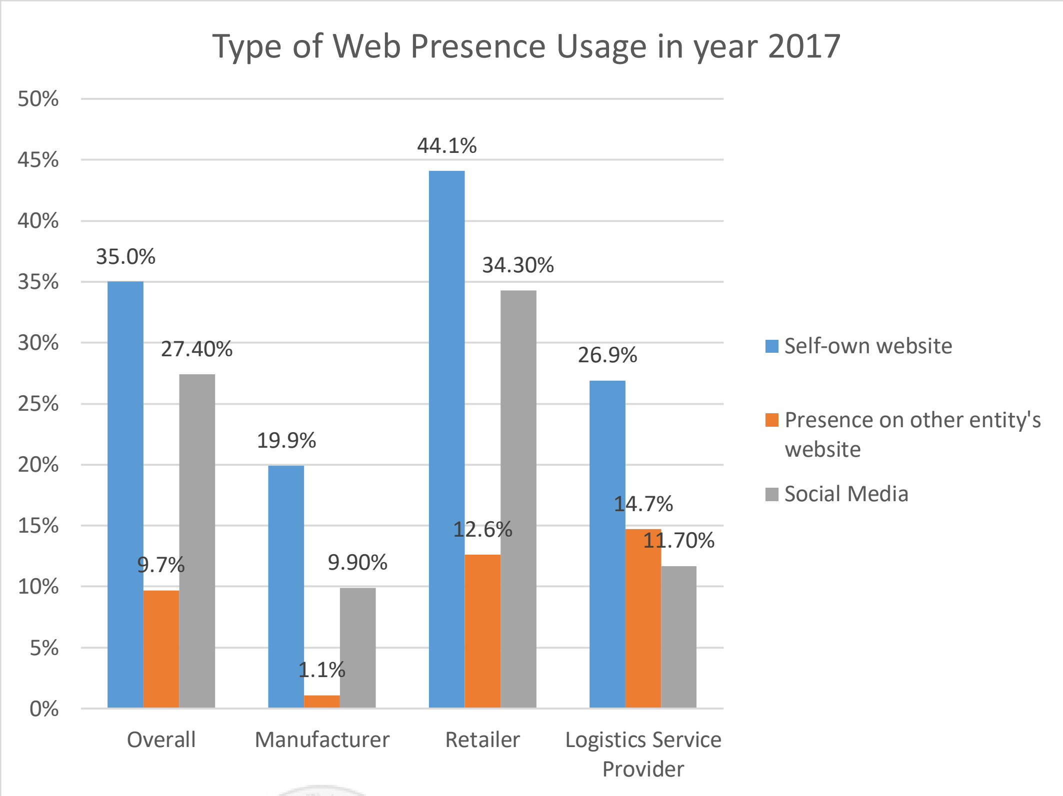


*Figure 3.13*
*Type of Web Presence Usage in 2017*
*Source:* Department of Statistics Malaysia (2018)

With the rise of e-commerce, establishments in Malaysia are aware of the advantages associated with Internet application and desire to duplicate the business model in their companies (Kaur et al., 2019). These can be demonstrated through the report to confirm that companies are becoming more advanced in using the Internet for different functions such as delivering information, customer service, banking service and selling products. The percentage of companies using the Internet for various functions has proliferated from 2015 to 2017, as shown in Figure 3.14. At the same time, it clearly demonstrates that companies in Malaysia are aware of the trend of omnichannel, and they are trying hard to keep up with the trend.

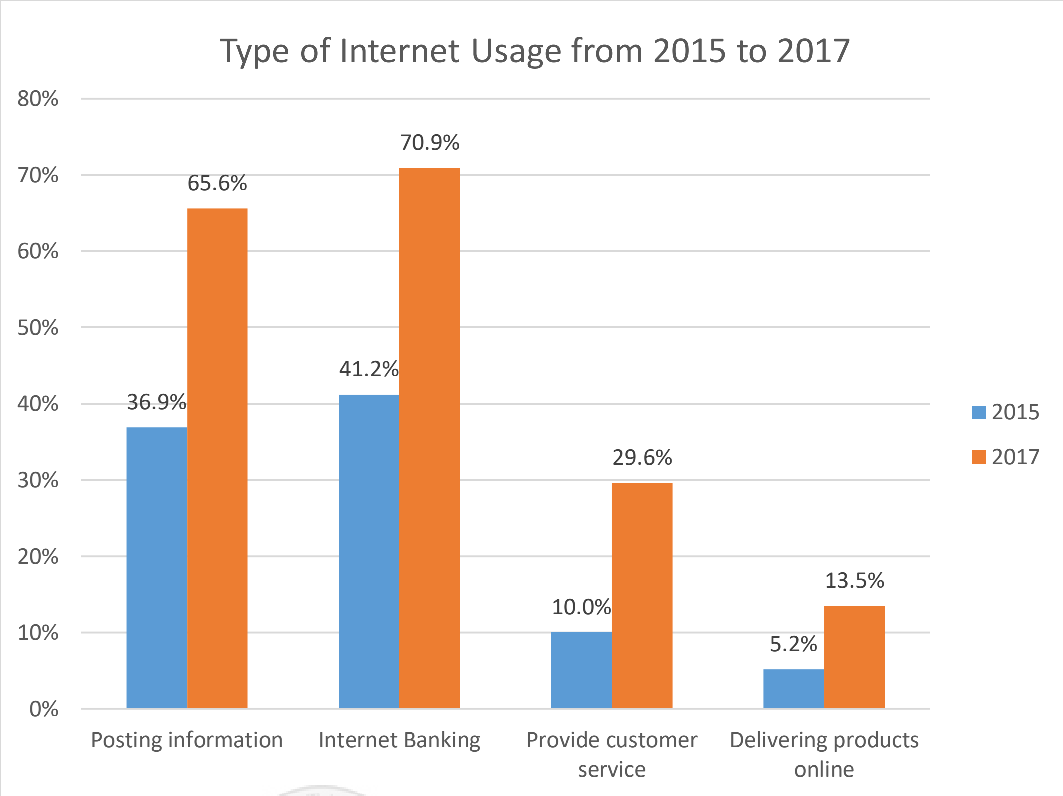


*Figure 3.14*
*Type of Internet Usage in Malaysia from 2015 to 2017*
*Source:* Department of Statistics Malaysia (2018)

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In Malaysia, most establishments belong to SMEs covering all sectors from manufacturing, services, agriculture, construction, and mining and quarrying. SMEcorp has defined SMEs according to the number of employees, which is different for the manufacturing sector and other sectors (Table 3.3).

*Table 3.3 Definition of SMEs*

| Number of employees | Manufacturing | Services and other sectors |
|---|---|---|
| Medium | Between 75 to 200 | Between 30 to 75 |
| Small | Between 5 to 74 | Between 5 to 29 |
| Micro | Less than 5 | Less than 5 |

*Source:* SME Corp. Malaysia (2013)

According to the report by SME Corporation Malaysia (2017), 98.5% of establishments in Malaysia belong to SMEs. Most of the establishments belong to micro companies (693,670) in which the number of employees is less than five people. The second-largest group among establishments in Malaysia are small companies which are 192,783 establishments. Approximately 20,612 establishments belong to medium companies, while 13,559 establishments are large companies (Department of Statistics Malaysia, 2016).

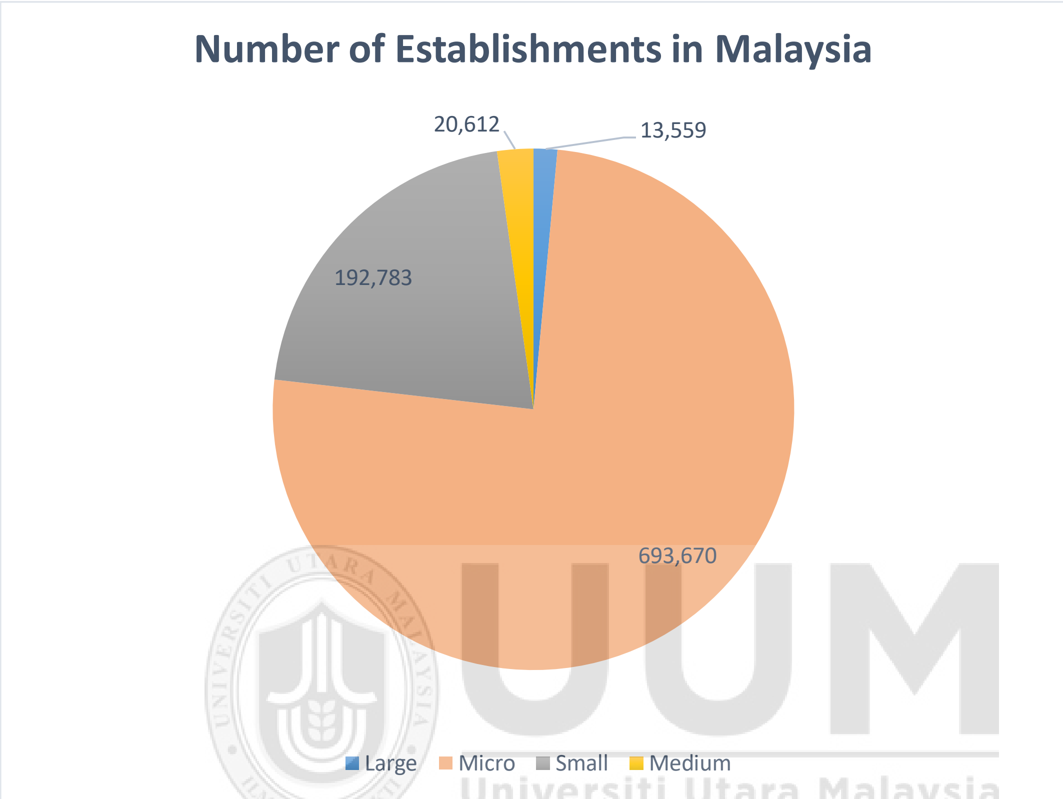


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*Figure 3.15*
*Number of Establishments in Malaysia*
*Source:* Department of Statistics Malaysia(2016)

The number of establishments for omnichannel firms, including manufacturers, retailers, and logistics service providers, is shown in Figure 3.15. Manufacturers have a similar portion of small and micro-size establishments; most of the manufacturers are in the groups of small (between five to 74 employees) and micro- (less than five employees). However, most retailers and logistics service providers are in the micro establishment group with less than five employees, as shown in Figure 3.16. Some studies have shown that firm size influences the output of the reverse logistics system (Autry et al., 2001; Vlachos, 2016). Hence, this study includes firm size in the data collection.

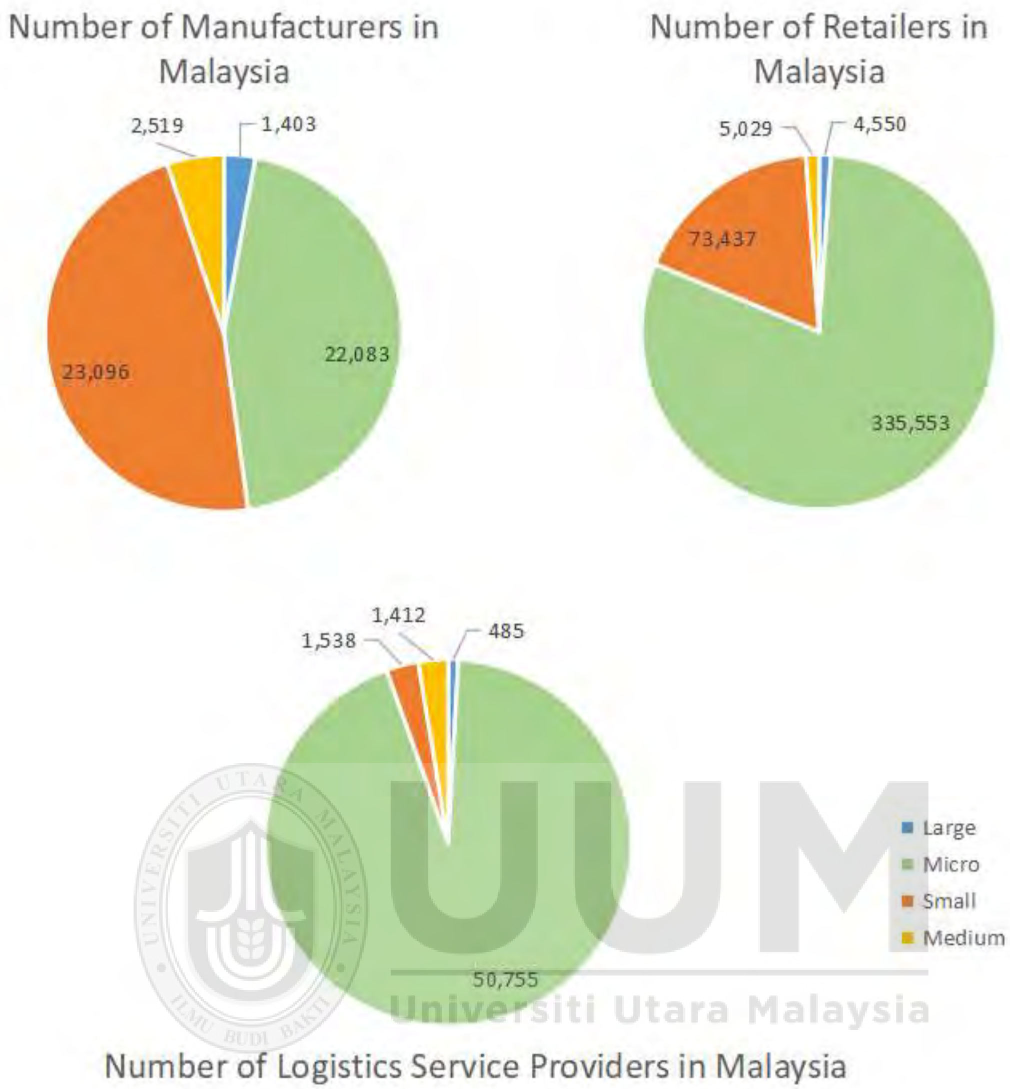


*Figure 3.16*
*Number of Omnichannel Firms in Malaysia*
*Source :* Department of Statistics Malaysia (2016)

This part discusses the profile of the potential respondents, which provides a comprehensive understanding of the demographics of the target population. The next section discusses the data collection method used in this study and how the database is collected from the target population.

## Phase in SED

Researchers can select numerous data collection methods in the mixed methodology approach. Research questions can properly guide the selection of the correct data correction method. The previous section explained the background of the research population for data collection. This section will discuss how the data was collected and the related justification. The data collection method will select between qualitative and quantitative inquiry. Collecting data using different inquiries, such as questionnaires and interviews with participants, would help to produce reliable and effective data.

### Stage 1: Qualitative Phase I

As mentioned, the first phase of SED began with a qualitative approach to address research questions. Semi-structured interviews were used to collect data to consolidate the themes by using a phenomenological interviewing approach. The phenomenological interview is useful for collecting descriptions of context by using broad and open-ended questions (Bevan, 2014; Roulston, 2010). A priori themes derived from a fixed set of open-ended questions by interviewing the respondents with reverse logistics management experience (Ryan & Bernard, 2003).

This phase used a qualitative method to identify the following quantitative phase guided by the research questions. Among the qualitative method, this study selected a semi-structured interview technique as it is a flexible instrument for data collection and penetrating the field (Seuring, 2005). Accordingly, invitations were sent to potential respondents via email (refer to Appendix B). The email listings were obtained from the related association and directory, such as manufacturers (Federation of Malaysian Manufacturers), retailers (Malaysia Retailer Association & Malaysia Retail Chain Association), and logistics service providers (Marshall Cavendish Business Information). After that, respondents were reviewed to ensure the reliability and credibility of the data. Respondents invited to attend must hold managerial positions with at least one year of working experience in supply chain-related fields (Huscroft et al., 2013; Myles & Church, 2022). A semi-structured interview was arranged to interview experts in reverse logistics as their on-field experience is useful for this study. The decision for the number of respondents in the qualitative method has not as many limitations as the quantitative method. Therefore, this study captured participants based on respondents' voluntary participation until sufficient information is captured, which is estimated to be between three to ten respondents (Creswell, 2014).

During the interview sessions, the conversation between the participants and the interviewer were recorded. At the same time, the interviewer took notes to assemble a conceptual summary from the conversation for those notions that explained research phenomena in a natural status. After that, the audio was transcribed into written form by cross-checking with the written notes for thematic analysis.

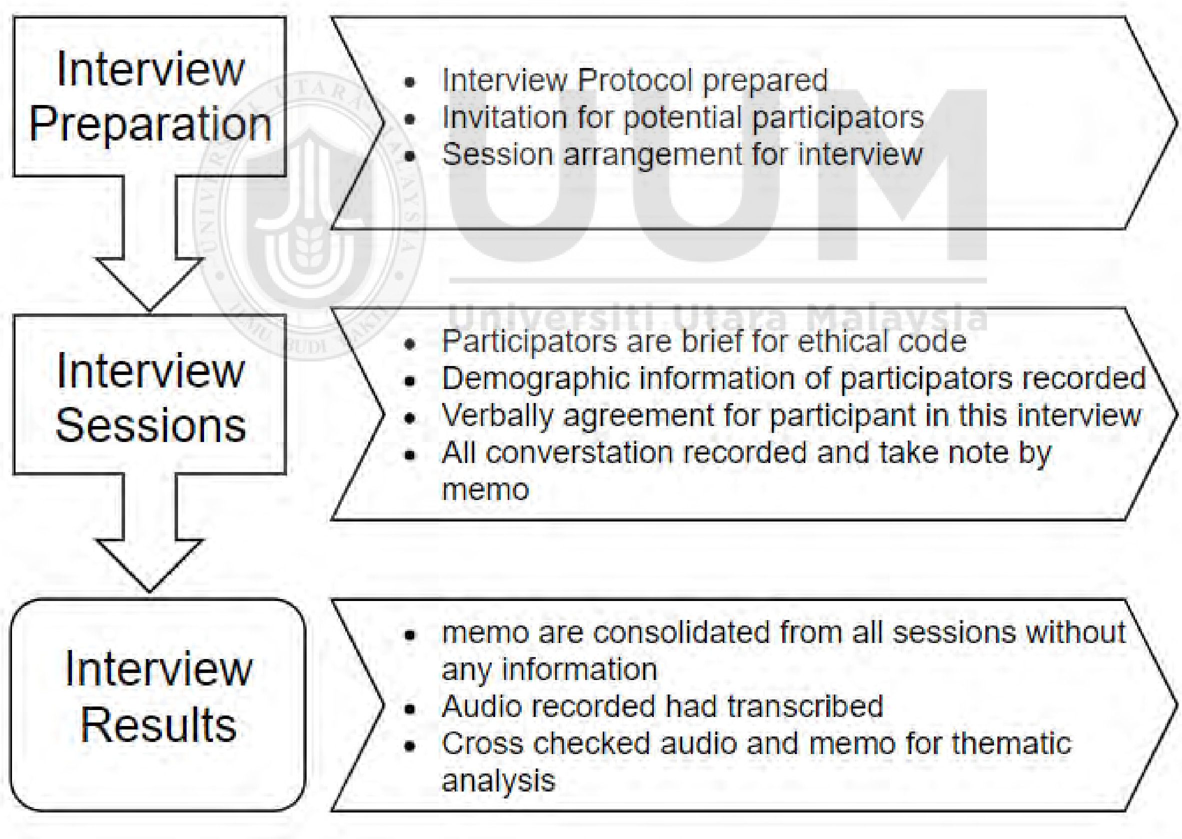


*Figure 3.17*
*The interview processes for qualitative phase 1*
*Sources: Author illustration*

Thematic analysis is defined as a method for identifying, analyzing and reporting themes within qualitative data (Roulston, 2010). It is a suitable method for organizing data by grouping data based on themes. These data was categorized based on themes and supported by the evidence in the interpretations. The findings of thematic analysis assisted the researcher in exploring the construct of reverse logistics systems in omnichannel companies.

The ethical research protocol was shared with the participants before the interview session started. Besides that, the participants' demographic information will be recorded for each interview session. The research questions were answered with the application of open-ended questions, allowing participants to answer in their own words to identify the a priori themes (Table 3.4).

*Table 3.4 Research question with interview guide*

| Research Question with interview guide | Themes and areas investigated |
|---|---|
| What are the different factors associated with RL that influence omnichannel firm performance?<br>• Please describe the return process in your firm.<br>• Do you think return process or return management is important for your firm? Why and how?<br>• Is return process or return management interrelated with …? | Top management support |
| | Formalization |
| | Flexibility |
| | Information System |
| | Collaboration |
| | Supplier |
| | Regulator |
| | Customer |
| | Competitor |

*Source: Author illustration*

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These interview sessions are important to confirm the tools in the following quantitative phase. A phenomenology interviewing provides opportunities for participants to reflect or elaborate on their own experience within reverse logistics management. The primary goal of this inquiry is to verify the a priori themes that originated from the literature review and whether they fall within the scope of omnichannel reverse logistics management collated with themes generated from this interview inquiry. Overall, the process flow of the interview session until the qualitative analysis is shown in Figure 3.17. The findings of the interview session were compiled into groups based on the themes in the process of thematic analysis. After that, the findings provided a robust structure for the development of data collection method in the following quantitative phase.

### Stage 2: Quantitative Phase

The second phase in the SED is the quantitative phase, which is supported by the output of qualitative phase. The findings of thematic analysis generate the combination of themes which reinforce the development of survey in the quantitative phase.

In this phase, this study uses questionnaires for data collection from the sample randomly in order to answer research objectives and research questions. The questionnaire is a suitable method to collect data for analysing various social issues and phenomena (Matthews & Ross, 2010). Using the questionnaire is relatively cost-effective and authentic, but it may suffer from low response rates (Kumar, 2011; Sekaran & Bougie, 2016). Thus, this study needed extra effort to follow up with potential respondents to increase the quantity of the collected questionnaires or response rates (Matthews & Ross, 2010).

The questionnaires (refer to Appendix C) were sent to the respondents through Internet and mail surveys. Both types of surveys have geographic flexibility to cover the research boundaries and enable respondents to answer without the researcher being present (Matthews & Ross, 2010). Mail survey refers to surveys sent to the potential respondent through mail, while for the Internet survey, an invitation link will be sent to potential respondents (Sekaran & Bougie, 2016). Besides that, the data collected through the distribution of the Internet and mail surveys are effective and cost-efficient, but the response rate is relatively low (Sekaran & Bougie, 2016). Respondents may feel offended when receiving an online softcopy survey, which causes non-response bias. In order to counteract non-response bias, mail surveys in hardcopy format can be made available upon request by respondents. Respondents will receive a hardcopy of the survey package, which comprises the questionnaire booklet and a pre-addressed return envelope with a postage stamp. Applying a multi-mode survey increases the response rate and overcomes the bias related to a single-mode survey (Dillman et al., 2009).

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For the mail survey method, an email with invitation links was sent to the related key person within the companies, namely the employee in charge of the supply chain and logistics operation, or the top management of the company itself. The email listing were obtained from the related association and directory, such as manufacturers (Federation of Malaysian Manufacturers), retailers (Malaysia Retailer Association & Malaysia Retail Chain Association), and logistics service providers (Marshall Cavendish Business Information). As discussed previously, the email was sent to 1000 companies in the group of retailers and 500 companies in each of the manufacturers and logistics service providers groups. Two weeks after the email was sent, an email reminder was sent to the respondents to increase the response rate (Saeed et al., 2005). Overall, 1000 emails with both invitation links and softcopy were sent to retailers, while 500 emails were sent to both manufacturers and logistics service providers. Besides, 18 sets of hardcopy questionnaires were distributed as requested by the respondents. In this research, 453 questionnaires were received, including softcopy (46 sets), hardcopy (18 sets), and an online survey (389 sets).

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The next part discusses the structure of the questionnaire after the type of survey is decided. The development of a questionnaire is important for collecting useful data for this study.

### *Development of Questionnaire*

The development of the questionnaire is the most critical step in quantitative research because a structured questionnaire could provide the correct data needed for analysis in this research, as shown in Figure 3.18 (Matthews & Ross, 2010).

In order to design the questionnaire, an extensive search of previous articles related to the reverse supply chain was conducted. This ensures the questionnaire design in this quantitative stage is entirely reliable for this study. Therefore, the instruments in the questionnaire are captured from previous empirical studies that had to go through reliability and validity testing (Huang et al., 2015; Ye et al., 2013).

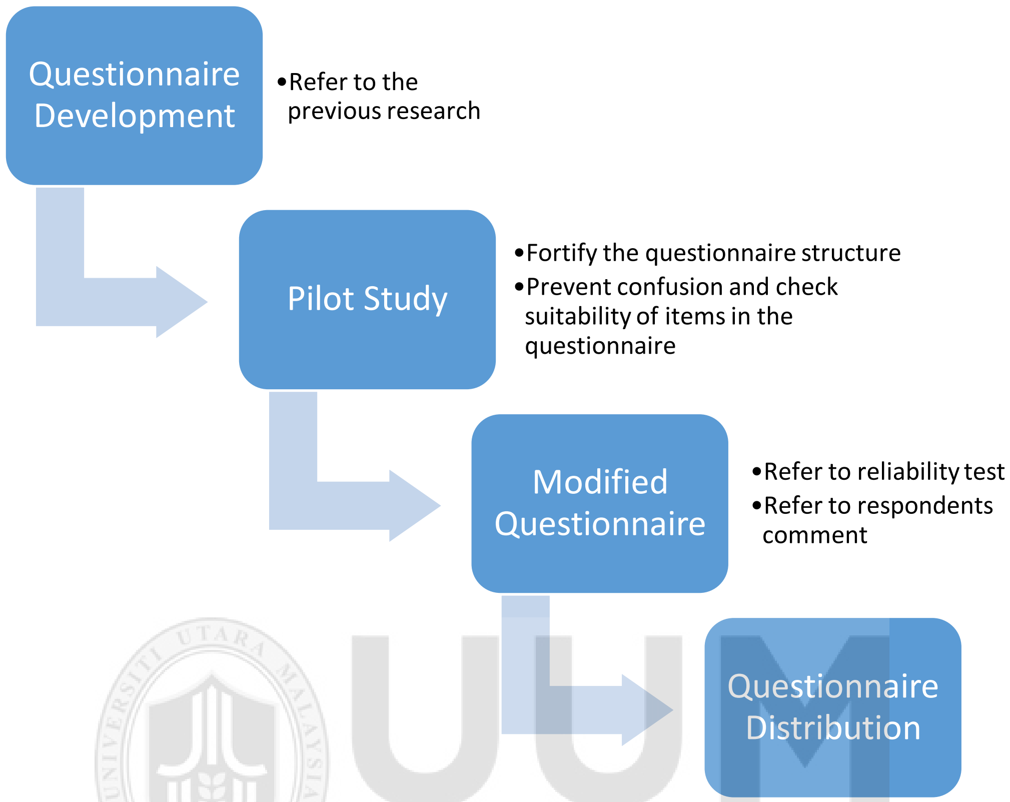


*Figure 3.18*
*Sequence of Questionnaire Development*
*Source: Author Illustration*

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Overall, the structure of the questionnaire can be differentiated into four parts consisting of demographic factors, firm factors, task environment, and omnichannel firm performance.

*Demographic factors*

As this study evaluates reverse logistics in the omnichannel context, the respondents must work in omnichannel firms. Each respondent answered a questionnaire to represent their companies. In this study, there are different types of companies in the omnichannel system, and their roles are different. Therefore, there are various questions for respondents from different types of companies. Omnichannel companies are identified through their core function (Saghiri et al., 2017). The related questions in Table 3.5 are asked to identify if the company has involvement in the omnichannel context.

Table 3.5 Role identity instruments based on previous studies

| Role | Core function | Question |
|---|---|---|
| Manufacturer | Produce goods and products for sales | Is your company connected to customers through the Internet? (Saghiri et al., 2017) |
| Retailer | Selling products through Internet platforms or physical store | Is your company connected to customers through the Internet? (Bernon et al., 2016; Hübner et al., 2016; Saghiri et al., 2017) |
| Logistics Service Provider | Providing logistics service to other parties | Does your company provide services to fulfil online orders? (Rai et al., 2018) |

Besides that, respondents are also asked if their companies collect returns from customers to allow data collection on reverse logistics management in the company. To ensure the reliability and credibility of data, respondents invited to answer the questionnaire must hold managerial positions with at least one year of work experience in supply chain-related fields (Huscroft et al., 2013). In order to obtain reliable data, some prerequisite questions are identified on a suitable scale (Table 3.6). It is critical to assess whether the respondent possessed ample information to fill in the questionnaire accurately (Morgan et al., 2016). Potential respondents were disqualified from the sample if they do not fulfil the requirements.

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Table 3.6 Screening instruments

| Question | Scale |
|---|---|
| Does your company collect products from customers? | Nominal scale |
| Current working position | Category scale |
| Working experience in supply chain-related job scope | Category scale |

Source: Author illustration

Furthermore, the demographic background of the respondents' company regarding the number of employees, the availability of a free return policy and the responsibility of returns management handling is collected. Respondents were requested to provide the related information regarding their company. Demographic data is very important for this study to gain a better understanding of the audiences and examine the existence of different effects for different groups. Some previous studies have indicated that these variables (firm size, availability of free return and responsibility of returns handling) can influence firm performance. Nevertheless, some researchers highlight that firm size and the responsibility of return handling are too slight to influence firm performance (Autry et al., 2001; Vlachos, 2016). Some studies stated that a free return policy could indirectly influence firm performance by mostly boosting the sale volume instead of overall firm performance (Janakiraman et al., 2016; Su, 2009; Webster & Weng, 2000). Thus, answers to these three questions are elicited from omnichannel firms. However, logistics service providers are not valid for questions such as the availability of free returns and outsourcing of return management. Hence, questions about the availability of free returns and the responsibility of return handling only include retailers and manufacturers. Overall, this study includes these three variables in observing the relationship between these variables and omnichannel firm performance (Table 3.7).

*Table 3.7 Demographic instruments based on previous studies*

| Question | Scale |
|---|---|
| Firm Size (Number of employees) | Ratio scale |
| Retailer and Manufacturer<br>Does your firm provide free returns for customers? | <br>Nominal scale |
| Handling of returns management by | Nominal scale |

*Source:* Autry et al. (2001); Janakiraman et al. (2016); Su (2009); Vlachos (2016); Webster & Weng (2000)

### *Operational Definitions*

As discussed, reverse logistics variables include two determinants, which are firm and task environment factors (Carter & Ellram, 1998). There are many other constructs belonging to each factor. After the study by Carter and Ellram (1998), many researchers further examined different factors of reverse logistics empirically (Genchev, 2009; Huang et al., 2015; Huang et al., 2016; Huang & Yang, 2014; Huscroft et al., 2013; Morgan et al., 2016; Shafiq & Naqvi, 2012; Škapa, 2014; Ye et al., 2013). These factors can be grouped into firm and task environment factors, and the measurement items retrieved from previous studies. The firm and task environment factors were measured by a multi-item scale. Multi-item scales could enhance the reliability of measurements (Ketokivi & Schroeder, 2004).

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### Reverse Logistics Variables: Firm Factors

In this study, firm factors include top management support, formalization, flexibility, information system, and collaboration. Previous literature was reviewed in order to obtain the instruments that can measure the firm and task environment factors. Twenty-one items were used to measure five constructs of firm factors. All the measurement items used in the analysis are captured from previous studies as shown in Table 3.8.

*Table 3.8 Independent variable (firm factors) instruments based on previous studies*

| Variables | No. of Item | Operational Definition |
|---|---|---|
| Top Management Support<br>1) Our top managers recognize the importance of returns management implementation.<br>2) Our top managers proactively support returns management implementation.<br>3) Our top managers are willing to invest the resources needed to implement returns management.<br>4) Our top managers have a substantial influence on our company's returns management implementation. | 4 | Degree of support from top management toward reverse logistics management |
| Sources: (Richey, Genchev, et al., 2005; Shafiq & Naqvi, 2012; Ye et al., 2013) | | |
| Formalization<br>1) The job description of related practitioners in returns management is clearly stated.<br>2) The hierarchy of authority in returns management is clearly stated.<br>3) The standard operating procedures (SOP) in returns management are clearly stated.<br>4) There are standard methods for employees to transfer information to other relevant persons. | 4 | Clear instructions and definitions of reverse logistics activities and responsibilities for control and practices in reverse logistics management |
| Sources: (Dahlstrom et al., 1996; Hall & Johnson, 2016; Tiwari, 2013b) | | |
| Flexibility<br>1) My firm has the ability to handle difficult and nonstandard return requests.<br>2) My firm has the ability to authorize and perform special requests made by customers.<br>3) My firm has the ability to cover and handle different volumes of returns regardless of small or large capacities.<br>4) My firm has the ability to cover and handle return requests from different channels. | 4 | The capacity and capability of reverse logistics systems efficiently respond to complexities and uncertainties in the reverse flow |
| Sources: (Bai & Sarkis, 2013; Nair, 2005; Stevenson & Spring, 2009; Um, 2017) | | |
| Information System<br>1) Information systems enable information sharing with all departments inside the company.<br>2) Information systems enable planning of return | 5 | The capability of information systems that used in reverse logistics |

| | | |
|---|---|---|
| effectively.<br>3) Information systems enable faster product return handling in my company.<br>4) Information systems enable us to track products easily.<br>5) Information systems reduce errors while handling transactions during the product return process. | | system |
| Sources: (Daugherty et al., 2005; Mahindroo et al., 2018b; Olorunniwo & Li, 2010) | | |
| Collaboration<br>1) Different departments in my company work together to achieve goals of returns management.<br>2) Different departments in my company have a mutual understanding of responsibilities in returns management.<br>3) Different departments in my company work together as a team in returns management.<br>4) Different departments in my company conduct joint planning to anticipate and solve operational problems for returns management. | 4 | The synergistically shared process within a firm where two or more departments closely work together in reverse logistics system |
| Sources: (Richey et al., 2005; Stank et al., 1999b) | | |

### Reverse Logistics Variables: Task Environment Factors

The task environment in this study included suppliers, regulators, customers, and competitors. The measurement instruments were obtained from previous studies to increase this study's reliability. Nineteen items were used to measure four variables in task environment factors. All of the items are listed in Table 3.9 below.

Universiti Utara Malaysia

*Table 3.9 Independent variable (task environment) instruments based on previous studies*

| Variables | No. of Item | Operational Definition |
|---|---|---|
| Customer<br>1) My firm adopts returns management to fulfil the requirement of most of the customers.<br>2) My firm adopts returns management to protect consumer rights by the government.<br>3) My firm design returns management operations based on customer information and requirement.<br>4) My firm has a good sense of how our customers value our services.<br>5) My firm believes that this business exists to serve customers. | 5 | The capability of the company recognizes and reacts to the influence of the customer |
| Sources: (Eltayeb & Zailani, 2011; Ye et al., 2013) | | |
| Competitor<br>1) The intense competition has placed intense pressure on our company's returns management strategies.<br>2) Our competitors' earlier implementation of returns management provides a benchmark and guidance for our company's returns management. | 5 | The capability of the company recognizes and reacts to the influence of the competitor |

| | | |
|---|---|---|
| 3) Competitors have a strong influence on our company's returns management.<br>4) Competitors with well-developed returns management are perceived favourably in our industry.<br>5) Our competitors are using returns management to their advantage. | | |
| Sources: (Chu et al., 2017; Wu et al., 2012; Ye et al., 2013) | | |
| Regulatory<br>1) Through the collection of returns, my firm tries to reduce or avoid the threat of current government legislation.<br>2) Through the collection of returns, my firm tries to reduce or avoid the threat of future government legislation.<br>3) Regulations in other countries, such as Europe, Japan, and the USA, induced my firm to collect rejected products.<br>4) There are a large number of regulations or restrictions imposed by the government on my firm's industry. | 4 | The capability of the company recognizes and reacts to the influence of the regulatory |
| Sources: (Abdullah & Yaakub, 2015; Eltayeb & Zailani, 2011; Hsu et al., 2013) | | |
| Supplier<br>1) There are well-defined goals, scope and responsibilities between supplier and our firm in returns management.<br>2) We maintain cooperative long-term relationships with our suppliers in returns management.<br>3) Our managers participate in joint planning sessions with suppliers in returns management.<br>4) My firm effectively shares returns information externally with suppliers.<br>5) My firm experiences improved performance by integrating returns management with suppliers. | 5 | Thecapability of the company recognizes and reacts to the influence of the supplier |
| Sources: (Danese, 2013; Jeszka, 2014; Morgan et al., 2016; Olorunniwo & Li, 2010) | | |

There were a total of forty-eight items used to measure reverse logistics variables. The following section discusses the measurement design for the dependent variable, i.e., omnichannel firm performance.

### Omnichannel Firm Performance

The performance of an omnichannel firm is measured as the outcome of firm and task environment factors. Studies on reverse logistics management frequently depended upon firm performance for measuring the effectiveness of reverse logistics practices (Abdullah & Yaakub, 2015; Eltayeb & Zailani, 2011; Huang et al., 2010; Jeszka, 2014; Vlachos, 2016; Ye et al., 2013). Using firm performance was beneficial for this research as it gave meaningful information to managers seeking approaches and strategies to improve firm performance. This study measured the effects of reverse logistics on firm performance, similar to previous studies (Huang et al., 2015; Vlachos, 2016; Ye et al., 2013).

However, the database of firm performance is rarely announced to the public for individual business units or privately held companies. Hence, it is difficult for researchers to collect accurate and reliable performance data for firm performance in empirical studies. Some researchers have indicated that perceptual measures are correlated closely with objective firm performance measures such as profitability (Ketokivi & Schroeder, 2004; Vickery et al., 1993). Thus, this study applied perceptual performance measures to measure the perceptions of the reverse logistics effect on omnichannel firm performance. Respondents were requested to evaluate their firm's performance through effective reverse logistics implementation accordingly to the measurement items in Table 3.10. Then, respondents indicated the extent to which their firm achieved success through effective reverse logistics systems. There are a total of six measurement items to measure omnichannel firm performance in this study.

Universiti Utara Malaysia

*Table 3.10 Dependent variable instruments based on previous studies*

| Variables | No. of Item | Operational Definitions |
|---|---|---|
| Omnichannel Firm Performance<br>1) Achieve cost reduction<br>2) Environmental regulatory compliance<br>3) Improve customer relationship<br>4) Improve profitability<br>5) Reduced inventory cost or investment<br>6) Improve the company's reputation | 6 | Perceptions of company performance measured against cost, customer relationship, profit, and reputation. |
| Sources: (Abdullah & Yaakub, 2015; Autry et al., 2001; Daugherty et al., 2005; Huang et al., 2015; Vlachos, 2016; Ye et al., 2013) | | |

The questions about independent variables (firm and task environment factors) and dependent variables (omnichannel firm performance) were designed based on previous studies and answered on a seven Likert scale as follows (García-Sánchez et al., 2018; Huang et al., 2015; Huang & Yang, 2014; Huscroft et al., 2013; Mishra & Napier, 2014; Morgan et al., 2016;

Richey et al., 2005). Respondents chose between the seven Likert scale values, as provided in Table 3.11.

*Table 3.11 Seven Likert Scales*

| Descriptions | Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| Score | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

*Source:* Sekaran & Bougie(2016)

Seven Likert scales are often used to measure respondent perceptions towards certain concepts (Sekaran & Bougie, 2016). Besides that, seven Likert scales are suitable for respondents with high cognitive abilities (Weijters et al., 2010). Seven Likert scales were used in this study, as it provides a compromise between the confusion of sufficient options provided, and enables manageable choices for the respondents. Some researchers have argued whether the midpoint or neutral option would be suitable for data collection (Nadler et al., 2015). However, the option of "neutral" is suitable in this study as the respondents hold managerial positions which require adequate knowledge about reverse logistics (Chyung et al., 2017). Therefore, seven Likert scales were applied in this study.

Universiti Utara Malaysia

Additionally, a pilot study was conducted, and some comments given by the respondents helped to enhance the study's credibility. The first sketch of the questionnaire combined the related questions used in previous studies, was applied to confirm its internal reliability. To attain reliable results, Cronbach's alpha value of more than 0.6 (Clark & Watson, 1995) is considered acceptable, as it has been frequently applied to studies of reverse logistics (Abdullah & Yaakub, 2015; Jeszka, 2014). In the pilot study, the internal consistencies of the scales were found to be sufficient for further data analysis, as shown in Table 3.12.

*Table 3.12 Cronbach's Alpha of Pilot Study*

| Constructs | Items | Cronbach's Alpha | Mean | Variance | Std |
|---|---|---|---|---|---|
| Top Management Support | 4 | 0.712 | 22.863 | 6.001 | 2.450 |
| Formalization | 4 | 0.833 | 23.220 | 8.613 | 2.935 |
| Flexibility | 4 | 0.728 | 23.250 | 7.994 | 2.827 |
| Information System | 5 | 0.697 | 29.490 | 7.415 | 2.723 |
| Collaboration | 4 | 0.799 | 23.570 | 9.850 | 3.139 |
| Customer | 5 | 0.779 | 30.960 | 9.678 | 3.111 |
| Competitor | 5 | 0.913 | 26.820 | 24.948 | 4.995 |
| Regulator | 4 | 0.817 | 20.800 | 11.601 | 3.406 |
| Supplier | 5 | 0.785 | 30.530 | 9.414 | 3.068 |
| Omnichannel Firm Performance | 6 | 0.814 | 33.040 | 15.958 | 3.995 |

Next, the data was analyzed, and the findings were used for further discussion in the focus group in the third phase.

### Stage 3: Qualitative Phase II

After the quantitative data analysis was done, this was the qualitative phase applied to the focus group. The focus group is a type of qualitative inquiry to gain an in-depth understanding of the social context in the form of group interviews (Kitzinger, 1995). Focus group have the advantage of encouraging participants that decline to be interview alone. Besides that, discussions in focus groups are more effective as they motivate participants to give responses and debate opinions without interruption by the researcher (Kitzinger, 1995; Krueger & Casey, 2015).

Focus groups are suitable in this phase to shed light on the findings of quantitative analysis to provide a comprehensive understanding (Krueger & Casey, 2015). Frequently, focus groups are applied in mixed methodology research to verify and cross-check the outputs that are generated from both qualitative and quantitative analysis (Bloor et al., 2001; Guest & Fleming, 2014; Roulston, 2010). Moreover, a focus group in this qualitative phase can improve the validity of the entire SED (Creswell, 2014). Triangulation is a technique to improve reliability and validity in qualitative research with a focus group in this phase (Creswell, 2014; Sekaran & Bougie, 2016). Utilizing a focus group also triangulated the findings of the previous phase and contributed to the convergence of research outputs. Hence, the primary goal of this phase is to ensure the research questions are addressed. This phase shares the findings of the prior phase with the focus group for confirmatory and explanatory purposes to seek validation of the findings.

The invitation were delivered to the potential respondents through email (refer to Appendix D) during this phase, as shown in Figure 3.19. The email listing was obtained from the related association and directory, such as manufacturers (Federation of Malaysian Manufacturers), retailers (Malaysia Retailer Association & Malaysia Retail Chain Association), and logistics service providers (Marshall Cavendish Business Information). Following that, responders were examined to confirm the accuracy and legitimacy of the data. Those who responded were required to hold managerial positions and have at least one year of experience working in a field relevant to supply chains (Huscroft et al., 2013).

Universiti Utara Malaysia

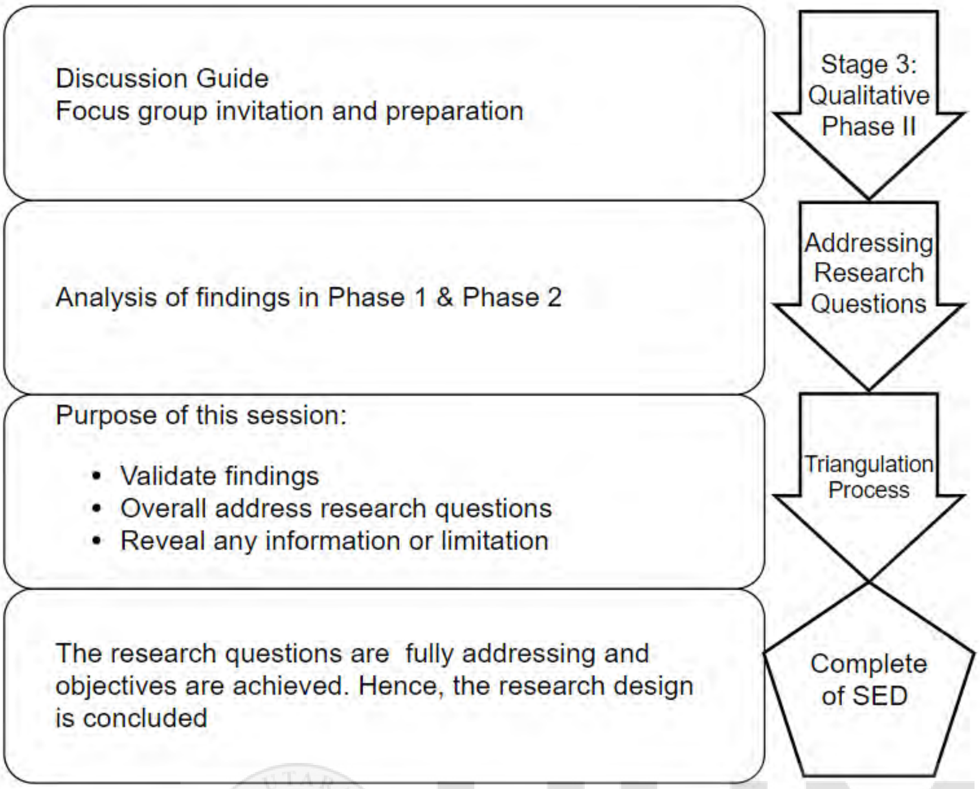


*Figure 3.19*
*The process of qualitative phase II based on research questions*
*Source: Author illustration*

The data collected through the focus group was analyzed through micro-interlocutor analysis. A micro-interlocutor analysis is a method that looks at the consensus of multiple participants on a particular subject (Onwuegbuzie, 2018). The consensus of multiple participants on the quantitative and qualitative findings would reflect the general study outcome. In this phase, the constant comparison analysis technique will be applied to decompose the findings to develop a rich and comprehensive database (Leech & Onwuegbuzie, 2007). As a complementarity purpose, the comparison technique is a suitable application for grouping the themes, which allows cross-analysis saturation to verify the outcome of the previous phase (Onwuegbuzie et al., 2009, 2010). To summarize, the focus group design is intended for the systematic dimension, which systematically refers to the focus group's verification function (Onwuegbuzie et al., 2009). Hence, micro-interlocutor analysis aims to verify the previous findings through discussion by the homogeneity or consensus of the overall member opinion.

The appropriate number of participators in a focus group is four to eight individuals, as suggested by (Kitzinger, 1995). This focus group was organized online, which could overcome the place limitations that discourage the participants of volunteers (Nyumba et al., 2018). The volunteers for the focus group discussion were selected from an overall sampling of the research population. The invitation email was sent to the potential participators, including manufacturers, retailers and logistics service providers.  Potential participants were then extensively screened to ensure that the focus group was diversified. Eleven participants were chosen because they represented the ideal mix for the focus group. The focus group was held online utilizing an internet video conferencing tool due to geographical restrictions (Google Meet). The focus group conversation took place in English and lasted roughly 60 minutes. The discussion was recorded and observed for further analysis.

Hence, the final phase of SED was a guarantee of the mixed methodology approach in solving the research questions. Details on the reliability and validity issues are discussed in the next section to ensure the credibility of the instruments used in this study.

Universiti Utara Malaysia

### Reliability & Validity

There are different approaches to examining the reliability and validity of both measurements in mixed methodology design (Creswell, 2014; Sekaran & Bougie, 2016). The application of mixed methodology could better increase the credibility of findings (Onwuegbuzie et al., 2010). Multi-method of data collection could improve the study's validity (Creswell, 2014). This section is separated into two parts that identify each research approach's reliability and validity.

#### *Qualitative Approach*

The concept of reliability and validity in the qualitative approach differs from the quantitative approach (Creswell, 2014; Sekaran & Bougie, 2016). Validity in the qualitative approach refers to the accuracy of captured findings, while reliability refers to consistent findings across different inquiries (Gibbs, 2007). There are two qualitative phases in this SED research design, which is the first phase is the development of the origin for the entire set of RQs, and the third phase is a convergence of overall research findings.

Several strategies were applied in this study to improve the validity of qualitative inquiry, such as triangulation and evidence (Creswell, 2014; Gibbs, 2007). Triangulation refers to the multiple inquiries for data collection and data analysis for the entire study, determining the data quality. Data triangulation has been a common technique for assessing the overall quality of a study, particularly in mixed methodology (Teddlie & Tashakkori, 2009). The final phase of the focus group was the triangulation findings collected in the interview and survey phases. This phase aimed to find affirmations on the overall findings, shed light on any new phenomenon for further study and discover any limitations. In the discussion, the study emphasized the consensus statements for the outcome by the leading of research questions.

Universiti Utara Malaysia

Besides that, the good qualities of the qualitative approach should be indicated in the data analysis with rich information (Creswell, 2014; Gibbs, 2007). The interview and focus group was conducted to ensure data saturation was achieved and to assist in addressing the research questions. The validity of this phase was attained by rich evidence expressed in the data reporting section.

These strategies empowered the reliability and validity of the research design and inquiry. The triangulation process can examine the credibility of the findings. The data saturation was achieved by the discussion in the focus group and interviews.

### *Quantitative Approach*

In the second phase of SED design, quantitative inquiry was applied, and certain precautions needed to be taken to examine the credibility of the instruments used in this study. Instruments with a high rating in reliability and validity lead to meaningful interpretations of the facts (Creswell, 2014). In order to improve the credibility of the questionnaire approach, a pilot study was conducted. Additionally, the pilot test is relevant as the comments given by the respondents help to enhance the credibility of the study. The first sketch of the questionnaire, which combined the related questions used in previous studies, was applied to confirm its internal reliability. To attain reliable results, Cronbach's alpha value of more than 0.6 (Clark & Watson, 1995) is considered acceptable, as has been frequently applied in studies of reverse logistics (Abdullah & Yaakub, 2015; Jeszka, 2014). In the pilot study, the internal consistencies of the scales were found to be sufficient for further data analysis.

At the same time, validity represents whether the results of the subject matter under study are associated with current business practices. In other words, it checks if the measurements measure what they set out to assess. Therefore, an examination of validity is conducted before processing further data analysis. There are three types of validity, as defined by Sekaran and Bougie (2016).

- Content validity is established by ensuring that the instruments can fully represent the conceptual definition that needs to be tested (Sekaran & Bougie, 2016). Generally, content validity is examined by expert judgement rather than statics analysis (Edmonds & Kennedy, 2017). The instruments are considered to have content validity when the instruments have theoretical support from previous studies and the items accurately measure the domain of the concept (Newman et al., 2013). The literature review in chapter two provided the construct's origin in the related research. The objective of content validity is to describe the detail of a definition and to develop instruments for data collection that models have been tested from previous researches (Hair et al., 2014). In parallel, this validity ensures that the choices of the scale items are suitable for the conceptual assumption and practical understanding. The materials in this study were captured from previous research; hence the earlier materials were believed to be valid and credible, which had been tested and examined. Besides that, the questions in the questionnaire had obtained the inspection of the experts from industry and academia to secure content validity.

- Criterion-related validity is established by ensuring the measures of concept respond as expected depending on the previous research, which juxtaposes with other research that used the same measures. There are two types of criterion-related validity: concurrent and predictive validity. Concurrent validity is the existing criterion validity, while predictive validity presents somewhat later (Sekaran & Bougie, 2016). As discussed before, this study applied a cross-sectional time horizon. Hence, this study adopted concurrent validity. Multiple relationships between variables are discussed, as expected in the previous chapter, and these are the prospective interrelationships that take criterion-related validity into consideration.
- Construct validity is established by examining if the measured instrument conforms with findings that are expected from theories (Matthews & Ross, 2010). This type of validity ensures that the findings of this study can be evaluated and the relationships of the constructs can be predicted and elaborated (Sekaran & Bougie, 2016). Construct validity is present with sufficient definitions and measures of variables in the study (Creswell, 2014). There are two types of methods to evaluate construct validity: convergent and discriminant.
- Discriminant validity is used to distinguish the scales that are distinct from other constructs, while convergent validity applies to obtain the scales' correlation with

Universiti Utara Malaysia

other factors of the same construct (Bagozzi et al., 1991; Sekaran & Bougie, 2016). Construct validity is critical in confirming a measurement model. Consequently, factor analysis is performed to assess the convergent and discriminant validity of the data (Hair et al., 2014).

The issues of reliability and validity were examined carefully by appropriate methods to ensure the study's credibility. The next section elaborates on the method used for data analysis to generate a useful output.

### Quantitative Data Analysis Method

The data analysis method can also be differentiated into the qualitative and quantitative approach. Qualitative analysis was conducted in the first phase to generate valuable findings which can produce a robust framework. For the quantitative approach, the step of data analysis was conducted after sufficient data was collected from the respondents. Data analysis aims to improve credibility and produce output for this research. To complete this study, a few steps were conducted in the data analysis process.

#### *Data Cleaning*

The step of data cleaning was conducted to improve the quality of the data. In this step, the received questionnaires were reviewed, and the missing data and the outliers are screened. Outliers refer to those responses where one or more of the collected data is unique from the overall observation (Hair et al., 2014). These particular steps are critical to confirm the appropriateness of the data for further analysis within the overall research design. In this step, all missing data and outliers were removed for further data analysis.

#### *Reliability and Validity Test*

In order to increase the credibility of this study, different tests were conducted to ensure the reliability and validity of constructs, as shown in Table 3.13. Before proceeding to advanced multivariate analyses, the goodness of measures of this study was analysed through reliability analysis and validity tests.

*Table 3.13 Reliability and Validity Test*

| Psychometric Issues | Measures |
|---|---|
| Reliability | Cronbach's alpha & Composite Reliability |
| Validity | Factor analysis |

*Source: Author*

For instance, the test of Cronbach's alpha is a suitable approach to test the internal consistency of scales. Cronbach's alpha consists of a value between zero to one, where the scales are considered acceptable if the value is higher or equal to 0.6. As a rule of thumb, constructs with an alpha value of more than 0.6 were accepted in this study. Hence, this study applied the criteria recommended by Bhatnagar et al. (2014) in order to establish consistency and reliability. The reliability of the variables was determined based on the assumptions as stated in Table 3.14. Similar to Cronbach's alpha, the internal consistencies of the instruments were tested by composite reliability, and more than 0.6 was considered acceptable (Bagozzi & Yi, 1988; Hair et al., 2014).

*Table 3.14 Cronbach's Alpha*

| CRONBACH'S ALPHA | |
|---|---|
| $\alpha \geqslant 0.9$ | Excellent |
| $0.7 \leqslant \alpha < 0.9$ | Good |
| $0.6 \leqslant \alpha < 0.7$ | Acceptable |
| $0.5 \leqslant \alpha < 0.6$ | Poor |
| $\alpha < 0.5$ | Unacceptable |

*Source:* (Bhatnagar et al., 2014)

Validity analysis was also important to ensure that the measurement tool can measure variables accurately. This study applied factor analysis to validate the measurement instrument and research model because it identifies the relationship between firm and task environment factors with omnichannel firm performance. Factor analysis has the ability to assess the validity of the observed variables (measured through the questionnaire) together

Universiti Utara Malaysia

with unobserved variables by factor analysis. The aims of factor analysis can ensure that the construct measurement is valid and reliable for reaching the study's conclusions.

In this step, the convergent and discriminant validity of the measurement model was tested based on the factor loadings and average variance extracted (AVE) value. The observed variable validity describes the variance of a single observed item relative to an unobserved variable by assessing the standardized outer loadings of the observed variable. Observed items that owned outer loadings of a minimal 0.7 are considered acceptable. However, an outer loading of less than 0.7 should not be removed. By following the rule of thumb by Hair et al. (2014), the items with an outer loading between 0.4 to 0.7 are deleted if these will increase composite reliability. However, if the outer loading of the item is lower than 0.4, it should be discarded from the construct.

In order to establish convergent validity, the average variance extracted (AVE) is the measurement tool used in this study. AVE refers to the commonality of a construct, which means that the percentage of an unobserved variable can be explained by the observed items (Hair et al., 2014). The latent constructs should obtain a minimal 50% of the variance from the observed variable in the measurement model. Hence, this indicates that the AVE value for all unobserved variables should be above 0.5. If all the AVE values are more than 0.5, convergent validity for this study is confirmed.

To examine the measurement model's discriminant validity, the indicators' cross-loading is assessed. The cross-loading value of a construct should be greater than other constructs in the path model. Besides that, the Fornell and Larcker criterion was the approach used to assess the discriminant validity as recommended by Hair et al. (2014). Fornell and Larcker's criterion verifies validity by comparing the square root of the AVE values with the latent variable correlations. If the square root of the AVE values for the construct is greater than any correlation value with other constructs, the discriminant validity can be secured. This indicates that the measurement model accepts validation for the discriminant validity.

After conducting the reliability and validity test, the current measurement model has sufficient credibility with confirmation of adequate reliability and both convergent validity and discriminant validity. The next step is to proceed to multivariate analysis.

#### *Descriptive Statistics Analysis*

Descriptive statistics aims to provide information through frequencies, measures of central tendency, and dispersion (Sekaran & Bougie, 2016). This study used questionnaires to collect data from respondents, and the data were analyzed to compare the variables numerically which enhances the understanding of data interpretation. This step aimed to produce data presentation in numerical and graphical forms for comprehensive cognizance of the database. The measures of central tendency, such as means, medians and mode, can show patterns in the respondent samples, further assisting in gaining a better understanding. Besides that, pie charts and line graphs are used to make the data easier to interpret and interesting to view. All data collected through the questionnaires are decoded into percentage distribution figures to obtain precise solutions for the research questions.

#### *Normality Analysis*

In this study, a normality test was conducted to analyse the data. Although normality is not required for the Partial Least Squares Structural Equation Model (PLS-SEM), the normality of variables was still examined. If the variables are a highly abnormal distribution, they may incur standard errors (Hair et al., 2014). The normality of variables could be observed through the skewness and kurtosis of the normality distribution graph.

A zero value for skewness and kurtosis occurs when the observed variables are in a normal distribution. A positive number for skewness and kurtosis shows the distribution as skewed to the right, while a negative number shows the distribution as skewed to the left (Gravetter et al., 2018). Besides that, the researcher also used the web application (Cain et al., 2017) to examine if the data are normally distributed. Overall, this study tested all the items in each construct by using visual examination tools such as histograms, normal Q-Q plots and box plots. Based on the observation, an observation of a bell-shaped curve in the histogram indicates a normal distribution for the examined construct (McDonald, 2014).

### *Statistics Analysis*

The partial Least Squares Structural Equation Model (PLS-SEM) is the second-generation technique in statistical analysis. It has been chiefly used for theory development in exploratory studies (Hair et al., 2014). PLS-SEM is suitable for this study as the concept of omnichannel is still dynamic, as researchers recommended, indicating that PLS-SEM is ideal in the early phase of theory development. PLS-SEM is an appropriate method for developing theory in situations of high complexity and low theoretical knowledge, and omnichannel is still new, as mentioned previously (Garson, 2016; Henseler et al., 2009). Major approaches of SEM consist of path analysis, confirmatory factor analysis, second-order factor analysis, regression models, covariance structure models, and correlation structure models. This technique is suitable for this study to develop a theory of business management, particularly in the reverse logistics field (Mateos-aparicio, 2011). Besides that, PLS-SEM could also help predict the key drivers of reverse logistics to improve omnichannel firm performance. PLS-SEM is a more powerful tool to identify relationships in social science studies than other approaches (Hair et al., 2012). For instance, some of the researchers have applied PLS-SEM in their studies in reverse logistics fields, such as Huscroft et al. (2013) and Abdullah and Yaakub (2015).

PLS-SEM is a nonparametric method which means that this method does not face such obstacles concerning the distribution of the dataset (Garson, 2016). PLS-SEM handles distribution from the database by using the bootstrapping technique to assess the significance value of the path coefficient (Hair et al., 2014). The objective of this study is to use PLS-SEM to grasp better the influence of reverse logistics factors in omnichannel firm performance. This study can discover and present a variance-based structural equation model for reverse logistics in omnichannel companies by applying PLS-SEM. Furthermore, applying PLS-SEM not only identifies the significant path coefficients in the measurement model. At the same time, PLS-SEM also could evaluate the effects of other constructs in the measurement for the significant path coefficients variables.

## Ethical Consideration

Ethical aspects are important in research methodology to ensure that the research is reliable and trustworthy. Research ethics are some standards or principles that an individual study should follow and establish to ensure the protection of the subjects' dignity and the usefulness of the information (University of Minnesota: Center for Bioethics, 2003). Stakeholders should understand the existence of the ethics code; its implication may be nothing, but it is a necessity for a better society (Iltis, 2005). Without following the ethics code, the study would have a high potential to face ethical issues such as data manipulation, privacy violence, coercion and deception (Oliver, 2010; Pruzan, 2016). Researchers should carefully examine the righteousness of the study as an enhancement to avoid erroneous results. In the study of social science, the process of data collection often involves human beings either directly or indirectly (Akaranga & Makau, 2016). Therefore, there are certain ethical considerations that should be complied with, as suggested by Jalil (2017).

### *Privacy*

Concern for treating the information given by the respondent as strictly confidential with sufficient privacy is one of the critical obligations of the researcher (Sekaran & Bougie, 2016). Breaches in privacy protection may incur harm or distress to the respondents (Loue,

Universiti Utara Malaysia

2002). The principle of anonymity in a study would help researchers increase privacy by not identifying respondents' information. Respondents can avoid mentioning their names, which reduces the possibility of any other sensitive information about a respondent being revealed (Akaranga & Makau, 2016). Obviously, anonymity is a powerful assurance of privacy and is suitable in studies when using surveys as the data collection method. Accordingly, the survey in this study did not request respondents to provide any information that may directly or indirectly recognize their identity. Hence, researchers need to respect privacy and the principles required for researchers to follow.

*Telling the truth and reporting findings accurately*

Researchers are obligated to perform and report their studies accurately. Researchers may encounter ethical dilemmas in reporting the research when facing risks such as fabrication, falsification and plagiarism (Israel & Hay, 2006). Falsification refers to manipulating or distorting the results or data, which can lead to unreliable research. On the other hand, fabrication refers to the action of the researcher creating and reporting false data and results. Plagiarism is the prevalent form of research misconduct; it refers to the act of duplicating other ideas, data or results without giving appropriate credit (Smith, 2000).

Universiti Utara Malaysia

The research misconducts are clear, and researchers need to have a good understanding of these ethical definitions. Researchers can only avoid bias and wrong actions if these serious research misconducts are understood (Pruzan, 2016; Smith, 2000).

*Making results understandable to various groups of stakeholders*

It may be possible to conduct the research with complete impartiality, with only the findings reported by mistake. The results may have been modified to fit expectations, and studies may agree with the supporting 'desirable theory' that is commonly accepted. Frequently, researchers may or may not purposely neglect the study results when the results do not support their manuscript (McNemar, 1951). Besides that, most researchers have either misplaced or destroyed the data. Wolins (1962) re-examined seven published studies only to discover that three of the seven articles had an existing bias in the original data analysis, which may completely alter the conclusion.

Therefore, the application of ethical principles in any study is important. Hence, the researcher need to examine the ethical code carefully in this study and ensure that respondents understand their purpose and rights throughout the study. This study's findings support the better performance of the integrity and culture of future studies. These related persons contribute directly or indirectly from the beginning to the end of the study processes, and their contributions will be recognized as rational and acceptable (Jalil, 2017).

## Summary

The discussion in chapter three involved the application of the quantitative methodology approach within the relevant worldviews in this study. The choice of quantitative methodology is supported using research questions and research objectives to pick the choice of research design and methods. Examining the relationship between reverse logistics factors and omnichannel firm performance is necessary to illustrate the holistic view of reverse logistics. The research scope has been displayed to shed light on the relationship between independent and dependent variables in this study of omnichannel reverse logistics. This chapter clearly outlined the processes that were taken through the research journey, including the development of the questionnaire instrument, sampling design, data collection strategies and data analysis methods. Besides that, the type of reliability and validity approaches were described and justified to ensure the credibility of this study.

The following chapter focuses on the data analysis processes and summarizes the findings of quantitative analysis, which comprise the reliability and validity test, descriptive analysis, normality analysis and statistical analysis.

Universiti Utara Malaysia

# CHAPTER 4: QUALITATIVE PHASE I & QUANTITATIVE PHASE II ANALYSIS

Universiti Utara Malaysia

## Introduction

This chapter focuses on the findings from qualitative phase I and the quantitative phase, which will be combined to further affirmation in qualitative phase II. This chapter is divided into two sections, with a discussion focusing on the outcomes that may address the research questions. The data collected during the qualitative phase I was analyzed using thematic analysis, which assembled the knowledge into various themes. The themes were cross-checked against prior literature and described using enriched data.

The themes were then be aligned with the questionnaire design to ensure the reliability of data collection tools. After collecting sufficient data from respondents, the quantitative analysis proceeded with demographic analysis, correlation analysis, and PLS-SEM analysis. Finally, additional analysis was performed to explore further the role of various factors in the reverse logistics system.

## Stage one: Qualitative Analysis Phase I

Using thematic analysis, the first phase of this qualitative data analysis aimed to distinguish the highlighted themes from within the discussion and discovery of themes (Roulston, 2010). These highlighted themes were incorporated into the research question. Phenomenological interviewing was applied to gather those highlighted themes used in the research question in which the themes originated from the previous literature review.

## Thematic Analysis

The semi-structured interviews were conducted using a phenomenological approach (Roulston, 2010) to survey the interviewees' experience and knowledge of the reverse logistics system at their respective companies. The interviewees were inspired by prompts that originated from a priori themes. After that, the themes mentioned by interviewees were examined and restructured in a table. As mentioned previously, two main reverse logistics factors were identified as influencing omnichannel firm performance. The two main reverse logistics factors are firm factors (context of the reverse logistics system in the company) and task environment factors (external environment of the company that recognizes and reacts to the reverse logistics system). The transcriptions and memo notes were used to analyze the qualitative data collected from the researcher and interviewees. Based on thematic analysis, the data were used to generate initial codes that compose significant themes of firm and task environment factors. The coding of interviews was based on the concepts that originated from Chapter 2 (literature review). The interviews of this qualitative phase were exploratory to explain the second stage of the quantitative phase. The illustration from the interviewees was quoted to make the explanation and clarification robust (Labra et al., 2019). The result of this qualitative analysis is not a measurement of omnichannel firm performance. Still, the context, discussion, and focal point during this session are crucial elements of the qualitative analysis.

The author's cogitation from transcriptions and memo notes was used to analyze interviews. The coding system composed a structured table in the first stage (refer to Appendix E). Besides, a demographic analysis of the interviewees was conducted, with 72.7% of respondents being management personnel from omnichannel companies. Most of the interviewees are from the category of retailers because the retailer group is the most considerable portion of omnichannel companies in Malaysia.

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About six interviewees (54.5%) represent the retailer category, three interviewees (27.3%) represent the manufacturer category, and two interviewees (18.2%) represent the logistics service provider category. About eight of 11 interviewees work as executives in their companies, while the remaining three interviewees work at a higher management level in their companies. As suggested by previous studies, the interviewees are the management for reverse logistics systems in omnichannel companies, which strengthened the results of the interviews. All of the interviewees have worked in the supply chain for more than two years, and seven interviewees had two to four years of working experience. In particular, two interviewees had more than 10 years of working experience, which provided rich data for this research (Table 4.1).

*Table 4.1 Demographic of Interviewees*

| Item | | Number | Percentage |
|---|---|---|---|
| **Role Of Omnichannel Company** | Retailer | 6 | 54.5% |
| | Manufacturer | 3 | 27.3% |
| | Logistics Service Provider | 2 | 18.2% |
| **Working Experience** | 2- 4 Years | 7 | 63.6% |
| | 5-10 Years | 2 | 18.2% |
| | More Than 10 Years | 2 | 18.2% |
| **Position** | Executive | 8 | 72.7% |
| | Manager | 3 | 27.3% |

Most of the themes were found in the analysis, especially those that often appeared in conversation, such as customer, formalization, and collaboration. The findings of all interviews are discussed in the following section.

## Firm and Task Environment Factors

This section will discuss the results of the qualitative phase, which will provide a more comprehensive understanding using descriptive explanation (Guest & Fleming, 2014). All interviews were carefully reviewed to identify the themes of reverse logistics systems that improve omnichannel firm performance. The frequency of themes will be highlighted based on the number of individuals mentioned in the related themes.

### *Firm Factors*

The firm factor will be discussed first as it represents the context of reverse logistics systems within the company. Respondents mentioned their company's reverse logistics system, which was equipped with certain internal elements. The main themes associated with these internal elements were top management support, formalization, flexibility, information system, and collaboration.

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### I. Top Management Support

About eight of 11 interviewees mentioned top management support in their reverse logistics system. Most interviewees highlighted the role of top management as a decision-maker in resolving problems or errors in reverse logistics systems. One interviewee stated:

*I09: There is a daily report auto-generated and sent to the manager ... normally, they need to have a group discussion, as well as provide preventive and corrective action.*

This shows that top management is dedicated to minimizing errors in the reverse logistics system to ensure the functionality of the reverse logistics process. Simultaneously, some of the top management will participate in the reverse logistics process to minimize costs, as one of the interviewees stated:

*I05: We need approval from top management before we scrap the seal because it incurred cost ... sometimes they will give some suggestions to the technical persons in the factory. So, they can do some improvements to the products to reduce the problem.*

Besides, retailing and manufacturing companies collect feedback on returned products. Some of the interviewees mentioned that top management would evaluate the reasons for the returns. Following that, they will plan for future improvements based on customer feedback. One interview stated an example:

*I04: The manager and top management will oversee the return reason and provide advice to the people in charge to be careful in future orders. This is because our product had different voltage and different material which need a person in charge to be alert about the order details.*

Top management is also aware of the advantages of reverse logistics systems and is willing to devote resources to them. In addition, some companies that emphasize the reverse logistics system will have a special team to handle the reverse logistics system, as one interview stated:

I06: *The PRS team member will always ask for the reason why consumers want to return certain goods. So, they will find out the reason and try to assist the customers to understand the products or give other recommendations of products to the user ... return policy in Amway is helping to grow the new market, new buyers and new users, which benefit the company. So, the advantages of the return process to Amway actually is the extra cost where we had to bear any returned goods and fully refund the customers, and we will not resale* *back the items to the customers. Aside from this cost, we also have other costs like set up a counter and form up a technician group. So, it is just purposely to serve all kinds of returns from our end customers.*

In order to increase firm performance, the role of top management in reverse logistics systems have been annotated by interviewees to ensure the processes are effective and efficient.

### II. Formalization

About nine of 11 interviewees frequently highlighted formalization-related elements. For instance, their company has standard operation procedures (SOP) in their reverse logistics process. All personnel involved must adhere to the SOP guidelines during the returns process. Interviewees mentioned that SOPs are important when dealing with many customers as the SOPs can simplify the return processes.

*I01: We do have our SOP for the collection process. In the good return process, our sales executives and drivers are required to check on the spot to make sure the products are still in good condition. Then, only we can proceed to the next step, which issues the CN to our customer. Due to the big number of customers, that's why the SOP is very important. It became a guideline for our return process, which makes it faster and improves customer satisfaction.*

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Besides that, interviewees mentioned a return policy in their reverse logistics system. All terms and conditions of returns refer to a return policy, such as a valid period, product type, and return options. In the interview, interviewees show that the return policy may be published in a variety of places, including online website stores and invoices. This published return policy can be read by customers at a time during their purchase journey.

*I01: In our company, we do accept the return of goods based on the return policy. We do accept the returned good based on the date of invoice. If not more than a week or seven days, we will accept returned goods, provided in good condition and original packaging. It means that all the company should have their own return policy, and they should be listed down all the terms and conditions clearly in the policy.*

Some of the interviewees also mentioned that they need to achieve some goals in their reverse logistics processes based on the standard operating procedure. The existence of process goals ensures that the reverse logistics system can function effectively in order to improve customer service and customer satisfaction.

*I11: There are standard operating procedures for us to follow. These can make sure our performance can meet the standard, such as a reply to the customer request within three days. These can help to improve customer experience through excellent and responsive service.*

These descriptions demonstrated that the formalization element exists in omnichannel companies. When omnichannel companies practice the formalization element in the reverse logistics system, they may be able to improve firm performance, particularly in terms of customer relationships.

### III. Flexibility

Flexibility is also frequently mentioned by most of the interviewees (90.1%) in the reverse logistics process. In one case, an interviewee directly mentioned that the company should equip the reverse logistics system with flexibility.

*I10: The return process is also related to the flexibility of our company. If the return process is easy and fast, this mean our company is very flexible with our customer's request. These can help the company to build a good image among customers.*

In particular, other interviewees also mentioned additional elements related to flexibility in the return process, such as schedule, channel, and product. In order to provide convenience to customers, some companies offer flexible channels for customers to return unwanted products. Customers can choose to either return through physical stores or pick up.

*I06: Customers can do their return process in any of our retail stores nationwide in Malaysia. So, customers can bring their returned items to our counter, and our staff will verify for the products ...* Otherwise, *Amway will arrange for a service technician or delivery team to collect parcels from customers.*

Customers can return their products in retail stores or pick them up by courier which is offered by these omnichannel companies. Furthermore, omnichannel companies offer various for customers to initiate returns, such as a website store, an e-commerce platform, email, social media, and even a retail outlet.

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*I10: They will contact us by clicking the return function in the market place so the third-party platform will trigger us about the return case. If the customer purchases the product from their own website, they can contact us directly by clicking the message button in our online store to connect to us. Besides that, they also can email us or contact us through social media such as Facebook and tell us their issues. Customers can return the goods to the nearest retail outlet, and then our salesperson will assist in shipping back the item.*

Instead of channels, some companies manage a wide range of products and can handle returns for a variety of products. This ability is important for companies that sell or manage various types of products.

*I02: Our company has many customers, so we do have a huge variety of products ... So, we do collect different products, such as mouses, laptops, computers, servers, and others. We can use different kinds of transportation to collect the goods such as motor, van, and lorry.*

Another perspective of flexibility would be the returns request made by customers. Omnichannel companies are willing to handle a variety of return reasons.

*I10: We accept all kinds of returns. For example, broken products due to courier service provider miss handling and packaging problem are allowed to be returned. Let say if our customer wants to change the size and color of the product and they can request for return too.*

In order to resolve various kinds of return requests, they have flexibility from the return policy that would answer customer requests. Different products would have different types of return policies based on the product's characteristics.

*I11: We accept different kinds of returns based on the return policy as mentioned in the information on products. We got different kinds of return policies which have different return availability. The product sells at our LazMall allow customers to return within 15 days. Other products that manage by our company have a return period between seven days or 14 days. Besides that, our platform also sells products that are direct managed by our seller, and this kind of products have their own return period as decided by the seller. At the same time, customers need to discuss with the seller before proceeding for return. Customers are only allowed to return when the seller has provided permission to return. However, some products are completely not allowed for return, especially those perishable products such as food.*

From the aspect of collection in the return process, companies are offering a pick-up schedule based on customer preferences. Customers are entitled to choose their preferred time for the carrier to come over and collect unwanted goods.

*I06: The collection for customer schedules is based on customer preferences. At the same time, we also communicate with our third-party because we are assigning our forwarder or our technician to meet up with customers. So, both parties had to be agreed on the timeline, and then only the collection can be happening. For sure, we will try to follow our customers' preferences and we will give feedback about the timing to our forwarder and technician.*

Interviewees also described some unexpected incidents in the reverse logistics process. At the same time, their companies can resolve the issue with a flexible solution. For instance, one of the omnichannel companies borrowed transports from other departments to fulfill an immediate return order.

*I02: It depends on the type of problem. There was an incident that happened last month; we were facing a request from the customer that needed to collect and make delivery on the same day due to their monthly sales target. At that time, we were facing a shortage of vehicles in collection arrangements. So, I must call other warehouse manager to assist us to collect and deliver that batch of products. We are lucky enough because we managed to settle the collection and delivered on the same day without disappointing our customers.*

Another example would be the interviewee's company offering solutions to the vendor who has obstacles picking up returned products.

*I03: Our client personal in charge will arrange for a transporter (to pick up returned products). In case they cannot find a transporter, and they have an urgent order. They will request we use our own transporter. Then, we will check with our driver (for the availability).*

Generally, omnichannel companies that flexibly equip their reverse logistics systems can ensure customer satisfaction and maintain a good customer relationship.

### IV. Information System

For the theme information system, many kinds of information systems, such as Oracle EDS and Korean ERP system, were mentioned directly by interviewees.

*I06: We do have the information system to do tracking for all kinds of processes, and we are using AS1. Previously, we were using AS400 system and now we had switch to another new system which is called oracle EDS.*

*I07: We do have a standard system that records the return information, which is the Korean ERP system.*

Interviewees described the function of the information system in the reverse logistics process. Mostly, interviewees mentioned their company uses an information system to record the reverse logistics process, whether the order is in the process of return or has been returned.

*I02: After all this (product condition and detail) checking is completed, we will upload the details to our system based on the collection and customers will need to acknowledge that the returned goods have been received in our warehouse.*

By using the data stored within the information system, omnichannel companies could use the data to identify the root cause of returns. If omnichannel companies can study the reason for returns clearly, they could resolve the problem and improve their firm performance.

*I04: We also have our system to key in all the details needed for the return process. This kind of information system enables us to trace the return reason to identify the mistake that had been done.*

Some omnichannel companies can track the status of returned goods by using the information system. The tracking function ensures that the customer is kept up to date on the status.

*I06: After that, they will key in that information into the system based on the document. So, we are using both documents and system for tracking purposes.*

Besides, the information system of some companies plays a role as a communication tool, as described by interviewees. Omnichannel companies use the information system to communicate with customers about return details. To provide appropriate information, the interviewee also provided details about the input and output of the information system.

*I03: The company used our warehouse management system to retrieve orders from our clients. Some of the sessions for my company used it to retrieve the order from my clients. First, receive the email from the client about the new order. Then, upload the excel file into our warehouse management system to print out the order.*

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Furthermore, one interviewee highlighted the function of the information system as a communication platform between vendors and end-users. They can discuss the returns process using the information system for further actions.

*I11: We have our own order management system to manage all the orders which include those return orders. First, the platform had been using to communicate between our company, sellers and customers.*

The information system allows for internal communication within the firm, with the in-charge person performing their task according to the instructions. When the task is completed, the status will be updated in the system. Next, the returned goods will be transferred to the related department or personnel.

*I02: Information system is mainly for recording each job, including delivery and returns. Customer service will be key in the job inside the system, and other teams will be take action based on the system.*

The information system also plays a role as a reminder, preventing further delays in customer return requests. The reminder function could ensure that the return process is effective and efficient.

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*I10: For the backend platform of our marketplaces and online store, the customer clicks the return function and a notification will be sent to us, which will be directly record in the system. If we want to extract the info, we can just put out from the backend system. Information system also will trigger us to respond to our customers soon as possible. For example, if we didn't respond to our customer, the system will generate a pop up message which reminds us.*

Overall, interviewees highlighted the various roles of information systems in the implementation of reverse logistics systems.

### V. Collaboration

About 10 of 11 interviewees highlighted that several teams or departments are involved in the return process. They must collaborate to ensure the smooth operation of the reverse logistics system. The different teams each had their task in the return process, but they needed to collaborate to complete it. They coordinate with other teams to ensure the effectiveness of the reverse logistics system. For instance, the collaboration between the customer service and the logistics department was frequently highlighted by interviewees. Mostly, the logistics department would be responsible for the collection process.

*I1: There will be three parties involved in the goods return process. So, the first party will be the customer. Customer must make sure the returned goods are in good condition and original packaging, as I mentioned before. Then they will request a good return through the phone call or email with our sales executive. The second party is from our company sites whether is driver or sales executive (logistics). They will go and collect the returned goods from our customer. Our sales executives need to check on the returned goods on the quantity and quality. The third party also is from our company sites which is the customer care (customer service). They will issue a credit note (CN) to our customer after we make sure the returned good is acceptable and staging in our warehouse.*

Besides, some omnichannel companies have also organized a department that purposely handles those returned products. The department must also collaborate with other departments in the return process.

*I10: We will pass the returned goods to our rework department before we pass back the returned goods to our warehouse. So, the rework department will check and verify whether the goods need to be reworked or is it okay to return to warehouse or the goods must be disposed.*

Furthermore, interviewees stated the importance of information sharing between various departments in the reverse logistics process. They mentioned that the customer service team needs to provide the correct information to the logistics department to ensure that they had collected the correct returned unit at the right time in the proper place from the correct person.

*I7: We have a few departments in the office, and the communication with the customers is only one person. So, the single person that communicates with customers will collaborate with other departments, such as the department that is in charge of repairs. The person will know all the information for the return process and maintain contact with the customers.*

The information shared among departments also helps employees to perform their tasks. For example, a particular department may decide where to send returned products based on the information from other departments.

*I6: Our customer service is charged of information collection on the returned goods. However, the decision on whether for accept the returned goods still will depend on the PRS team. They are the one who are make decision whether to accept the return or not.*

Some of the interviewees also provided details on the communication methods used between different departments in the return process, whether verbally or electronically.

*I10: The process is in hierarchy order which mean each department have their task and finishing the task to pass to next department. We normally transfer the message verbally and form will be fill out with details and pass to next department.*

*I2: Customer service will be key in the job inside the system and other team will be act based on the system. For example, it will generate a list for the transporter team to know what shipments need to be collected and for the transit team to know what shipments need to be transited to another branch. Each team will be performing the job and update to the system. After that, the system will automatically trigger the next team to perform their job.*

Hence, the themes of collaboration between various departments in the return process can be observed through interviews with various omnichannel company experts.

### Task Environment Factors

The influence of task environment elements is also evident with employees from omnichannel firms. They explained the role of these external elements in the reverse logistics system. The common themes, which are grouped in the task environment factors, are supplier, customer, regulator, and competitor. In particular, all interviewees mentioned the existence of a reverse logistics system to accommodate customer requirements.

#### I. Supplier

The role of suppliers in the reverse logistics system was also mentioned by the interviewees. About 10 of 11 interviewees agreed that the reverse logistics system is interrelated with their company's supplier. For instance, they highlighted that the reverse logistics system has always been linked with suppliers.

*I1: We will follow the supplier return policy. We will return the goods to our suppliers. We will make sure the returned goods are in good packaging. After that, we will inform our supplier, and they will come along with their lorry. Count down will be done before returning to the suppliers. They will issue a GRN for us and then as soon as those returned goods arrive at the supplier warehouse. After that, they will provide us a CN.*

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One of the interviewees mentioned that having a good relationship with the supplier is important for good reverse logistics management. The relationship could be enhanced through communication between omnichannel companies and their suppliers.

*I1: It is important to maintain a good relationship with our supplier in a good return management. It can help to maintain a two-way communication between supplier with our company.*

Their company shares end-user feedback with suppliers to improve their products. Companies that integrate with suppliers can ensure that customer demand arrives at the supplier, which provides proper planning of supplier production. Some of the omnichannel companies will send back the returned products to the supplier to find the root cause of the returns.

*I7: They (supplier) will also need to know the issue of the products, so they need us to send back to the headquarter. Basically, they (supplier) just want to check what is the issues behind to ensure the quality problem.*

Another choice is for omnichannel companies to diagnose the reason for returns and collaborate with suppliers to develop a comprehensive solution.

*I10: When the customer returns the goods to us, this means we can understand their satisfaction and any weakness that we need to be improve. For example, a bottle of shampoo broken during the delivery process and return by customer... Let's say the return cases related with packaging, we will work with our packaging supplier and request to produce a better solution for us. If the return cases related to quality issues, we will highlight and notify the supplier to make sure them have improvements and solutions for these.*

Besides, most of the omnichannel companies have made a contract with their supplier to handle returned goods. Some of the suppliers will handle the returned goods, whereas other companies will need to manage the returned goods on their own. By following the contract agreement, employees in the company can follow the return procedure agreed upon by both parties. So, both parties can seek benefit maximization by aligning the return process in the related functional department.

*I6: We have different agreements with different suppliers. Some of the suppliers accept good returns, and they are willing to bear the cost incurred for repair or disposal by themselves. Some of them are not. So, it depends on the agreement that had been signed between Amway and our suppliers.*

Hence, the theme of supplier has emerged in the reverse logistics system of omnichannel companies.

### II. Customer

In all the interviews, the customer theme can be observed from all the interviewees. Customers were frequently mentioned as the main priority in the reverse logistics system. They emphasized the importance of an effective reverse logistics process in improving customer service. Hence, they must ensure that the return process is responsive and agile to boost customer confidence. For instance, omnichannel companies must efficiently process returns for refunds or replacements.

*I02: For the collection step, we aim to do the collection within one day. The next day, we must deliver to our customers if there is not trouble. If not, we may face complaints from our customers due to our inefficient ... We need to make sure our return process is efficient and effective so that only our customer will be satisfied with our service.*

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By using an effective reverse logistics system, omnichannel companies hope to increase customer loyalty and thus boost sales opportunities.

*I01: Due to the big number of customers, that why the SOP is very important. It became a guideline for our return process which make it faster and improve customer satisfaction ... Having these good return management systems, we may provide the best and good customer service to our local customer. When our local customers are satisfied with our customer service, then they will become more loyal to our company. Our company performance also will keep going up by boosting the sales.*

Omnichannel companies also aim to maintain good relationships with their customers by utilizing an excellent reverse logistics system.

*I07: Most of the return management depends on how we want to keep the good relationship with our customers ... What we are looking for and prioritizing would be to maintain and improve the good relationship with our customers.*

Besides, some omnichannel companies provide customers with a liberal return policy that allows for unjustified returns. Customers would be more willing to purchase from the company if the return policy was more liberal. Moreover, omnichannel companies offer customer-driven return policies, such as a full refund policy or free return cost (Janakiraman et al., 2016).

*I04: Return policy is very important. If the company could have a good return policy, the company could build a good relationship with customers. For example, our company responds to those manufacturing defects products. We need to proceed with it as soon as possible, and the customer will satisfied and have a good impression of our company.*

Interviewees also argued that returns are unavoidable, and all companies provide a certain warranty period for customers to return defective or unwanted goods. In particular, one of the omnichannel companies provides a nearly unlimited warranty period as long as the product expiry date is more than six months. Customers will be satisfied and confident with the quality assurance that omnichannel companies provide.

*I06: Customers can bring their returned items to our counter, and our staff will verify for the products to make sure that the products meet the two requirements as mentioned, which is the consumption cannot be more than 80% and the expiry date must be more than six months ... return policy in Amway is helping to grow the new market, new buyer and new user which is very beneficial to the company.*

Furthermore, interviewees also stated that their company designed a return process which is convenient for customers. For example, customers can choose a return method that is more convenient and easier for them, such as a return in-store or pick up by courier. The convenience of reverse logistics systems would increase customer satisfaction.

*I11: After the return request has been approved, there will be a return option for the customer to choose. Customers can either choose courier pick up or drop off at the courier office. Besides that, customers also can choose to drop off at a preferred location which is convenient for them.*

One of the interviewees noticed the necessity and importance of a reverse logistics system in improving firm performance.

*I11: Return management is necessary for the company to handle the return. We cannot simply refuse returns from our customers because these will affect the reputation of our company. If we can handle returns properly, we could increase our reputation and become a positive brand among customers.*

An environmentally friendly element also emerged in the reverse logistics system, as one of the interviewees mentioned that their company does not provide the return policy and return procedure in hardcopy, whereas their customers can search through their library system. The interviewee mentioned that these steps could enhance their company's eco-friendly objectives. Numerous researchers have mentioned that companies implement eco-friendly strategies in response to customer pressure (Huang et al., 2015).

*I09: In order for environmentally friendly, we are providing an online manual (return policy) which is easier for customers to download it from our online channels.*

The objective of these omnichannel companies is to match with customers who are concerned about environmental protection. By practising eco-friendly objectives, omnichannel companies could enhance their reputation as eco-friendly companies. Hence, the rich descriptions provided by interviewees provided a focal point on the themes of the customer.

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### III. Regulator

About seven of the 11 interviewees argued that the regulator plays a role in the reverse logistics system of their companies. They recognize the requirement of regulators when planning for the reverse logistics process. In the return process that must cross borders and be delivered to other countries, they are aware of the difference in customs declaration for returned products. Companies can waive duty and tax when they export or import goods that are labeled as returned goods.

*I08: The government implementing a convenience return process is difficult when international border crossing is involved. We need to understand the complexity of bringing and sending goods which include custom clearance, duty paid and paperwork filling. All these processes take time and money. Of course. It is essential for a company to cooperate with the government in the return process. It does gain the goal of producing sustainable long value creation.*

However, some companies would rather pay double tax as the process of returning goods is more tedious.

*I07: In the customs declaration, there is a sector where you can waive for duty charges and SST in the option of send back to warranty and repair as well. However, we need to show that the items will be returned to the customer to fulfil the options. So, customs there will ask for airway bill number and documentation. Sometimes, it is a little bit tedious to go through all this process so we will do a normal declaration instead of a declaration for returns. We rather paying for double tax and duty.*

Some of the omnichannel companies have noticed the regulation on moving goods, especially for those restricted during festivals. Omnichannel companies must be able to reformulate the reverse logistics process in order to comply with the regulations.

*I02: Normally, there would be a road ban during public holiday such as Chinese New Year and Hari Raya. During the road ban period, heavy transportation such as lorries is restricted on roads. We need to avoid using trucks on road for both delivery and collection, but we are going to use van or motor for operation. Although we had been limited for the road ban, we are still able to handle the small size product. We need to communicate with customers for the delay in delivery and collection to obey the road ban of the government.*

Besides, some of the interviewees also mentioned Malaysia's consumer protection law. They understand that returns are necessary for their companies to protect consumer rights. They use the laws and regulations listed in the consumer protection law as a guideline for the duration and type of returns in their reverse logistics system.

*I10: There is consumer right regulation or certain law that protect consumer right. They have the right to return the goods and ask for a replacement. The regulatory or government will set up a specific criterion to help us to justify the return cases, whether it is acceptable or totally unreasonable that we can reject our customer. I mean this is not only protecting consumer right but also sets up a standard for us to handle the return process. If the return case is unreasonable, the standard set up by government can help us or vendors to protect ourselves.*

Moreover, one of the interviewees mentioned that their company follows all the laws and regulations when disposing of returned goods. Their company have assigned the disposal of those returned goods to an authorized third-party service provider. They emphasized that they do not want to neglect the rules and regulations set by the government, so they appoint an authorized third party for the disposal task. Their reverse logistics system is influenced by the Solid Waste and Public Cleansing Management Bill 2007 (Khor & Udin, 2012).

*I06: After the shop received the returned goods, we will dispose the returned goods following government laws that have been set. For every returned good that we received, we dispose it by our third party. We had to follow the rule and regulations that had been set by Malaysia. We had to assign a third party to conduct the dispose on behalf of Amway. This is to ensure rules and regulations that had been set by the government will not be neglected.*

All these testimonies demonstrated that the reverse logistics system in omnichannel companies recognizes and reacts with the themes of the regulator.

### IV. Competitor

About seven of the 11 interviewees showed that the reverse logistics system is interrelated with competitors. They mentioned using reverse logistics as a tool or a competitive advantage to compete with other companies. For instance, the reverse logistics system has become more important for companies in times of fierce competition. They apply an effective reverse logistics process to compete with other companies.

*I1: Besides that, having good return management and the company can stay competitive in the market compare with other competitors.*

These omnichannel companies also try to use a reverse logistics system to satisfy customers. Using the effective reverse logistics system, they can avoid customers switching to other companies.

*I2: If we fail to make our customer satisfy, they (customer) may switch to other company. We try to improve our service to fulfil the requirement of our customers for ensuring they don't complaint us. Only if our service is satisfying then the reputation of our company can be improved. Nowadays, information sharing is too easy through the internet, and the negative news can damage our company's reputation.*

One of the interviewees mentioned that omnichannel companies use reverse logistics systems as a weapon to fight against other competitors.

*I6: It will be very good bullet point for Amway when completing with other competitor as we are a direct selling company.*

A strong reverse logistics system is also part of customer service. If reverse logistics management is worse than competitors, the market for companies will shrink.

*I11: The return process had been a part of customer service. Customers may tend to switch to other company if they are dissatisfied with our customer service. For example, the return process is less efficient, low response and hassle and the customer will be disappointed with our service. These will cause customer to not buy products from our company. As compared to competitors, we try to improve our return management and return process by trying to be more responsive and less hassle.*

Furthermore, interviewees emphasized that they will improve the capability of reverse logistics management by imitating their competitors.

*I8: The company would maintain a good relationship with the customer so they would do whatever it takes to keep the customer by referring to other companies to enhance their return management.*

However, some interviewees disagreed but emphasized that the reverse logistics systems of various companies are similar. This is because their company intends to improve its reverse logistics management.

*I10: The return management, procedures, flow is the same in the market. It depends on how we do it and how we handle the case. Everything has room of improvement. When we find any weakness that needs to boost, then we need to react fast and solve it.*

Overall, these findings have shown that omnichannel companies are recognized, and they react to the element of the competitor.

### *Development of the theoretical framework*

During the phases of the literature review, a conceptual framework (Chapter 2) was developed to explain the influence of reverse logistics systems on omnichannel firm performance. The qualitative analysis of SED can help to strengthen the construction of a theoretical framework (Creswell, 2014). The conceptual framework in Chapter 2 was produced based on the models and frameworks from numerous studies. However, there are only a few reverse logistics studies in the omnichannel business environment. Hence, the thematic analysis was applied to validate the conceptual framework further.

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Based on the findings of thematic analysis, the themes of reverse logistics systems that emerged in the interviews can be divided into two groups: internal (firm factors) and external (task environment factors). The detailed description could be found in all of the themes identified during the literature review phase. These aspects all appear to be related to the firm, and task environment factors in reverse logistics systems are the keys to improving omnichannel firm performance. According to Carter and Ellram (1998), knowing how to develop and manage these firm factors is key to enhancing omnichannel firm performance. Based on the interview, the firm factors that interviewees described included top management support, formalization, flexibility, information system, and collaboration. From an organizational perspective, the task environment factor is another key to enhancing omnichannel firm performance. These omnichannel organizations conform to the task environment actors, which may benefit their firm performance. Numerous researchers also argued that the influence of task environment factors, including supplier, customer, regulator, and the competitor must be recognized and conformed. According to the interview with omnichannel firms' experts, there is an external influence in the reverse logistics system. Omnichannel firms can survive in the market and increase their performance by identifying and corresponding to these external influences. Overall, the construct of reverse logistics in omnichannel companies from the previous conceptual framework was further fortified, as shown below.

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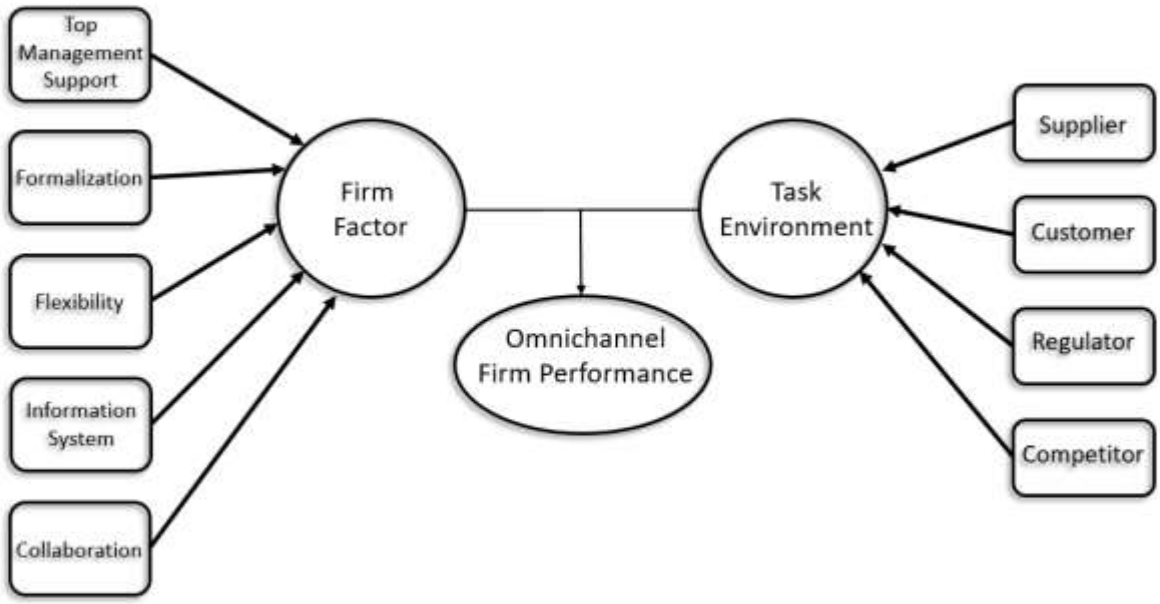


*Figure 4.1 Conceptual Framework Developed from Qualitative findings*

In conclusion, the findings of this thematic analysis further validated the development of a conceptual framework (Figure 4.1). The results of the qualitative phase I suggest that enhancements in the reverse logistics system from both firm and task environment factors benefit omnichannel companies. The validated conceptual framework could further empower the conduct of the next quantitative phase. The degree of effectiveness in firm factors and the degree of conformity in task environment factors would both influence omnichannel firm performance. Therefore, the omnichannel reverse logistics framework would be effective and essential to omnichannel companies. Next, the omnichannel reverse logistics framework was further tested by quantitative analysis.

## Stage 2: Quantitative Phase

After data collection from potential respondents, this section will be further processed with quantitative data analysis. The focus of the analysis will be on reverse logistics factors in omnichannel firm performance. The analysis's goal was to statistically demonstrate the influence of reverse logistics factors towards omnichannel firm performance. First, the data were screened to ensure that the data is free from unusual during data recording, such as coding and inputting. Next, reliability and validity tools were applied to ensure the data was reliable and valid.

The data is then presented by descriptive analysis to report on and provide a picture of the variables in the quantitative survey. A frequency distribution table was used to provide a summarization of categorical data among omnichannel companies. Following that, correlation analyses were applied to explain the relationship between reverse logistics and omnichannel firm performance. In the last step, multivariate analysis was used to examine both firm and task environment factors associated with the omnichannel firm performance. Since the design of the questionnaire was derived from the qualitative phase, the outputs are believed to relate to both firm and task environment factors in omnichannel firm performance. Thus, the outputs would support the construction of a reverse logistics framework among omnichannel companies.

### Data Screening

Before data analysis, the data must be screened to ensure that it is free from errors, which can easily occur while entering data (Pallant, 2016). These particular data screening steps in any multivariate analysis are important to ensure that the results are meaningful at this quantitative stage. Overall, 1000 emails with both invitation links and softcopy were sent to retailers, while 500 emails were sent to both manufacturers and logistics service providers. Besides, 18 sets of hardcopy questionnaires were distributed as requested by the respondents. In this research, 453 questionnaires were received, including softcopy (46 sets), hardcopy (18 sets), and an online survey (389 sets). Received questionnaires also had been reviewed by pre-screening questions to ensure the company operates within the omnichannel environment and has a reverse logistics system. All data were merged for screening outliers and normality testing.

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The accuracy of the outcomes in the main analysis was verified by inspecting the frequency and exploration data involved in the 453 cases. Following that, the data were inspected for outliers, which are instances where the observed data is numerically unique from the overall observation. The outlier in this study was identified by Mahalanobis distance ($D^2$). The method determines the outliers by setting the predetermined threshold with an alpha level of 0.001 (Pallant, 2016; Tabachnick & Fidell, 2013). In this case, a total of 5 cases were identified and removed because $p < 0.001$. Consequently, 448 cases were left for further analysis.

Furthermore, frequency tabulation and exploration were also used to examine the normality of the collected data. Skewness and kurtosis could be used to determine the normality of the data. If the data falls within the acceptable range of 1.96, it is considered normal (Hair et al., 2014). Hence, the collected data were examined using the Kolmogorov Smirnov and Shapiro Wilk test to achieve a non-significant value ($p > 0.05$). However, the outcomes were significant, which violates the assumption of normality (Pallant, 2016). This situation is common when the sample size is large ($n > 50$) (Field, 2018; Shapiro et al., 1968). In such a situation, normality can be determined visually by observing the variable distribution (Pallant, 2016; Tabachnick & Fidell, 2013). This research consists of 448 cases, which is considered a large sample size; therefore, visual inspection would be more suitable. In this study, all variables showed a bell-shaped curve in the histograms, confirming the normality assumption for all items (Garson, 2012).

### Demographic analysis

Following data screening, the study proceeded to descriptive analysis, which started with demographic analysis. Hence, the demographic analysis was conducted in this section to understand clearly the characteristics of the research population. It is vital to ensure that the data is reliable for analysis and that the outcomes are generalizable to the target population

(Salkind, 2012). The data is displayed by frequency analysis, comprised of a pie chart and table.

*Role of a working company*

The first survey question was used to identify the role of respondents' companies based on the primary function of their company (Figure 4.2 & Table 4.2). A frequency table was used to explain the roles of the participants' companies. There are 112 (25.0%) respondents working in the manufacturer enterprise, 228 (50.9%) respondents working in the retailer enterprise, and 108 (24.1%) respondents working in the logistics service provider enterprise. The data showed a majority of respondents work in the retail enterprise, similar to the economic census (Department of Statistics Malaysia, 2017). Sufficient data were collected from 3 types of companies in the omnichannel environment. This is important to ensure that the results can be generalized to companies that operate or will operate in the omnichannel environment.

*Table 4.2 Role of companies (Questionnaire Respondents)*

| Role of companies | Frequency | Percentage (%) |
|---|---|---|
| Manufacturer | 112 | 25.0 |
| Retailer | 228 | 50.9 |
| Logistics Service Provider | 108 | 24.1 |
| Total | 448 | 100.0 |


*Figure 4.2 Role of companies (Questionnaire Respondents)*

*Position of respondents*

Respondents were required to provide their position within their company when filling out the survey to ensure that the information provided by respondents is reliable and acceptable for this study. The respondent must be at least executive level in order to provide comprehensive information. According to Table 4.3 or Figure 4.3, many of the respondents are at the executive level, with Executive (192 respondents or 42.9%) and Senior Executive (220 respondents or 49.1%). Other than that, there was one respondent (0.2%) at the top management level, six respondents (1.3%) at the senior manager level, and 29 respondents (6.5%) at the manager level, who took part in the survey. Other respondents who did not hold a managerial position were removed from the survey.

*Table 4.3 Position of Respondents (Questionnaire Respondents)*

| Position | Frequency | Percentage (%) |
|---|---|---|
| Top Management | 1 | 0.2 |
| Senior Manager | 6 | 1.3 |
| Manager | 29 | 6.5 |
| Senior Executive | 220 | 49.1 |
| Executive | 192 | 42.9 |
| Total | 448 | 100.0 |

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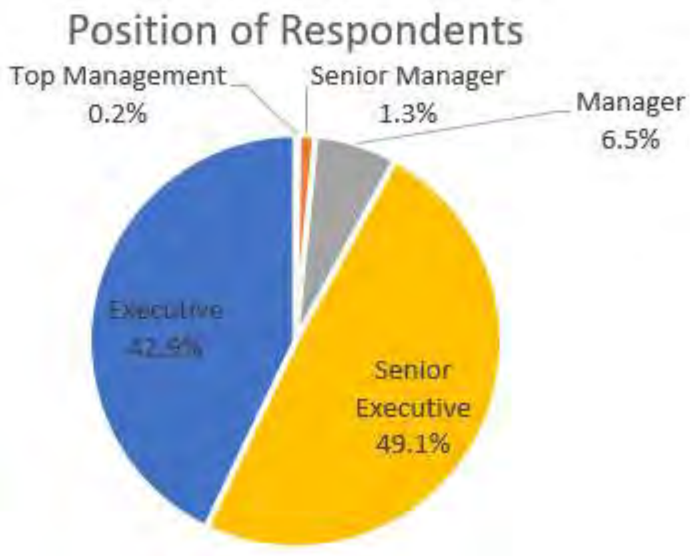


*Figure 4.3 Position of Respondents (Questionnaire Respondents)*

### *Working Experience of Respondents*

To ensure the reliability and credibility of data, the survey continued to request respondents for information regarding working experience (Figure 4.4 & Table 4.4). To provide meaningful information, the respondents must have at least one year of supply chain-related working experience. Most respondents have six to 10 years of working experience (208 respondents or 46.7%) and 16 to 20 years of working experience (173 respondents or 38.6%). About 31 respondents (6.9%) have worked in the supply chain industry for at least one to five years, whereas tow respondents (0.4%) have worked more than 31 years. Besides, there are nine respondents (2.0%) who worked for 11 to 15 years, and 24 respondents (5.4%) have worked 21 to 30 years of working experience. The respondents with less than one year of working experience were removed from the data recording.

*Table 4.4 Working Experience of Respondents (Questionnaire Respondents)*

| Working Experience | Frequency | Percentage (%) |
|---|---|---|
| 1 - 5 years | 31 | 6.9 |
| 6 - 10 years | 209 | 46.7 |
| 11 - 15 years | 9 | 2.0 |
| 16 - 20 years | 173 | 38.6 |
| 21 - 30 years | 24 | 5.4 |
| above 31 years | 2 | 0.4 |
| Total | 448 | 100.0 |


*Figure 4.4 Working Experience of Respondents (Questionnaire Respondents)*

### *Firm Size*

Respondents were also asked to provide the number of employees in their company in order to determine their particular firm size. According to SME Corp. Malaysia (2013), the size of a company can be determined by the number of employees in the company (Figure 4.5 & Table 4.5). Based on the results, 39 respondents (8.7%) work in a micro company. From Table 4.20, most of the respondents work in small (183 respondents or 40.8%) and medium (221 respondents or 49.3%) companies. Besides, the pattern of firm size is similar to the overall population in Malaysia, with 1.1% of surveyed enterprises (5 respondents) being of a large size and the majority of companies being small and medium enterprises (SME Corporation Malaysia, 2017).

*Table 4.5 Firm Size of Omnichannel Companies (Questionnaire Respondents)*

| Firm size | Frequency | Percentage (%) |
|---|---|---|
| Micro | 39 | 8.7 |
| Small | 183 | 40.8 |
| Medium | 221 | 49.3 |
| Large | 5 | 1.1 |
| Total | 448 | 100.0 |

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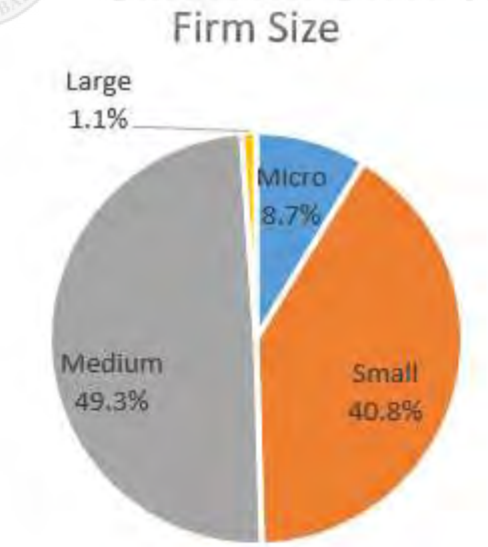


*Figure 4.5 Firm Size of Omnichannel Companies (Questionnaire Respondents)*

### *Free Return Policy*

Respondents from retailers and manufacturer companies were about the availability of a free return policy (Figure 4.6 & Table 4.6). Among them, 285 respondents (63.6%) declared that they provided a free return policy, while 55 respondents (12.3%) stated they did not provide a free return policy for their customers. The remaining 108 respondents (24.1%) work in logistics service provider positions, so no free return policy is available.

*Table 4.6 Availability of Free Return Policy (Questionnaire Respondents)*

| Free return policy | Frequency | Percentage (%) |
|---|---|---|
| Yes | 285 | 63.6 |
| No | 55 | 12.3 |
| LSP | 108 | 24.1 |
| Total | 448 | 100.0 |

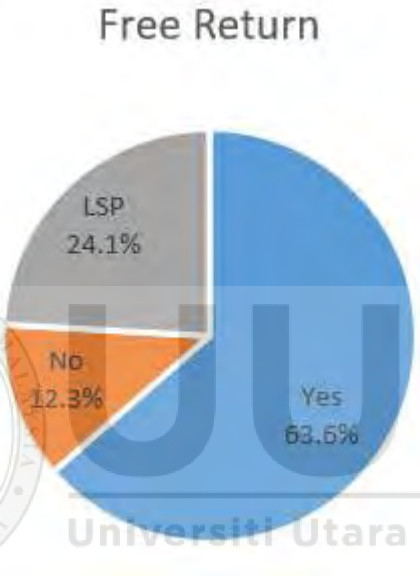

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*Figure 4.6 Availability of Free Return Policy (Questionnaire Respondents)*

Handling of Reverse Logistics

Retailer and manufacturer respondents were also asked to choose either an internal or third party to handle the company's reverse logistics activities (Figure 4.7 & Table 4.7). About 70 respondents (15.6%) handle reverse logistics activities internally. Most of the respondents (270 respondents or 60.3%) have outsourced the reverse logistics operation to other service providers. The remaining 108 respondents (24.1%) work as logistics service providers, which are the service providers who provide services to other companies.

*Table 4.7 Handling of Reverse Logistics (Questionnaire Respondents)*

| Handling of Reverse Logistics | Frequency | Percentage (%) |
|---|---|---|
| Internal | 70 | 15.6 |
| Third-Party | 270 | 60.3 |
| LSP | 108 | 24.1 |
| Total | 448 | 100.0 |

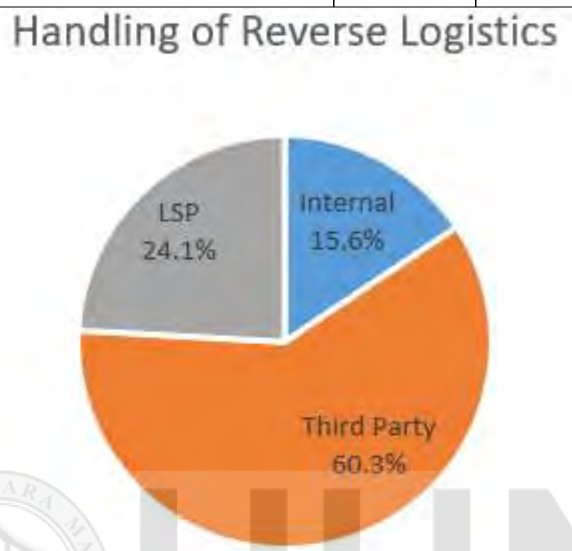


*Figure 4.7 Handling of Reverse Logistics (Questionnaire Respondents)*

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## Correlation

The previous section provided demographic information about survey respondents to provide a brief understanding of their background in order to minimize potential bias. Following that, Pearson correlation analysis was carried out to examine the relationship between numerous variables and omnichannel firm performance. The outcomes in Table 4.8 show the strength of the linear relationship between variables. In this research, the Sig. (2-tailed) value identifies whether there is a significant relationship between the two variables. If the Sig (2-Tailed) values of Table 4.8 are less than or equal to 0.05, there is a statistically significant correlation between the two variables. However, if the Sig (2-Tailed) value of the outcome is more than 0.05, this means that there is no statistically significant relationship between the two variables.

Overall, Pearson correlation analysis was done for all variables associated with omnichannel firm performance. Based on Table 4.8, free return and responsibility for handling reverse logistics have no significant relationship with omnichannel firm performance because p-values are larger than 0.05. The free return shows no significant relationship with firm performance, which is similar to previous studies (Su, 2009). This is because offering free returns may boost sales, but may also cause certain negative effects, such as high rebate costs (Webster & Weng, 2000). Handling reverse logistics has no significant relationship with firm performance, consistent with prior research (Autry et al., 2001). Firm size has a significant relationship with omnichannel firm performance (r = 0.180), with p-values less than 0.05, but Vlachos (2016) highlighted that firm size is a weak predictor for predicting firm performance (Pervan & Višić, 2012). Hence, this research will not further examine the effect of firm size on omnichannel firm performance.

*Table 4.8 Pearson Correlation Table*

| | | Omnichannel Firm Performance |
|---|---|---|
| Firm Size | Pearson Correlation | 0.180$^{**}$ |
| | Sig. (2-tailed) | 0.000 |
| Free Return | Pearson Correlation | -0.053 |
| | Sig. (2-tailed) | 0.259 |
| Handling of Reverse Logistics | Pearson Correlation | -0.038 |
| | Sig. (2-tailed) | 0.419 |
| Top Management Support | Pearson Correlation | **0.121**$^{*}$ |
| | Sig. (2-tailed) | 0.011 |
| Formalization | Pearson Correlation | **0.113**$^{*}$ |
| | Sig. (2-tailed) | 0.017 |
| Flexibility | Pearson Correlation | **0.505**$^{**}$ |
| | Sig. (2-tailed) | 0.000 |
| Customer | Pearson Correlation | **0.474**$^{**}$ |
| | Sig. (2-tailed) | 0.000 |
| Collaboration | Pearson Correlation | **0.427**$^{**}$ |
| | Sig. (2-tailed) | 0.000 |
| Information System | Pearson Correlation | **0.139**$^{**}$ |
| | Sig. (2-tailed) | 0.003 |
| Competitor | Pearson Correlation | **0.101**$^{*}$ |
| | Sig. (2-tailed) | 0.033 |
| Regulator | Pearson Correlation | **0.137**$^{**}$ |
| | Sig. (2-tailed) | 0.004 |
| Supplier | Pearson Correlation | **0.420**$^{**}$ |
| | Sig. (2-tailed) | 0.000 |

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**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In terms of the relationship between numerous independent variables and omnichannel firm performance, all of the firm and task environment factors found significant relationships with omnichannel firm performance with p-values less than 0.05. All firm and task environment factors positively influence omnichannel firm performance. By referring to the effect size from Cohen (1988), effect sizes from 0.10 to 0.29 indicate a small effect, while medium effect sizes range from 0.3 to 0.49, and large effect sizes range from 0.5 to 1.0 (Pallant, 2016). Based on the results, only flexibility was found to strongly influence omnichannel firm performance (r=505). Furthermore, customer (r=0.474), collaboration (r=0.427) and supplier (r=0.420) all have a moderate relationship with omnichannel firm performance. Other independent variables, such as top management support (r=0.121), formalization (r=0.113), information system (r=0.139), competitor (r=0.101) and regulator (r=0.137), only have a small effect on omnichannel firm performance. Hence, this particular analysis can conclude that all firm and task environment factors positively influence omnichannel firm performance. Next, statistical analysis was used to develop the structural model in omnichannel reverse logistics.

### PLS-SEM Analysis

This study used SmartPLS 3.3.2 application to conduct the partial least squares modeling to investigate the model of omnichannel reverse logistics because it is an appropriate tool for theory development in a new environment (Urbach & Ahlemann, 2010). As this study collected data from a single source, the concerns about common method bias should be tested by examining the full collinearity (Kock & Lynn, 2012). By using the suggested method, all variables will be regressed to a common variable. There would be no single source bias from the data if VIF $\leq 3.3$. The data found no bias from a single data source as the results show VIF was less than 3.3, as demonstrated in Table 4.9.

*Table 4.9 VIF Table*

| (CONSTANT) | TMS | FOR | FLE | IS | COL | SUP | CUS | REG | COM | OFP |
|---|---|---|---|---|---|---|---|---|---|---|
| VIF | 1.246 | 2.532 | 1.974 | 1.508 | 1.781 | 1.931 | 1.846 | 2.355 | 2.112 | 1.682 |

Note: TMS = Top Management Support, FOR = Formalization, FLE = Flexibility, IS = Information System, COL = Collaboration, SUP = Supplier, CUS = Customer, REG = Regulator, COM = Competitor, OFP = Omnichannel Firm Performance

## Measurement Model

Anderson and Gerbing (1991) used a 2-step approach to test the measurement model. First, we tested the measurement model by examining the validity and reliability of the instruments based on Hair et al. (2019). Following that, the study continued with the structural model to conduct hypothesis testing.

To ensure the measurement model is reliable and valid, this study examined the loadings, average variance extracted (AVE), and composite reliability (CR) (Hair et al., 2019). The assessment standard in this study included factor loadings of the indicators greater than 0.5 and a composite reliability (CR) of the various dimension greater than 0.7. The Average Variance Extracted (AVE) was greater than 0.5, but less than 0.4 of AVE. As Fornell and Larcker's (1981) criterion mentioned, the convergent validity of instrument is sufficient if AVE is less than 0.5, but CR is more than 0.6. From Table 4.10, the results demonstrated that all the AVEs were more than 0.5 except for customer and omnichannel firm performance. However, the CR of the customer and omnichannel firm performance was more than 0.7, which is considered acceptable by the convergent validity of both constructs. The loadings of each construct are shown in Table 4.10, and they are greater than standard 0.5. This study also looked at the composite reliability (CR) to verify the internal consistency of scale items. The CRs of each construct ranged from 0.778 to 0.927, which was adequate, given that the standard is 0.7, as Hair et al. (2019) suggested. Hence, the data of these results have convergent validity because all of the requirements met the researchers' aforementioned guidelines.

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*Table 4.10 Measurement Model Table*

| CONSTRUCTS | ITEMS | LOADINGS | CR | AVE |
|---|---|---|---|---|
| **COLLABORATION** | COL1 | 0.843 | 0.801 | 0.575 |
| | COL3 | 0.720 | | |
| | COL4 | 0.704 | | |
| **COMPETITOR** | COM1 | 0.602 | 0.853 | 0.542 |
| | COM2 | 0.609 | | |
| | COM3 | 0.790 | | |
| | COM4 | 0.771 | | |
| | COM5 | 0.870 | | |
| **CUSTOMER** | CUS1 | 0.679 | 0.778 | 0.414 |
| | CUS2 | 0.533 | | |
| | CUS3 | 0.666 | | |
| | CUS4 | 0.671 | | |
| | CUS5 | 0.656 | | |
| **FLEXIBILITY** | FLE2 | 0.762 | 0.809 | 0.586 |
| | FLE3 | 0.774 | | |
| | FLE4 | 0.759 | | |
| **FORMALIZATION** | FOR1 | 0.842 | 0.876 | 0.640 |
| | FOR2 | 0.701 | | |
| | FOR3 | 0.790 | | |
| | FOR4 | 0.857 | | |
| **INFORMATION SYSTEM** | IS1 | 0.872 | 0.815 | 0.535 |
| | IS2 | 0.577 | | |
| | IS3 | 0.870 | | |
| | IS5 | 0.538 | | |
| **REGULATOR** | REG1 | 0.870 | 0.889 | 0.669 |
| | REG2 | 0.818 | | |
| | REG3 | 0.702 | | |
| | REG4 | 0.871 | | |
| **SUPPLIER** | SUP1 | 0.872 | 0.787 | 0.558 |
| | SUP3 | 0.585 | | |
| | SUP5 | 0.756 | | |
| **TOP MANAGEMENT SUPPORT** | TMS1 | 0.856 | 0.927 | 0.761 |
| | TMS2 | 0.837 | | |
| | TMS3 | 0.899 | | |
| | TMS4 | 0.896 | | |
| **OMNICHANNEL FIRM PERFORMANCE** | OFP1 | 0.736 | 0.783 | 0.421 |
| | OFP2 | 0.681 | | |
| | OFP3 | 0.627 | | |
| | OFP5 | 0.619 | | |
| | OFP6 | 0.569 | | |

Note: COL2, FLE1, IS4, SUP2, SUP4, and OFP4 were deleted due to low loadings

In the following step, this study assessed the discriminant validity using Fornell and Larcker criterion (1981). Based on the practices of Fornell and Larcker, the discriminant validity can be defined by two criteria: correlation coefficient between two constructs less than one and

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correlation coefficient of two constructs less than the dimensions of Cronbach's α reliability. The result of this study showed that the correlation coefficient of the two dimensions is less than one, which is consistent with the standards set by the previous studies. The correlation coefficient of one measure is greater than the rest of the other measures, which fulfills the second criterion, as shown in Table 4.11. This study also examined the discriminant validity by using the heterotrait-monotrait ratio of correlations (HTMT) criterion, as suggested by Franke and Sarstedt (2019) and Henseler et al. (2014). The HTMT value, which should be less than 0.9, can be used to test discriminant validity. The results are displayed in Table 4.12, and all of the HTMT values were less than 0.9, indicating no discriminant validity problem. Hence, the results indicated that the respondents recognized all measures as distinct constructs. Therefore, the results of both tests indicated that the discriminant validity of the measurement model was present. When the results from Table 4.11 are combined with Table 4.12, it indicates the measurement items are both valid and reliable.

*Table 4.11 Fornell Larcker Criterion Table*

| Fornell Larcker Criterion | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1.Collaboration | **0.758** | | | | | | | | | |
| 2.Competitor | 0.129 | **0.736** | | | | | | | | |
| 3.Customer | 0.478 | 0.043 | **0.643** | | | | | | | |
| 4.Flexibility | 0.534 | -0.010 | 0.580 | **0.765** | | | | | | |
| 5.Formalization | 0.133 | 0.619 | -0.010 | 0.020 | **0.800** | | | | | |
| 6.Information System | 0.121 | 0.425 | 0.147 | 0.163 | 0.178 | **0.732** | | | | |
| 7.Omnichannel Firm Performance | 0.480 | 0.123 | 0.513 | 0.529 | 0.132 | 0.164 | **0.649** | | | |
| 8.Regulator | 0.136 | 0.571 | 0.014 | 0.010 | 0.736 | 0.125 | 0.154 | **0.818** | | |
| 9.Supplier | 0.583 | 0.074 | 0.556 | 0.547 | 0.100 | 0.169 | 0.501 | 0.109 | **0.747** | |
| 10.Top Management Support | 0.081 | 0.180 | 0.092 | 0.171 | 0.070 | 0.425 | 0.141 | 0.017 | 0.097 | **0.872** |

*Table 4.12 HTMT Table*

| HTMT | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1.Collaboration | | | | | | | | | | |
| 2.Competitor | 0.194 | | | | | | | | | |
| 3.Customer | 0.721 | 0.138 | | | | | | | | |
| 4.Flexibility | 0.817 | 0.070 | 0.880 | | | | | | | |
| 5.Formalization | 0.184 | 0.774 | 0.089 | 0.075 | | | | | | |
| 6.Information System | 0.178 | 0.547 | 0.203 | 0.234 | 0.239 | | | | | |
| 7.Omnichannel Firm Performance | 0.690 | 0.209 | 0.742 | 0.784 | 0.167 | 0.249 | | | | |
| 8.Regulator | 0.197 | 0.695 | 0.075 | 0.071 | 0.878 | 0.139 | 0.201 | | | |
| 9.Supplier | 0.844 | 0.105 | 0.824 | 0.826 | 0.158 | 0.220 | 0.693 | 0.164 | | |
| 10.Top Management Support | 0.106 | 0.207 | 0.118 | 0.222 | 0.085 | 0.520 | 0.172 | 0.071 | 0.152 | |

## Structural Model

Although PLS-SEM does not require normality, this study still assessed the multivariate skewness and kurtosis using the guidelines from Hair et al. (2017) and Cain et al. (2017). The application of visual inspection normality may be insufficient for multivariate normality. Therefore, this study further proceeded to inspect the multivariate normality using the web application suggested by Ramayah et al. (2018). By using the web application (Cain et al., 2017), the analysis showed that the data is not multivariate normal from Mardia's multivariate skewness ($\beta = 61.459$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 244.115$, $p < 0.01$). Hence, this study used a 5,000-resampling bootstrapping procedure to obtain the structural model's path coefficients, standard errors, t-values, and p-value (Ramayah et al., 2018). This study included p-values ($p < 0.05$, as significant), confidence intervals, and effect sizes for testing the hypothesis, as p-values alone would not be a good standard for testing the hypothesis (Hahn & Ang, 2017). The results of hypothesis testing are displayed in Table 4.14.

In the beginning, the analysis focused on the effect of nine variables on omnichannel firm performance. The results showed that $R^2$ is 0.405 ($Q^2 = 0.148$), which indicates that the nine variables explained 40.5% of the variance in omnichannel firm performance, as shown in

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Table 4.13. The $R^2$ value of 0.405 is above the 0.26 value suggested by Cohen (1988), indicating a substantial model. Next, the effect sizes were also evaluated. By referring to the effect size ($f^2$) from Cohen (1988) and suggestions from Ramayah (2018), effect sizes of 0.02 indicate a small effect, while moderate effect sizes are 0.15 and large effect sizes are 0.35 (Pallant, 2016). From table 4.14, it is evident that flexibility (0.049), collaboration (0.019), supplier (0.020) and customer (0.046) have a small effect on producing the omnichannel firm performance. Flexibility ($\beta = 0.234$, $p < 0.05$), Collaboration ($\beta = 0.141$, $p < 0.05$), Supplier ($\beta = 0.150$, $p < 0.05$) and Customer ($\beta = 0.219$, $p < 0.05$) were shown to have a significant positive relationship with omnichannel firm performance. Therefore, it can be concluded that H3, H5, H6 and H7 were supported. However, Top Management Support ($\beta = 0.044$, $p > 0.05$), Formalization ($\beta = 0.013$, $p > 0.05$), Information System ($\beta = 0.013$, $p > 0.05$), Regulator ($\beta = 0.096$, $p > 0.05$), and Competitor ($\beta = 0.010$, $p > 0.05$) were not significant factors toward omnichannel firm performance as the p-values were not significant. The PLS-SEM Measurement Model is included in Appendix F. Hence, the results showed that H1, H2, H4, H8, and H9 were not supported, as depicted in Figure 4.8.

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*Table 4.13 R-square table*

| | R Square | R Square Adjusted |
|---|---|---|
| Omnichannel Firm Performance | 0.405 | 0.393 |

*Table 4.14 Hypothesis Testing*

| Hypothesis | Relationship | Std Beta | Std Error | t-value | p-value | BCI LL | BCI UL | $f^2$ | VIF |
|---|---|---|---|---|---|---|---|---|---|
| **H1** | TMS > OFP | 0.044 | 0.044 | 1.013 | 0.156 | -0.025 | 0.118 | 0.003 | 1.243 |
| **H2** | FOR > OFP | 0.013 | 0.063 | 0.209 | 0.417 | -0.093 | 0.113 | 0.000 | 2.532 |
| **H3** | FLE > OFP | 0.234 | 0.062 | 3.800 | 0.000 | 0.140 | 0.340 | 0.049 | 1.881 |
| **H4** | IS > OFP | 0.013 | 0.049 | 0.274 | 0.392 | -0.069 | 0.091 | 0.000 | 1.508 |
| **H5** | COL > OFP | 0.141 | 0.067 | 2.091 | 0.018 | 0.032 | 0.249 | 0.019 | 1.748 |
| **H6** | SUP > OFP | 0.150 | 0.060 | 2.480 | 0.007 | 0.053 | 0.252 | 0.020 | 1.893 |
| **H7** | CUS > OFP | 0.219 | 0.060 | 3.665 | 0.000 | 0.127 | 0.321 | 0.046 | 1.765 |
| **H8** | REG > OFP | 0.096 | 0.062 | 1.552 | 0.060 | 0.000 | 0.200 | 0.007 | 2.339 |
| **H9** | COM > OFP | 0.010 | 0.055 | 0.185 | 0.427 | -0.096 | 0.089 | 0.000 | 2.112 |

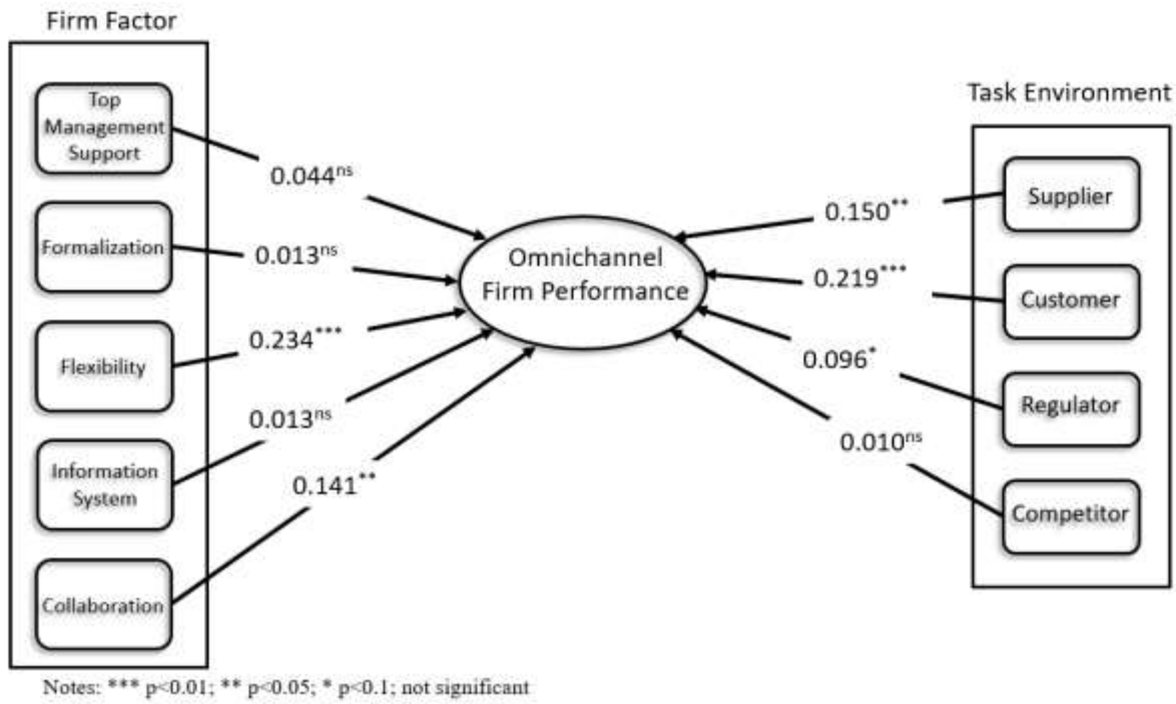


*Figure 4.8 Results of Structural Model*

Next, the predictive relevance of the measurement model was tested using PLS prediction with a 10-fold procedure, which is a holdout sample-based technique that can bring case-level prediction on an item. Shmueli et al. (2019) proposed that if all of the constructs of the PLS model were smaller than the Regression Linear Model (LM), this could indicate the existence of strong predictive power. In contrast, the predictive relevance is not confirmed if all the constructs of the PLS model were bigger than the LM constructs. If most item differences (PLS-LM) were lower, this could indicate that the model has moderate predictive power. If the minority of item differences (PLS-LM) is lower, the model will have low predictive power. According to Table 4.15, the PLS model was more accurate than the LM model. Hence, it may be concluded that the measurement model has strong predictive power.

*Table 4.15 PLS Predict*

| | PLS | | LM | | PLS-LM | | |
|---|---|---|---|---|---|---|---|
| | RMSE | MAE | RMSE | MAE | RMSE | MAE | $Q^2$_predict |
| **OFP1** | 0.658 | 0.527 | 0.667 | 0.525 | -0.009 | 0.002 | 0.267 |
| **OFP2** | 0.461 | 0.247 | 0.490 | 0.284 | -0.029 | -0.037 | 0.177 |
| **OFP3** | 0.724 | 0.526 | 0.730 | 0.547 | -0.006 | -0.021 | 0.097 |
| **OFP5** | 0.668 | 0.484 | 0.678 | 0.510 | -0.010 | -0.026 | 0.098 |
| **OFP6** | 0.838 | 0.672 | 0.856 | 0.704 | -0.018 | -0.032 | 0.069 |

Based on the previous PLS-SEM results, the analysis has reviewed the path coefficient and t-value to examine this study's hypothesis. The supported hypotheses were significant at the 0.05 level of significance and expected a positive relationship. The significant factors showed a coefficient value ranging between 0.141 and 0.234. Table 4.16 summarizes the results of hypothesis testing in this study.

*Table 4.16 Results of Hypothesis Testing*

| Hypothesis | Results |
|---|---|
| $H_{1(a)}$: Top management support has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(b)}$: Formalization has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(c)}$: Flexibility has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{1(d)}$: Information system has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(e)}$: Collaboration has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(a)}$: Supplier has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(b)}$: Customer has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(c)}$: Regulator has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{2(d)}$: Competitor has a significant and positive effect on omnichannel firm performance. | Rejected |

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## Summary

This chapter discussed all of the qualitative and quantitative analyses conducted to investigate reverse logistics systems in the omnichannel environment. First, thematic analysis was used to illustrate the reverse logistics factors that influence reverse logistics systems and how they may impact firm performance in an omnichannel context. Following that, multiple quantitative approaches were used to validate the firm and task environment factors in reverse logistics that would boost omnichannel firm performance. For instance, Pearson correlation analysis was used to investigate the relationship between reverse logistics factors and omnichannel firm performance. Next, a structural model was developed to validate whether firm and task environment factors influence firm performance in an omnichannel context. Previously, reliability and validity of measures were also examined by both Cronbach alpha and composite reliability. The loading value of constructs must also be more than 0.5, and all AVE values must be more than 0.4. Based on the results, four hypotheses are supported. The following chapter will provide affirmative findings using the focus group method and discuss the respective conclusions in each stage.

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# CHAPTER 5: TRIANGULATION AND DISCUSSION

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## Introduction

Analysis from stages 1 and 2 have proposed some answers to the overall research questions in this study. The findings have suggested that firm and task environment factors would influence omnichannel firm performance. Thereupon, the last stage of mixed methodologies should be used for triangulating rather than looking for new elements. As discussed before, the purpose of this stage is to validate the overall findings and ensure that the research questions are resolved. This chapter is divided into two parts that discuss the outcomes of Stage 4 as well as a discussion for all stages to answer research questions.

The first part of this chapter is devoted to the analysis of findings from Stage 4 of the SED. The findings from the qualitative phase I and quantitative phase are used to address the overall research questions. Stage 4 involves using focus groups as a triangulation tool to test the validity of overall findings from two segregate analyses (qualitative and quantitative). A mixed methodology research design will only be complete with the existence of triangulation (Jalil, 2017). The technique of methodological triangulation, which uses more than one method to study the phenomenon, could benefit this study by increasing validity, data confirmation, richness of data, and robust understanding of knowledge (Jalil, 2017).

The second part of this chapter focuses on the overall outcomes from the different qualitative and quantitative phases by referring to the research questions, literature review, and frameworks. Firstly, this section discusses the outcomes from qualitative phase I, which provides additional information. Next, the quantitative outcomes will be discussed according to the research questions. Following that, the findings of qualitative phase II will be discussed and focus on confirming the overall research questions.

## Stage Four: Reflection of Stage one and Stage two in SED

The previous stages of analysis shed light on the results that will significantly contribute to the omnichannel environment. The thematic analysis indicated the factors present in the reverse logistics system and how they would influence firm performance in an omnichannel environment. Following that, numerous quantitative analyses were conducted to investigate the reverse logistics factors that would improve omnichannel firm performance. Pearson's correlation test demonstrated that all reverse logistics factors influenced omnichannel firm performance positively. In addition, PLS-SEM was applied, and it was discovered that two firm factors (flexibility and collaboration) and two task environment factors (supplier and customer) have a significant relationship with omnichannel firm performance.

In a reverse logistics system, firm factors such as flexibility and collaboration are essential to improve omnichannel firm performance. Omnichannel companies need to possess these capabilities for better firm performance. Besides, this research also indicates that task environment factors have latent effects on firm performance. Omnichannel companies must conform with both suppliers and customers for better sustainability. Hence, this study shows the predominant factors that could help omnichannel companies achieve superior performance in reverse logistics through flexibility, collaboration, supplier, and customer. Besides that, other factors such as top management support, formalization, information system and competitor may play an important role as indirect factors in reverse logistics systems.

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Therefore, the last stage used a focus group to triangulate the results from data analysis (Stage 1 and Stage 2). This particular stage aimed at looking for verification and confirmation of the findings from the thematic analysis (Stage 1), Pearson's correlation (Stage 3), and PLS-SEM (Stage 3). The application of focus groups enables a cross-check of the result from stage 1 and stage 3, providing a more robust result.

### The Demographic Analysis: Focus Group

The focus group was held to verify the findings from qualitative phase I and quantitative analysis phase I. Thus, this study was conducted to investigate the reverse logistics system in omnichannel companies. Hence, the focus group participants must be experts who work in omnichannel companies such as manufacturers, retailers, and logistics service providers (Saghiri et al., 2017). The participants of this focus group were invited through stratified random sampling, which reduces bias and allows the results to be generalized (Neuman, 2002). A total of 100 emails were delivered to three groups of potential participants: retailers, manufacturers, and logistics service providers. About 11 participants accepted the invitation for the focus group, which is sufficient based on the recommendation of previous studies (Kitzinger, 1995; Mason, 2010). Their details were reviewed before participating in the focus group discussion. This is important to ensure that the participants work in omnichannel companies and have sufficient knowledge and understanding of the reverse logistic system in their companies. Due to geographical limitations, the focus group was conducted online by using an online video conference application (Google Meet). Moreover, an online focus group may enhance the sense of anonymity, and participants may be more willing to provide their opinions (Kite & Phongsavan, 2017; Nyumba et al., 2018). Hence, the outcome of the focus group would provide a robust confirmation of the overall results.

The participants in the focus group were evenly represented from the omnichannel companies, with four working in a retailing company, four working in manufacturing, and three working in logistics service operations. In order to ensure the results are generalized for omnichannel companies, the participants were evenly extracted from the role of the omnichannel company. Among the participants, three have two to four years of working experience, and seven have five to 10 years of working experience. Only one participant has been working in the supply chain-related industry for more than 10 years. All of the participants hold a managerial position, indicating that they have adequate knowledge about reverse logistics systems in their company (Table 5.1).

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*Table 5.1 Demographic of Focus Group Interviewees*

| Item | | Number | Percentage |
|---|---|---|---|
| **Role Of Omnichannel Company** | Retailer | 4 | 36% |
| | Manufacturer | 4 | 36% |
| | Logistics Service Provider | 3 | 28% |
| **Working Experience** | 2- 4 Years | 3 | 28% |
| | 5-10 Years | 7 | 63% |
| | More Than 10 Years | 1 | 9% |
| **Position** | Executive | 7 | 63% |
| | Manager | 4 | 37% |

### Stage Four: Qualitative Phase (Triangulation)

Here, the findings from the qualitative and quantitative phases converge and be compared in this triangulation phase. The triangulation stage is critical to cross-check the findings in SED and seek a consensus opinion on how to represent the overall findings. This stage applied the micro-interlocutor approach to confirm the unanimous views from members in the focus group (Onwuegbuzie et al., 2009). The findings reflect the overall study by getting uniform consensus through a micro-interlocutor approach. The objectives of this focus group were reviewed again over the findings from prior stages and will not be explored for new information. The application of a focus group enables the overall findings to be more robust and transferable (Teddlie & Tashakkori, 2009).

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A semi-structured interview was conducted with eleven interviewees to explore the reverse logistics system in their company concerning firm performance. In particular, the exposure of the reverse logistic system enables the detection of general themes related to reverse flow. These themes were then examined in the quantitative phase to identify the interaction between firm and task environment factors with omnichannel firm performance. Thus, the triangulation technique was suitable for application to compare both findings through a focus group. The guideline question discussed in the focus group were based on the research questions shown in Table 5.2.

*Table 5.2 Discussion question for focus group*

| Research Questions (RQ) | Discussion Questions for Focus Group |
|---|---|
| What are the various factors associated with RL that influence omnichannel firm performance? | D1: From the internal reverse logistics system, research has shown top management support, formalization, flexibility, information system, and collaboration will influence firm performance. Do you agree?<br>D2: For external reverse logistics, a reverse logistics system that conforms with the customer, supplier, regulator, and competitor, will influence firm performance. Do you agree? |
| What are the relationships between firm and task environment factors with the omnichannel firm performance? | D1: If top management is aware of reverse logistics, it will improve firm performance. Do you agree?<br>D2: Firm performance will drop if the reverse logistics system is informal. Do you agree? Why?<br>D3: If the reverse logistics system is flexible, firm performance will improve. Do you agree? Why?<br>D4: Firm performance will increase if a good information system is installed for the reverse logistics system. Do you agree? Why?<br>D5: Do you agree that good teamwork between different departments in the reverse logistics process will improve firm performance? Why?<br>D6: Do you agree that a good relationship with suppliers in the reverse logistics system will improve firm performance? Why?<br>D7: Companies can increase performance by meeting the customer requirements. Do you agree?<br>D8: If a company could fulfill regulator requirements from the aspect of reverse logistics, it will improve firm performance. Do you agree? Why?<br>D9: Company performance will improve if they consider competitors. Do you agree? |
| What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance? | D1: In the reverse logistics system, the element of flexibility, the collaboration between team, supplier, and customer is important to improve firm performance. Do you agree? |

By following the guidelines of Onwuegbuzie et al. (2009), the feedback of members was coded to show the similarity from the focus group, and the results were generated. Hence, the findings from the two phases converged for this last stage. As mentioned before, this triangulation process was important to verify the outcomes from previous stages (Creswell, 2014). Appendix G reflects the consensus of focus group members regarding the themes that were explored and examined in prior stages. Therefore, the findings of triangulation would reflect the overall outcome of SED.

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During the triangulation stage, the micro-interlocutor analysis revealed that most of themes were agreed upon by all respondents. The triangulation stage combined and cross-checked the findings from prior stages, with most of the respondents agreed on the findings. Hence, the reliability and validity of the findings were guaranteed. In developing the omnichannel reverse logistics framework, it can be concluded that the majority of respondents concur that firm and task environment elements are the underlying factors influencing company performance in the omnichannel ecosystem. Hence, the majority agreed that the aspect of firm factors (top management support, formalization, flexibility, information system, and collaboration) and the aspect of task environment factors (supplier, customer, and competitor) manipulated firm performance.

The next sections were important in presenting the verification of findings in addressing RQs from this qualitative phase.

### Verification in addressing RQ1: What are the various factors associated with RL that influence omnichannel firm performance?

RQ1 seeks to determine the influence of reverse logistics systems on omnichannel firm performance. Prior studies indicated that reverse logistics abilities and the capability of reverse logistics to conform to external stakeholders are important indicators for improving company performance (Huang et al., 2015; Vlachos, 2016; Ye et al., 2013). Along with the rise of the omnichannel ecosystem, these elements have also been found in the reverse logistics system, which is believed to have a relationship with company performance (Bernon et al., 2016; Hübner & Holzapfel, et al., 2016). Based on the findings of prior stages, the firm and task environment factors would affect omnichannel firm performance. Hence, the verification addresses RQ1 by investigating the relationship between firm and task environment factors with omnichannel firm performance.

First, the discussion of the focus groups started with verifying the relationship between firm factors and firm performance. About eight focus group members agreed without further explanation. Typical responses from group members would explain that these internal factors in the reverse logistics system are important to ensure less disruption in the reverse flow and embrace an effective and efficient reverse logistics system. One member stated:

> *"..important to ensure the return process could be smooth and less disruption…"*

Similarly, other factors would be critical to ensure communication flow in the reverse logistics process, as expressed by one member:

> *"..reverse logistics system could be coordinated better with a good IT system and collaboration between staff. So, our staff can obtain the correct information through the IT system."*

Therefore, it could be suggested that these firm factors are critical in omnichannel companies to ensure the proper operation of reverse logistics programs. The notion in this triangulation phase would recommend that firm factors are essential to ensure the information and instructions are shared among the reverse flow. By having proper information, omnichannel companies may be able to handle returned products more quickly. Across the inquiries, all members agreed that these firm factors did play a role in influencing reverse logistics systems in omnichannel companies.

Next, the discussion continued to ask for opinions on the relationship between task environment factors and omnichannel firm performance. About six members agreed without clarification, while two members did not respond. The majority of members agreed that task environment factors would influence firm performance, one member stating:

> *"Reverse logistics system needs to conform with other parties so that the company can be in the right trend."*

By recognizing external influences, omnichannel companies can react to these external forces with correct reaction. In particular, members frequently mentioned that companies need to manage the relationship with suppliers and customers, where one member stated:

> *"company can fulfill the demand for the customer, supplier… (with proper reverse logistics program)"*

One member added:

> *"The communication between supplier and customer in the reverse logistics management can ensure all things go right"*

In clarification of the exposition, members would frequently highlight the customer and supplier. This implies that omnichannel companies shed light on these two external forces when designing the reverse logistics system. Interestingly, one member provided strong clarification on the competitor element. The response was:

> *"...reverse logistics system needs to be better than other companies so customers will choose our company."*

The idea behind these statements is that omnichannel companies should be familiar with other competitors' reverse logistics programs so they can ensure that customers will not switch to other companies because of their poor reverse logistics system. Hence, task environment factors would influence omnichannel firm performance, and a poor design of the reverse logistics system could drive away potential business.

Finally, RQ1 was answered, indicating that firm and task environment factors would influence omnichannel firm performance. A company's capabilities in reverse logistics system, which include top management support, formalization, flexibility, information system, and collaboration, will influence the company's ability to thrive in the omnichannel ecosystem. Furthermore, for superior performance, omnichannel companies must recognize and respond to external influences such as supplier, customer, regulator, and competitor via their reverse logistics system.

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### Verification in addressing RQ2: What are the relationships between firm and task environment factors with the omnichannel firm performance?

In this part, RQ2 focuses on the relationship between the firm and task environment factors with the performance of a company that operates in an omnichannel context. So, the focus of this RQ2 would be on two vital factors in the framework that are synthesized by different elements. This part is critical to verify the positive relationship of each element within the firm and task environment and omnichannel firm performance.

#### *Firm Factors*

For firm factors, the reverse logistics abilities in omnichannel companies consist of top management support, formalization, flexibility, information system, and collaboration, all of which would positively influence omnichannel firm performance. Hence, this triangulation stage was cross-checked by these firm factors. About nine of the 11 members from the focus group believed that top management somehow significantly impacted firm performance. This question was not answered by two members. One member stated:

> *"The management of returned product need the awareness of top management. Our company always ensures the return management in the right trend to avoid waste of resources and environmentally friendly."*

The senior-level executive was on high alert regarding the implementation of reverse logistics programs. By that, they could help companies to save costs by reducing resource waste. They are responsible for setting the direction of the reverse logistics system and ensuring that the programs can meet objectives such as satisfying customer demand. One member commented:

> *"With the support and awareness of management level, the system could be more effective and customer demand can be fulfilled."*

Hence, top management support was considered an element that would influence omnichannel firm performance across agreements from majority members. In the following discussion, the confirmation of formalization as a factor in improving firm performance was

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secured. All focus group members agreed that formalization in a reverse logistics system would enhance company performance. Most members said:

> *"...informal means no consistency on the rules or SOP to follow..."*

Poor formalization in reverse logistics programs may confuse the operation and even delay the overall process. The existence of standard operating procedures in a reverse logistics system would represent uniformity in the reverse flow, which speeds up the process flow. One member added:

> *"Standard procedure is needed to ensure the processes go smoothly. So, waste of resources can be avoided as our products are time-sensitive. We need to ensure that our product can deliver on time."*

Speed is essential for time-sensitive products in the reverse flow system. Raw materials could be regained from the reverse logistics system if the program could respond quickly by following the proper guidelines. The reverse logistics staff could carry out appropriate activities according to the circumstances. Standard operation procedures could provide employees with a benchmark in the reverse logistics process flow, such as products that allow returning in the gatekeeping function, as one member commented:

> *"I do agree that the returns can be handled properly with some guidelines. So, we know what products should be returned."*

The discussion continued to confirm the element of flexibility in the reverse logistics system. About seven out of 11 members agreed that flexibility is essential to improve firm performance. This question elicited no responses from four members. One member mentioned:

> *"Yes. It would lead to reducing storage cost."*

Flexibility in reverse logistics programs would help omnichannel companies to reduce costs. The idea in these statements reveals that omnichannel companies may be able to resolve return cases. Multiple members highlighted:

> *"…increase business amendment of the process based on the urgent basis."*

> *"It would help to respond faster if something urgent happens."*

A high level of flexibility in reverse logistics systems could allow omnichannel companies to handle various reverse supply chain changes. In particular, omnichannel companies can handle rush returns order in term of resources, where one member added:

> *"It is important for us to have sufficient transport, human power, and equipment to handle returns from our client order."*

By having the flexibility to fulfill requirements, customers would be satisfied with the ability of omnichannel companies. One member expressed:

> *"…flexible return management is important too. It would ensure the process has less disruption. Staff also can be able to handle any issues that may happen. Less disruption in the processes would enable customers to satisfy so customers could be confident with our products."*

In this case, flexibility would assure troublesome reverse flow and higher customer satisfaction. So, customers will be confident with the reverse logistics program in omnichannel companies and will purchase their products. Thus, flexibility is confirmed as an element in a reverse logistics system that could enhance firm performance.

There was a discussion about how the information system influenced the reverse logistics system in omnichannel companies for sustainability. About nine out of the 11 members agreed that the information system impacted the reverse flow, whether for internal companies or external parties. One member presented:

> *"...employee can proceed with returns according to the formal system so customers can get the approval. Customers will be satisfied with how to return so they can return the things either in our shop or postage..."*

One member added:

> *"For example, my company have a very good information system that could well inform and customers will know about the related details on the return process."*

Both statements revealed that customers were requested to return items online, whereas omnichannel companies reviewed and approved their returns using an information system. Gatekeeping processes equipped with a convenient information system ensure that the return process is easily initiated. The omnichannel reverse logistics system can be observed to choose to return through the physical or online channel. Hence, customer satisfaction could be increased through the convenience of service and information visibility. One member proposed:

> *"A good information system could help us to trace the status and avoid disruption to the process. Any information could be updated to let the teams know about the issues so we can respond faster. A faster response would ensure our product can be delivered faster."*

Additionally, members did agree that an information system was used for internal communication to resolve the return cases. By accurately sharing instructions along with the reverse flow, the returned products should be resolved faster and redeliver returned products to customers. Another member also agreed:

> *"I agree because the reverse logistics can maximize the company assets, allow better cash flow, reducing environmental impact."*

The accelerated reverse supply chain allows returned products to be reintroduced into the regular supply chain, allowing cash flow can be regenerated. The environmental impact may be reduced as well because returned products in good condition can be resold to customers. Overall, the information system plays a role in sharing the details of reverse flow with

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internal and external parties. Thus, an effective reverse logistics program with clear information could enhance omnichannel firm performance.

The collaboration factor was also confirmed in the focus group discussion. About nine of 11 members agreed that collaboration would impact omnichannel firm performance, while two members had no response to this question.

The circumstances discussed were concerned with the communication between different departments, which encouraged a positive reverse logistics flow. One member commented:

> *"...returns involve different departments, so they need to have proper communication for the information to be coordinated among staff. So, the returns can be handled correctly, and we do not need to do a double job."*

Good teamwork between different departments ensures that every staff receives information in the reverse flow. Proper decision-making can be achieved by having adequate information, which helps to reduce job redundancy and increase productivity. One member added:

> *"If one department is having problems, then the department also would be affected."*

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One member also stated:

> *"There are different teams involved in the process, so good teamwork would enable them to play their role in collection and delivery. They can inform each other of the issues that may happen and try their best to avoid certain problems. By that, they can ensure the schedule can be maintained, and the processes run smoothly."*

Every employee oversees a different activity in the reverse supply chain, and good collaboration allows for information sharing among employees. Potential reverse flow issues could be avoided, and reverse programs could be carried out as planned. Waste of resources can thus be avoided, and omnichannel firm performance can be improved.

In this part regarding RQ2 verification, there were a variety of responses and interconnected themes that further explain and confirm the firm factors. For example, the information system was demonstrated in terms of how it would affect the reverse logistics system and firm performance. Most members thought that an information system was necessary for sharing information with related personnel and external parties such as customers. Consequently, the elements of firm factors were confirmed in terms of their impact on firm performance in an omnichannel context.

### *Task Environment Factors*

Next, the verification proceeded to check the relationship of task environment factors with omnichannel firm performance. The elements of task environment factors in reverse logistics systems that would positively influence firm performance include supplier, customer, regulator, and competitor. The recognition of supplier influence in the reverse logistics system was important, gaining majority agreement in the focus group. One member noted:

> *"…when a good relationship with suppliers, and you could expect the suppliers could fulfill the demand during the return processes."*

The special response included:

> *"The supplier may give a refund on the returns."*
>
> *"…it can reduce the cost as well."*

By maintaining a close connection with suppliers, omnichannel companies can obtain benefits directly from the supplier, such as refunds for the returned products and cost reductions from the return operations. Additionally, a member from the service provider company revealed:

> *"We need to maintain a good relationship with suppliers as the reverse logistics services may directly impact our reputation. Frequently, the supplier will have a visit to our company to inspect our service and discuss some issues."*

In an omnichannel environment, reverse logistics operations are part of the logistics service provider. Suppliers will work closely with service providers in reverse logistics activities for proper decision-making and problem-solving. Besides, problem-solving can also be observed in other omnichannel companies with their suppliers. One member added:

*"Good relationship with suppliers can allow us to communicate closely with suppliers. We can contact suppliers immediately if any problems (product quality) occur. We can solve the issues together by council or meeting. Hence, we may eliminate the potential losses."*

Omnichannel companies transmit feedback to suppliers for better product development. Sales losses could be avoided by improving product quality in collaboration with suppliers. Hence, integrating suppliers with omnichannel companies would improve the overall reverse logistics strategy, thereby improving company reputation and performance.

The customer was considered one of the overarching themes in this focus group discussion. Most of the members (n = 11) unanimously supported the recognition and conformity of customers in making the reverse logistics strategy successful. One member commented:

*"…when customer satisfied so they come back and purchase again so this is important…"*

Omnichannel companies that can meet customer requirements would encourage customers to purchase and repurchase their products. Another member added:

*"…. the provided service needs to be satisfied by our customers as it will be directly impacted our reputation. Nowadays, social media and reviews could widely spread the bad news that may potentially damage our brand name."*

In particular, customer feedback could spread to other potential customers through an online channel such as social media and feedback in an online shop. The reverse logistics programs in omnichannel companies could also influence brand reputation. In the reverse logistics system, customers expect the collection of returned products could be punctual, whereby one member added:

*"…we need to ensure the delivery and collection on time. Complaints from customers could be reduced...,"*

Other members also related this to the customer relationship and customer satisfaction.

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*"We try our best to serve our customers, including contacting customers before collecting and adjusting our schedules based on customer requirements. These all are important to improve customer relationships so the customer can know we are providing the best service for them. We will follow closely with customer requirements and make sure our operation can perform accurately. So, customers can satisfy with our services."*

In an omnichannel environment, logistics service providers play an important role in reverse logistics operations, such as a collection to meet customers' demands. One member also specified:

*"Customer is our main priority."*

This aligns with the notion that customers would be the primary factor that needs to gain attention from omnichannel companies. Hence, it was confirmed that the customer is a factor that would influence omnichannel firm performance. Omnichannel companies that can meet customers' demands will perform better. Moreover, the regulator was considered as an aspect of task environment factors. About five out of 11 members agreed on the element of the regulator. This question elicited no response from six members. Only two members positively indicated this factor, which is related to government requirements and environmental sustainability.

*"We always ensure we are complying to government requirements."*

Other members highlighted:

*"help the company to improve different aspects such as environmental sustainability."*

According to the most common responses, omnichannel companies that abide by government regulations can achieve environmental sustainability. Besides, most of the respondents were silent on this question, which may represent that the regulator lacks influence on most omnichannel companies in terms of reverse logistics.

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The competitor was also confirmed as one of the elements that would contribute to a company's success or failure. Almost every member believed the competitor was a critical element of the reverse logistics system. About nine members expressed their detailed views without hesitation. The common responses related to better reverse logistics programs when compared with other companies.

> *"Having a good return management and company can stay competitive in the market compared with other competitors."*

Omnichannel companies with exclusive reverse logistics programs that outperform other companies may be able to stay in the market. In other words, omnichannel companies need to equip an excellent reverse logistics system in order to compete with other companies in the industry. One member noted:

> *"Company can learn from a competitor on how they handle those returned goods."*

Omnichannel companies can also learn from other companies to improve their reverse logistics programs. Omnichannel companies must recognize the influences of other companies to ensure they have the competitive power to sustain themselves in the market.

> *"We are notified of the changes in the market. So, we can provide the service that could be more competitive in the market."*

As a result, omnichannel companies can design the appropriate reverse logistics programs that meet market requirements. Hence, the competitor in the task environment was verified, and omnichannel companies that acknowledge the competitor's impact may improve their sustainability.

In summary, RQ2 was addressed by confirming that both firm and task environment factors positively influence omnichannel firm performance. The members of the focus group accomplished a general agreement that these firm and task environment factors will have an impact on omnichannel firm performance. The agreement ensured the existence of these firm and task environment factors within the reverse logistics system. Next, the verification was repeated to confirm the role of firm and task environment factors.

### Verification in addressing RQ3: What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance?

The last verification stage focused on RQ3, which was a general conclusion about the role of firm and task environment factors in predicting omnichannel firm performance. The discussion focused on direct significant factors. This part asked the opinion of members about the role of significant factors (flexibility, collaboration, supplier, and customer) on firm performance. About nine out of 11 members agreed that these factors significantly influence omnichannel firm performance. One of the members commented:

> *"I agree that return management should be equipped with these elements. An effective and efficient return process could enhance company performance. The less disruption return process could reduce extra cost."*

From this comment, the benefits of an excellent reverse logistics system in omnichannel companies can be observed. First, a good reverse logistics system can avoid a breakdown in the returns activities through the reverse flow. Thus, extra costs to recover the reverse supply chain in omnichannel companies could be avoided. One member also detailed:

> *"...reverse logistics will go back to everyone between the production team, supplier, and customer to communicate on getting back the products..."*

A logistics service provider company member emphasises these factors' importance by demonstrating how the returned products and information will pass through various entities such as suppliers, customers, and the company itself. An excellent reverse logistics system will allow the information and goods to go through various personnel without hassle. One member added:

> *"These all aspects are important to ensure the reverse logistics strategies can be the competitive advantages of the company... Good return management could help to improve customer satisfaction with timely and minimize errors... A double job can be avoided..."*

These firm and task environment factors can provide omnichannel companies with competitive advantages in designing reverse logistics strategies by ensuring that the returns activities are carried out effectively. Besides, some members related it to brand image, reputation and customer satisfaction.

> *"brand reputation can be enhanced... Customer complaints can reduce from time to time via good return management."*
>
> *"A good return management also can help the company to build a positive brand... help us to gain customers' trustworthiness in our brand."*
>
> *"Customer also less complaint about our operation, so a good image also can spread among the society."*

Customers' complaints had to be considered through the reverse logistics system. Thus, customers' feedback is identified and treated for superior performance. Besides that, good brand images and customer relationships can also be achieved by implementing a strong reverse logistics system. Concisely, these would attract more potential customers to omnichannel companies via a noble reverse logistics system. Hence, these factors will play a significant direct role in boosting omnichannel firm performance.

In conclusion, this section affirmed that direct factors are essential to influence omnichannel firm performance. The section is vital to show that industries agreed on the existence of these factors in the reverse logistics system. Industry experts agreed with the direct factors that positively influence firm performance. Hence, both firm and task environment factors are important factors in reverse logistics systems for company sustainability.

### Stage Four: Reflection of Final Stage in SED

The micro-interlocutor analysis will continue to report the consensus or concur with the reaction as suggested by Onwuegbuzie et al. (2010) and Jalil (2017). The analysis could provide numerical values that identify the trend of homogeneity from the overall discussions.

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The quantitative value is important to present the trend of responses in the focus group, making the analysis more precise and cohesive.

The first part of the discussion focused on the presence and impact of firm and task environment factors in the reverse logistics system among omnichannel companies. The outcomes were generated from Stage 1 (Interview) and Stage 3 (Correlation), representing the internal and external elements when expressed in the focus group. The agreement on the outcomes was satisfied and unanimous (Avg of firm factors = 4.1 & Avg of task environment factors = 4.0). Members from the focus group discussion assented that firm and task environment factors existed and influenced company performance in an omnichannel environment (Carter & Ellram, 1998; Dowlatshahi, 2000; Vlachos, 2016).

Reflection on RQ1 revealed that omnichannel companies were aware of the firm factors in the reverse logistics system that ensured the reverse flow operations were more effective and efficient. As for the firm factors, the reflection was concentrated on firm factors' ability to make the reverse logistics flow less hassle and more productive. Designing reverse logistics programs in omnichannel companies must recognize and conform to external parties. Reflection revealed that the capability to conform to task environment factors would increase the competitive power of omnichannel companies. Reflection on RQ1 towards similarity, as they noticed the firm and task environment factors and believed that these factors benefited their companies. Hence, the existence of firm and task environment factors was verified, leading to omnichannel companies' sustainability.

The second part of the discussion concentrated on the reflection on nine discussion topics among the focus group members. Most of the discussion topics gained agreement among various focus group members. In particular, the importance of the role of firm factors such as top management support, formalization, flexibility, information system, and collaboration achieved consensus from the industrial experts. These firm factors are vital to ensure various reverse logistics operations in various omnichannel companies can be carried out properly. For instance, instruction and guidelines from standard operating procedures and information sharing between different departments are considered successful factors in improving omnichannel firm performance (Genchev, 2009; Huscroft et al., 2013). Furthermore, task environment factors such as suppliers, customers, regulators, and competitors are considered essential for reverse logistics systems.

Business sustainability could be achieved through the ability to conform to task environment influences. In particular, omnichannel companies must consider customer feedback for improving reverse logistics strategies (Abdullah & Yaakub, 2015).

From the reflections of RQ3, both firm and task environment factors played important roles in boosting omnichannel firm performance. The major aspects of firm factors that influence firm performance are flexibility and collaboration. Besides, the aspects of task environment factors such as customer and supplier are the main themes which are considered essential for omnichannel companies to achieve sustainable practices. These factors are considered overarching themes during the focus group discussion (Table 5.3, which is similar to the results from Stage 1 and Stage 3 (Avg of RQ3 = 3.8).

*Table 5.3 Average for Consensus of Focus Group*

| **Research questions with Discussion Item** | **Average** |
|---|---|
| **Research Question 1 (RQ1)** | |
| D1: From the internal reverse logistics system, research has shown top management support, formalization, flexibility, information system, and collaboration will influence firm performance. Do you agree? | 4.1 |
| D2: For external reverse logistics, a reverse logistics system that conforms with the customer, supplier, regulator, and competitor will influence firm performance. Do you agree? | 4.0 |
| **Research Question 2 (RQ2)** | |
| D1: If top management is aware of reverse logistics, it will improve firm performance. Do you agree? | 3.9 |
| D2: Firm performance will drop if the reverse logistics system is informal. Do you agree? Why? | 4.4 |



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| | |
|---|---|
| D3: If the reverse logistics system is flexible, firm performance will improve. Do you agree? Why? | 4.1 |
| D4: Firm performance will increase if a good information system is installed for the reverse logistics system. Do you agree? Why? | 4.3 |
| D5: Do you agree that good teamwork between different departments in the reverse logistics process will improve firm performance? Why? | 4.1 |
| D6: Do you agree that a good relationship with suppliers in the reverse logistics system will improve firm performance? Why? | 4.3 |
| D7: Company can increase performance by conforming to the customer requirement. Do you agree? | 4.2 |
| D8: If a company could fulfill regulator requirements from the aspect of reverse logistics, it will improve firm performance. Do you agree? Why? | 3.5 |
| D9: Company performance will improve if they consider competitors. Do you agree? | 4.1 |
| **Research Question 3 (RQ3)** | |
| D1: In the reverse logistics system, the element of flexibility, a collaboration between team, supplier, and customer is important to improve firm performance. Do you agree? | 3.8 |
| **Overall average** | 4.1 |
| | |
| Code | |
| SA= Illustrate supporting critical examples or statements that agree with the discussion | 5.0 |
| A = Agree with discussion verbally or non-verbally | 4.0 |
| NR= Did not comment agree or disagree (no response) | 3.0 |
| D = Disagree with the discussion verbally or non-verbally | 2.0 |
| SD= Illustrate supporting critical examples or statements that disagree with the discussion | 1.0 |

The final stage of the qualitative phase was completed by triangulating the results to confirm each research question. The focus group provided an opportunity to cross-check and validate the impact of firm and task environment factors. The use of micro-interlocutor analysis allows data transformation and consolidation by using numerical values to represent members' responses. As a result of this micro-interlocutor analysis, the research questions were validated. In omnichannel businesses, the reverse logistics system compounded by the firm and task environment factors was critical for sustainability. Members' meaningful opinions assured the effects of firm and task environment factors in the omnichannel ecosystem.

In conclusion, the triangulation phase verified the ability of both firm and task environment factors to influence company performance and revealed the relationship between firm and task environment factors and omnichannel firm performance. The focus group confirmed that the presence of these factors does occur to improve firm performance. The section that follows will go over the overall research findings from the qualitative and quantitative phases of the SED research design.

## Omnichannel Reverse Logistics System

The main objective of this study was to investigate the reverse logistic system in the omnichannel business ecosystem. To achieve the research's primary aim, the interdisciplinary lens indicated in Chapter 2 was used to explain the subjects that could generate meaningful output. This particular study drew upon multidisciplinary knowledge, as discussed in Chapters 1 and 2, to produce results capable of resolving multifaceted issues. A single-discipline study of reverse logistics may be incapable of resolving the complex issues involved in managing both firm and task environment factors in reverse logistics to boost omnichannel firm performance (Carter & Ellram, 1998). This study intends to provide revelatory insight instead of simply filling theoretical gaps (Corley & Gioiia, 2011). In this case, the study could provide enriching knowledge for theory and research and offer brilliant perspectives for problem-solving in reverse logistics management. The outline of contribution in this study is illustrated in Figure 5.1.

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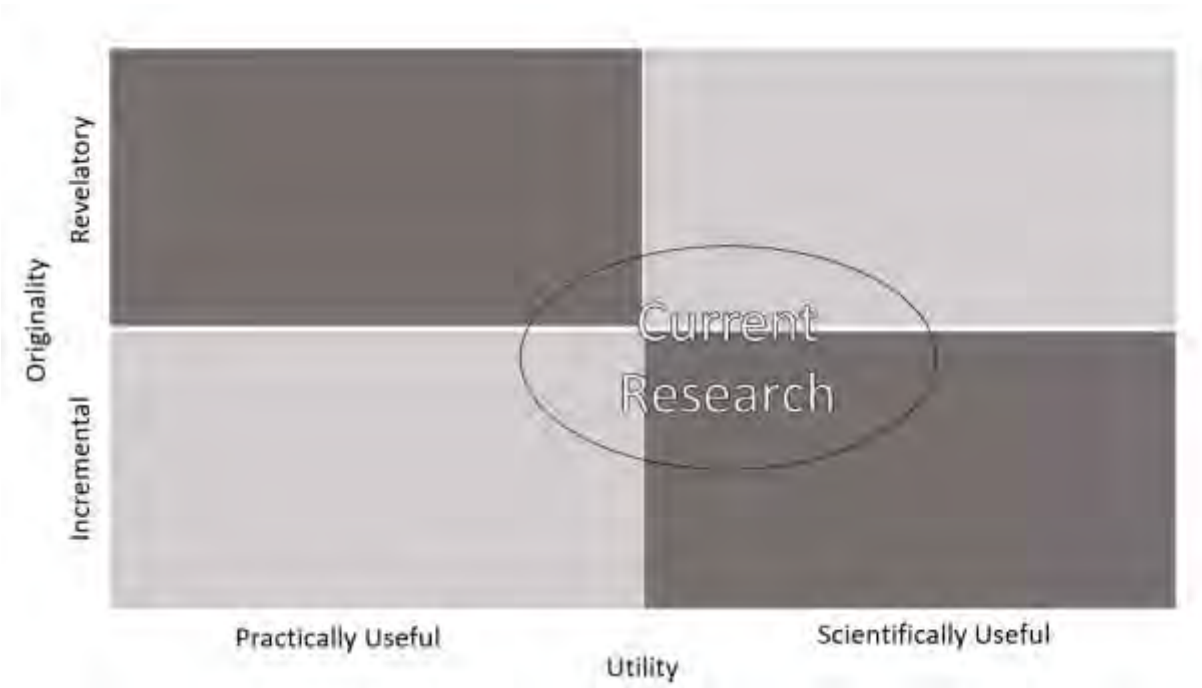


*Figure 5.1 The Contribution of Knowledge Quadrant by* (Corley & Gioiia, 2011)

The process of recognizing, analyzing, and confirming a reverse logistics system in an omnichannel context is discussed in each stage of SED. First, the reverse logistics system elements were identified to seek underpinning factors in the omnichannel reverse logistics system. These factors were pre-condition elements in reverse logistics to achieve sustainable performance with the support of previous studies in Chapter 2 and discussion in Chapters 4 and 5. An effective and efficient reverse logistics should include firm and task environment factors, as presented in Chapter 2. By utilizing this mindset, the initial conceptual framework was developed. The developed conceptual framework in omnichannel reverse logistics was further examined and affirmed through quantitative and qualitative analysis as presented in Chapters 4 and 5.

As mentioned before, the main objective of this study was to investigate the reverse logistics system in an omnichannel ecosystem. Unfortunately, current studies in reverse logistics have not kept up with the latest trends in omnichannel, and are thus unable to provide the knowledge to solve complex and multifaceted issues. Hence, this study is organized to reveal three objectives that can be answered by three research questions, as presented in previous chapters.

RO1: To explore the reverse logistics factors that affect omnichannel firm performance:

- RQ1: What are the various factors associated with RL that influence omnichannel firm performance?

RO2: To examine the relationship between the firm and task environment factors with firm performance in the omnichannel context:

- RQ2: What are the relationships between firm and task environment factors with omnichannel firm performance?

RO3: To explain the relationship between the firm and task environment factors with firm performance in the omnichannel context:

- RQ3: What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance?

The predictive factors to improve firm performance from reverse logistics systems are firm and task environment factors (Carter & Ellram, 1998). Therefore, a mixed methodology approach was applied with relevant consideration to explore and examine these reverse logistics factors to improve omnichannel firm performance (Ågerfalk, 2013; Creswell, 2014), as presented in Chapter 3.

The first stage of SED was able to identify firm and task environment factors in the reverse logistics system, as presented in Chapter 4. It was also discovered that these firm and task environment factors would boost omnichannel company performance. These factors were cross-checked with previous studies as described in Chapter 4, resulting in a fundamental framework for further investigation.

The second stage was essential in revealing and examining these firm and task environment factors that significantly influence omnichannel firm performance, both directly and indirectly. The application of quantitative analysis provided answers to the research questions. Hence, the fundamental framework could be improved further. The triangulation phase used a focus group to further confirm the outcomes and increase its rigor. The application of triangulation allows the data from both qualitative and quantitative analyses to converge, resulting in a more robust and comprehensive understanding of the phenomenon (Teddlie & Tashakkori, 2009).

## Discussion

This section focuses on the outcomes of each stage of the SED. In general, research questions were answered using the findings from all stages. As a result, the discussion will combine the empirical findings with research questions, a literature review, and a research framework. The first section focused on qualitative findings from Stage 1 by combining previous studies and related theories. Following that, the discussion moved on to the results of quantitative analyses of data collected from Malaysian omnichannel companies, which are classified as Manufacturer, Retailer, and Service Provider. Finally, the discussion of triangulation in Stage 4 strengthens the findings of previous qualitative and quantitative analyses.

### RQ1: What are the various factors associated with RL that influence omnichannel firm performance?

The first research question focused on the elements of reverse logistics systems owned by omnichannel companies.

### Stage 1: Qualitative Phase I Findings

This stage is critical for creating a solid framework for omnichannel reverse logistics. The preliminary framework was built using the underlying theories and models from previous research. As the business environment evolves, the reverse logistics system may evolve to meet the needs of omnichannel companies. As a result, it is critical to investigate the reverse logistics system in an omnichannel environment. A set of elements in the thematic analysis for firm and task environment factors represented the composition of latent variables. The firm and task environment factors were refined further from the previous conceptual framework developed based on the literature review. The improved conceptual framework is more precise and provides a solid foundation for the quantitative approach in stage 2.

According to the thematic analysis results, top management support, flexibility, collaboration, information system, and formalization are the related firm factors in reverse logistics systems that were considered as firm capabilities. Respondents were asked to describe their respective

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companies' reverse logistics systems, and these are the factors discovered in their reverse logistics operations. Respondents frequently emphasized top management's role in making the reverse logistics process more effective and efficient. Top management is critical because they make direct decisions to improve or correct the business based on feedback from the reverse logistics system. Similar to previous studies (Ngesa & Shale, 2017; Shafiq & Naqvi, 2012), their focus and motivation on reverse logistics systems would assist companies in achieving competitive advantages.

Furthermore, top management commits resources to the reverse logistics system for it to be effective and efficient, such as human resources (a team designed to handle reverse logistics operations) or facility (equipment for reverse logistics operation). When top management provides resources, it promotes good reverse logistics practices. As a result, omnichannel businesses can reduce inventory costs while improving customer relationships, resulting in improved firm performance (García-Sánchez et al., 2018; Shafiq & Naqvi, 2012).

Moreover, formalization can also be observed in the reverse logistics system, such as standard operation procedures (SOP), return policy, and goal setting. A standardized reverse logistics process could accelerate progress and make the process clear for all the involved parties (Genchev et al., 2011; Han & Cueto, 2016). Furthermore, a positive relationship can be observed between goal setting and firm performance. Most interviewees commented that return cycle time could improve customer relationships and satisfaction (Han & Cueto, 2016). Overall, the formalization has simplified the reverse logistics process, making it more effective and providing better customer service.

In addition to formalization, interviewees also described flexibility in the reverse logistics system. They specifically indicated flexibility as a channel, schedule, and product, which contributes to better firm performance (Bai & Sarkis, 2013). In an omnichannel environment, companies provide various channels for customers to raise the return request (website store, e-commerce platform, email, social media, and face-to-face) and return the products (pick-up by courier and return in-store). Besides, the flexible schedule for collection is also important to follow customer preferences for better customer relationships. Interviewees also mentioned they must be flexible with the reverse logistics system's problems to avoid customer dissatisfaction in terms of timely response time (Bai & Sarkis, 2018; Muntaka et al., 2017; Slack, 2005). Hence, flexibility is a significant factor in a complex reverse logistics environment, similar to previous studies (Bai & Sarkis, 2013; Mishra & Napier, 2014; Slack, 2005).

Interviewees also mentioned the presence of an information system in an omnichannel reverse logistics system. The information system has frequently been identified as a key expectation in sustainability (Daugherty et al., 2005; Mai et al., 2012). These describe the function of an information system in recording related information in a reverse logistics system that supports reverse logistics-related decisions such as disposal and redesign. According to interviewees, information systems also motivate and enable communication between different parties in a reverse logistics system, such as between different teams and between customers, suppliers, and the company (Olorunniwo & Li, 2010). In the reverse logistics program, the information system application could improve omnichannel companies' responsiveness and product visibility (Morgan et al., 2016). Omnichannel businesses can ensure customer satisfaction through effective and efficient reverse logistics processes, which may increase repurchase intent (Daugherty et al., 2002).

According to interviewees, the reverse logistics process often involves multiple teams, and team collaboration is essential. In particular, integrating the marketing and operation department to handle the return process will achieve superior performance in response to customer requirements (Stank et al., 1999b). As the omnichannel reverse flow becomes more complex, multiple teams need to work together to handle return products. A positive relationship can be observed between collaboration and reverse logistics capability (Bernon et al., 2016; García-Sánchez et al., 2018; Morgan et al., 2016). Besides that, information coordination between various teams could ensure those accurate decisions are made, such as deciding the subsequent action for returned products. Communication, either verbally or electronically, would provide information support for other teams in the reverse logistics process. A good collaboration between teams will ensure superior performance for omnichannel companies by reducing waste and enhancing customer satisfaction (Mai et al., 2012; Mollenkopf et al., 2011).

Aside from the themes within omnichannel companies, other themes have been identified in thematic analysis. According to interviewees, the supplier is linked with reverse logistics systems. Omnichannel companies have partnered with suppliers in the return process to handle returned products, which could ensure process efficiency and reduce inventory costs (Vlachos, 2016). Moreover, when handling returned products, omnichannel companies maintain a good relationship with their supplier (Olorunniwo & Li, 2010). Thus, omnichannel companies can exchange information with suppliers and improve their products based on feedback (Škapa & Klapalová, 2019a; Vaz et al., 2013). Formal contract are also used between omnichannel companies and suppliers for better integration in the reverse logistics flow (Jack et al., 2010). When integrating with supply chain partners, omnichannel companies may gain better insight into supplier capabilities and joint planning (Morgan et al., 2016; Škapa & Klapalová, 2019a).

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Apart from the supplier, interviewees frequently spoke about the customer within the reverse logistics system. Among omnichannel companies, customers have requested a responsive and convenient return process (Tiwari, 2013a). As a reward, omnichannel companies can build good relationships and increase customer satisfaction. Furthermore, when omnichannel companies design a lenient reverse logistics program for customers regarding return reason, return dateline, return condition and return channel, this could improve firm performance by boosting purchase and repurchase intention (Janakiraman et al., 2016). Surprisingly, no interviewees mentioned customer pressure for environmentally friendly products, which is different from other studies (Chu et al., 2017; Huang et al., 2010; Wu et al., 2012). However, omnichannel companies do practice environmentally friendly reverse logistics. Other studies proposed that companies that practice eco-friendly strategies could enhance their brand reputation among customers (Abdullah & Yaakub, 2015; Akdoğan & Coşkun, 2012; Huang et al., 2016). This particular view has extended the traditional perspective that the customer is always right by focusing on the key factor of the customer in reverse logistics systems for their requirement instead of a simple reverse logistics program (Jack et al., 2010; Ye et al., 2013).

Interviewees also reported the existence of regulators in the reverse logistics system. The interference of regulators in the reverse logistics system among omnichannel companies can be observed in several operations. Some laws and regulations must be followed when the return process requires crossing a border, which is a more complex procedure (Cullinane & Cullinane, 2018). This situation is common in an omnichannel environment, as customers can buy products online from other countries. This particular procedure needs more attention from omnichannel companies to avoid double costs and double work. Moreover, there are some laws and regulations for moving goods in Malaysia, such as heavy transportation restrictions during certain periods. Omnichannel companies must be aware of these regulations and communicate with customers to avoid customer dissatisfaction due to the delay. Interviewees also indicated that omnichannel companies have an effective reverse logistics system to protect consumer rights (Lysenko-ryba, 2017). There are also laws and regulations (Solid Waste and Public Cleansing Management Bill, 2007) providing guidelines

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about proper handling methods of returned products in an environmentally friendly manner (Abdullah & Yaakub, 2015; Khor & Udin, 2012; Ye et al., 2013). Hence, omnichannel companies strictly follow the rules for superior performance in cost and reputation, which is consistent with other studies (Beleya et al., 2017; Huang & Yang, 2014).

Finally, interviewees mentioned competitors with reverse logistics systems in an omnichannel environment. In a competitive market, omnichannel companies use the reverse logistics system as a competitive tool to compete with other companies (Tang & Tang, 2016). A poor reverse logistics system would cause the company to lose market share to other competitors. Specifically for the retailing industry, they will compare their reverse logistics system with other companies in order to provide better customer service (Dias et al., 2019). Omnichannel companies will improve their reverse logistics by referring to other companies, as supported by mimetic pressure from institutional theory (Chu et al., 2017). Interviewees emphasized that they will improve reverse logistics programs to be more responsive and convenient than competitors to attract more customers (Ye et al., 2013). It showed that the reverse logistics system is influenced by competitor factors and improves firm performance in terms of operation and environmental performance (Chu et al., 2017; Huang & Yang, 2014).

The 11 interviewees revealed the nine factors of reverse logistics systems in omnichannel environments in Stage 1. However, due to the small sample size, it is still too early to conclude that reverse logistics factors will improve omnichannel firm performance. The thematic analysis provided a thorough understanding of reverse logistics in omnichannel companies, as well as their role in improving firm performance. The preliminary findings classified two categories of reverse logistics factors (firm and task environment) that would influence firm performance among omnichannel companies to relate the first stage findings to the omnichannel reverse logistics framework, as shown in Figure 5.2.

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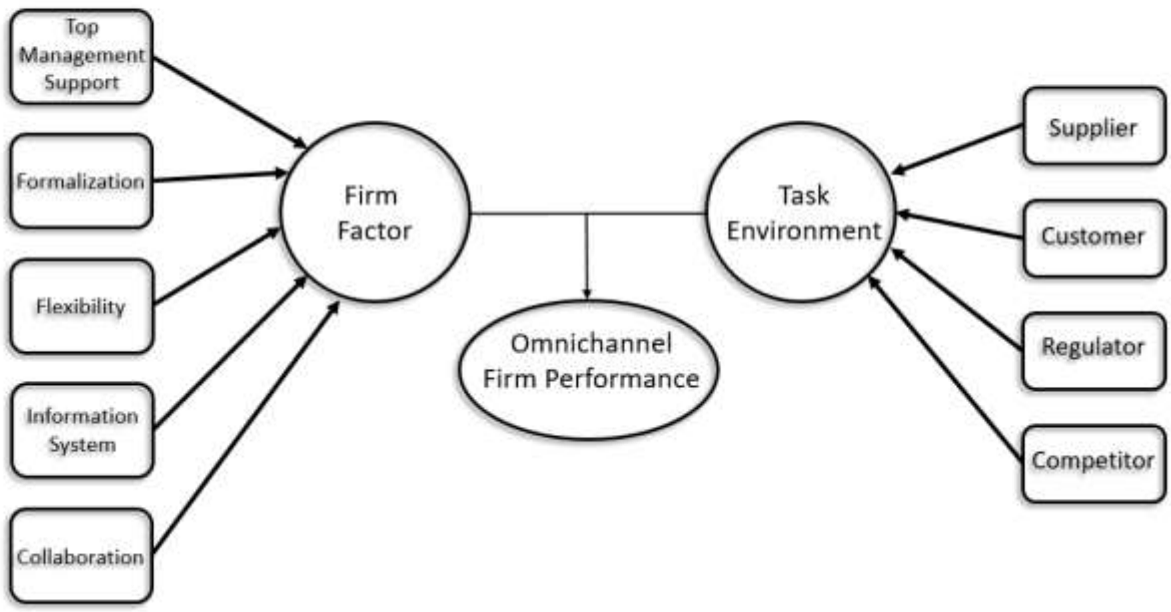


*Figure 5.2 Conceptual Framework Developed from Qualitative Phase I*

## Stage 3: Quantitative Phase Findings

This quantitative analysis was conducted to further study the outcomes from the qualitative phase. In particular, the quantitative analysis is critical to resolving the RQs (RQ1, RQ2, and RQ3). This stage was important to check the reverse logistics factors in the omnichannel environment derived from the thematic analysis. In addition, the quantitative approaches were used to examine which elements within each factor (firm or task environment) were accepted as a significant factor.

First, demographic analysis was used to study the characteristics of respondents in this quantitative study. The data on omnichannel companies were collected from three types of companies: 25% of manufacturing, 24.1% of logistics service providers, and 50.9% of retailers. The majority of respondents work in-retailer companies, which reflects the actual population. The data on respondents' working experience and positions were retrieved from knowledgeable respondents working in omnichannel companies who provided insight into reverse logistics systems in the omnichannel environment.

Besides, respondents from manufacturer and retailer companies were asked if they provide full refunds in their reverse logistics system and who is responsible for the reverse logistics system. The result indicated that the majority of omnichannel companies offered a full return shipping policy because they believed it might increase their sales (Bower & Maxham, 2012). Most omnichannel companies have outsourced their reverse logistics program, which is similar to previous studies (Bernon et al., 2016; XiaoYan et al., 2012). Hence, the outcomes are believed to be reliable to generalize to companies that operate in an omnichannel environment.

Next, the Pearson correlation approach was applied to investigate the relationship between reverse logistics factors and omnichannel firm performance. As mentioned before, this study aims to develop the conceptual framework for reverse logistics systems in omnichannel companies. Thus, the researcher must seek the correlation and predictive value of reverse logistics factors on omnichannel firm performance. In general, the reverse logistics system was represented by firm and task environment factors, as mentioned by Carter and Ellram (1998) and Dowlatshahi (2000). Examining the Intra organization element on reverse logistics is insufficient, as a successful reverse logistics system is incomplete without environmental elements. Hence, both firm and task environment factors were included in the analysis to investigate how a complete reverse logistics system influences omnichannel firm performance.

The Pearson correlation results indicate that both firm and task environment factors would have a significant influence on omnichannel firm performance. The internal elements of the reverse logistics system, defined as firm factors, were tested with omnichannel firm performance to examine the correlation of firm factors with firm performance in the omnichannel environment. Among the firm factors, flexibility was discovered to have the strongest effect on omnichannel firm performance, with a positive correlation (r(448) =

+0.51). Besides that, collaboration was also found to have a significant positive influence on omnichannel firm performance.

Other firm factors such as top management support, information system, and formalization also positively influence omnichannel firm performance. This was unsurprising, as some researchers indicated that firm performance could be achieved when the company enhances the firm factors (Bai & Sarkis, 2013; Mahadevan, 2019; Mahindroo et al., 2018b; Muntaka et al., 2017; Olorunniwo & Li, 2010; Richey et al., 2005). Besides, there was also a significant positive correlation between firm size and reverse logistics on omnichannel firm performance. However, some studies have demonstrated that firm size is a weak predictor to predict firm performance (Pervan & Višić, 2012; Vlachos, 2016). Therefore, the firm size was not further examined in this study.

As mentioned by Carter and Ellram (1998) and Dowlatshahi (2000), the elements that influence reverse logistics from outside organizations cannot be neglected. The task environment factors were examined using Pearson's correlation to investigate the external factor that influences omnichannel firm performance. The task environment factors, including supplier, customer, regulator, and competitor, have shown a positive correlation with omnichannel firm performance, which indicates that firm performance will increase when conforming to task environment factors (Huang & Yang, 2014; Mahadevan, 2019; Tiwari, 2013b). Compared to the task environment factor, the effect size of supply chain factors (customer and supplier) on omnichannel firm performance is stronger than the regulator and competitor factors. However, it is not sufficient to identify whether the reverse logistics system significantly improves omnichannel firm performance. To investigate how a reverse logistics system improves omnichannel firm performance, a PLS-SEM was performed to test the hypothesis. Hence, Pearson's correlation helps identify reverse logistics factors that

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improve omnichannel firm performance. This is vital to address RQ1 as it demonstrates that reverse logistics factors will influence firm performance in omnichannel environments.

### Stage 4: Qualitative Phase II Findings

This is the final stage of the overall research design and involves methodology triangulation via focus groups. This stage used RQs to resolve overall outcomes from previous stages and triangulate prior findings generated by stages 1 and 3. Consequently, the results of stages 1 and 3 were cross-examined cohesively in this stage. In general, stage 1 findings revealed that the reverse logistics system was composed of firm and task environment factors that are important for improving company performance. According to the findings of stage one, firm factors include top management support, formalization, flexibility, an information system, and collaboration. On the other hand, the subset of task environment factors consists of the supplier, customer, regulator, and competitor.

Based on the results of stage 1, the preliminary assumption could be achieved, indicating that both firm and task environment factors influenced omnichannel firm performance, which is consistent with previous studies (Carter & Ellram, 1998; Dowlatshahi, 2000; Vlachos, 2016). In addition, the assumption was further examined in the quantitative phase, and the results have shown both firm and task environment factors have a relationship with omnichannel firm performance. In parallel, many studies have identified these firm and task environment factors in reverse logistics systems, but they did not broadly discuss these elements in the omnichannel ecosystem, which this study covered.

Hence, the triangulation phase verified the existence of both firm and task environment factors in reverse logistics system and their effects on omnichannel firm performance. In terms of reverse logistics abilities, they agreed that top management support, formalization, flexibility, information system, and collaboration did emerge, which will affect the performance condition. They also supported that reverse logistics systems met the requirements of external parties, including the customer, supplier, regulator, and competitor, and these would impact sustainability.

### RQ2: What are the relationships between firm and task environment factors with the omnichannel firm performance?

The second research question focused on the relationship between firm and task environment factors with the omnichannel firm performance. Different firm and task environment factors was identified from research question 1. Thus, this research question will identify their relationship with omnichannel firm performance.

### Stage 1: Qualitative Phase I Findings

From the analysis, the reverse logistics factors in omnichannel companies can be categorized as firm and task environment factors. The firm factor is the capabilities of omnichannel companies to manage reverse logistics supported by a resource-based view (Wernerfelt, 1984). At the same time, omnichannel companies must recognize and react to the task environment actors identified by Dill (1958) and supported by institutional theory (DiMaggio & Powell, 1983). All task environment actors had grouping as task environment factors, which requires omnichannel companies to conform to a reverse logistics system. This particular stage encapsulated the presence of reverse logistics factors that would influence omnichannel firm performance.

The reverse logistics factors are exposed in stage 1, and firm performance would be affected by the degree of the firm and task environment factors described by interviewees. Reverse logistics factors in omnichannel companies were similar to previous studies (Huang et al., 2016; Huscroft et al., 2013; Richey et al., 2005; Tiwari, 2013b; Vlachos, 2016; Ye et al., 2013), which examined the effect of reverse logistics factors. The studies by these authors indicated that reverse logistics factors would influence firm performance. This study affirms the previous findings by showcasing the presence of firm and task environment factors. This result contributes to the conceptual framework to test the theory further. Across the data,

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omnichannel companies must develop competencies in reverse logistics to create better performance, and a simple reverse logistics system is insufficient (Morgan et al., 2016). Hence, this analysis was used to generate a preliminary proposition from 11 interviewees with thematic analysis. Since the first stage was completed, a clear understanding was provided, and research questions (RQ1, RQ2, RQ3) were partially resolved. The research continued to the stage 2 quantitative phase to further test the theory in omnichannel reverse logistics.

At the same time, the qualitative phase applied the necessary approaches to demonstrate rigor and credibility. It is crucial to ensure the generated data is high quality, which means a rich and comprehensive illustration of truthful experiences among the interviewees (Roulston, 2010). The high quality of data was maintained with open-ended questions to ensure the researcher's neutrality. Structural questions were then used to explore more in-depth information (Bevan, 2014). For example, after the interviewee mentioned utilizing the computer to check the details of returned products, a follow-up question was raised to encourage the interviewee to describe more about the information system in the reverse logistics system.

The complete transcripts were then sent to the interviewees for further checking and verification. This was to ensure that the data was correct and that interviewees understood reverse logistics management sufficiently (Roulston, 2010). Moreover, the thematic analysis also enhances the rigor of the approach by examining the regularities of each concept presence across interviewees (Ryan & Bernard, 2003), and the concepts were cross-checked with prior studies (Belotto, 2018). Consequently, the first stage data is reliable and provides a robust basis for the second stage.

### Stage 3: Quantitative Phase Findings

The PLS-SEM was used to measure the pattern and strength of the relationship between reverse logistics system (firm and task environment factors) and omnichannel firm performance, demonstrating whether these variables were predictor variables. In particular, PLS-SEM was suitable for developing the theory of reverse logistics systems in an omnichannel environment (Hair et al., 2014).

The structural model results identified flexibility as a significant factor that positively influences omnichannel firm performance ($\beta = 0.234$, $p < 0.05$). The finding is consistent with previous research (Bai & Sarkis, 2013; Muntaka et al., 2017) that suggests a firm with more flexibility in reverse logistics may perform better. Omnichannel companies with a high degree of flexibility are capable of handling complexity and uncertainly in reverse logistics flow. When companies implement an omnichannel strategy, they should be more flexible in managing reverse logistics flow in terms of channel, equipment, volume, labor, scheduling, and equipment (Bai & Sarkis, 2013). Flexibility in an omnichannel company is vital because it allows the company to respond to changes in reverse logistics flow, such as return details of qualities, quantities, and channels. An omnichannel company can utilize its resources of equipment and labor to handle the products from different channels. In particular, omnichannel companies can overcome the complexity of reverse logistics by flexible work scheduling. Once omnichannel companies implant a high degree of flexibility in the reverse logistics program, the flexible reverse logistics program can improve business performance. Specifically, they can provide excellent service quality for their operations by being flexible with their reverse logistics programs (Genchev et al., 2005).

According to the analysis results, the influence of collaboration between teams in reverse logistics on omnichannel firm performance is significant ($\beta = 0.141$, $p < 0.05$), which indicates that collaboration significantly impacts the firm performance of omnichannel

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companies. As discussed previously, teamwork between different teams in handling reverse flow is important to enhance an organization's performance. In particular, information sharing and process coordination between teams are necessary for the omnichannel context. For example, customer service needs to share accurate information with the logistics department to collect returned goods (Hernández et al., 2011). The reverse flow of omnichannel companies is more complex and requires a high level of integration (Bernon et al., 2016; Hübner et al., 2016). Continuous and practical collaboration may be more critical for omnichannel companies dealing with reverse logistics flow. Different teams in omnichannel companies must link together in handling returned products due to the uncertainty in reverse logistics. Efficient collaboration in reverse logistics programs could provide effective service and rapid response (Chen et al., 2009). Better alignment across teams in reverse logistics also ensures that omnichannel companies deploy strategic resources to gain a competitive advantage (Morgan et al., 2016). Hence, collaboration significantly impacts omnichannel firm performance, which is consistent with prior studies (Chen et al., 2009; Mahadevan, 2019; Mai et al., 2012; Morgan et al., 2016). In a context associated with a complex environment, the influence of collaboration remains substantial and necessary for information and process integration within the organization's boundaries.

These two firm factors elements significantly influenced the omnichannel firm performance. However, other firm factors, such as top management support, formalization, and information system, had no significant influence in predicting omnichannel firm performance. Surprisingly, these findings contradict previous studies (Daugherty et al., 2005; Huang et al., 2012; Mahindroo et al., 2018a; Škapa, 2012). Based on the structural model, the outcome demonstrated that top management support, formalization, and information system had no significant influence on omnichannel firm performance, which was $p > 0.05$. This structural model, in turn, only evaluated the direct relationship of predicting factors toward omnichannel firm performance. Some studies showed that top management support moderates the reverse logistics system by moderating the relationship between collaboration and omnichannel firm performance (Chu et al., 2017; Mai et al., 2012). Top management initiatives to improve reverse logistics capabilities make the reverse flow more effective and efficient. In particular, top management is essential for directing and organizing employees within reverse logistics operations, which helps to increase performance (Ngesa & Shale, 2017). So, these particular firm factors may play a role as a moderator towards reverse logistics instead of directly related to omnichannel firm performance.

Some studies also looked into formalization to explain its role as a moderator between customer and omnichannel firm performance. Some studies demonstrated that proper planning or formalization could enhance reverse logistics efficiency (Pfohl et al., 2012; Škapa, 2014). Strategic planning of reverse logistics systems allows omnichannel companies to properly manage the reverse flow effectively by responding rapidly to customer requirements (Han & Cueto, 2016). Specifically, a better formalization reverse logistics system could reduce potential ambiguity in the reverse flow (Genchev et al., 2011). For instance, the existence of a return policy could inform the customer about information regarding the time required to process returned products and refunds.

Although information systems are not a significant factor in predicting omnichannel firm performance, some studies agree that information systems should be combined with other factors to achieve competitive advantage (Daugherty et al., 2002; Huscroft et al., 2013; Mai et al., 2012). In particular, Mahindroo et al. (2018) stated that the information system is critical to maintaining the connection with customers through quick response time and managing the return efficiently. The information system also enables a more effective decision-making process in flexible reverse logistics, whereby a compatible information system coordinates different parties in reverse logistics operations. For instance, omnichannel companies must have a proper information system to organize various channels offered to customers for returns. Hence, top management support, formalization, and information systems may impact omnichannel firm performance indirectly in the reverse logistics system. However, the main focus of this study was to develop a fundamental theory for reverse logistics in omnichannel, so the role of non-significant firm factors will not be further explored.

As the reverse logistics system must adapt to the changing environment, this study also tested the relationship between task environment factors and firm performance in an omnichannel context. The results demonstrated that the customer is a significant factor in predicting omnichannel firm performance ($\beta = 0.219$, $p < 0.05$). Companies can sustain themselves in the omnichannel environment when the reverse logistics system recognizes customer requirements. Companies that offer proper after-sales service will help to intensify customer loyalty and enhance the firm's competitive advantages (Abdullah & Yaakub, 2015). In particular, return rates in the omnichannel environment are higher (Bernon et al., 2016), indicating more customers will go through the reverse flow, and customer experience will be evaluated based on the reverse logistics program. For instance, customers are looking for a convenient return process, such as selecting a preferred channel for returning goods. If omnichannel companies could provide these services, it would enhance customer satisfaction and repurchase intention (Hübner et al., 2016). Besides that, omnichannel companies should have a collection system equipped with a well-established relationship with customers because it will improve customer relationships and generate high sales (Ang & Tan, 2018). In conclusion, customers positively influence omnichannel firm performance, consistent with previous research (Huang et al., 2015).

More interestingly, the supplier was found to have varying impacts on omnichannel firm performance in terms of magnitude. The results reveal that the degree of conformity with

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suppliers positively impact omnichannel firm performance ($\beta = 0.150$, $p < 0.05$). The integration of suppliers in reverse logistics management will improve omnichannel firm performance. An omnichannel firm that integrates with suppliers would have an effective and efficient reverse logistics system. Omnichannel companies cooperate with suppliers to further optimize the reverse logistics operation and consider reverse logistics management. For instance, omnichannel companies can reduce waste and improve profitability by sharing information and process integration (Lau & Wang, 2009). Sharing information on product defects among supply chain actors would help to reduce return volume. Suppliers can respond to specific matters and make decisions that improve performance (Niemann et al., 2017). Omnichannel companies also develop strong relationships with suppliers by conforming to supplier standards in reverse flow. A common standard in the supply chain enables the process integration between omnichannel companies and suppliers. These could further enhance the reverse flow without delay and thus increase customer satisfaction (Bernon et al., 2013; Niemann et al., 2017; Vlachos, 2016). For example, an agreed-upon return policy with suppliers enables omnichannel firms to accelerate the reverse process flow that improves customer relationships. Hence, omnichannel companies that practice better integration with suppliers in reverse logistics management would have better firm performance (Huang et al., 2015).

Contrary to expectations before the study, competitors and regulators had no significant influence on omnichannel firm performance ($p > 0.05$). As mentioned, the path model analysis only evaluates the direct relationship between predicting factors and omnichannel firm performance. Previous correlation analysis stated that competitors and regulators positively influence omnichannel firm performance, so both factors may influence omnichannel firm performance as moderators.

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A study by Huang and Yang (2014) indicated that competitors and regulators positively moderate the relationship between reverse logistics capabilities and firm performance. Omnichannel companies that recognize the competitor changes would better conform to customer requirements. These firms are paying attention to how other companies attract customers using reverse logistics systems (Ye et al., 2013). In particular, companies will be autonomously influenced by competitors towards implementing green supply chain practices (Chu et al., 2017; Ye et al., 2013). Intense competition will motivate omnichannel to implement an efficient reverse logistics system that may indirectly improve firm performance. For example, high competition pressure will motivate omnichannel companies to better handle the returned product in terms of flexibility, which will reduce costs (Huang & Yang, 2014; Tang & Tang, 2016). Hence, as the moderator may indirectly influence omnichannel firm performance, this will need further study.

Previous studies also showed a direct or indirect relationship between regulators and firm performance (Álvarez-Gil et al., 2007; Carter & Ellram, 1998; Huang et al., 2016; Ye et al., 2013). Nevertheless, none of these studies was conducted in Malaysia; the difference lies in the legislation of Malaysia with other countries. Other countries like Taiwan (Ye et al., 2013) and Western nations (Canning, 2006) have enforced certain legislation or policies to motivate companies to take responsibility for returned products or materials. In Malaysia, companies face less legislation regarding reverse logistics. Hence, Malaysia's omnichannel companies may not benefit from the regulator implementing reverse logistics effectively (Eltayeb & Zailani, 2011). However, studies also indicated that the regulator is a factor that influences the implementation of reverse logistics, while the relationship between the regulator and firm performance is mediated by the reverse logistics system, which requires further study (Huang et al., 2015). Nevertheless, the main focus of this study was to develop a fundamental theory for reverse logistics in omnichannel, so the role of the non-significant factors will not be further explored.

### Stage 4: Qualitative Phase II Findings

The role of these factors was further confirmed in the last stage as a significant direct factor. Firm factors (flexibility and collaboration) and task environment factors (supplier and customer) were the significant factors that directly influence omnichannel firm performance. Most of the focus group members agreed on the role of both firm and task environment factors in predicting omnichannel firm performance. Hence, these firm and task environment factors significantly impact the performance of omnichannel companies.

The general view of the triangulation process is demonstrated in Figure 5.3, which shows the overall SED design, and the third stage represents the findings generated from the focus group discussion by verification from prior stages. The last stage provided the opportunity to integrate and compare the findings from both stages. The reverse logistics elements were further examined in the last stage analysis.

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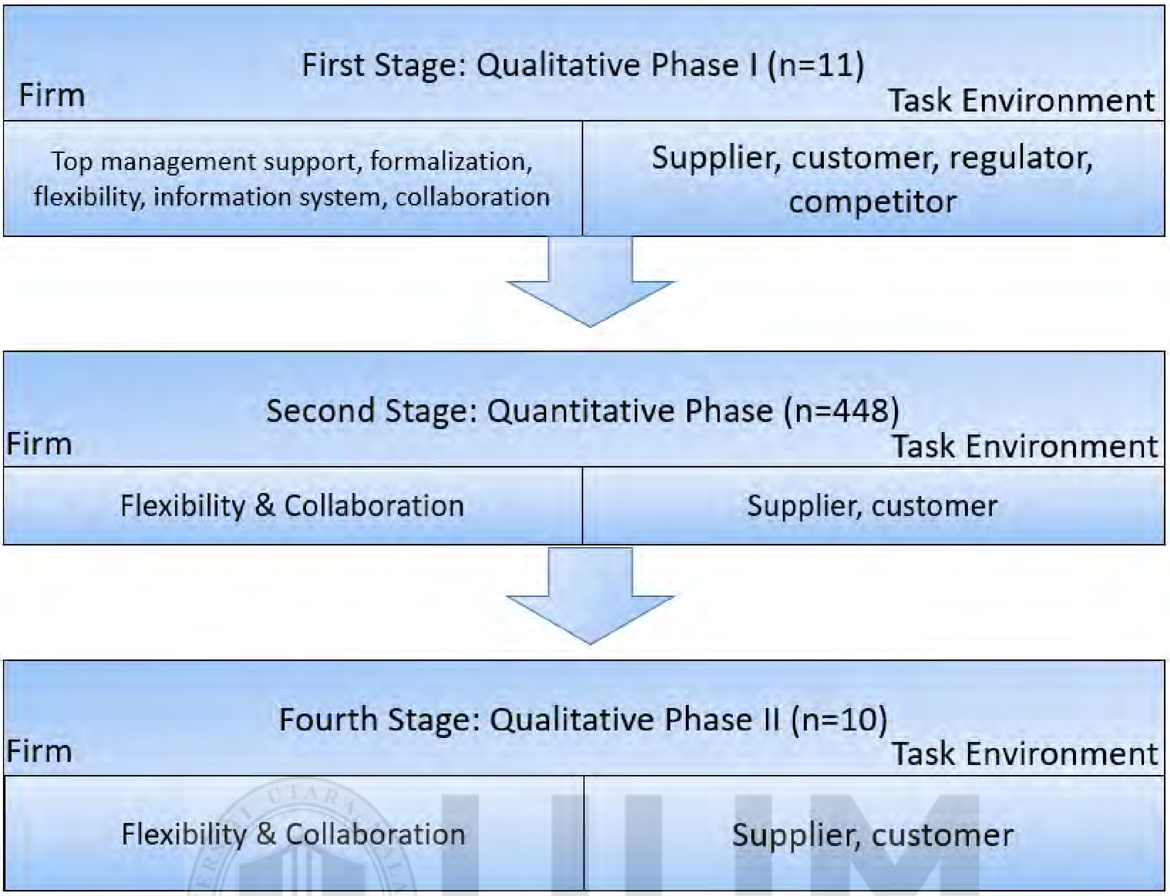


*Figure 5.3 SED research design with major themes and samples.*

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Overall, this study compared the results to previous studies, which acknowledged the role of firm and task environment factors in predicting sustainable performance. Similar to prior studies, a sustainable reverse logistics system should have abilities such as flexibility and collaboration (Bai & Sarkis, 2013; Mahadevan, 2019; Mahindroo et al., 2018; Muntaka et al., 2017; Olorunniwo & Li, 2010; Chen et al., 2005). Simultaneously, the designed reverse logistics system should recognise and adapt to external influences such as the supplier and the customer (Álvarez-Gil et al., 2007; Carter & Ellram, 1998; Huang et al., 2016; Ye et al., 2013).

Numerous researchers (Carter & Ellram, 1998; Dowlatshahi, 2000; Vlachos, 2016) agreed that both internal and external elements influenced sustainable reverse logistics practices. Furthermore, Jalil (2017) emphasized the existence of a symbiosis or an integrated effect between internal and external elements, which would better explain the influence of predicting sustainable behavior. Unlike prior studies, this research not only examines the influence of both firm and task environment factors in reverse logistics systems. This research also explores and explains the reverse logistics system in the omnichannel ecosystem, specifically the influence of reverse logistic systems on company performance.

The integration of interdisciplinary theories recognized that the two major elements of sustainable practice were internal and external and that both firm and task environment would improve performance. This study emphasized the robustness of a mixed methodology research design that ensures comprehension of these elements in an omnichannel reverse logistics system.

It is undeniable that the findings of this study show that companies in an omnichannel business environment require an effective and efficient reverse logistics system to be sustainable. The omnichannel reverse logistics system would be the key to improving company performance, and both firm and task environment factors could assist the company in implementing sustainable practices for longevity.

### RQ3: What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance?

The last research question focused on the strength between the firm and task environment factors with the omnichannel firm performance. In particular, this research question will look into the most significant factors that impact omnichannel firm performance.

#### Stage 3: Quantitative Phase Findings

From the findings of Stage 3, firm factors (flexibility and collaboration) and task environment factors (customer and supplier) are determinants in predicting omnichannel firm performance. Among these factors, flexibility ($B = 0.234$, $p < 0.05$) is the most significant factor impacting omnichannel firm performance. The results showed that omnichannel firm performance would increase by 0.234 if flexibility increase by 1. Firm performance grows faster if the reverse logistics system is more flexible. At the same time, the customer also has similar power to influence omnichannel firm performance, which is B=0.219 ($p<0.05$). This represents that if customer increase by 1, omnichannel firm performance will increase by 0.219. Customers are more willing to support the company if an omnichannel company is willing to fulfil their requirements. Hence, flexibility and customer are the most significant factors that impact omnichannel firm performance.

In general, the hypothesis testing is summarized in Table 5.4. The table provides a summarized view of the hypothesis tested in the study. By looking into the results, it reveals the significant factors that influence omnichannel firm performance.

*Table 5.4 Summary of hypothesis testing*

| Hypothesis | Results |
|---|---|
| $H_{1(a)}$: Top management support has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(b)}$: Formalization has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(c)}$: Flexibility has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{1(d)}$: Information system has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{1(e)}$: Collaboration has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(a)}$: Supplier has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(b)}$: Customer has a significant and positive effect on omnichannel firm performance. | Supported |
| $H_{2(c)}$: Regulator has a significant and positive effect on omnichannel firm performance. | Rejected |
| $H_{2(d)}$: Competitor has a significant and positive effect on omnichannel firm performance. | Rejected |

By validating the impacts of the firm and task environment factor on omnichannel firm performance, this analysis offers an understanding of the reverse logistics mechanism underlying how these factors have the potential to improve firm performance for achieving sustainability. The firm and task environment factors recommended in this research attempt to illustrate the factors of reverse logistics system underpinning omnichannel firm performance, which discovered that flexibility, collaboration, supplier, and customer are significant factors for predicting omnichannel firm performance. Hence, this quantitative analysis phase verified the firm and task environment factors from the thematic analysis. The quantitative test results confirm and illustrate the qualitative phase I outcomes that superior flexibility and collaboration would improve omnichannel firm performance. Furthermore, higher conformity with the supplier and customer influenced sustainable omnichannel firm performance, as shown in Figure 5.4.

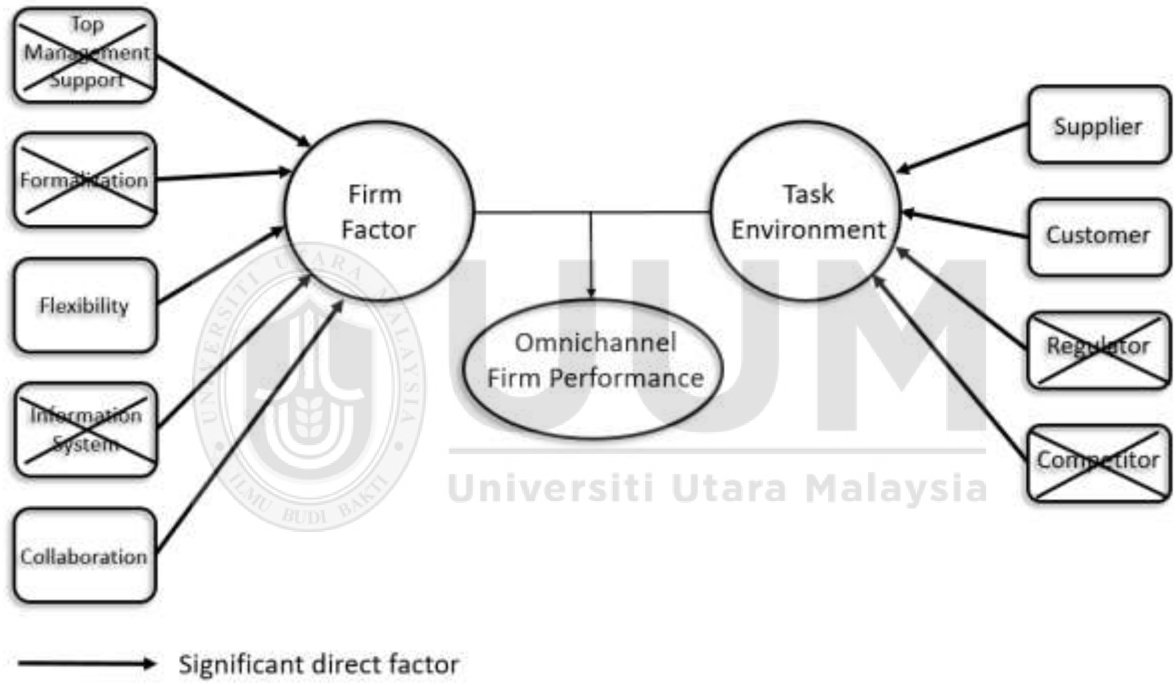


*Figure 5.4 The Validation of analysis from the first phase*

The quantitative analysis methods used in this stage were suitable and sufficient for further investigating the exploration data on the omnichannel reverse logistics system proposition. The quantitative analysis also provides the outcomes that could answer research questions. In summary, the quantitative phase analysis provided fundamental support for the overall objectives of this study and exposed some propositions for confirmation in the next stage.

### Stage 4: Qualitative Phase II Findings

According to the preceding stages, establishing an effective reverse logistic system exemplifies incorporating both firm and task environment factors in the design, as demonstrated by the triangulation process. The triangulation process implied that both firm and task environment factors were important in reverse logistics systems, indicating that a company can achieve sustainability in an omnichannel environment, where most focus members agree that flexibility and the customer are important.

Furthermore, omnichannel-related researchers imply the existence of an effective reverse logistics system in companies composed of firm and task environment factors to handle the reverse flow. The authors have discussed the components of reverse logistics systems as they relate to firm and task environment factors in omnichannel companies. For instance, inter-department and inter-organizational operations were discussed to improve customer service and operational performance (Bernon et al., 2016). Aside from that, Hübner et al. (2016) discussed how a flexible channel and resources in reverse flow would help to improve customer relationships. Prior work in an omnichannel business environment revealed the effects of both firm and task environment factors.

Overall, this study has revealed the reverse logistics system in the omnichannel ecosystem, specifically the effects of reverse logistics elements on firm performance. This understanding provides a comprehensive view of the evolution of reverse logistics, specifically the transition into an omnichannel business environment. This study suggests that an effective reverse logistics system could help omnichannel companies improve their performance. This perspective aided in understanding industrial experts' perspectives on how the reverse logistics system could help companies improve performance (Bernon et al., 2016; Hübner et al., 2016).

## Summary

This chapter presented two debates. The first presented details of the triangulation phase, and the second emphasized the rationalization from all qualitative and quantitative stages in the SED. The first stage was a qualitative phase in which data was collected through interviews and analyzed using a thematic approach. The findings investigated the presence of both firm and task environment factors in an omnichannel reverse logistics system, implying that the presence of these reverse logistics factors could improve firm performance. This discussion has reaffirmed the reverse logistics framework (Carter & Ellram, 1998), which proposed the existence of internal and external factors.

The reverse logistic system identified five firm factors (top management support, formalization, flexibility, information system, and collaboration) and four task environment factors (customer, supplier, regulator, and competitor). These identified factors receive support from existing studies as they are grouped based on themes.

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The discussion then focused on the third stage of the quantitative analysis phase. According to the correlation analysis, all firm and task environment factors positively influence omnichannel firm performance. PLS-SEM was then used to perform multivariate analysis in order to develop a conceptual framework in omnichannel reverse logistics. According to the study, flexibility, collaboration, customer, and supplier relationships have a significant direct relationship in predicting omnichannel firm performance. Prior studies have found support for using these direct factors to predict firm performance in this study. Contrary to previous research, top management support, information system, formalization, regulator, and competitor, were not significant predictors of omnichannel firm performance. Some previous studies have provided a fundamental understanding of the impact of these non-significant factors.

The triangulation process was utilized to cross-check the outcomes after obtaining the quantitative and qualitative analysis results. With a focus group, this phase was a confirmatory and convergence approach. The discussion in this process aimed to verify the two stages in accordance. Factors that influence firm performance include both firm and task environment variables. The significant direct factors influencing omnichannel firm performance were firm factors (flexibility and collaboration) and task environment factors (customer and supplier). These firm and task environment factors were important as prerequisite factors for reverse logistics systems in omnichannel companies to improve their performance.

In general, the comprehensive findings show that the firm and task environment factors are pivotal factors in reverse logistics systems for omnichannel companies. The firm and task environment factors, which could ensure the omnichannel company's sustainability, were used to represent the efficiency and effectiveness of the reverse logistics system. In conclusion, using a focus group is important to triangulate the results obtained from mixed methodology. The triangulation approach is essential to refine the rigor and trustworthiness of findings (Leech & Onwuegbuzie, 2007).

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# CHAPTER 6: GENERAL CONCLUSION

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## Introduction

This chapter presents the overall summaries of the findings of research questions. The general conclusion will also be discussed based on the findings. At the end of the discussion, the framework for an omnichannel reverse logistics system is revealed to ensure that the various issues of this study are resolved entirely. Besides that, this chapter will also discuss this study's strengths and limitations and also suggest recommendations for future research.

## Summary of Overall Findings regarding the ROs and RQs

This section summarizes the overall findings to answer this study's research questions.

### RQ1: What are the various factors associated with RL that influence omnichannel firm performance?

The reverse logistics system was found to have firm and task environment factors. These findings are similar to previous studies that suggested a reverse logistics system could be constructed with two elements: internal and external. The firm factor is the internal element of the reverse logistics system that ensures effective and efficient operations that could boost omnichannel company performance. Simultaneously, the task environment factor is the external element of the reverse logistics system, where omnichannel companies should design the reverse logistics program to meet the requirements of external stakeholders to get a better firm performance.

In Stage 1, thematic analysis was applied to address this research question, and the outcomes reveal the existence of firm and task environment factors. From the Stage 1 analysis, firm factors include top management support, formalization, flexibility, information system, and collaboration, whereas task environment factors include the supplier, customer, regulator, and competitor. Similar to previous studies, omnichannel companies owned an effective reverse logistics system comprised of firm and task environment factors that could improve their firm performance. Due to the nature of the qualitative analysis, the result was not final and could not be generalized to the population (Farghaly, 2018).

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To further examine these firm and task environment factors, Pearson's Correlation was used to investigate the correlation between these variables and omnichannel firm performance. The results were gathered from a larger sample size for better generalization and robust data. Using a larger sample size could also cross-check the outputs from Stage 1. Overall, the results revealed that each firm and task environment factor significantly influenced omnichannel firm performance, as examined in Stage 4. By answering this question, these factors could be used as the underpinning factors to explore further their role in reverse logistics systems for better sustainability.

### RQ2: What are the relationships between firm and task environment factors with omnichannel firm performance?

The goal of RQ2 was to identify the factors associated with firm and task environment factors that influence omnichannel firm performance. Based on the findings, firm factors significantly influence omnichannel firm performance, and flexibility and collaboration have a significant direct relationship with omnichannel firm performance. These indicate that omnichannel companies can improve their performance with a high degree of flexibility and collaboration among teams in the reverse logistics system, such as rapid response and hassle-free operation. Other firm factors such as top management support, information system and formalization may be indirect factors toward omnichannel firm performance.

Besides, task environment factors have a significant direct influence on omnichannel firm performance that conform with the supplier and customer, which could boost their performance. These represent if the reverse logistics system of omnichannel companies could satisfy customers, in which case their companies' customer relationships would improve. Furthermore, omnichannel companies that can coordinate and cooperate with suppliers in reverse logistics systems may perform better in terms of cost-saving and product improvement. Other task environmental factors, such as the competitor and regulator, may indirectly influence the omnichannel reverse logistics system.

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Hence, overall firm and task environment factors influenced omnichannel firm performance. Omnichannel companies need to have a strategic reverse logistics system that includes these firm (flexibility and collaboration) and task environment (supplier and customer) factors. Omnichannel companies can achieve sustainable performance with an effective and efficient reverse logistics system. Stage 4 also confirmed that both the firm and task environment factors from Stages 1 and 2 positively influenced omnichannel firm performance, which is vital to ensure that the results could address RQ2 completely.

### RQ3: What are the strengths of the relationships between firm and task environment factors with the omnichannel firm performance?

The primary consideration of the final research question was to explain the interrelationship between firm and task environment factors that influence omnichannel firm performance. From the findings of Stage 3, firm factors (flexibility and collaboration) and task environment factors (customer and supplier) are determinants that predict omnichannel firm performance. Among these factors, flexibility and customer are the most significant factors in the omnichannel firm performance revealed in the PLS-SEM. The reverse logistics programs that are flexible and conform to customer requirements could help the omnichannel company to perform better.

Furthermore, Stage 4 is critical in addressing RQ3 by seeking expert confirmation on the importance of firm and task environment factors on omnichannel firm performance. The reflections from the focus group confirmed that both firm and task environment factors are important in the reverse logistics system. The absence of these factors in reverse logistics may create chaos in the reverse flow, disrupting normal operations. However, the reverse logistics system could be effective and efficient for omnichannel companies with the existence of these indirect variables. Overall, this final research question is essential to show all the elements of the firm and task environment are critical determinants to influence omnichannel firm performance. In conclusion, the comprehensive findings from the previous stages were cross-checked, and the results were satisfactory. Thus, it is critical to understand both firm and task environment factors in omnichannel reverse logistics systems for companies to pursue longevity.

## The Omnichannel Reverse Logistics Framework

This research is dedicated to developing a robust omnichannel reverse logistics framework. This section is critical for integrating the research findings in order to generate the omnichannel reverse logistics framework. As mentioned previously, the resolution of RQs could contribute to developing a robust framework. By summarizing the findings from RQs, it could be concluded that both firm and task environment factors are important in improving omnichannel firm performance. Reverse flow capability in omnichannel companies would help the omnichannel firm in developing a systematic reverse logistics system that would stimulate firm performance. Simultaneously, omnichannel companies that can conform to the task environment requirement will perform better than other companies. The respective framework is summarized in Figure 6.1.

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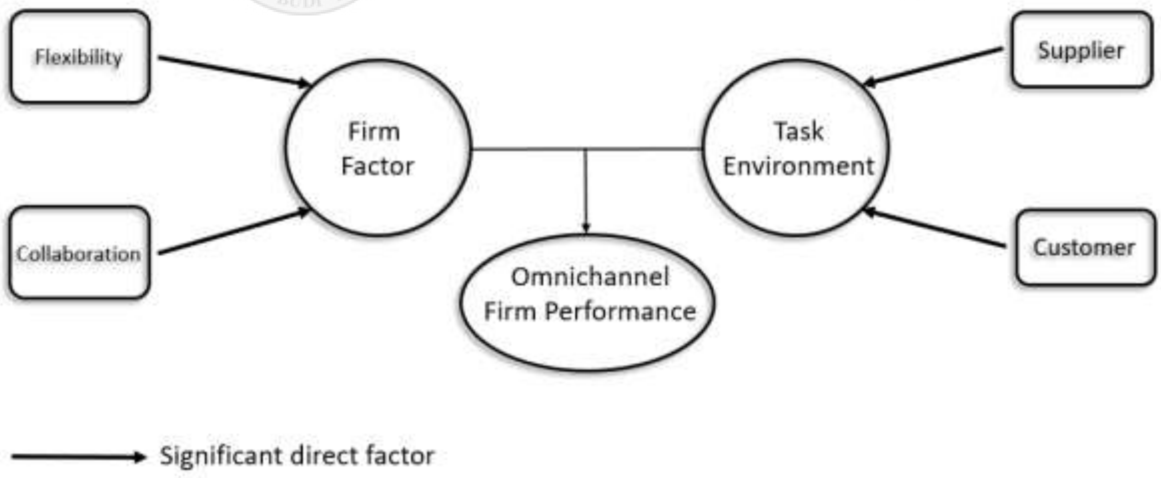


*Figure 6.1 The Omnichannel Reverse Logistics Framework*

From a firm perspective, omnichannel companies should input flexibility and collaboration into reverse logistics programs. However, other drivers, such as top management support, formalization, and information systems, must not be neglected. These indirect drivers play a role in facilitating the reverse logistics flow that could satisfy the requirements of stakeholders. If these indirect drivers are not present, they will restrict omnichannel companies from succeeding. From a task environment perspective, omnichannel companies will obtain superior performance when the strategy matches the external circumstances. Hence, the management of omnichannel companies must understand the business industry's external environment to recognize external changes and respond to these changes appropriately. Based on the findings, the primary forces, including the customer and supplier, could influence the ability of the reverse logistics system to boost performance. Omnichannel companies must recognize and conform to these task environment factors for designing a proper reverse logistics strategy. Hence, this framework indicates that this research would ultimately achieve RO4 to develop a reverse logistics framework in the omnichannel ecosystem.

## Implications of the study

This section discusses the theoretical implications, practical implications, limits, and recommendations for future research based on the empirical findings. These implications are crucial for omnichannel businesses that implement reverse logistics systems to boost firm performance.

### Theoretical Implications

The primary goal of this study is to generate a body of knowledge that will help researchers incorporate the reverse logistics effect into their research. Besides, this study would contribute to the previously unexplored reverse logistics in the current era, especially in the omnichannel context (Dias et al., 2019). Reverse logistics has been recognized as a part of sustainability in supply chain management, and this study will advance the field of reverse logistics and the issue of sustainability (Banihashemi et al., 2019; Carter & Easton, 2011). Current studies have focused on the operational planning of reverse logistics while ignoring strategic planning (Hübner et al., 2016). This research converges past empirical researchers to develop the concept of internal (Bai & Sarkis, 2018; Hall & Johnson, 2016; Mahadevan, 2019; Morgan et al., 2016; Ngesa & Shale, 2017) and external (Álvarez-Gil et al., 2007; Yi Chun Huang et al., 2015; Vlachos, 2016) dimensions within reverse logistics. The findings filled the research gap by exploring the reverse logistics system in the omnichannel context and examining the reverse logistics factors that improve omnichannel firm performance.

Accordingly, a robust framework comprising all relevant theories and frameworks could be established to provide a multifaceted view of reverse logistics that improves understanding of certain phenomena in an organization. Multiple theories were applied in this study to provide a robust understanding of omnichannel reverse logistics. The developed omnichannel reverse logistics framework integrates four theories: reverse logistics framework, the resource-based view (Wernerfelt, 1984), institutional theory (DiMaggio & Powell, 1983), and task environment theory (Dill, 1958). As a result of incremental research, both firm and task environment factors were examined with the support of previous studies in reverse logistics (Carter & Ellram, 1998; Dowlatshahi, 2000; Vlachos, 2016). The reverse logistics framework served as the basic framework in this study, explaining that the reverse logistics system consists of two elements (internal and external). This basic framework was applied to the theoretical framework with other theories relevant to the research objectives. Based on the knowledge lens of the resource-based view (Peteraf, 1993), firm factors are assets and capabilities in the reverse logistics system that positively react to firm performance. According to the findings, this study further strengthens previous studies highlighting the importance of collaboration and flexibility in the reverse logistics system (Bai & Sarkis, 2013; Carter & Ellram, 1998; Morgan et al., 2016; Škapa & Klapalová, 2019a). Therefore, the results confirm the importance of firm factors in an omnichannel reverse logistics system.

According to institutional theory (DiMaggio & Powell, 1983) and task environment theory (Dill, 1958), omnichannel companies must align the design of reverse logistics systems with external factors such as customers, suppliers, regulators, and competitors. However, only two factors found a positive relationship with omnichannel firm performance. The findings further support previous studies that mentioned the role of the supplier and customer in the reverse logistics system. The omnichannel companies that conformed to the supplier and customer influence could perform better. Contrary to previous literature, the regulator did not affect omnichannel firm performance (Huang & Yang, 2014). These may happen due to a lack of reverse logistics legislation in Malaysia, so omnichannel companies cannot obtain advantages from the regulator (Eltayeb & Zailani, 2011). These results continue to demonstrate that omnichannel companies with the ability to recognize and respond to indications in the external environment have a competitive advantage over less agile companies.

Most of the previous studies investigated reverse logistics as a single channel, and only a few recent studies (Ang & Tan, 2018; Bernon et al., 2016; Hübner et al., 2016) highlighted the difference in reverse logistics in the omnichannel context. The developed framework, which is supported by multiple theories, can offer a robust or more useful model and framework, which contributes to seamless research design and techniques. The study's omnichannel reverse logistics framework was assumed suitable for an interdisciplinary study that assembles the interplay between the company and the reverse logistics in the omnichannel context. This study further fortified the application of existing theories such as the reverse logistics framework, the resources-based view, institutional theory and task environment theory in the omnichannel context. Besides that, this study further explores and examines the factors for reverse logistics framework in the omnichannel environment.

Hence, this research provides empirical evidence that both firm and task environment factors are significant in reverse logistics and support omnichannel companies to sustain themselves in the market. This is an important contribution to our knowledge because it is the first study

Universiti Utara Malaysia

to examine reverse logistics strategic aspects in an omnichannel context. Moreover, this research not only explains why these firm and task environment factors are significant in reverse logistics, but it also discovered that both firm and environment factors are important for firm performance. Undoubtedly, further research into both factors in the reverse logistics system are required.

Cameron Sinclair said: "It angers me when sustainability gets used as a buzzword. For 90% of the world, sustainability is a matter of survival" (CNN, 2008). Industry ecological support is a concept that sustainability should be given more attention, and more effort should be made to achieve it. Many studies have agreed that reverse logistics is a part of sustainability (Ali et al., 2018; Banihashemi et al., 2019; Carter & Easton, 2011). This study is a stepping stone towards pursuing a sustainable solution by investigating reverse logistics in omnichannel firm performance.

### Practical Implications

Previous literature has discovered an increasing trend in omnichannel, with many studies focusing on supply chain management but overlooking reverse logistics. Similarly, a finite number of empirical research resolves the practicality of reverse logistics systems in an omnichannel context. In Malaysia, regulators such as the Malaysian Digital Economy Corporation (MDEC) and Retail Group Malaysia encouraged entrepreneurs to participate in the development of an omnichannel business environment. However, omnichannel companies have faced a massive amount of returned goods via different channels. Accordingly, due to difficulties in managing reverse logistics, 5 billion pounds of waste is generated through omnichannel returns (Constable, 2019).

Based on the outcomes of this study, managers and related practitioners may be able to manipulate reverse logistics systems to improve firm performance. From a practical perspective, omnichannel companies, including retailers, manufacturers, and logistics service

Universiti Utara Malaysia

providers, can design systematic reverse logistics programs to help their companies to perform better. Reverse logistics is one of the critical functions in company operations and improving the relationship between stakeholders and entrepreneurs to benefit both mutually. Relevant entrepreneurs should develop more effective and efficient programs to support the reverse supply chain by including both firm and task environment aspects to boost performance.

Companies operating in an omnichannel business environment may refer to this framework for competitive advantages. The present reverse logistics programs, such as flexible channels for returning goods, can be modified or fortified for companies to move forward. Furthermore, this study could provide guidelines for companies to gain a competitive advantage by proficiently developing their reverse logistics programs. This research is especially important in Malaysia for entrepreneurs who want to start operating in an omnichannel environment. Since inefficient reverse logistics may negatively impact firm performance, omnichannel companies must be proactive in planning reverse logistics systems.

Universiti Utara Malaysia

This research also contributes to society by encouraging companies to practice efficient reverse logistics. Previously, companies implemented reverse logistics programs in order to comply with government regulations (Abdullah & Yaakub, 2015). However, this study found that omnichannel companies gain from better performance by reverse logistics that conform with customers and suppliers. Hence, omnichannel companies should take the initiative to advance their reverse logistics system to align firm factors with other stakeholders. Apart from presenting statistical evidence on the outcome of the reverse logistics system, this study demonstrated the importance of flexibility, collaboration, customers and suppliers that support firm performance. Management is encouraged to design a flexible and high degree of collaboration reverse logistics system as this will improve operational efficiency in the return stages, including gatekeeping, collection, sortation and disposal. Additionally, logistics managers should always conform to customer and supplier requirements when handling reverse flows that improve company performance.

Therefore, the outcomes of this study are useful for designing sustainable reverse logistics for handling returns by taking into account the determinant factors that can enhance firm performance (Hübner et al., 2016). Incremental improvements in reverse logistics performance can lead to enhanced sustainability of omnichannel companies via reducing inventory waste, improving profitability, improving reputation, improving customer relationships, reducing carbon footprints, and reducing natural resource depletion. Planning an omnichannel reverse logistics system for firm and task environment factors proposed in this research would be helpful knowledge to practitioners attempting to pursue sustainability in the business ecosystem. This study can dispel managers' concerns about implementing a reverse logistics system to manage reverse flows in omnichannel businesses. By referring to the omnichannel reverse logistics framework, logistics managers are able to handle a vast number of returned goods that improve firm performance. The next section discusses the limitations of this study and potential improvements for future studies.

## Limitations and Future Implications

This research empirically demonstrated the interaction between firm and task environment factors in reverse logistics towards omnichannel companies. Nevertheless, the limitations in this study should be addressed in future studies. The duration for data collection in this study was short, ranging from 6 to 10 months. A finding based on longitudinal and multiple intervals research would be more robust and accurate. In longitudinal research, findings could be more clearly explored and explained in terms of how, when, and why firm and task environment factors can help boost firm performance.

The study's conceptual framework was convergent from many previous theories. This research revealed the factors that have become increasingly important in today's reverse logistics system, such as customer and flexibility. However, other factors that could better explain the relationship between reverse logistics systems and omnichannel firm performance could be included in the framework. Future studies could investigate other factors within the firm and task environment context to boost firm performance. This framework could serve as a guideline for other researchers looking into the other predictors in the reverse logistics system.

This study on omnichannel firm performance is limited to nine anteceding variables within the reverse logistics system, and one outcome variable. The findings of this study revealed only 40% of the variance in omnichannel firm performance. However, this study is only focused on the factors within the reverse logistics system. Future study should be expanded to analyze the influence of other predictors, such as warehouse management systems (Hübner et al., 2016), last-mile distribution (Rai et al., 2018) and information systems (Mahindroo et al., 2018a).

Lastly, this research was conducted in Malaysia, with data collected from Malaysian entrepreneurs. The generalization of the results was robust in the Malaysian context. The final goal of this study was to develop a strong theoretical framework for omnichannel companies in Malaysia. However, a sound theoretical framework should be capable of being applied generally in different populations. Hence, further studies could be replicated in other contexts to investigate the framework further. This research provides an opportunity for other researchers to explore the omnichannel reverse logistics system from various perspectives, including different countries and cultures. As a result, the theoretical framework can be further refined and extended.

## Conclusion

This study develops an omnichannel reverse logistics framework that could help companies implement an excellent reverse logistics system. This study proved that both firm and task environment factors in reverse logistics systems are effective in the omnichannel environment. Brodin said: "Ethical business, sustainable business is the only way to do business in the future. Ethics need to be not just on the surface but in everything you do." (INGKA Group, 2020). The CEO and president of the INGKA group supported that businesses in the omnichannel ecosystem will be more dependent on sustainable practices to thrive. Sustainability should be one of the main objectives of every company in their operations. A good reverse logistics system could assist companies in pursuing sustainability.

Universiti Utara Malaysia

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# Appendix A

## Literature studying reverse logistics system

| References | Topic | Key findings | Factors considered |
|---|---|---|---|
| (Richey et al., 2005) | The Role of Resource Commitment and Innovation in Reverse Logistics Performance | Innovation is mediator for resources commitment and reverse logistics performance in large company. | Resources commitment<br>Innovation |
| (Jack et al., 2010) | Reverse Logistics Capabilities: Antecedents and Cost Savings | Resource commitments and contractual obligations would be positively influence reverse logistics capabilities.<br>Customer opportunism also positively influence reverse logistics capabilities.<br>Reverse logistics capabilities partially mediates the relationship between resource commitments, contractual arrangements, and reverse logistics cost savings. | Customer Orientation<br>Customer opportunism<br>Resources Commitments<br>Contractual Arrangements |
| (Huscroft, 2010) | The Reverse Logistics Process in the Supply Chain and Managing Its Implementation | Information system would positively influence the ability of cost saving and process innovation. | Information System Technology |
| (Eltayeb & Zailani, 2011) | Drivers on the RL: Evidence from Malaysia Certified Companies | Low level of RL in Malaysia Firms and companies take part in reverse logistics to obtain business benefits | Regulatory<br>Social Responsibility<br>Customer Pressure<br>Expected Business Benefits |
| (Ho et al., 2012) | Factors Influencing Implementation of Reverse Logistics: A Survey Among HK Business | RL Implementation significant with<br>1)Background Information<br>-Number of Staff<br>3)Perceptions of RL<br>-Benefits<br>4)Company Support<br>-Finance<br>-Resources<br>-Human Resources | Expected Business Benefits<br>Internal Department<br>Business partners |

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| | | | |
|---|---|---|---|
| | | 5)Business Partners in Supply Chain<br>-Qualification and Support of Partners<br>-Cooperation and Relation with Partners | |
| (Mai et al., 2012) | The Role of Return Management Orientation, Internal Collaboration and Information Support in Revere Logistics | The Role of Return Management Orientation, Internal Collaboration and Information Support are important to influence reverse logistics implementation | Return Management Orientation<br>Internal Collaboration<br>Information Support |
| (Škapa, 2012) | Reverse Logistics: Relationship between Planning, Strategy and Profitability | Strategy orientation and formalization are important for process effectiveness in reverse logistics system | Strategy Orientation<br>Formalization |
| (Huang & Yang, 2014) | Reverse Logistics Innovation, Institutional Pressure and Performance | Institutional pressure is important for process effectiveness in reverse logistics system. At the same time, it would improve company performance. | Regulatory<br>Competitor<br>Customer |
| (Huscroft et al. 2013) | Task Technology Fit for Reverse Logistics Performance | IS Compatibility not significant, IS use and RL technology Innovativeness significant for cost effectiveness while IS use not significant, IS compatibility and RL technology Innovativeness significant for process efficiency | Technology<br>Information System |
| (Ye et al., 2013) | The impact of institutional pressures, top managers' posture and reverse logistics on performance—Evidence from China | Top mangers' posture is the mediator of the relationship between institutional pressures government, customer and competitor and RL implementation. RL will increase performance | Regulatory<br>Competitor<br>Customer<br>Top managers' posture |
| (Abdullah & Yaakub, 2015) | RL: Pressure for Adoption and The impact on Firm Performance | Regulatory pressure and demanding customer pressure significant to reverse logistics | Financial and Competitive Pressure<br>Demanding Customer's Pressure<br>Regulatory |

| | | | |
|---|---|---|---|
| | | | Pressure<br>Corporate Citizenship Pressure |
| (Jeszka, 2014) | Product Return Management in the Clothing Industry in Poland | 1)Cooperation with suppliers and logistics operator's significance to savings<br>2)Computerisation of return handling significance to savings<br>3)Employees' experience and competences significance to savings and return management | Supplier<br>Computerisation<br>Employee |
| (Morgan et al., 2016) | Developing a Reverse Logistics Competency: The Influence of Collaboration and Information Technology | Collaboration and information system are important to reverse logistics competency and logistics Performance | Collaboration<br>Information system |
| (Vlachos, 2016) | Reverse logistics capabilities and firm performance: the mediating role of business strategy | It was close-loop capability, derived from the resource-based view of firm theory,<br>which had the highest effect on all three performance variables and particularly on cost and customer<br>satisfaction. | Supplier integration<br>Coordination<br>Incentives<br>Conformability |
| (Mahindroo et al., 2018a) | Moderated influence of return frequency and resource commitment on information systems and reverse logistics strategic performance | Information system and resources commitment were important for reverse logistics to improve performance. | Information system<br>Resources commitment |
| (Škapa & Klapalová, 2019a) | The Effectiveness of Reverse Logistics: The Empirical Test of Its Factors for Product Returns Reduction | Planning between supplier is important to improve the performance in reverse logistics. | Formal planning<br>Supplier integration<br>Knowledge management |

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# Appendix B

## Email invitation for participation In interviews

Dear Sir / Madam

The School of Technology Management and Logistics at the University Utara Malaysia is conducting a research project studying the effectiveness and efficiency of reverse logistics in omnichannel companies. You are invited to participate in an interview session which maximum 1 hour per session. The purpose of this interview is to understand the relationship between reverse logistics and omnichannel firm performance.

We would appreciate your views on the issues and your support is important for a better understanding of reverse logistics in Malaysia omnichannel companies.

Respondents' responses are voluntary and will be confidential. All responses will be kept strictly anonymous. Only the research team will view any of responses.

If you have any questions or concerns, please contact Yee Jing Foo, Researcher for this project under the supervision of Dr. Emy E. A.Jalil, at tel. (mob) 016-5105101 or email yee_jing_foo@oyagsb.uum.edu.my or yeejingfoo92@gmail.com.

Thank you for your kind consideration and attention.

Best Regards

Mr. Yee Jing Foo

PhD Candidate

School Of Technology Management & Logistic [STML]
University Utara Malaysia
Sintok
06010 Bukit Kayu Hitam
Kedah

Universiti Utara Malaysia

## Consent Form

I, of

**Hereby agree** to be a participant in this study to be undertaken

By *Yee Jing Foo*

And I understand that the purpose of the research is ***to understand relationship between*** r***everse logistics and omnichannel firm performance***

**I understand that**

1. The aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2. I voluntarily and freely give my consent to my participation in such research study.

3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

4. Individual results will not be released to any person except at my request and on my authorisation.

5. I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Signed:

Date:

The contact details of the researcher are:

Tel. (mob) 016-5105101 or yee_jing_foo@oyagsb.uum.edu.my or yeejingfoo92@gmail.com.

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## Interview Protocol

In this research, we assess the effectiveness and efficiency of reverse logistics systems and omnichannel firm performance. It aims to reveal how factors associated with reverse logistics systems affect omnichannel firm performance. So, the information you provide in this interview will be used to reveal and explain the influence of reverse logistics factors on the omnichannel firm performance. All your answers will be kept confidential; no-one will be able to identify you from your responses.
The interview takes less than 20 minutes.

Before we start, I would like to clarify that this interview will be conduct in condition of anonymous to ensure ethical consideration. So, this interview would not request for any information that will direct revealed your identity and your identity will be keep in confidential. I will be recording this conversation as a record for my research purpose.

Interviewer Name: ……………………………………………………….
Date: …………………………………………………………………………

Demographic Background (For Interviewee)

| | |
|---|---|
| Position | |
| Company Role | |
| Working Experience | |
| Company Name | |

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## Template used for call for participation either online or postal

The School of Technology Management and Logistics at the University Utara Malaysia is conducting a research project studying the effectiveness and efficiency of reverse logistics in omnichannel companies. We would appreciate your company's views on the issues and therefore request the related person in charge for return process to complete this questionnaire.

Please complete the questionnaire at your earliest convenience or complete it in online at https://forms.gle/mSpqoktyXcf4QwD79. Your assistance is critical for a better understanding of reverse logistics in omnichannel companies.

Besides that, your company are invited to participate in an interview session which maximum 1 hour per session. The purpose of this interview is to understand the relationship between reverse logistics and omnichannel firm performance.

Your responses are voluntary and will be confidential. All responses will be kept strictly anonymous. Only the research team will view any of the responses.

If you have any questions or concerns, please contact Yee Jing Foo, Researcher for this project under the supervision of Dr. Emy E. A.Jalil, at tel. (mob) 016-5105101 or email yee_jing_foo@oyagsb.uum.edu.my or yeejingfoo92@gmail.com.

We appreciate you taking the time to complete the survey and thank you for your consideration.
Yours sincerely,

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# Appendix C

## Questionnaire used for online and email distribution

Dear Respondents,

You are invited to participate in this survey to gather information about your perceptions of company's reverse logistics system. You will be given 10minutes to complete this questionnaire. The purpose of this study is to investigation the relationship between reverse logistics system and omnichannel firm performance. The information obtained will be used for our research in the completion of PhD. Your responses are voluntary and will be confidential. Responses will not be identified by any individual.

Group Member's Name:

1) YEE JING FOO (904027)

Supervisor Name: Dr. Emy Ezura A. Jalil

**Some details about you. Fill in this section for background information.**

1. Please indicate the core function of your company. *

   *Mark only one oval.*

   - ◯ Selling products through internet platform or physical store *Skip to question 2*
   - ◯ Produce goods and products for sales *Skip to question 9*
   - ◯ Providing logistics service to other parties *Skip to question 16*

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**Retailer Firm Background**

Some details about you. Fill in this section for background information.

2. Are your firm selling goods or services through online channels? *

   *Mark only one oval.*

   - ◯ Yes *Skip to question 21*
   - ◯ No

3. Are your firm collects products from customers? *

*Mark only one oval.*

- ( ) Yes    *Skip to question 21*
- ( ) No

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4. Current working position *

*Mark only one oval.*

- Top Management
- Senior Manager
- Manager
- Senior Executive
- Executive
- Non-Executive
- Other

5. Working Experience in supply chain related job scope: *

*Mark only one oval.*

- 1 - 5 years
- 6 - 10 years
- 11 – 15 years
- 16 - 20 years
- 21 - 30 years
- above 31 years

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6. Number of employees in your company: *

*Mark only one oval.*

- below 5 employees
- 5 - 29 employees
- 30 - 74 employees
- above 75 employees

7. Is your firm providing free returns for customers? *

*Mark only one oval.*

- Yes
- No

8. Which parties handling returns management? *

*Mark only one oval.*

- Internal
- Third Parties

*Skip to question 21*

## Manufacturer Firm Background

Some details about you. Fill in this section for background information.

9. Are your firm connecting to customers through internet? *

*Mark only one oval.*

- Yes *Skip to question 21*
- No

10. Are your firm collects products from customers? *

*Mark only one oval.*

- Yes *Skip to question 21*
- No

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11. Current working position *

*Mark only one oval.*

- Top Management
- Senior Manager
- Manager
- Senior Executive
- Executive
- Non-Executive
- Other

12. Working Experience in supply chain related job scope: *

*Mark only one oval.*

- 1 - 5 years
- 6 - 10 years
- 11 – 15 years
- 16 - 20 years
- 21 - 30 years
- above 31 years

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13. Number of employees in your company: *

*Mark only one oval.*

- below 5 employees
- 5 - 75 employees
- 75 - 200 employees
- above 200 employees

14. Is your firm providing free returns for customers? *

*Mark only one oval.*

- Yes
- No

15. Which parties handling returns management? *

*Mark only one oval.*

- Internal
- Third Parties

*Skip to question 21*

LSP Firm Background

Some details about you. Fill in this section for background information.

16. Are your firm providing services to fulfill online orders *

*Mark only one oval.*

- Yes
- No

17. Are your firm collects products from customers *

*Mark only one oval.*

- Yes
- No

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18. Current working position *

*Mark only one oval.*

- Top Management
- Senior Manager
- Manager
- Senior Executive
- Executive
- Non-Executive
- Other

19. Working Experience in supply chain related job scope: *

*Mark only one oval.*

- 1 - 5 years
- 6 - 10 years
- 11 – 15 years
- 16 - 20 years
- 21 - 30 years
- above 31 years

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20. Number of employees in your company: *

*Mark only one oval.*

- below 5 employees
- 5 - 29 employees
- 30 - 74 employees
- above 75 employees

Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

**Top Management Support**

21. Our top managers recognize the importance of returns management implementation. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

22. Our top managers proactively support returns management implementation. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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23. Our top managers are willing to invest resources needed to implement returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

24. Our top managers have a substantial influence on our company's returns management implementation. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

## Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

### Formalization

25. The job description of related practitioners in returns management is clearly stated. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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26. The hierarchy of authority in returns management is clearly stated. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

27. The standard operating procedures (SOP) in returns management is clearly stated. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

28. There are standard methods for employees to transfer information to other relevant person. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

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**Flexibility**

29. My company has ability to handle difficult and nonstandard return request. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

30. My company has ability to authorize and perform special requests made by customers. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

31. My company has ability to cover and handle different volume of returns no matter small or large capacities. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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32. My company has ability to cover and handle return request from different channels. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

Information System

33. Information systems enable sharing information with all departments inside the company. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

34. Information systems enable planning of return effectively. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

35. Information systems enable faster product return handling in my company. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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36. Information systems enable us to track products easily. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

37. Information systems reduce errors while handling the transactions during the product return process. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

## Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

### Collaboration

38. Different departments in my company work together to achieve goals of returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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39. Different departments in my company have a mutual understanding of responsibilities in returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

40. Different departments in my company work together as a team in returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

41. Different departments in my company conduct joint planning to anticipate and solve operational problems for returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

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Customer

42. My firm adopt returns management to fulfill the requirement of most of the customers. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

43. My firm adopt returns management due to protect consumer rights by government. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Strongly Agree |

44. My firm design returns management operations based on customer information and requirement. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Strongly Agree |

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45. My firm had a good sense of how our customers value our services. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Strongly Agree |

46. My firm believes that this business exists to serve customers. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Strongly Agree |

47. The Intense competition had strong pressure on our company's returns management strategies. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | Strongly Agree |

48. Our competitors' earlier implementation of returns management provides a benchmark and guidance for our company's returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | Strongly Agree |

49. Competitors have a strong influence on our company's returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | Strongly Agree |

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50. Competitors with well-developed returns management are perceived favorably in our industry. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | Strongly Agree |

51. Our competitors are using returns management to their advantage. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

Regulator

52. Through collection of returns, my firm tries to reduce or avoid the threat of current government legislations. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

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53. Through collection of returns, my firm tries to reduce or avoid the threat of future government legislations. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

54. Regulations in other countries, such as Europe, Japan and USA, induced my firm to collect rejected products. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

55. There are a large number of regulations or restrictions imposed by the government on my firm's industry. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

## Reverse Logistics System

Reverse logistics is all the process of collecting rejected goods or products from the consumers. The statements below are concerned about returns management system. Please read the following statements and indicate your views based on the scale below.

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### Supplier

56. There are well defined goals, scope and responsibilities between supplier and our company in returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

57. We maintain cooperative long term relationships with our suppliers in returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

58. Our managers participate in joint planning sessions with suppliers in returns management. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

59. My company effectively shares returns information externally with suppliers. *

*Mark only one oval.*

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| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

60. My company experiences improved performance by integrating returns management with supplier. *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Omnichannel Firm Performance

Please indicate the extent to which your company has achieved the following improvement through returns management.

61. Please indicate the extent to which your company has achieved the following improvement through returns management. *

*Mark only one oval per row.*

| | Strongly Disagree | Disagree | Slightly Disagree | Neutral | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| Achieve cost reduction | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |
| Environmental regulatory compliance | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |
| Improve customer relationship | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |
| Improve profitability | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |
| Reduced inventory cost or investment | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |
| Improve company's reputation | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ | ⬭ |

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# Appendix D

## Email invitation for participation in focus group

Dear Sir / Madam

The School of Technology Management and Logistics at the University Utara Malaysia is conducting a research project studying the effectiveness and efficiency of reverse logistics in omnichannel companies. You are invited to participate in a focus group which approximately 1 hour per session. The purpose of this focus group is to understand the relationship between reverse logistics and omnichannel firm performance.

We would appreciate your views on the issues and your support is important for a better understanding of reverse logistics in Malaysia omnichannel companies.

Respondents' responses are voluntary and will be confidential. All responses will be kept strictly anonymous. Only the research team will view any of responses.

If you have any questions or concerns, please contact Yee Jing Foo, Researcher for this project under the supervision of Dr. Emy E. A.Jalil, at tel. (mob) 016-5105101 or email yee_jing_foo@oyagsb.uum.edu.my or yeejingfoo92@gmail.com.

Thank you for your kind consideration and attention.

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Best Regards

Mr. Yee Jing Foo

PhD Candidate

School Of Technology Management & Logistic [STML]
University Utara Malaysia
Sintok
06010 Bukit Kayu Hitam
Kedah

## Consent Form

I, of

**Hereby agree** to be a participant in this study to be undertaken

By *Yee Jing Foo*

And I understand that the purpose of the research is ***to understand relationship between*** r***everse logistics and omnichannel firm performance***

**I understand that**

1. The aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2. I voluntarily and freely give my consent to my participation in such research study.

3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

4. Individual results will not be released to any person except at my request and on my authorisation.

5. I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Signed:

Date:

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The contact details of the researcher are:

Tel. (mob) 016-5105101 or yee_jing_foo@oyagsb.uum.edu.my or yeejingfoo92@gmail.com.

## Discussion guide used for focus group

| Explanation | |
|---|---|
| A. Introduction | i. My name Jing Foo. I would like to thank you for your willingness to take part in this interview for my research project.<br>ii. Once again, I am PhD student of Universiti Utara Malaysia (UUM). I am conducting a research to look into the reverse logistics system in omnichannel environment. This particular interview is important to explore the reverse logistics system in your company that would likely to provide a comprehensive understanding of reverse logistics management.<br>iii. I have several questions that related to the reverse logistics system. When you answer, please express your thoughts and concerns about each of the questions or statements or any other related issues. You view and ideas are very important to us. |
| B. Preliminary Procedures | i. Please remember that there are no right or wrong answers to any of these questions. Please feel free to state your own viewpoints, feelings and personal experiences.<br>ii. The more intel we get from you, the more it will help us develop a better framework to help the community.<br>iii. All comments are welcomed, both positive and negative. If you don't have an answer or do not understand the question, it is okay to tell me so. |
| C. Procedure | i. Before we start, I would like to clarify that this dicussion will be conduct in condition of anonymous to ensure ethical consideration.<br>ii. So, this discussion would not request any information that will directly reveal your identity and your identity will be kept confidential. I will be recording this discussion as a record for my research purpose.<br>ii. As mentioned previously, this is an discussion for my PHD research in reverse logistics so I would more focusing on the return management in your company. So, we are going to start the discussion now. |
| **Discussion Questions for RQ1** | |
| D1: From the internal of reverse logistics system, research has shown top management support, formalisation, flexibility, information system and collaboration will influence firm performance. Do you agree? | |
| D2: For external of reverse logistics, reverse logistics system that conforms with customer, supplier, regulator and competitor will influence firm performance. Do you agree? | |
| **Discussion Questions for RQ2** | |
| D1: If top management aware about reverse logistics, it will improve firm performance. Do you agree? | |
| D2: Firm performance will drop if the reverse logistics system is informal. Do you agree? Why? | |
| D3: If the reverse logistics system is flexible, firm performance will improve. Do you agree? Why? | |
| D4: Firm performance will increase if a good information system is installed for the reverse logistics system. Do you agree? Why? | |
| D5: Do you agree that good teamwork between different departments in reverse logistics process will improve firm performance? Why? | |

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| |
|---|
| D6: Do you agree that good relationship with suppliers in reverse logistics system will improve firm performance? Why? |
| D7: Company can increase performance by conform to the customer requirement. Do you agree? |
| D8: If company could fulfil regulator requirement from the aspect of reverse logistics, it will improve firm performance. Do you agree? Why? |
| D9: Company performance will improve if they take competitor into consideration. Do you agree? |
| **Discussion Questions for RQ3** |
| D1: In the reverse logistics system, the element of flexibility, collaboration between team, supplier and customer is important to improve firm performance. Do you agree? |
| Closing |
| i. Any additional information on return management that you want to share with me?<br>ii. So, I think that all the questions. Thank you for the assistance. The information that you have provided is important. You have been very helpful to this study. Thank you again. |

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# Appendix E

## Open structure interview guideline

| Explanation | |
|---|---|
| A. Introduction | i. My name Jing Foo. I would like to thank you for your willingness to take part in this interview for my research project.<br>ii. Once again, I am PhD student of Universiti Utara Malaysia (UUM). I am conducting a research to look into the reverse logistics system in omnichannel environment. This particular interview is important to explore the reverse logistics system in your company that would likely to provide a comprehensive understanding of reverse logistics management.<br>iii. I have several questions that related to the reverse logistics system. I hope you can express and describe the reverse logistics system in your company. Your perception are very important to this study. |
| B. Preliminary Procedures | i. Please remember that there are no right or wrong answers to any of these questions. Please feel free to state your own viewpoints, feelings and personal experiences.<br>ii. The more intel we get from you, the more it will help us develop a better framework to help the community.<br>iii. All comments are welcomed, both positive and negative. If you don't have an answer or do not understand the question, it is okay to tell me so. |
| C. Procedure | i. Before we start, I would like to clarify that this interview will be conduct in condition of anonymous to ensure ethical consideration.<br>ii. So, this interview would not request any information that will directly reveal your identity and your identity will be kept confidential. I will be recording this conversation as a record for my research purpose.<br>ii. As mentioned previously, this is an interview for my PHD research in reverse logistics so I would more focusing on the return management in your company. So, can we start now? |
| **Interview Questions** | |
| Demographic | i. Which company u working now? As what positions?<br>ii. How many years have you worked?<br>iii. What is the main business of your company in the market?<br>iv. Is your company involved in using online channels?<br>v. Is your company allow for return? What kind of returns? |
| Reverse Logistics System | i. Can you explain the return process in your company in details from the beginning till the end?<br>ii. Is the return management will improve your company performance? How? |
| Follow up questions for each | i. As you mentioned 'factor', can you discuss more? |

| | |
|---|---|
| factor that mentioned by interviewees and prior studies<br>-Formalization<br>-Flexibility<br>-Top management Support<br>-Information System<br>-Collaboration<br>-Supplier<br>-Customer<br>-Competitor<br>-Regulator | ii. As you mentioned 'factor', how it influence return management?<br>iii. As you mentioned 'factor', how it improve firm performance?<br>iv. How the 'factor' influence reverse logistics system?<br>v. How the 'factor' in reverse logistics system improve performance? |
| Closing | |
| i. Any additional information on return management that you want to share with me?<br>ii. So, I think that all the questions. Thank you for the assistance. The information that you have provided is important. You have been very helpful to this study. Thank you again. | |

## The summary of interviews

| Interview Summary | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding to the interviews: Interviewees requested to describe the reverse logistics programs in their company. Most of the discussion were heavier on the return management, which handling the returns from customers. All of them agreed that return management was important in their company. It is key operation in their company to improve company performance. The characteristics and elements of reverse logistics system were identified and summarized below: | | | | | | | | | | | |
| Themes Identified /Interviewees | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 |
| <u>Top Management Support</u> | | | | | | | | | | | |
| Attitude | | | | 1 | 1 | | | | 1 | | |
| Decision Making | | 1 | 1 | | 1 | | | 1 | | 1 | |
| Commit Resources | | 1 | | | | 1 | | | | | 1 |
| Involvement | | | 1 | 1 | 1 | | | 1 | 1 | | |
| <u>Formalization</u> | | | | | | | | | | | |
| Standard Operation Procedure | 1 | 1 | | 1 | | | 1 | 1 | 1 | 1 | 1 |
| Return Policies | 1 | | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Goal setting | | 1 | | | | | 1 | 1 | | 1 | 1 |
| <u>Flexibility</u> | | | | | | | | | | 1 | |
| Product | | 1 | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 |
| Volume | | 1 | 1 | | | | 1 | | | | |
| Equipment | | 1 | 1 | | | | | 1 | | | |
| Labour | | | 1 | | | 1 | | | | | |
| Channel | | | | 1 | 1 | 1 | 1 | | 1 | 1 | 1 |
| Scheduling | | 1 | 1 | 1 | | 1 | 1 | | | 1 | 1 |
| <u>Information System</u> | | | | | | | | | | | |
| Tracking | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Communication Tool | | 1 | | | | | 1 | | | 1 | 1 |
| Data recording | | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| <u>Collaboration</u> | | | | | | | | | | | |
| Process flow through different | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| departments | | | | | | | | | | | |
| Information sharing | 1 | 1 | | | | | | | 1 | 1 | 1 |
| Process coordination | | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <u>Supplier</u> | 1 | | | | | | | | | | |
| Return policy | 1 | | | | | 1 | | | | 1 | |
| Contractual agreement | | | 1 | 1 | | 1 | | | 1 | | 1 |
| Intregation & communication | 1 | 1 | | 1 | | | 1 | 1 | 1 | 1 | 1 |
| <u>Regulator</u> | | | | | | | | | | | |
| Law Regulations | | 1 | | | | 1 | 1 | 1 | | 1 | 1 |
| Environmental Issues | | 1 | | | | | | | | | |
| <u>Customer</u> | | | | | | | | | | | |
| Liberal Return Policy | | | | 1 | | 1 | | | | 1 | |
| Customer service | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Environmental Issues | | 1 | | | | | | | 1 | | |
| <u>Competitor</u> | | | | | | | | | | | |
| Intense Competition | | | | | | | | 1 | | | |
| Compete with other competitor | 1 | 1 | 1 | 1 | | 1 | | 1 | | 1 | 1 |
| Imitating strategies | | | | | | | | 1 | | 1 | 1 |
| <u>Improved omnichannel firm performance</u> | | | | | | | | | | | |
| Cost Reduction | | 1 | 1 | 1 | | | | 1 | 1 | 1 | |
| Environmental regulatory compliance | | | | | | 1 | | | | | |
| Improve customer relationship | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Improve profitability | 1 | | | | | 1 | | 1 | | | |
| Reduce inventory cost & investment | | | | | | | | | 1 | | |
| Improve reputation | | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |

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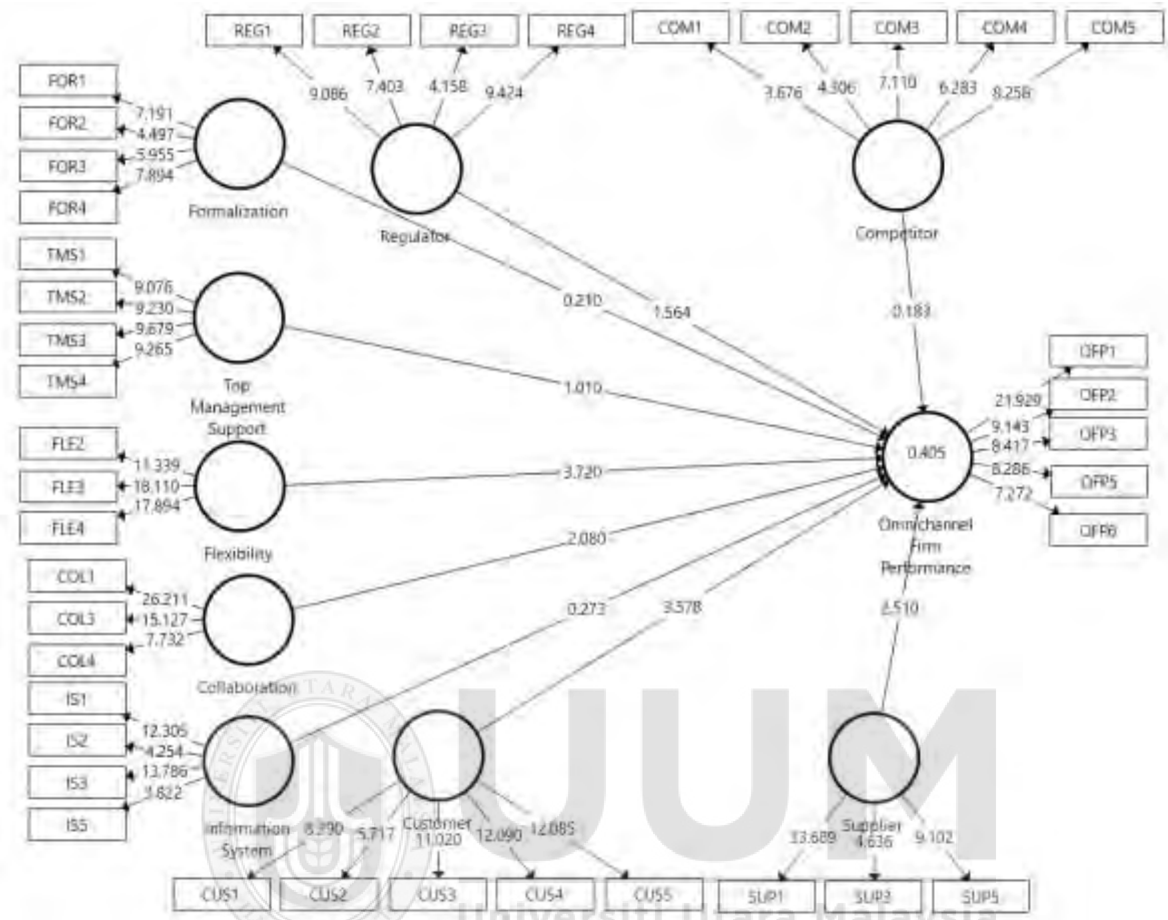
# Appendix F

PLS-SEM Measurement Model

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## Appendix G

The Tabulation of response using Micro-interlocutor Analysis (Onwuegbuzie et al., 2010)

| Research questions with Discussion Item | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Discussion Questions for RQ1** | | | | | | | | | | | | |
| D1: From the internal of reverse logistics system, research has shown top management support, formalisation, flexibility, information system and collaboration will influence firm performance. Do you agree? | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4.1 |
| D2: For external of reverse logistics, reverse logistics system that conforms with customer, supplier, regulator and competitor will influence firm performance. Do you agree? | 4 | 4 | 4 | 3 | 4 | 3 | 5 | 4 | 4 | 4 | 5 | 4.0 |
| **Discussion Questions for RQ2** | | | | | | | | | | | | |
| D1: If top management aware about reverse logistics, it will improve firm performance. Do you agree? | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 5 | 3.9 |
| D2: Firm performance will drop if the reverse logistics system is informal. Do you agree? Why? | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 4.4 |
| D3: If the reverse logistics system is flexible, firm performance will improve. Do you agree? Why? | 5 | 3 | 4 | 3 | 5 | 3 | 5 | 5 | 3 | 4 | 5 | 4.1 |
| D4: Firm performance will increase if a good information system is installed for the reverse logistics system. Do you agree? Why? | 3 | 4 | 4 | 4 | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 4.3 |
| D5: Do you agree that good teamwork between different departments in reverse logistics process will improve firm performance? Why? | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 5 | 5 | 4 | 5 | 4.1 |
| D6: Do you agree that good relationship with suppliers in reverse logistics system will improve firm performance? Why? | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 3 | 5 | 3 | 4.3 |
| D7: Company can increase performance by conform to the customer requirement. Do you agree? | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 3 | 5 | 4.2 |
| D8: If company could fulfil regulator requirement from the aspect of | 4 | 4 | 5 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 3.5 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| reverse logistics, it will improve firm performance. Do you agree? Why? | | | | | | | | | | | | |
| D9: Company performance will improve if they take competitor into consideration. Do you agree? | 4 | 4 | 4 | 4 | 4 | 3 | 5 | 5 | 5 | 4 | 3 | 4.1 |
| **Discussion Questions for RQ3** | | | | | | | | | | | | |
| D1: In the reverse logistics system, the element of flexibility, collaboration between team, supplier and customer is important to improve firm performance. Do you agree? | 3 | 4 | 4 | 1 | 3 | 4 | 5 | 5 | 4 | 4 | 5 | 3.8 |

| Code | |
|---|---|
| SA= Illustrate supporting critical examples or statements that agree with the discussion | 5 |
| A = Agree with discussion in verbal or nonverbal | 4 |
| NR= Did not comment agree or disagree (no response) | 3 |
| D = Disagree with the discussion in verbal or nonverbal | 2 |
| SD= Illustrate supporting critical examples or statements that disagree with the discussion | 1 |

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