



SUSTAINABLE LOGISTICS & TRANSPORTATION

BOOK CHAPTERS

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PREFACE

This book pursues to present final year projects (FYP) on Sustainable Logistics and Transportation operations within a supply chain that undergraduate students are doing. It provides insight into the students' critical thinking, the lessons learnt, and insights gained from the knowledge of a logistics sustainability perspective in everyday life. Sustainability is very important nowadays as it supports Sustainable Development Goals (SDGs) by striving to improve the environmental health and quality of life for the survival of companies, community, and country. Sustainable logistics and transportation refer to producing and sustainably distributing goods, taking into account environmental, financial and social factors. When put together, the two words suggest an environmentally friendly and efficient transport and distribution system.

The goal of a sustainable logistics system is to improve profitability and reduce environmental impact for long-term performance. The sustainable logistics system considers three aspects essential for a logistics system: economics, the environment, and social. It is similar to green logistics but focuses primarily on material handling, waste management, packaging, and transport. As the focus on supply chain sustainability increases, companies pay more attention to their warehousing, logistics, and transportation role in the overall picture of sustainability. It is well acknowledged that with Sustainable Logistics and Transportation, the managing, coordinating and monitoring resources needed to move products will be more smooth, timely, cost-effective and in a reliable manner towards environmental, financial and social factors. Thus, the recommendation may reflect current and future generations awareness of sustainability issues, especially in logistics.

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THE PERFORMANCE MANAGEMENT WAREHOUSE OPERATION AMONG SMALL AND MEDIUM ENTERPRISES (SMES) IN BATU PAHAT, JOHOR DARULTAKZIM

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INTRODUCTION

Background of study

The field of logistics has grown rapidly in recent years, and this has become an important factor for the competitiveness of companies (Guarnieri et al, 2006). According to the development of the world of logistics, make sure there are improvements in this field, whether the transport or warehousing sector. This is to ensure that they can reach the maximum level of effectiveness and efficiency. This means that companies continue to strive to improve their services to the satisfaction of their customers, entering a more intense competition with other companies in the industry that can offer a better service in a shorter period of time. Logistics involves not only the magnitude of businesses, but this field can be seen in all sectors, whether small or large. The name of the Small and Medium Enterprises (SMEs) is no stranger to being heard in Malaysia. This company is very well known among small entrepreneurs whether in the city or in the countryside. The government also provides a lot of assistance to new entrepreneurs who want to venture into this field either in terms of financial assistance or skills courses. A strong organizational structure as well as operational skills whether inventory management or skilled workers can help an enterprise to grow more advanced and good.

The warehouse performance measurement standard involves efficiency, speed, productivity, versatility, reliability, and time associated with few internal as well as external variables (Saleheen, 2014). For 2019, Malaysia's SME GDP increased by 5.8 per cent compared to 6.2 per cent in 2018. However, the performance remained above GDP and Non-Malaysian SMEs which recorded 4.3 per cent and 3.4 per cent respectively. The contribution of SMEs to GDP increased to 38.9 per cent from 38.3 per cent in the previous year. The value added of SMEs at a continuous 2015 price was RM552.3 billion compared to RM522.1 billion in 2018. Nominally, SMEs' GDP recorded RM586.9 billion in 2019 (Department of Statistics Malaysia, 2019). SMEs can be defined as programs that on average receive government support in terms of finance or related courses for their business. In this globalized era, SMEs are still considered important to the economies of both developed and developing countries in this competitive business climate this industry plays an important role in economic growth and can offer more job opportunities (Ladzani & Vuuren, 2002). According to several studies, SMEs help in economic growth, reduce poverty, and create more employment opportunities around the world (Karides, 2005). The warehousing operations sector is not only limited to the storage process

of goods but there are also other processes involved. The basic functions that are already known as a place to store goods, these functions include the management of goods, the process of determining the location of storage and the placement of products. SMEs companies also have a warehousing sector, but not as large as large companies. The warehousing sector of SMEs companies is usually close to their business area.

Nevertheless, there are also entrepreneurs where the area of processing goods before going to the finished goods, the storage area and the business area are the same place, because they only run a small business or are still in the beginning stage. However, they still have a product storage place, where there will be many processes that will be carried out to ensure the smooth operation of the warehouse and further able to improve the performance of warehouses as well as their business.

Problems Statement

The problems and issues on warehouse efficiency are the most major concern for the SMEs while managing their warehouse operation performance. To make sure the warehouse operation runs smoothly and efficiently; the upper management of the company need to make sure the warehouse operation is error free. Issues and challenges affecting warehouse efficiency processes are becoming seriously focused in managing the logistics industries, in which warehousing is part of the major logistics activities in the service providers (Saifudin et al. 2014). Other major activities related are transportation, inventory management, order processing, information system and packaging. Instead, warehousing has been a neglected area of business activity in Malaysia (Rosena, et al. 2008).

Meanwhile, the common problem faced by business company in implementing the smart warehouse is the mindset of companies in trying to salvage the existing warehouse management system that has been long outdated (Luff, 2017). Many companies have sought to less expansive solutions to address their needs but failed to re-evaluate the return of investment that incorporates in upgrading the warehouse software with advanced technology (Krishan & Wahab, 2019). Furthermore, (Chan & Wei, 2017) have conducted a study at manufacturing Small and Medium Enterprises (SMEs) in Batu Pahat, Johor and identify the most common problem faced by the manufacturing SMEs is poor inventory management. Based on Fatoki (2014) study showed that the one of the causes failures of SMEs are from internal factors which is lack of management skills include lack of management experience, lack of functional skills and poor staff training and development and poor attitudes towards customers.

Therefore, this research will be conducted to evaluate the performance management warehouse operation among Small and Medium Enterprises (SMEs) in Batu Pahat, Johor. Several factors have been identified based on several previous studies, which are inventory management, management skills and Warehouse Management System (WMS).

Research Questions (RQs)

1. Does the inventory management can improve the warehouse operations performance?
2. Do the management skills can help in improving the warehouse operations performance?
3. Does the warehouse management system can improve the warehouse operations performance?

Research Objectives (ROs)

1. To identify whether inventory management can improve the warehouse operations performance.
2. To identify whether management skills can help in improving the warehouse operations performance.
3. To find out if warehouse management system can help in improving the warehouse operations performance.

LITERATURE REVIEW

Warehouse Operation Performance among SMEs

The shortened form Small and Medium Enterprise (SMEs) is generally utilized as a part of worldwide associations and in European Union nations, for example, the Unified Countries (UN), the World Bank and the World Exchange Association (WTO). The term small and medium business (SMB) is also established in a few other countries of the world (Syed, Ahmadani, & Shaikh, 2012). The arrangement and meaning of organizations are by and large in view of quantifiable attributes, for example, number of workers, deals volume or worth of assets (Power, Sohal, & Rahman, 2001). Generally, the specific definition for SMEs used by any nation in the world is based on a few unique parameters that include deals or services, number of staff and capital levels (Wong & Aspinwall, 2014). The performance of the firm can be affected by the warehouse operations due to several factors (Ramli, 2017)

SMEs business firms play an essential part in the economy of any nation (Wong & Aspinwall, 2014). In numerous purviews, the SMEs division has pulled in expanding and noteworthy consideration from policy makers. This consideration has concentrated on SMEs improvement, business birth rates and enterprise in the created economies. These economies look to the SMEs part for arrangement of expanded business, financial improvement, and development (Dean & Dalrymple, 2004). The widespread adoption of modern information technology (IT), such as warehouse management systems (WMS), creates new possibilities for optimizing warehouse operations (Ha, 2018).

Inventory Management

An inventory is a list of the items held in stock, but many people use it to mean both the list of items and the stocks themselves (Waters, 2017). Inventory management can be defined as the sum total of those related activities essential for the procurement, storage, sale, disposal or use of material. In addition, according to the to the (Islam, Pulungan & Rochin, 2019) define that the good inventory management is compulsory to maintain material at optimal costs. Furthermore, inventory can define as a list of goods and materials which are available in stock for business (Sharma & Vivek, 2016). To make all the decision making, inventory management is playing a significant role in handling the inventory in a business which is the activities to be carried out, policies of inventory management, and procedures in handling the inventory in order to ensure enough quantity of each item is always kept in the warehouse (Chan, Shiau Wei., 2017). Based on Ooi, Idrus & Abdullah (2017) study they stated that inventory management is always about optimizing the inventory to achieve good firm performance, increase, and effectiveness and increase efficiency. Poor inventory management in production floor will cause excess or shortages of raw material which indirectly impact business performance of the company.

According to Esther (2012), the researcher claimed that effective inventory management system able to reduce the level of difficulties of operations which can lead to the success of an organization such as executing, administrating, and scheduling of distribution and shipping network. Inventory management has been posited as an important function in determining warehouse performance (Baker, 2007). Besides, based on (Kannan & Tan, 2005) mention that inventory management strategy has been discussed among scholars in contemporary supply chains and practitioners have been more concerned about their impact on business performances. Through simulation, previous researcher (VandenBerg, 1999) illustrated that inventory management has been one of the determinants of warehouse efficiency. Likewise, according to Stevenson (2007) speculate that inventory cost component for example holding costs are directly related to warehousing costs, therefore holding lots of inventory comes with more costs for storage and space. Other researcher Gu (2010) also stated that in improving warehouse performance, the trend is to maximize warehouse capacity, which can be achieved, for instance, by the block storing, efficient shelving and palletizing.

Management Skills

Management has long been regarded as the most critical element in maintaining outstanding production standards (Taninecz, 1997). To achieve excellent efficiency, management is important. It is one of the most significant reasons for the acceptance of management practice and this aspect has been unquestionably acknowledged by many scholars (Kasul & Motwani, 1995).

Osman (2007) found that two of the three critical success factors for Tabung Ekonomi Kumpulan Usaha Niaga (TEKUN) are management skills and specialization in job creation. This is in line with a study by Abdullah and Mustapha (2009) who found that business management practices from the perception of successful Bumiputera farmers are at a high level. In contrast to the study found that aspects of knowledge and skills of entrepreneurial management are the main weaknesses of SME entrepreneurs conducted (Salamon & Abu, 2011).

Warehouse Management System (WMS)

According to Dotoli et al. (2015) define that warehouse management system is a database driven computer application, which is used by logistics personnel to improve the efficiency of the warehouse by directing cutaways and to maintain accurate inventory by recording warehouse transactions. The developing role of warehouses centers has significantly affected the improvement of WMS. WMS is an information-based IT instrument used to improve warehouse proficiency by organizing warehouse center activities and to keep up accurate inventory by recording warehouse transactions (Shiau & Lee, 2009). In addition, Jin (2013) states that WMS can reduces the management costs, improves team and equipment usage rates, and shortens workflow. Furthermore, Zhou and Fei (2016) claims the automated warehouse is an important part of the development of the modern logistics system because it generates economy of space and work.

Appropriate and effective use of WMS can increase the effectiveness and productivity of warehouse centers, consequently assisting to accomplish a decrease in organization warehousing costs. Through the overall use of WMS in the logistics industry, one can likewise get a clear picture of the improvement of the warehousing sector. More (2016) stated that a

WMS primarily aims to control the movement and storage of materials within a warehouse and process the associated transactions, including shipping, receiving, put-away and picking. Meanwhile, Sahuri and Utomo (2016) mention that a system based on web service can help small enterprises to improve their warehouse management and business. The main idea of this system is to send information about the stock to the mobile phone through Short Message Service (SMS), it supports faster and easier decision-making because it provides accurate data compared to the manual system that depends on recording all items the manually.

METHODOLOGY

Research Framework

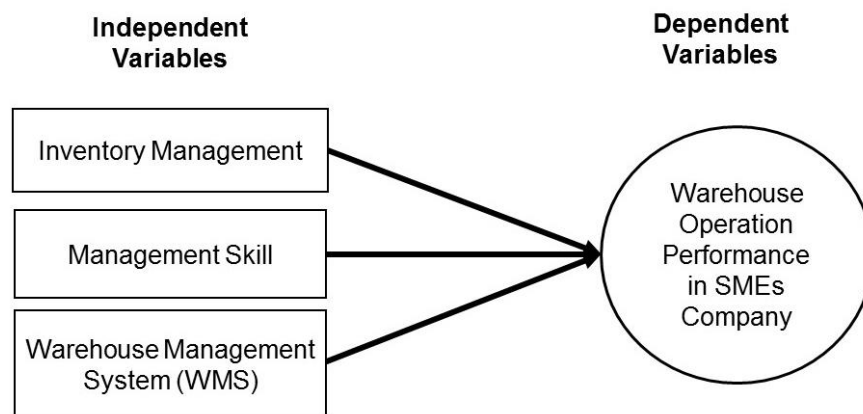


Figure 1
Research framework of Warehouse Operation Management in SMEs

The underpinning theory of the theoretical framework above is supported by the Theory of Constraint (TOC). This theory was introduced by Dr. Elyahu Goldratt (1984). Theory of Constraints is basically used to accomplish a system's goal by identify its constraints and utilize them. TOC to identify constraints and bottleneck in the warehouse. When a clear map of the warehouse operation is made TOC will be employed to find solutions that resolve the bottlenecks, with the result of a more effective and efficient warehouse. According to Chou (2008), TOC has developed and been adapted to other logistics problem such as inventory problems. The implementation of TOC should make it possible to reduce costs of material flow through the supply chain. Appropriate inventory allocation for different links within the supply chain, coupled with the application of suitable models of inventory replenishment, is the basis for cost optimization (Cyplik, Hadis & Domanki, 2009). Furthermore, the previous study by Vatumalae, Rajagopal and Sundram, (2020) have applied the TOC to explore the significant benefit using WMS in warehouse operation. This theory is strongly believed to support the entire research process in improving the warehouse operation performance for inventory management, management skills and WMS.

Hypotheses of the Study

Three hypotheses were developed in this study:

H1: There is a significant relationship between inventory management and the warehouse operation performance among SMEs in Batu Pahat, Johor.

H2: There is a significant relationship between management skills and the warehouse operation performance among SMEs in Batu Pahat, Johor.

H3: There is a significant relationship between warehouse management system (WMS) and the warehouse operation performance among SMEs in Batu Pahat, Johor.

Research Methodology

Quantitative method is one of the descriptive survey designs which involve collecting data in order to answer the questions raised in the research (Welman, Kurger, & Mithcell, 2011). For this research, the quantitative research method was suitable to be applied to classify the success factors to the management of warehouse operation among small and medium enterprise (SMEs). In this study, the descriptive analysis will describe and compared variables numerically that focus in two aspect: central tendency and dispersion. This study's quantitative data will be analyzed by using the Statistical Package of Social Science (SPSS) analysis software. In this study, the sampling technique that suitable to be used is probability sampling technique. The sample size was determined by referring to Krejcie and Morgan (1970) rule of thumb. The target population for this research was selected from 300 of SMEs in Batu Pahat, Johor. The sample size needed is 169 owner or manager. Therefore, 169 respondents will be selected randomly from the population to fill up the questionnaire given.

The questionnaire is divided by five section which is section A asked about demographic data of respondents consist of five items. Section B asked about the DV which is warehouse operation performance consist of five items and next section is IV consist of section C inventory management have ten items, section D management skills have five items and lastly section E warehouse management system (WMS) have seven items. All the questionnaire is adapted and adopted from the past researcher. In this study, Likert scale method will be used as a measure of each variable. Likert scale is a scale used to measure the attitudes and opinions of respondents, where respondents will be asked to complete the questionnaire. The completed forms will be evaluated according to their response, the questionnaire contains questions used in the research or known as variables.

For the section B warehouse operation performance and section D management skills, the frequency was measured by using a 5-point Likert scale which rank from 1 = strongly disagree to 5 = strongly agree. Furthermore, for section C inventory management and section E warehouse management system (WMS) was designed to identify their inventory management and WMS by using a 5-point Likert scale which rank from 1 = strongly disagree to 5 = strongly agree. Besides, the questionnaire also has Dichotomous scale consist of two options i.e., yes and no. Also, the Multiple-choice scale also included in the questionnaire. The research questionnaire has been distributed to 169 respondents from SMEs in area of Batu Pahat. However, only 64 responses have been collected successfully. Despite that, the past researcher (Chan, Shiau Wei., 2017) also done the similar research among SMEs Batu Pahat that is the size is manageable.

RESULTS AND DISCUSSION

Reliability Analysis

Table 1
Reliability Analysis for Variables

Variables	No of item	Cronbach's Alpha	Status
Warehouse Operation Performance	5	0.765	Acceptable
Inventory Management	10	0.711	Acceptable
Management Skills	5	0.870	Good
Warehouse Management System	7	0.815	Good

The reliability tested for dependent variable that is Warehouse Operation Performance (WOP), consist of 5 items got 0.765 for Cronbach's Alpha, it is also shows the status for the instrument is good according to Nunnally (1978). Next is reliability test on independent variables that is Inventory Management (IVM) shows that the Cronbach's Alpha for IVM variable is 0.711 and it is in range 0.7 according to Nunnally (1978), this is means that the status is good. Besides, for Management Skills (MS) with the 5 total of item shows that the Cronbach's Alpha is 0.87 and it is in a good status. Next is Warehouse Management System (WMS) with 7 total of item shows that the Cronbach's Alpha is 0.815, so according to Nunnally (1978), the status is good.

Demographic Analysis

Table 2
Frequencies of Demographic Data

		Industry	Position	Position period	Business period	No Employee
N	Valid	64	64	64	64	64
Mean		1.61	1.48	2.67	3.19	3.11
Median		1.00	1.00	3.00	3.00	3.00
Mode		1	1	2	4	4

Based on the table shown five questions were asked to the respondents as the demographic questions to collect data such as industry, position, position period, business period, and number of employees. Based on the result, our respondent's majority is consisting of food and drinks industry which is (76.6%) respondents. Furthermore, majority our questionnaire is answered by the owner of SMEs which is (51.6%). Then for the position period, 1-5 years got the highest percentage. Meanwhile, the result also shown that most of the business period of SMEs in Batu Pahat is more than 10 years and most of the SMEs got above 20 number of employees.

Normality Test

Table 3
Normality Test Using Skewness and Kurtosis

Variables	Skewness			Kurtosis		
	Statistic	Std Error	Z value	Statistic	Std Error	Z value
Warehouse Operation Performance	-.213	.299	-0.71074	-.731	.590	-1.23737
Inventory Management	-.382	.299	-1.27459	-.519	.590	-0.87948
Management Skills	-.393	.299	-1.31256	-.535	.590	-0.90596
Warehouse Management System	-.128	.299	-0.42801	-1.519	.590	-2.57191

According to George and Mallery (2010), the normality test is normal if the skewness and kurtosis value are within ranges ± 2 . Based on the table above shown that z value of skewness and z value of kurtosis for warehouse operation performance (WOP), inventory management (IVM), management skills (MS) and warehouse management system (WMS). The result shown all of variables is normally distributed because all the z value of skewness and kurtosis are within ranges ± 2 .

Pearson Correlation

Table 4
Pearson Correlation Analysis

		Warehouse Operation Performance	Inventory Management	Management Skills	Warehouse Management System
Warehouse Operation Performance	Pearson Correlation	1	-.046**	.520**	.537**
	Sig. (2-tailed)		.717	.000	.000
	N	64	64	64	64
Inventory Management	Pearson Correlation	-.046**	1	-.251**	-.050*
	Sig. (2-tailed)	.771		.046	.693
	N	64	64	64	64
Management Skills	Pearson Correlation	.520**	-.251**	1	.451**
	Sig. (2-tailed)	.000	.046		.000
	N	64	64	64	64
Warehouse Management System	Pearson Correlation	.537**	-.050*	.451**	1
	Sig. (2-tailed)	.000	.693	.000	
	N	64	64	64	64

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

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

Pearson Correlation is used to identify the linear relationship between dependent variable to each independent variable. Based on the table above, it shows that the result indicated for two independent variable, MS and WMS have a positive significant relationship with warehouse

operation performance which are ($r=0.520, 0.537$). However, the result of correlation between warehouse operation management and inventory management shows a negative and low correlation. While for the correlation between warehouse operation performance and management skills is $r = 0.520$, so the correlation is moderate. For correlation between warehouse operation performance and warehouse management system is $r= 0.537$, it is show that it has moderate or marked correlation. Therefore, all the constructs are valid which satisfy the rule of thumb convergent validity.

Coefficient Result

Table 5
Coefficient Table

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.220	.924		1.320	.192
Inventory Management-IVM	.108	.174	.065	.621	.537
Management Skills-MS	.429	.137	.368	3.146	.003
Warehouse Management System-WMS	.220	.067	.374	3.302	.002

Based on Coefficient table, the two predictor variables which management skills ($p = 0.003 < \alpha$) and warehouse management system (WMS) ($p = 0.002 < \alpha$) were found to be of significance in explaining warehouse operation performance. Meanwhile, inventory management is not able to show any significant result ($p = .537 < \alpha$). Other than that, the largest beta value found in warehouse management system (WMS) ($\beta = 0.374$) and followed by management skills ($\beta = 0.368$). From these two-analysis using alpha and beta value, Warehouse Management System (WMS) makes the strongest contribution to explain warehouse operation performance.

Table 6
Summary of the Results of all the Hypotheses Tested

No.	Hypothesis	Result
H ₁	There is a significant relationship between inventory management and warehouse operation performance among SMEs company.	Not Supported
H ₂	There is a significant relationship between management skills and warehouse operation performance among SMEs company.	Supported
H ₃	There is a significant relationship between warehouse management system (WMS) and warehouse operation performance among SMEs company.	Supported

CONCLUSION

From the findings of the questions and objectives of the study, it shows that the questions were answered smoothly, and the analysis was made using SPSS. The value of statistical analysis has been interpreted as a knowledge term so that it can be used to make relationship analysis and achieve the objectives of the study. The three independent variables namely inventory management, management skills and warehouse operation management show positive results on the dependent variables which is warehouse operation performance among SMEs. With this consent, objectives can be achieved in conducting this study. The objectives are to identify whether inventory management can improve the warehouse operations performance, to identify whether management skills can help in improving the warehouse operations performance and to find out if warehouse management system can help in improving the warehouse operations performance.

From the results, the first independent variable, inventory management has shown a no significant relationship between inventory management and warehouse operations performance. Therefore, this had met the first hypothesis for H1, no supported the relationship between inventory management and warehouse operations performance. Second, the H2 hypothesis shows that there is a significant relationship between management skills and warehouse operations performance that has also been accepted. The independent variable with a strong correlation at 0.87. Third, the independent variables that are the warehouse management system also show positive results from the data analysis. Warehouse management systems are used to enhance warehouse management capabilities effectively and efficiently. Therefore, H3 have a significant relationship between warehouse management system and warehouse operations performance.

In conclusion, studies have shown that hypotheses are accepted with the data analyzed in Chapter 4. Two independent variables and dependent variables have a significant relation, which is management skills and WMS. The SMEs Company using an excellent management skill, it will positively influence their warehouse operation performance and this hypothesis is supported by the previous researcher from Kasul and Motwani (1995). When the SMEs Company implement the warehouse management system, it will positively influence their warehouse operation performance and this hypothesis is supported by the previous researcher from Mohammad (2017). Other independent variables which is inventory management not implementing a good inventory management in their warehouse, this will negatively influence their warehouse operation performance his supported by the previous study by Chan and Wei (2017). Based the results of the study, warehouse operation performance uses few factors for their practice to meet the requirements of the study conducted. Therefore, it will create better performance and in turn will further enhance the name of the SMEs organization.

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ACCURACY OF ORDER PICKING IN THE ERA OF E-COMMERCE

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INTRODUCTION

In the past decade, the shifting from traditional business model to e-commerce, the global economy, and customer-oriented markets have dramatically changed the business environment. As a result, some new trends have emerged in the warehouse. The warehouse is now more functional than ever. The obvious role of the warehouse is to store or support products, but the warehouse now provides other value-added activities or services. Examples of these activities and services include product consolidation, cross-assembly, quality inspection, final assembly, packaging, reverse logistics, information services and others. Therefore, consumers have combined their distribution networks to reduce security stocks, gain economies of scale, and make the network more controlled. Besides, many manufacturers and sellers usually want to concentrate on their core business to take full advantage of their warehousing activities. Thus, products are usually stored at a third-party logistics provider in a central warehouse. Besides, with the huge increment of e-commerce, warehouses today typically receive many small orders, which must be selected within a short period of time (D.Son, 2014). Also, there are other trends, such as small group production, product customization, on-site delivery, logistics and large environmental protection. In general, these new developments make warehouse operations more complex and complexity of making orders increases. For many companies today, warehousing research is becoming increasingly important.

There are tons of products such as raw material, goods-in-process and finished goods that are required to be moved from one point to another within a logistics chain (Stocks, 2017). For instance, from the point of origin to the point of consumption or from manufacturers to end users. The products or goods might be buffered or stored at a place or space which is known as a warehouse for a period of time. Within the warehouse, a variety of activities are carried out, such as receiving, storing, order picking, shipping and delivery. The most imperative activity is order picking, which is the process of obtaining the actual amount of the actual products for fulfilling the order of the customer. The process of order picking has long been called labour-intensive operations in manual systems and capital-intensive operations in automated systems. It may consume up to 60% of the total labour force in the warehouse. For ordinary warehouses, the cost of order picking was estimated to be 55% of the warehouse's total operating expenses. For these reasons, warehousing experts believe that receiving orders is the primary task of improving warehouse productivity and efficiency. In recent years, research in this field has grown exponentially, and there has been a large amount of literature on various methods of how to effectively order pick (Pokua-duah, 2015).

Research Question

1. Does fulfilment method affecting the accuracy of order picking?
2. Does the warehouse layout impacting the accuracy of order picking?
3. Does the communication technology influencing the accuracy of order picking?

Research Objectives

1. To determine whether the fulfilment method can affect the accuracy of order picking.
2. To identify whether the warehouse layout can impact the accuracy of order picking.
3. To indicate whether the communication technology can influence the accuracy of order picking.

PROBLEM STATEMENT

E-commerce, the transformation from traditional business model to the new norm of business model nowadays has experienced a dramatic growth since it launched to the market. According to Kerick (2019), the retail e-commerce sales worldwide had achieved 3.5 trillion USD in 2019 while it is estimated to achieve a higher number of 4.9 trillion USD in 2021. However, at least 30% of the products and services purchased online are returned, and undoubtedly the factor of receiving wrong items is the main reason for the consumers to return the products (Saleh, n.d.). In Malaysia, e-commerce business has expanded so fast in recent years, and there is an average of 24% growth rate annually (Malaysia e-commerce insights, 2019).

Warehouse management affects customer satisfaction and supply chain costs; therefore, this is a key factor in the company's profitability and competitiveness. Although there is an increment every year in the Malaysia market, yet the issue of returning purchased products is also high which is about 23.8% of the online shoppers facing this current issue. For an E-commerce business owner, returns can be a big and troublesome problem. In terms of personnel and resources, the cost of processing returns is high, and there is a risk that returns may not be easy to resell. All of this will affect the profits of E-commerce businesses, and some industries suffer more losses than others. For an e-commerce business, this is a particular and common problem. Among them, the reason for returning products due to wrong items received is about 33.6% (Malaysian Communications and Multimedia Commission, 2018).

In order to explore the factors that cause the wrong items delivered and received, we should focus on the process of order picking. Order picking is the process of moving products from storage for the purpose of meeting customer needs and satisfactions. In the simplest form, the order arrives at the warehouse, and then the order picker is sent to the pick-up area along with the customer list to pick up the goods from the warehouse. In order to find the best storage method, many studies have been conducted. Part of the reason for the extraordinary efforts in this area is that order picking activity is a very expensive activity. Usually, order picking bears most of the operating costs of the warehouse. For the factor of inaccurate inventory picked for an order, mainly caused by three factors: fulfilment method, warehouse layout design and communication. Order picking covers a wide range of operations, from positioning the vehicles to place selected products on product shelves. The remaining activities include picking up an empty pick carrier, the procurement of information, and delivering the full pick carrier at some point after the process of picking is done (Nie and Fan, 2015).

Every error in the warehouse affects profits. The order picking errors will bring the company to suffer huge losses. These include loss of sales, return costs, additional shipping costs, and customer service costs, repackaging costs, warehouse labour costs and sales costs (J.D., 2015). Order picking errors usually indicate delivery errors, which can lead to lower down the customer satisfaction and customer retention. Order picking errors will affect the customer's understanding of the entire order. This is why it is important to improve the recruitment and fulfilment process before impacting customers. In addition, returns are expensive. The warehouse owners bear the cost of problem records, returns and relabelling.

Furthermore, the transportation cost even exceeds the return cost. The cost of speeding up the correct sequence must also be considered. For customer service costs, errors affecting customers mean that customer service will spend more time resolving complaints and resolving problems. Similarly, do not forget that returned items need to be repackaged before sale. Therefore, it caused the organisation to lose money and affected their revenue.

LITERATURE REVIEW

Accuracy of Order Picking

Accuracy is defined as the state or quality of being precise or correct. It is imperative for determining the degree of measurement, calculation of result based on the correct value or standard. Accuracy indicates how close the measured value is to the actual value. This is important because poor equipment, poor data processing or human error can lead to inaccurate results (Turbide, 2017). Accuracy is the distance between the same object measurement networks.

Order picking is the process of obtaining the actual amount of the actual products for fulfilling the order of the customer. The process of order picking has long been called labour-intensive operations in manual systems and capital-intensive operations in automated systems (Taneja, 2018). Traditionally, orders are made by giving employees a list of printed articles, stating their position in the warehouse, the quantity to be collected, and a brief description. It may consume up to 60% of the total labour force in the warehouse. For ordinary warehouses, the cost of order picking was estimated to be 55% of the warehouse's total operating expenses. For these reasons, warehousing experts believe that receiving orders is the primary task of improving warehouse productivity and efficiency (Frazelle, 2014).

Accurate order picking is usually the most important responsibility in warehouse operations. For each wrong order picking, the actual cost of the wrong order does not include customer dissatisfaction. In many warehouses, activity of order picking is the largest spending category in the business. Choosing a good order picker requires a senior manager who plans, monitors, inspects and interacts. The process of order picking is not easy and cannot be saved. Although we have made all the advances in automation, since no machine can achieve the goal of coordination of the brain, eyes and hands, usually humans need order improvement. Due to the high labour content, order picking can reduce errors. A good order record is the first step in choosing the right and effective documents. Warehouses rarely accept the quantity of goods or packages required for transportation (Ong, 2015). Goods shipped from warehouses must be orders collected from inventory, as the quantity of economic orders to the warehouse is rarely equal to the actual quantity purchased by the customer.

Fulfilment Method

Warehousing is the process of storing goods for later distribution. A warehouse is defined as a place where goods are collected. Warehousing is important for companies that import, export, transport and manufacture goods. They can organize everything in one place and can also save you money and increase productivity. Warehouse helps fulfil our orders efficiently. Warehousing allows you to store, ship, and distribute goods from one location. This allows you to track and manage inventory easily and effectively. It can also reduce transportation costs, increase flexibility and reduce personnel needs (Brandenberger, 2020). Warehouse adds value to your operations. Warehousing can deliver and distribute your products on time, thus increasing employee productivity and customer satisfaction. Warehousing helps reduce errors, damages your goods, and prevents them from being lost or stolen during the order fulfilment process, thus helping you deliver on time and increase your customers' brand value.

The traditional order picking method involves the use of paper sales orders to pick up goods from the shelves of the distribution centre. Employees are required to print orders from warehouse management system (WMS) software or enterprise resource planning (ERP). Employees will move between components through a fixed process most of the time, and then items can be extracted. (Heydari, Keung, and Hu, 2020). Nowadays, warehouses are undergoing development and transformation to become more complex and innovative. During the delivery process, intelligent fulfilment can provide many facilities to help the warehouse staff find and retrieve the goods requested by the customer in a short time. By using intelligent fulfilment methods in inventory management, inventory in warehouses can be managed more accurately and easily. Many logistics systems are goods, assets and goods that need to be delivered to customers. Therefore, for logistics, it is very important to use accurate identification and real-time tracking to determine location of the product (Ong, 2015).

One of the biggest advantages of the traditional order picking method is that the company does not need to invest in expensive technology. Traditional options do not rely on continuous system upgrades to keep the software running effectively. However, the main disadvantage is the increase in sequence errors due to human error. Pickers often make mistakes in the outdated system (Cattani, Gilland, and Swaminathan).

Warehouse Layout

Hassan (2002) stated that warehouse layout is to determine the input and output, location, number of aisles, space, design and the order picking zones within the warehouse. He opined that designing a warehouse is a tough task due to its related not only the processes inside the warehouse, however, it is also correlated to the other factors like cross docking, value added activities which are influencing the travel time of the goods, cost of handling and the throughput of the warehouse. On the other hand, Tonelli, Schenone, and Nan (2002) had conducted a research regarding the warehouse layout design, and the result concluded from their research figured out that a suitable warehouse layout design is useful in minimizing the travel time and the costs of handling. Other than that, simulation is important in evaluating the efficiency and effectiveness of the warehouse layout to indicate whether the design is the most appropriate solution for the organization.

Vrysagoti and Kontis (2011) said that the major problem of the warehouse layout is regarding the storage, design of the building and the layout of the warehouse. These problems may lead to the order picking problem because these problems are affecting the response time of the

warehouse staffs which influences the productivity of the warehouse. According to the statement of Mahmud (1987) indicated that the cost of handling and cost of the design is important in the consideration of the warehouse layout design. He opined that rectangular warehouse design can be utilized in the design of the warehouse because it is able to reduce the total costs of the material handling.

Moreover, Tippayawong, Sopadang, and Patitad (2013) had conducted a study related to the warehouse layout design for a chicken slaughterhouse. In the study, the researchers found that warehouse management occupied the highest cost among the logistics activities which reflected in the selling price and affecting the profit of the organization. In addition, they discovered that the layout of the warehouse is important because it is influencing the travel costs and time, the mode of transportation used and the productivity of the warehouse. Furthermore, there is another research conducted in investigating the maximum capacity of the warehouse based on the layout design (Huertas, Ramirez, and Salazar, 2007). In the study, the researchers said that the accessibility, flexibility, and adaptability are important when designing a warehouse layout for an organization. There is no any design of the warehouse layout that is the best, but all depends on the utilization of the organization based on the size of goods, the design of the goods and the location of the market.

Communication Technology

According to Arora and Gupta (2017), communication technology is playing a vital position in all kinds of business especially related to the other party like government. The communication between both sides become very important in completing the project. In the study conducted by Arora and Gupta (2017), data in the warehouse are needed to improve the efficiency and effectiveness of the decision making. It is related to the accumulation of the data for a few years hence they can analyse the data for the accuracy of the forecasting by those decision makers. Other than that, Rakers and Rosenkranz (2008) stated communication technology is important when transmitting the information between two different recursion levels in a company. The importance of communication technology in business management will be more obvious when the tasking and the loads of work high. Thus, a well communicated method between the warehouse department and information technology department, is a must in a business or a company for a better outcome and result through the cooperation of the departments.

Based on the study conducted by Golfarelli, Rizzi, and Cella (2004), communication technology can be assumed as a strategy in the way to achieve the goals of the company. Key Performance Indicators (KPIs) are one of the ways to transform the communication into an indicator that suits the task forces assigned. Therefore, the KPI manager has the responsibility to monitor all the reports and data that are collected in the warehouse to minimize the errors that may influence the efficiency and effectiveness of the warehouse. Information technology helps the warehouse owner to centralize all the information gathered and it can be used as a linkage of all the channel members and the difference between cost and value driven methods (Rogers, Daugherty, and Elinger, 1996). For instance, the utilization of electronic data interchange helps the warehouse to provide the continuous flow of the information within the organization and the consumers.

Through the research conducted by Rifaieh and Benharkat (2002), the researchers found that communication technology and the database are important within the warehousing process. However, there are a few limitations such as different versions of tools and the maintenance of the tools make the communication process become harder. Hence, a complete

format and program is essential in the organization in order to minimize the problems and obstacles in the communication process within the company. Consistent with the study by Haydn, Rutashobya, and Vetter (2007), data warehousing only occurred when there is an involvement of end users in order to make the communication process smoother and effective. The expectations of the end users are important which will allow the improvement of the warehouse based on the demand of the market. The data collected also can help the organization focusing on the real requirements and needs of the end users.

METHODOLOGY

This study will use quantitative methods. Quantitative Analysis (QA) is a technique aimed at understanding behaviour through modelling, measurement, and mathematical research. Questionnaires are shaped according to past research concepts, theory and information. Later, the target interviewees are those who worked in the warehouse that related to the e-commerce business. In addition, quantitative data will use information about the survey distribution of sample respondents. In this paper, the researchers will analyse the factors that affect the accuracy of order picking in the era of e-commerce in Bukit Mertajam area. The data that needed in the study is the factors in the warehousing that affect the accuracy of order picking. The questionnaires targeted the warehouses within Bukit Mertajam area and the data will be collected from the representative of the organization.

A warehouse is the investigation unit for the objective of study as the data were needed to obtain from the representative from each warehouse in Bukit Mertajam area. The focusing points of this study are about the factors that affect the performance of warehouses in the accuracy of order picking in the era of e-commerce. Hence, the researchers will collect the data from the representative of each warehouse and every questionnaire will be a new independent data. Probability sampling technique has been used in this study. In probability sampling, every participant gets a known probability of being chosen while in non-probability sampling every participant of the population is chosen without the utilization of probability. (McCombes, 2020) There are a few techniques involved in probability sampling which are systematic sampling, stratified sampling, cluster sampling, multi stage sampling and lastly area sampling. (Etikan and Bala, 2017) Due to the probabilistic method is used in the study to manage the biased of the sampling, hence the probability sampling technique is more suitable for this study. According to Dun and Bradstreet (n.d), there are 164 companies that provide warehouse and logistics services around Bukit Mertajam, Pulau Pinang. In collecting the data regarding to accuracy of order picking and the factors that could affect it, which is the fulfilment methods, communication and warehouse layout design, the researchers will be approaching a total number of 113 companies. The number of sample size is referred to the krejcie and morgan table 1970.

To determine the acceptance of the questionnaire, a pilot test was conducted to evaluate the questionnaire. There are 30 number of respondents were invited to respond to the online questionnaire and the researchers used Statistical Product and Service Solutions (SPSS) 23 Version to generate the results. Cronbach's Alpha was used to ensure the accuracy and reliability of the results. All the data will be examined by using descriptive analysis, reliability test, normality test, pearson correlation analysis and multiple regression analysis.

RESULTS AND DISCUSSION

This chapter examines the findings of this research by utilizing the application called Statistical Package for the Social Sciences (SPSS). The results for this research are issued, starting with an organization profile such as the relationship of the organization with e-commerce business, the problem of inaccurate order picking, the number of warehouse locations, the age of organization and the size of organization. The analysis persists with the reports on reliability test, Pearson correlation analysis, multiple regression analysis, normality test and hypothesis testing.

Demographic analysis

Table 1
Demographic analysis

Variables	Quota	N	%
Involvement of warehouse in E-commerce business	Involved	94	83.20
	Not involved	19	16.80
Problem of inaccurate order picking faced by warehouse	Yes	100	88.50
	No	13	11.50
Numbers of location of the warehouse	One	82	72.60
	Exceed one	31	27.40
Age of organization	Below 1 year	23	20.40
	1 to 2 years	12	10.60
	2 to 4 years	40	35.40
	4 years and above	38	33.60
Size of organization (Number of staff)	Below than 10	0	0
	11 to 20	47	41.60
	21 to 50	28	24.80
	51 and above	38	33.60

Note N=113*

From the results gathered, there are 94 warehouses or equivalent to 83.2% in the research field related to E-commerce business. The rest of the warehouse which is 19 warehouses or approximately to 16.8% are not involved in E-commerce business. In addition, most of the warehouses in Bukit Mertajam area are facing problems of inaccurate order picking. From the results gathered, there are 100 warehouses or equivalent to 88.5% in the research field facing the problem of inaccurate order picking. On the other hand, there are 13 warehouses or approximately 11.5% did not facing the problem of inaccurate order picking. Furthermore, a large portion of organizations contain warehouses in more than one location in Bukit Mertajam area. From the results collected, there are 82 warehouses or equivalent to 72.6% in the research field consisting of warehouses more than one location.

However, there are 31 warehouses or approximately 27.4% contain warehouses in one location only. The majority of the warehouses within the Bukit Mertajam area operate from 2 to 4 years. From the data gathered, there are 40 warehouses or equivalent to 35.4% in the research field operating from 2 to 4 years. Then continue with the second large portion which are 38 warehouses (33.6%) operate 4 years and above, 23 warehouses (20.4%) operate less than 1 year and lastly 12 warehouses (10.6%) operate 1 to 2 years. majority of the warehouses within

the Bukit Mertajam area which is 47 (41.6%) warehouses have 11 to 20 staff working in their warehouse. Besides, continuing with the second large portion which is 38 (33.6%) warehouses contain 51 staff and above working in the warehouse, 28 (24.8%) warehouses consist of 21 to 50 staffs working in the warehouse and no warehouse contains less than 10 staff.

Table 2
Normality test

Descriptive			
		Statistic	Std. Error
Accuracy of Order Picking	Mean	3.8142	.06717
	Skewness	-.610	.227
	Kurtosis	.646	.451
Fulfilment Method	Mean	4.1239	.07556
	Skewness	-.861	.227
	Kurtosis	.621	.451
Communication Technology	Mean	4.0531	.07420
	Skewness	-.762	.227
	Kurtosis	.557	.451
Warehouse Layout	Mean	3.8407	.06719
	Skewness	-.655	.227
	Kurtosis	.774	.451

The absolute value of skewness for Accuracy of Order Picking (AD), Fulfilment Method (CV), Warehouse Layout (SI) and Communication Technology (SE) are -0.610, -0.861, -0.762 and -0.655. Hence, the absolute values of skewness proved that the samples for the four variables considered as normal because all the results are between the ranges of -2 to 2. In addition, Ewan and Ahmad (2020) also mentioned that the sample considered as normal when kurtosis values lies between -4 to 4. Through the data analysis, the absolute value of skewness for accuracy of order picking (AD), fulfilment method (CV), warehouse layout (SI) and communication technology (SE) are 0.646, 0.621, 0.557 and 0.774. Thus, all the results of kurtosis values for the four variables showed the samples are normal in this study. Therefore, the samples of this study are normal since both values for skewness and kurtosis are in the range of ± 2 and ± 4 .

Table 3 Pearson Correlation correlates to the alternatives used in determining the level of correlation between two different variables and ranges of between -1 to +1. The values of the result are represented with r value. When r equals to +1, means there is a complete (straight-line) positive linear relationship between both variables. Meanwhile, a perfect linear negative relation is also shown when r value equals to -1. The strong and weak relationship can be defined by observing the r value, the strongest relationship is 1 and the weakest relationship is 0.

Table 3
Pearson Correlation

		AD	CV	SE	SI
Accuracy of Order Picking (AD)	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	113			
Fulfilment Method (CV)	Pearson Correlation	-.131	1		
	Sig. (2-tailed)	.037			
	N	113	113		
Communication Technology (SE)	Pearson Correlation	.192	.666	1	
	Sig. (2-tailed)	.042	.000		
	N	113	113	113	
Warehouse Layout (SI)	Pearson Correlation	.974	-.105	.189	1
	Sig. (2-tailed)	.000	.267	.044	
	N	113	113	113	113

H₁: There is a positive relationship between fulfilment method and accuracy of order picking.
H₂: There is a negative relationship between fulfilment method and accuracy of order picking.

There is a negative significant and low strength correlation between fulfilment method with accuracy of order picking with negative relationship ($r= 0.192$, $p<0.01$). This correlation analysis establishes that fulfilment method has a negative significant and low strength correlation to accuracy of order picking. Consequently, H₂ is supported.

H₃: There is a positive relationship between warehouse layout and accuracy of order picking
H₄: There is no relationship between warehouse layout and accuracy of order picking

There is a positive significant and low strength correlation between warehouse layout with accuracy of order picking with positive relationship ($r= 0.192$, $p<0.05$). This correlation analysis establishes that warehouse layout has a positive significant and low strength correlation to accuracy of order picking. Consequently, H₃ is supported.

H₅: There is a positive relationship between communication technology and accuracy of order picking
H₆: There is no relationship between communication technology and accuracy of order picking

There is a positive significant and high strength correlation between communication technology with accuracy of order picking with positive relationship ($r= 0.974$, $p<0.01$). This correlation analysis establishes that communication technology has a positive significant and high strength correlation to accuracy of order picking. Consequently, H₅ is supported.

Table 4
Summary of hypotheses

	Hypotheses	Decision
H ¹	There is a positive relationship between fulfilment method and accuracy of order picking.	Not Supported
H ²	There is a negative relationship between fulfilment method and accuracy of order picking.	Supported
H ³	There is a positive relationship between warehouse layout and accuracy of order picking.	Supported
H ⁴	There is no relationship between warehouse layout and accuracy of order picking.	Not Supported
H ⁵	There is a positive relationship between communication technology and accuracy of order picking.	Supported
H ⁶	There is no relationship between communication technology and accuracy of order picking.	Not Supported

CONCLUSION

The conclusion shown is satisfying as the result shows that fulfilment method, warehouse layout and communication technology have the relationship with the accuracy of order picking in warehouses in the era of E-commerce. Besides, the communication technology shows the greatest influence in influencing the accuracy of order picking as it has the greatest value in coefficient. The greater the coefficients of predicting variables, the greater the influence on the dependent variable. The research objectives are achieved. To increase the accuracy of order picking, the warehouse should improve from traditional communication technology to more advanced communication technology. Order picking directly affects warehouse operations and indirectly affects other business areas. Order picking speed allows warehouses to track order execution status and even make scheduling difficult. The number of pickers can also affect your customer satisfaction. No one likes to receive the wrong product or order. Other than the accuracy of order picking, the speed of the collection is also important in the performance of warehouse.

However, most warehouse managers pursue several goals for picking the same internal order. This goal makes employees efficient, effective and healthy. They will also optimize your picking process. All of these goals lead to a bigger goal, which is to build a more efficient and profitable warehouse. Reduce the error of choosing the front, which means that when the customer returns the item, the picker does not have to put it on the shelf. The return process (getting back the product from the customer and returning it to the warehouse) can be very expensive. Intelligent communication technology provides greater accuracy and productivity, thus increasing warehouse efficiency and improving processes. Sending employees to the right recruitment area can effectively pack customer orders, enable warehouses to meet aggressive delivery deadlines and improve recruitment efficiency.

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GREEN LOGISTICS PRACTICES AMONG LOGISTICS SERVICE PROVIDERS: AN IN-DEPTH STUDY

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INTRODUCTION

There is an increase in both interests and reactions to the concept of preserving the environment in recent years. While environmental issues have become critical concerns all over the world, organizations are always under pressure to develop environmentally responsible and friendly operations. Logistics activities in the supply chain and have attracted attention in recent years because of their negative environmental impact. Thus, ‘greenness’ has become a code-word for a range of environmental concerns and is usually considered positive. As logistics is a movement of products from producer to consumer, putting together the two words “green” and “logistics” suggest an environmentally friendly and efficient transport and distribution system.

Green logistics can be described as logistics system that is environmentally friendly to minimize the element of the ecological impact of logistics activities (Isaksson, 2012). Green logistics activities include transportation, warehousing, green distribution and marketing as well as reverse logistics such as waste recycling and disposal (Rajagopal *et al.*, 2015). The implementation of green logistics by a firm may show the firm’s ability to conserve resources, reduce waste, improve operational efficiency and provide the highest satisfaction to the social expectation of environmental protection (Blanco and Cottrill, 2014).

In order to maximize the profit and minimize the cost in logistics activities, LSP companies could implement the concept of green logistics. Currently, all LSP companies have management and operating standards to ensure the quality of the service provided is maintained. Thus, the integration of logistics services with the green logistics element may enhance the reputation of the company, therefore increasing customer demand. Furthermore, global logistics companies may be interested to have partnerships with LSP companies that implement green logistics. Therefore, local LSP companies should embrace the concept of green logistics. Dođru and Fişkin (2016) also support this statement, stating that by having the green logistics service, it is significantly able to reduce logistics costs and directly boost the logistics performance. Currently, Malaysia had been ranked 32nd out of 160 countries compared with the 25th ranking in 2014 in logistics service quality (World Bank Group, 2016).

Green logistics is an environmentally-friendly and efficient transport and distribution system (Isaksson, 2012). Logistics focuses on the movement of goods, sharing information and the coordination of the overall process. The logistics process mostly focuses on optimization,

reducing costs, increasing delivery speed and gaining maximal revenue (Tamulis, Guzavičius and Žalgiryte, 2012). In relation to “green” logistics, the logistics service providers (LSP) have to be environmentally responsible and sustainable as important factors in the environmental and supply chain strategies. There are many studies exploring and discussing different aspects of green logistics service provider (LSP) (Evangelista, 2014; Seroka-Stolka, 2014). Green LSPs are involved with producing and distributing goods in a sustainable way, more concerned with the surrounding environmental and social factors (Martinsen and Hüge-Brodin, 2010). Moreover, in the long term, green logistics providers could lower the inventory levels, reduce logistics cost, increase revenue, improve customer service, enrich the information for reverse logistics, and enhance corporate image (Srisorn, 2013). Researchers had identified that the greening of LSP business is one of the strategies to achieve and maintain competitive advantage (Karagülle, 2012). It also could aid the future growth of companies, with new market possibilities and the development of new products and services associated with environmental and green aspects. This is an opportunity for the LSP to integrate their business operations and service offerings with a sustainable approach in line with the current trend (Evangelista, 2014).

This study aims to explore the understanding about green logistics among LSP companies and to identify the barriers that preventing companies from implementing green logistics. The next section is the research methodology section describes the data collection process. Next, findings and discussion are presented. Finally, this paper concludes the overall result based on the objective presented.

METHODOLOGY

Participants, research setting, study period and procedure

The objectives of this study were to explore the understanding about green logistics among logistics service provider (LSP) companies and to identify the barriers preventing companies from implementing green logistics. Therefore, this study was qualitative in nature to which interview approach has been used. This approach may allow the researcher to gain in depth understanding about the issue discussed. Further, this study utilised open ended questions which allow interviewees to express their own opinions about green logistics and enabled freedom to elaborate ideas in the interviews.

There were fifty (50) companies which originated from Malaysia, Thailand, and Singapore located in Bukit Kayu Hitam Industrial Park (BKH Industrial Park). Eleven (11) companies have been identified as a Logistics Service Provider (LSP). It was acknowledged that this study should be a census study. However, due to year-end audit, inspection and operation, only three LSP companies agreed to be interviewed. The interview has been conducted in Oct 2017.

The appointment has been agreed and the meeting has been carried out at the company’s main office in BKH Industrial Park according to their time and schedule. The interview took about 45 minutes to 1 hour. The researcher used open ended questions as a guideline for the interview. It has been agreed that the company name will be anonymous. The individuals who have participated in this study were well versed in the issue of green logistics. The details of the respondent’s profile are shown in Table 1.

Table1

Respondent's profile.

Name	Position	Job experience
Respondent 1	CEO	8 years
Respondent 2	CEO	7 years
Respondent 3	Senior Executive	6 years

Background of LSP companies

Company A was a Bumiputera-owned LPS company that typically specializes in integrated operation and transportation services that can be customised according to customers' needs, such as the demands and delivery service requirements for their products and materials. Company A also engages in import and export activities involving two foreign countries, namely Thailand and Singapore. Company A started their operations since 2009 in Bukit Kayu Hitam.

Company B, established in 2010 is a new operator in Bukit Kayu Hitam. Basically, this company has expanded its business by collaborating with a foreign country; Thailand. This company's activities are more towards forwarding, transportation and brokerage. For the transportation activities, Company B sub-contracts the transport activities to another transportation company.

Company C is a homegrown company and had been registered as a Bumiputera Company and it totally specializes in transportation and logistics solutions. Basically, Company C is the company that solves problems in oil and gas, aerospace, construction, shipping agency services and lay-up solutions. Company C has its own warehouse for logistics service provider activities. It also owns a few land vehicles and is integrated with other stakeholders.

Interview schedule

A brief demographic and background of the companies' questions has been devised. The open-ended interview schedule was prepared based on previous literature to guide the discussions. The following questions sought to address the research objectives.

- i. Based on your knowledge, how would you define 'green logistics'?
- ii. How do you relate green logistics with a logistics service provider and logistics activities?
- iii. What are the barriers to practicing green logistics in your company?
- iv. What are your suggestions to implement and practice green logistics among LSPs?

Data analysis technique

The findings have been analysed using thematic analysis. Thematic analysis is a qualitative analysis technique to identify, analyse, and report patterns (i.e., themes) within data (Braun and Clarke, 2006). The transcripts were initially coded by grouping responses about green logistics, according to knowledge, logistics activities, barrier towards green logistics and future of green logistics among LSP. The findings are presented in accordance with each theme, with supporting data (quotes) provided. To protect participant's confidentiality, each quote is

presented without the company name or individual name. The researcher used Company A, Company B and Company C to represent the participants' opinion.

FINDINGS AND DISCUSSION

Understanding and knowledge of green logistics

The present study found that the level of understanding and knowledge of green logistics among the respondents is minimal. The LSP companies have the basic knowledge about the green logistics. For instance, Company A stated that green logistics is related to eco-friendly operations. On the other hand, Company B stated that green logistics was similar to the Halal concept. It can be said that his understanding towards green logistics is very different from the actual definition. Green logistics is defined as an environmentally-friendly and efficient transport and distribution system (Isaksson, 2012). In addition, all three companies also were not interested to know about green logistics in depth. For them, it is enough to have basic knowledge about green logistics. The researcher also found that all the respondents relate green logistics with the environment only, whereas from previous studies, green logistics has three principal components that always relate to this concept: economy, environment, and society (Seroka-Stolka, 2014). If these three components do not meet when defining green logistics, it could not meet the actual concept.

Therefore, knowledge and understanding is crucial to implementation and practices of green logistics (Evangelista and Durst, 2015). Because of that, the top management of the companies must meet all the understanding of the green concept to ensure the knowledge of green technology well delivered to the employees. However, in general, there is not a fixed meaning in order to understand the green concept. Therefore, this research noted that the level of the understanding about the green logistics is still minimal. That is why, the environmental issue is not being concerned and facing with challenges if LSP companies keep on the trends towards the green logistics.

Green logistics activities - Warehouse

The warehouse is one storage facility that keeps products from any fumigation, defects and any aeration, and it can be a busy place to move products for inbound and outbound operations. Here, all the processes from the packaging, labelling and assembling of products could be done concurrently to minimize the operations costs. Therefore, to value-add the warehouse, operators are looking at more environment-friendly operations, focusing on procedures in order to minimize the costs while at the same time increasing the social responsibility efforts (Srisorn, 2013).

Warehouse activity is a part of the logistics activities. From the interview, all the companies indicated that warehousing activity will not be affected whether they implement or do not implement green logistics in their companies. This is because in any situation, the warehousing activity and operation will continue as usual. In addition, the activity involved in the warehouse is not a major contributor to environmental pollution. As mentioned by Company A, they used the cross-docking concept, where this concept itself already helps to protect the environment. This is supported by previous research which stated that the cross-docking concept reduces pollution because indirectly this concept reduces the amount of land occupied by warehouses and the movement within the warehouses (Paciarotti, Ciarapica and Giacchetta, 2009).

Company B stated that they already partially implemented green logistics in the warehouse by providing the green packaging in their warehouse. Even though they do not really understand the concept of green logistics, they are trying to implement it gradually in their operation especially in the warehouse department. They mentioned that green packaging can help in reducing the environmental effects because it is produced with recyclable materials. This statement is in line with a research by Zhang and Zhao (2012) where green packaging is produced in an environmentally-friendly manner that has a low impact on both energy consumption and on the environment.

This research can summarise that in the respondents' opinion, warehouse activity has very little effect on green logistics. This is because the flow of the activities in the warehouse itself, not 100 percent gives impact the environment. Perhaps, if the activities in warehouse more on green, it may be due to the need of optimization or utilization of the space and make the operation effective and efficient in order to avoid delays in the movement of product in and product out.

This can be enlightened according to Dekker, Bloemhof and Mallidis (2012), the concept of the green warehouse be able to improve the energy efficiency and increase the business reputation. To be more specific, the green warehousing as part of sustainable supply chain would be in reassure the society's safety, health, and reduces its disturbance, lead to economic growth, jobs and prosperity and respect the environment. Therefore, the warehouse activity on this stage may not give much impact towards overall green logistics in LSP companies. Furthermore, many of the warehouse activities still used the manpower and suitable material handling equipment's to operate the operation.

This could be changed as many companies are moving towards going green due to the benefits to the environment as well as saving costs and improving sustainability. Thus, a green warehouse will be able to improve energy efficiency and enhance business reputation. Generally, the green warehouse incorporates three practices: 1) maintaining the warehouse temperature; 2) improving the lighting efficiency; 3) improving the energy efficiency in mechanical handling operations and handling the remaining pallets (McKinnon *et al.*, 2015). Many new warehouses around the world have been designed with consideration of the environment and sustainability, thus the building of new green warehouses.

Green logistics activities - Transportation

The other factor that relates to green logistics is transportation. Transportation is the key element for movement in the logistics industry (Rommert Dekker; Ioannis Mallidis *et al.*, 2012). Cepeda *et al.* (2017) emphasized that transportation contributes most to the environment impact. The transport sector contributes almost 23% of the world's greenhouse gas emission that comes from the burning of fossil fuels (Cristea *et al.*, 2013). Moreover, statistics had revealed almost 90% of all road transportation depends on diesel or petrol. The concept of green transportation provides the efficient and effective use of resources. For instance, instead of fuel, by using electricity, it does not produce any dangerous gases and is still able to move the cargo in high capacity. The green transportation also includes various low-pollution vehicles such as dual energy, natural gas, electric, hydrogen power and solar energy vehicle. Although green transportation is a new concept, it is practical because green transport offers a convenient, safe, efficient, low-pollution, humanized and diversified transportation system (Prause, 2014).

The transportation activities are a main issue that creates unhealthy surrounding. Usually the transportation in the Bukit Kayu Hitam used road transport such as trucks and lorry to move cargo. As expected, all the respondents agreed that transportation is one of the activities that contributes to the pollutions. This can be easily understood because transport is a major user of energy, and burns most of the world's petroleum when it moves from one place to another. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emissions of carbon dioxide. Within the transport sector, road transport is the largest contributor to global warming (Sushkov *et al.*, 2019).

Company B and Company C stated that transport is a major contributor to pollution, but Company A does not agree with that. He agreed that transport is only one of the contributors, not the main contributor. He further added that not only the logistics industry uses fuel, many other industries besides logistics uses fuel as the core element to run their activities like in the manufacturing industry. Company A statement is reinforced by the support stated by Ann and Su (2016) where electricity and heat production sectors are the major contributors of fuel combustion which contributes to pollution.

The awareness of pollution produced by the trucking industry as LSP companies explained by all respondents. Each of them provided their own opinion in this matter specifically the tools that may reduce the pollution and improve the environment. For instance, Company C stated that tracking of vehicles using GPS is one of the green logistics practices because it only uses satellite technology, which can help to reduce transportation cost, especially on the fuel cost where more savings could be derived since the drivers will be more alert and accountable with regards to their route. A GPS tracker allows the checker to monitor the route and gives the shortest route to optimize the resource more effectively and efficiently. The speed of the vehicle can also be detected using this system so that the drivers will drive more safely, hence minimizing the number of accidents of trucks on the road. This it may help Company C to achieve on-time shipment, economies of scale and preserves the environment. Although, Company C did not apply green logistics as a whole, the effort towards green logistics is there to continue.

Company B indicated that using NGV as a starting point to practise green logistics in their service, however, they do not guarantee that their vehicle can provide the same level of performance when their vehicle was used diesel. Vehicles need to have a high level of power to carry heavy loads. He is not convinced that if the company uses gas as a fuel source, their vehicles can perform well in carrying the loads. He added that if the company use gas as a fuel source for their transportation activities, they still need diesel as a backup fuel source. This means that they need to use both types of fuel to run their vehicles. This issue can easily understand as many vehicles that use NGV is small vehicle such as a car. However, with the latest technology advancement in vehicle design, automatic vehicle has been discussed and research around the world (e.g. Crandall and Formby, 2016; Hedenberg and Åstrand, 2016; Müller and Voigtländer, 2019). The aim is to offer an alternative for green logistics and provide sustainable environment.

It should be noted that several logistics decisions may involve environmental issues such as location, sourcing of raw materials, modal selection and transportation planning (Tamulis, Guzavičius and Žalgirytė, 2012). Thus, companies may face difficulties when balancing the trends towards green logistics and defining the strategic approach of green services that the LSP offers. However, previous research shows that logistics companies could enhance their

progress in green innovations by encouraging or supporting their employees for environmental activities, by training and educating them to become environment-friendly workers (Jazairy, 2018).

Barrier in implementing green logistics

All the three companies stated that they do not implement green logistics because of the cost. They argued that their company needs a big investment to purchase the technology in green logistics. This has also been highlighted by Tamulis et al. (2012) where the researcher stated that in order to implement several green methodologies in logistics activities, a high investment is needed by the company. This problem is aggravated when some of the companies have limited or do not have the sufficient budget and have prioritized the expenses according to urgency rather than importance (Denisa and Zdenka, 2015).

Basically, there are two types of cost involved in logistics management which are direct cost and transaction costs. Both types of costs are likely to constitute significant barriers to the adoption of green logistics (Denisa and Zdenka, 2015). To implement green logistics, it requires high investment, but in the end, it might yield a low return on investment (Chaghoooshi and Zereshki, 2014). Thus, it will not help the company to achieve a high profit margin. In addition, if they use the green concept, they also need advance technology adoption, they need to hire qualified employees, motivate and train employees to adopt green logistic practices to which it also requires an amount of investment (Dhillon, Bentley and Bukoye, 2016). Surely, it is not suitable for small companies to implement green logistics.

In addition, respondents from Company A and Company C also stated that Malaysia has been left behind in term of technology. Malaysian companies need to buy technology from other countries to be used within the organization. A high capability and skilled workforce in handling technology, specifically the new technologies related to green logistics are needed. The lack of skilled workforce is one of the barriers in implementing green logistics. This is stated in the study by Govindan, Kannan, and Haq (2014) who indicated that in order to operate a high-tech operating machine, it requires a high skilled workforce. Companies also need to invest in sending the staff for training and enhancing knowledge about green logistics in LSP. In short, the company needs to prepare a high investment. Thus, it may affect the company's capital and profit in the long term.

Finally, most LSP companies in Malaysia, especially in Bukit Kayu Hitam industrial area have yet to implement green logistics, as green logistics is not part of their corporate culture. In order to create a green culture among the LSP, government and top management of the companies should play an active role. Few research found that government regulations may encourage or discourage the use of innovation of green logistics because the government sets environmental regulations for the industry (Scupola, 2003; Lin and Ho, 2008). If the rules are not present, the organization will not engage in green practices because it is not an obligation. When there is no regulation and support system available, there is no reason for organizations to engage in green logistics practices. Further, the government also tends to encourage the organization to continue operating in their existing ways of supporting the old or traditional practice (Khidir and Zailani, 2011). Thus, lack of government support systems may consider the most dominant barrier to green logistics and development of its culture.

In order to encourage green logistics, the government should provide financial incentives, pilot projects, and tax reduction to stimulate the adoption of green practices for logistics companies.

The process of transportation, warehousing, packaging and inventory management from the producer to the consumer, and vice versa opened up markets for recycling and disposal, and led to an entire new sub-sector which is reverse logistics. In most cases, LSP is the operator that will be part of the process.

Future of green logistics among logistics service provider (LSP)

All respondents agreed that green logistics have a potential in improving LSP business. However, for Company A, the respondent does not support the green logistics implementation due to the cost. Even if the company has money to invest, Company A may not want to implement it because they want to minimize the cost, maximize the profit and run the company in conventional ways. Company B still plans to run the business by traditional way as usual. However, if the company received some funds from the government to implement green logistics, the company will accept it and will surely implement green logistics in the company for the company’s benefit and the environment. This is also similar to Company C, where the company will implement the green logistics if the government provides the funds or fully sponsors the implementation of green logistics. The findings were in line with Isaksson (2012). Future green logistics among LSPs are challenging, but has great potential to be implemented.

Proposed Conceptual Framework

Based on the findings, proposed conceptual framework for green logistics implementation is as below.

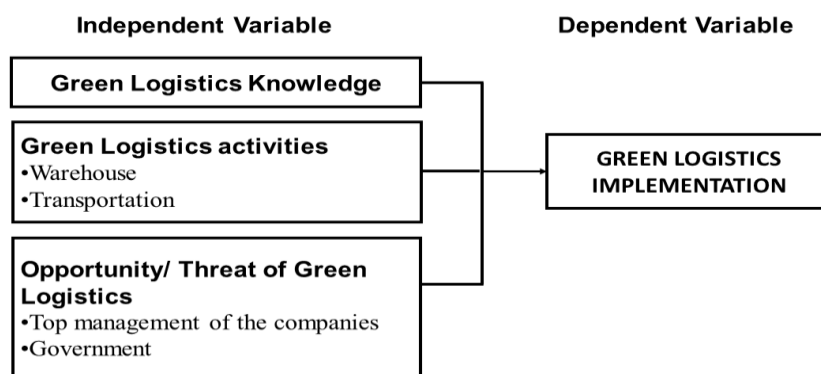


Figure 1

Proposed conceptual framework for green logistics implementation research in Malaysia.

CONCLUSION

The present study aims to explore the understanding about green logistics among logistics service provider (LSP) companies and to identify the barriers preventing companies from implementing green logistics. The study reveals some interesting findings which could have practical implications. The findings indicate that the implementation of green logistics among LSP is low due to some barriers. First, the level of knowledge about green logistics among LSP companies is minimal. However, logistics activities that the company carried out have some element of green logistics such as cross-docking and green packaging, thus emphasizing the possibility of implementing green logistics among LSP companies. Second, high cost of

investment to implement green logistics. This is because advanced technology is needed to implement green logistics activities to which lead to the need of highly skilled workers to operate the technology. Thus, training needs to be scheduled. Further, besides doubtful payback period for investing in green logistics, they also believed that the need for green logistics practices is not crucial in Malaysia.

The researcher suggests that support from the government in terms of providing monetary grants could be considered, especially to encourage green logistics practices among LSP companies. This suggestion is aligned with previous researchers who highlighted that cost is one of the factors in doing the business and materialising all the mission and vision of the organisation. Furthermore, investment for the investor could be encouraged by providing the incentive of green logistics to those who implement and practise it.

However, while the present study provides the current scenario of LSP companies in Malaysia, several limitations should be noted. This study acted as a baseline study to understand the green logistics practices among LSP companies in Malaysia. Due to the facts that this study is a case study research, the findings cannot be generalised to all LSP companies. More research about the implementation and practices of green logistics activities in LSP companies could be done, specifically focusing on the warehouse or transportation activities with a bigger sample size. Furthermore, proposed conceptual framework could be used to investigate further with bigger sample size for this issue. Future research also could be done in relation to an organisation or business culture towards green logistics.

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APPLICATION OF ROAD SAFETY PROCEDURE IN COMMERCIAL BUS COMPANIES: AN IN-DEPTH STUDY

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INTRODUCTION

An accident happened; however, when an accident involves a bus, the damage can be catastrophic. In Malaysia, in 2019, statistics indicated that 27 out of 6,167 death of road accident were involving bus passenger/ drivers (PDRM, 2020). This issue causes concern among Malaysian who used to travel interstate using bus express. Furthermore, many organisations are concerned about the frequency with which their employees are involved in road traffic crashes. However, in comparison to car drivers to which they have been trained in a driving school, many heavy vehicles and bus companies have their own professional driver training module.

In Malaysia, a code of practice for safety, health and environment (COP-SHE) was introduced in 2007. This COP-SHE has been developed by the Malaysian Institute of Road Safety (MIROS) to ensure the safety of heavy vehicle on the road. It sets out the minimum standard required by a service provider and drivers when transporting passengers. This code of practice has been developed to ensure the driver is a good reputation, fit and proper people to be responsible for carrying passengers and that vehicles transporting passenger are safe and clean. COP-SHE consists of guideline concerning the four standards of operation for the driver management, vehicle management, travel and risk management and document management system. Thus, it is expected that this guideline being follow-through by the bus company in their daily operation.

This study was a base-line study to investigate the road safety procedure that has been applied in the bus companies. The scope of the study was on the Standard of Procedure (SOP) that has been highlighted in COP-SHE. The data will be collected based on three elements of SOP, which were driver management, vehicle management and travel and risk management. However, this study did not investigate the document management system as the data storage, documentation and protection of the document are compulsory for company operation.

The current study was using a qualitative approach. Therefore, this paper commences with the research methodology that describes the data collection process. Next, findings and discussion are presented. Finally, this paper concludes the overall result based on the objective given and recommendations for future research is outlined.

METHODOLOGY

The researchers chose a qualitative approach to understand and gain in-depth information about the issue. As a base study, the researchers interviewed three operation manager of bus companies from the different market segment (i.e., express bus, travel & tour bus and stage bus company). The interview was designed to generate participant perspectives about ideas, opinions, understanding and experiences about road safety procedure in the company. After the data was collected, the transcribing process will be proceeding.

For this study, judgement sampling is used as the sampling method. Judgement sample allowed the researcher to select a sample that could provide an answer to the research question (Marshall (1996). In this study, the operation manager in each of the three bus companies, which are Company A, Company B and Company C was chosen to answer the semi-structured interview questions. Their selection is based on their experience in the daily operation of the bus companies. The semi-structured interview is to encourage and allows the interviewer to ask any question regarding the research to the operation manager and for the operation managers to explain their answer in detail. The data gathered been analysed using thematic analysis.

FINDINGS AND DISCUSSION

Table 1
Interviewees' profile

No.	Company	Gender	Working Experience (year)
1.	Company A (Local bus)	Male	>10 years
2.	Company B (Travel & Tour Bus)	Female	> 8 years
3.	Company C (Express bus)	Male	> 20 years

Driver Management

In driver management, it stated that the driver should be in good health condition, do not use drugs or alcohol, providing enough hours for the driver to rest mainly after a long journey, driver rotation and consistent schedule. The drivers also need to undergo in-house safety training. The previous study stated that certain behaviours could be targeted for training, uniquely individual drivers, by identifying areas where he or she differs from norms (Lisa Dorn & Gandolfi, 2010). For instance, driver behaviour like using a mobile phone while driving, eating on the bus, rude to the passenger and driving at high speed. Training inputs are required in various areas like competency-based placement, based management, leading front and back, team effectiveness and cohesiveness, disciplinary action, scheduling of bus operation and rural transport management (Hardik Shah, 2011). This training could increase the level of safety for the driver and passengers.

The findings indicated that although the companies operate different segment of service (i.e., local bus, travel and tour bus and express bus), they applied similar driver management procedure. All the three companies will check the driving record and have a face to face interview for the new drivers. For company A, the company also does the driving test and medical check-up. Besides checking on a driver record and face to face interview, Company B

requires the new driver does medical check-up, while Company C do the driving test without the need to do a medical check-up. Medical check-up provides benefits to bus companies. New drivers should undergo a medical check-up before reporting to work, and the existing drivers have a medical check-up every year. This procedure is to ensure the drivers always fit to drive. Previous studies related to heavy vehicle indicated that drivers might at least have one health condition with most common is high blood pressure (Meuleners, Fraser, Govorko, & Stevenson, 2015). Thus, with the increase in ages, it is suggested that bus company should consider making the medical check-up as a regular activity yearly for all bus drivers especially for those who are age 40 years and above.

The bus managers collectively agreed that driver training is beneficial. Thus, the new and existing drivers are scheduled to undergo training, especially for emergency response and hazard perception. Driver training, especially about hazard perception is an excellent program as it could improve the driving performance (Crundall, & Kroll, 2018). The respondents also stated that their companies would provide incentives for the drivers with a good driving record every year. This incentive is given to encourage drivers to be responsible while driving.

Another fact that well noted by all managers was working times. Research indicated that the maximum driving hours if the driver drives continuously is for 4 hours (Soccolich, et. al., 2013). They need 30 minutes of rest for every 4 hours driving with maximum working hours is 8 hours. The driver should have 16 days of working day per week and one day rest after six days working days. This working time is vital as many researchers such as Sparrow et al. (2016) indicated that excessive daytime sleepiness, reduced number of sleep hours, shift work and excessive driving time could lead to vehicle accidents. Thus, this study found that all the companies ensure that the driver gets enough rest. They implemented the driver rotation and working hours based on schedule, number of trips and distance travel.

Vehicle Management

All the respondents agreed that vehicle management is an essential aspect of bus companies either for long-distance bus service or short distance (local bus) service because they value the safety of passengers and the drivers (the company employees). As such, the respondents stated that the maintenance book record should be handy and periodic maintenance should be done to ensure safety and roadworthiness of the bus. Although each of the buses has their maintenance schedule, the bus driver usually inspects the vehicle before the journey to ensure the safety worthiness, especially the tires, brake and engine of the bus. They also agreed that an excellent maintenance record and using the original spare part might reduce the maintenance of the bus in the long term. All the three companies stated that if the bus was more than 15 years and not safe to be used, the bus will be sent for disposal. Besides, license and vehicle permits were provided by three companies to their bus driver for every trip. In summary, it shows vehicle management is crucial and has been taken seriously and applied by the three bus companies to increase levels of safety for passengers and bus driver. Furthermore, although vehicle problems not a major contributor to road accident, research indicated if the maintenance of the vehicle is done as scheduled, it could reduce the road crash risk and increase the safety of the passenger (Peck, Matthews, Fischbeck, & Hendrickson, 2015).

This finding was in line with previous research. In particular, bus companies should make comprehensive periodic maintenance with every single bus have its record of maintenance (Rögnvaldsson, Nowaczyk, Byttner, Prytz, & Svensson, 2018). Studies also indicated that the

age of buses also determines their technical readiness (Liu, Wu, Xie, & Kuo, 2017). With the latest advancing technology vehicle maintenance could be done more effective and efficient.

Travel and risk management

Bus company should identify all hazards associated with transport activities road and activity in the terminal and station. Based on the hazard identification, hazard risk assessment to be carried out and concluded the risk control, prevention of accidents of each traveller (Basri, 2010). The risk assessment should be carried out, including measures control to prevent the risk of accidents.

Concerning the above research statement, the findings found that besides topography, the weather condition is part of the hazard and risk during travelling because, if it is raining or haze, the driver could not see the road clearly. For topography, a good bus with an experienced driver could manoeuvre the slope and hilly area safely. Thus, all the respondents agreed that the drivers and the operations employee in the companies should be aware of the changes in road condition and the weather condition and topography of the area to increase safety and to avoid disaster areas (i.e., landslides and floods). This finding was in line with other research related to weather and topography of the road and its surrounding area (i.e., Jägerbrand, & Sjöbergh, 2016; Kumar, & Toshniwal, 2016).

Good driving habits and trained drivers can help reduce the risk of road crashes (Mallia, Lazuras, Violani, & Lucidi, 2015) because the drivers can make the right action to avoid an accident. Driver decision-making skills are essential in preventing accidents. All respondents stated that the driver would inspect based on the checklist given for travel. They will make sure that the first aid kits, fire extinguisher and emergency sign were in good condition. For long-distance bus, like express bus and travel and tour bus, they will stop at relax and rest (R&R) to rest or change driver, at the same time inspect tire pressure, brake and water. It is to reduce the risk of technical problems.

Also, GPS (Global Positioning System) is used as a monitoring system for Company A and Company C. It helps to monitor the bus movement to the destination. It also could reduce the pressure on the driver with an unfamiliar route. According to Pankaj Verma (2013), GPS can help in tracking the bus at a real-time and can also keep track the speed that bus use to deliver passenger in some destination. (Kamble, (2012). The bus informs location and how long that has been thereby using the tracking system. GPS also can detect the accident occurred by bus that proved to deliver passengers and directly reported to the respective authority through wireless technologies (Abid Khan, 2012; R. Rathinakumar, 2012).

Overall, from the findings, it shows that all three companies applied some safety procedure in line with COP-SHE guidelines to ensure the safety of their operation. Since driver behaviour is a significant factor that contributes to a road accident, all three companies agreed that recruitment process, training and reward should be implemented and emphasised. Not to forget, vehicle management and travel and risk management need to be in line with driver management. For example, although the company has a good driver, if there is a lack of bus maintenance, the company may place not only the good driver but also all passengers at high risk of road accidents. Therefore, the implementation of good driver management, vehicle management and travel and risk management may increase the level of safety in bus operation.

CONCLUSIONS

This study was done to investigate the road safety procedure that has been implemented by bus companies in Northern Malaysia. The findings found similarities and differences in the procedure each company implemented in managing their daily operation of bus activities. It also highlighted the importance of driver management, vehicle management and travel and risk management to be integrated into ensuring the safety of the bus operation. While the findings noted that the bus company's procedure in line with the COP-SHE guidelines, there were some guidelines in COP-SHE that have not been implemented.

Therefore, it is suggested that COP-SHE guidelines should be implemented entirely by heavy vehicle companies such as bus companies. COP-SHE has been developed to such level that the guidelines are relevant and easily implemented to reduce accident on the road. In Malaysian Road Safety Plan 2014-2020, Malaysia is very committed to reducing the fatality rate by 50%. Thus, cooperation from all transport companies such as bus companies is needed to ensure safety on the road.

It should be noted that this study has a few limitations that need to be considered. First, this study only a base-line study, that being done by interviewing the manager from three bus companies. It is highly recommended that future research should focus on each element in COP-SHE (i.e., driver management, vehicle management, travel and risk management and documentation) separately in more detail and using bigger sample size. Another limitation is that the scope of this study was bus companies. Therefore, for future research, other heavy vehicle companies such as lorries or trucking companies could be the sample for a research project.

In conclusion, safety is one critical part should be bus companies take more responsibilities to ensure the safety of the bus and passengers. To reduce accidents and transportation-related crashes, managing the driver behaviour, vehicle management and increasing safety infrastructure are essential. Thus, to make the bus operation smooth, they should follow all the guidelines provided by the government or their companies.

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DETERMINANTS OF ROAD ACCIDENT ON YOUNG ADULT MOTORCYCLISTS

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INTRODUCTION

According to the World Health Organization (WHO) (2018) Global Road Safety Status survey, each year, the lives of about 1.35 million people are cut short as a result of a road traffic accident. According to Lum (2019), in Asia and ASEAN, behind Thailand and Vietnam, Malaysia has the third highest fatality rate from road accidents. In 2016, transportation accidents (5.4%) were Malaysia's fourth most common cause of death. Road accident has been a significant problem in Malaysia and is now considered one of the social concerns.

According to the Royal Malaysian Police (2020), the highest total road accident death came from the young adult age category from 16 years until 25 years old. Combining these age category (16-25 years old) total road accident death cases from the year 2017, 2018, 2019 and 2020 (January- October) were 6620 death cases that are highest compared to other age category level in Malaysia. These prove that young adult motorcyclist involved more road accident and caused death compare to other age category riders in Malaysia. Thus, this study only focuses on young adult motorcyclists age category of 16 until 24 years old to identify road accident factors in Malaysia.

The causes of motorcycle accidents are subjective and involve multiple factors. Yaacob et al. (2017) revealed in the review analysis of road accident factor cases using the Haddon Matrix approach that (41%) of road accident factors derive from human actions, followed by (26%) of environmental and (33%) of vehicle factor. Also, Sultan et al. (2016) published in their report, human factor, road factor, vehicle factor, and environmental factor were the factors that lead to motorcycle crashes in Malaysia. In this study, human factors consist of self-error and other-driver error, environment factors, and vehicle factors that contribute to road accidents need to be examined in the Malaysian young adult motorcyclist rider's context.

Moreover, Ajzen (1991) Theory of Planned Behaviours (TPB) and Elliot et al. (2007) Motorcycle Rider Behaviour Questionnaire (MRBQ) are the most common theory and model used in road accident research. However, road accident research based on Traffic Locus of Control theory developed by Özkan & Lajunen (2005) is very limited. Apart from that, road accident research paper published in Malaysia are more focus in behavioural issues that contribute to a road accident (Rusli et al., 2020; Payani & Law et al., 2020; Hashmi et al., 2019; Ang et al., 2019); Manan et al., 2017; Abdullah et al., 2017). This study aims to identify road accident factors among 16-24 years young adult motorcyclist in Malaysia based on previous

studies and observation. This study used Traffic Locus of Control theory that consists of self, other drivers, vehicle, and environment factors in evaluating the road accident factors in the Malaysian context.

Therefore, this study examined with four intended objectives; (1) to identify the relationship between the self- factor and road accident among young adult motorcyclist; (2) to identify the relationship between the other drivers- factor and road accident among young adult motorcyclist; (3) to identify the relationship between the vehicle- factor and road accident among young adult motorcyclist; (4) to identify the relationship between the environment-factor and road accident among young adult motorcyclist.

REVIEW OF LITERATURE

The young adult traffic accidents cover the young age group population involved in road crashes due to inexperience, psychological immaturity and violent behavior leading to fatal and non-fatal injuries than adults (Chitme et al., 2015). According to Maqbool et al. (2019), an accident is an unplanned, uncontrolled event in which an individual's actions and reactions lead to personal injury or harm. According to the World Health Organization (WHO) (2020), defined youth are between 10 and 24 years age group, and young adults are between ages 15 and 24. United Nations (2020) also defines youth as being between 15 and 24 to determine young people's needs and provide guidance on youth growth. It indicates that young people are included in the group of young adults. This transition from childhood to adulthood brings about physical, sexual, psychological and social growth for young adults.

Scales et al. (2016) implied that young adults are essential in life and are in the evolving stage of their personal life. The lifespan from about the age of 18 to 25 years can be loosely described as youth or adulthood. In addition, Curtis (2015) also claimed that young adults are the crucial developmental stage of an individuals and the beginnings of adolescence to pursue social freedom. Adulthood is a complex, transformative period of human life that requires the growth from childhood immaturity and social dependency into adult life to the goal of maturity and social independence.

Özkan & Lajunen (2005) described self-factor as causes of accidents due to the driver's own mistakes or errors. Self-factor represents one of the internal factor occurrences of road accidents. Self or driver factors explained by Atubi & Onokala (2007) in traffic injuries, all causes related with drivers or vehicle users can lead to a road crashes, including driver actions, visual and auditory alertness, decision-making situation, response to the speed, confidence, insufficient attention on the road. According to Özkan & Lajunen (2005), the causes of traffic accidents associated with other driver's factor are reported by other driver's driving errors. Other drivers are one of the external reasons in the occurrence of road accidents. Houtenbos et al. (2005) pointed out other drivers from various directions will be interfered by other vehicle users. They have shared the same road space at the same time at some point. Drivers or riders can be influenced by other road user's unpredictable driving actions, and while riding on the road, the rider will be in unforeseen and risky circumstances. Özkan & Lajunen (2005) described a vehicle factor as causes of accidents due to vehicle failures. Vehicle-factor represents one of the external factor occurrences of road accidents. Adekitan et al. (2018) also indicated that the vehicle standard is important for the quality of the vehicle's performance and reliability. The vehicle's state will be adequately handled when the rider takes care of vehicle repairs to improve the vehicle's service life. Özkan & Lajunen (2005) elaborated environment as causes of accidents due to the undesirable environment that cannot be avoided.

Environment-factor represents one of the external factor occurrences of road accidents. According to Jawi et al. (2009), the weather and road conditions affect the rider's riding performance on the road. The poor weather will affect the rider's riding focus, reduce the rider's visibility, and increase an accident's risk. Johansson (2016) also notes that poor road conditions can increase vehicle defects and increase the motorcycle rider's travel time.

Theoretical Background

This study's theoretical background is drawn from the Traffic Locus of Control (T-LOC) theory developed by Özkan & Lajunen (2005). Özkan & Lajunen (2005) developed Traffic Locus of Control (T-LOC) enthused by Rotter (1966) Locus of Control theory and Driving Internality and Externality scale by Montag & Comrey (1987). T-LOC theory is based on the looking at the degree to which an individual typically perceives events in the driving situation as affected by internal control (self) or external control factors (other drivers, vehicle & environment, fate). Since its publication in 2005, the T-LOC has been translated and tested T-LOC factors into Bulgarian drivers (Totkova, 2020), Chinese drivers (Sun et al., 2020), Romanian drivers (Măirean & Havârneanu, 2019) & (Măirean et al., 2017) and Swedish drivers (Warner et al., 2010).

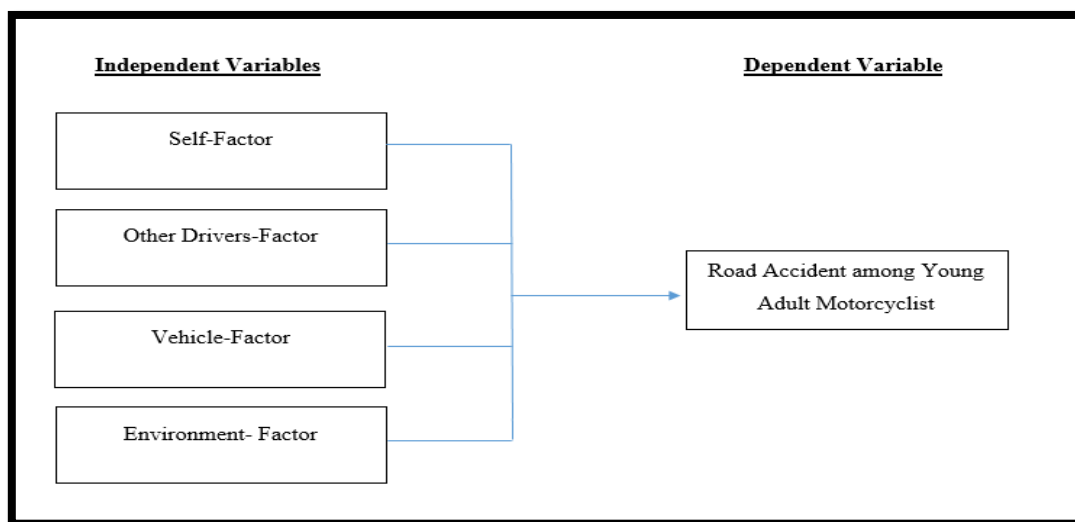


Figure 1.
Research Framework

An adapted version of T-LOC used in this study to identify road accident factors among young adult motorcyclist. In this study, four variables were chosen out of five variables from the original Traffic Locus of Control (T-LOC) scales. The actual T-LOC framework consists of variables (self, other-drivers, vehicle, environment and fate) and only chose the self-factor, other driver's factors, vehicle factor and environment factors. Variable of 'Fate' is not suitable for this present study. This is because 'Fate' factor was not significant and not related to the dependent variable of risky riding that contributes to road accident in Özkan & Lajunen's original research (2005). Questionnaire item included in 'Fate' variable such as bad luck and fate is not suitable for this study that examines road accident factors among young adult motorcyclist.

Hypotheses Development

Influences of Self-Factor in Road Accident among Young Adult Motorcyclist

Özkan & Lajunen (2005) researched the Traffic Locus of Control scale (T-LOC) and the relationship between Turkey undergraduate drivers with reckless driving. The 'Self' scale of T-LOC was related to each dependent variable of 'Driver Behaviour Questionnaire' (DBQ) scales, accidents and active accidents, and offences and traffic errors that contributed to accidents. In addition, Sun et al. (2020) found that in measuring T-LOC among Chinese drivers causing traffic accidents, self-factor was a strong predictor of risky, angry, and cautious driving styles. In contrast to this, Montag & Comrey (1987) research showed that driving internal factors or self-error are negatively associated with fatal accident involvement. Based on the above discussion, the following hypothesis is proposed:

H₀₁: There is no relationship between the self-factor and road accident among young adult motorcyclist.

H_{a1}: There is a significant relationship between the self-factor and road accident among young adult motorcyclist.

Influences of Other Drivers Factor in Road Accident among Young Adult Motorcyclist

Özkan & Lajunen (2005) classified other-driver factors as an external factor contributing to the road accident. Analysis in Özkan & Lajunen (2005) suggested that other drivers' variables were negatively associated with accident-related traffic errors. The other driver factor does not significantly determine the frequency of injuries, active accidents, passive accidents, violent breaches and ordinary T-LOC subscale. Meanwhile, other driver's factors are positively linked to the total measurement of traffic offences, as studied by Măirean et al. (2017). Therefore, the greater the driver's propensity to believe the other driver to be responsible for causing a traffic accident, the greater the number of traffic offences. Based on the above discussion, the following hypothesis is proposed:

H₀₂: There is no relationship between the other drivers-factor and road accident among young adult motorcyclist.

H_{a2}: There is a significant relationship between the other drivers-factor and road accident among young adult motorcyclist.

Influences of Vehicle-Factor in Road Accident among Young Adult Motorcyclist

According to Özkan & Lajunen (2005), the vehicle factor is an external factor leading to traffic accidents in their study. Vehicle factor had a good relationship in their study results with the number of traffic offences and errors in the factor structure of the multidimensional (T-LOC) and reckless driving relationship in the Driver Behaviours rating Questionnaire. However, Măirean et al. (2017) showed that the Romanian version of T-LOC's vehicle factor is not relevant in measuring traffic accidents and traffic offences among Romanian drivers. Based on the above discussion, the following hypothesis is proposed:

H₀₃: There is no relationship between the vehicle-factor and road accident among young adult motorcyclist.

H_{a3}: There is a significant relationship between the vehicle-factor and road accident among young adult motorcyclist.

Influences of Environment-Factor in Road Accident among Young Adult Motorcyclist

According to Özkan & Lajunen (2005), environmental factors have been shown in their research findings to positively correlate with the traffic errors in the Driver Behaviours Questionnaire score that lead to road accidents. Özkan & Lajunen (2005) used environmental factors as an external factor. In addition, analysis of Măirean et al. (2017) revealed that environmental factors are not important predictors among Romanian drivers in measuring traffic accidents and traffic offences. Based on the above discussion, the following hypothesis is proposed:

H₀₄: There is no relationship between the environment factor and road accident among young adult motorcyclist.

H_{a4}: There is a significant relationship between the environment factor and road accident among young adult motorcyclist.

METHODOLOGY

An explanatory analysis is the essence of this study. It is investigated if one occurrence causes another that seeks an explanation of the existence of particular road accident factors among young adult motorcyclists. This study engages in hypothesis testing to understand influences exists between variables. This study based on a correlational study in delineating important variables associated with the research problem. Study settings for this study are field study with non-contrived settings. The quantitative study is used where data were collected through survey questions. This study is a cross-sectional study where data collected within a short period of days from the respondents. For this study, an online survey questionnaire used to identify road accident factors among young adult motorcyclist. Collect the data from 16 to 24 years young adult motorcyclist from all state of Malaysia.

For this study, the populations are 3,880,988 which comprises the total number of registered motorcycles according to all age categories from the age 15 until 72 above in Malaysia in 2020 based on the statistics provided by Road Transport Department, (2020). 384 sample size was referred from Krejcie & Morgan (1970) sampling table, where authors suggests that a sample of 384 is enough for a population of one million or more. As the study's population sampling frame is available, the most suitable design for this study is probability sampling. Stratified random sampling was used to collect the respondent's survey data. The total population split into small group age categories (15-21 and 22-26), which amounted total motorcycle riders in these 15 to 26 ages categories 567,024. The unit of analysis is the individual motorcyclist. Primary and secondary data are used for this study to obtaining useful information for quantitative research design. For primary data, the data collected by distributing the online questionnaires to the respondents. The overall Cronbach score for all the 26 questionnaire items from five variables reported .859.

All questionnaire items are using a nominal scale and Likert scale, which are considered closed-ended questions. Study questionnaire includes two sections which are section A and section B. Section A represents respondent's background which nominal scales are utilized in this section. Section B consists of 26 questions and uses a five-point Likert scale from 'Strongly Disagree' to 'Strongly Agree' to assess the study component. Both methods adapt from previous literature work and have been updated to assess road accidents among young adult motorcyclists. In this study, SPSS program version 25 for Windows was used to analyze descriptive and inference

statistics. Descriptive statistics involves respondent's background. Meanwhile, inference statistics involves the Pearson Correlation Coefficient and Multiple Regression analysis.

FINDINGS

Demographic Profiles

Table 1
Summary of the frequency analysis for the respondent's background.

Description	Frequency (N=384)	Percent (%)
Gender		
Male	289	75.3
Female	95	24.7
Age		
16 years old	20	5.2
17 years old	25	6.5
18 years old	40	10.4
19 years old	35	9.1
20 years old	45	11.7
21 years old	56	14.6
22 years old	84	21.9
23 years old	52	13.5
24 years old	27	7.0
Motorcycle License		
Learner's Driving License (LDL)- 'L' License	66	17.2
Probationary Driving License (PDL)- 'P' License	101	26.3
Competent Driving License (CDL)- Full License	217	56.5
Motorcycle Riding Purpose		
To School/ Educational Institution	189	49.2
To Work	115	29.9
To Travel/ To Shopping	80	20.8
Motorcycle Riding Experience		

0-5 years	240	62.5
6-10 years	118	30.7
More than 10 years	26	6.8
Motorcycle Road Accident Involvement		
Yes	228	59.4
No	156	40.6

The demographic data consist of 384 respondents from age category from 16 until 24 years young adults who participated in this survey. In this survey, around two-thirds of the respondents were male which recorded (75.3%). Meanwhile, the female respondent recorded (24.7%). Apart from that, the respondent's age category, less than one-quarter of the respondents (21.9%), is 22 years old. 23 years age category respondents recorded (13.5%). 21 years age category respondents recorded (14.6%). Next (11.7%) respondents are age category of 20 years old. 18 years old respondents recorded (10.4%), 19 years old respondents recorded (9.1%) and 24 years category respondents recorded (7.0%). 17 years old respondents recorded (6.5%). Lastly, 16 years age category recorded (5.2%) as the least number of respondents. Besides that, more than half of the respondent (52.6%) stated have Competent Driving License (CDL) or Full License in the motorcycle license category. Meanwhile, (30.5%) respondent recorded have a Probationary Driving License (PDL) or 'P' license. Lastly, (16.9%) respondents have Learner's Driving License (LDL) or 'L' license.

Apart from that, the motorcycle-riding purpose category, slightly less than half of the respondents (49.2%), used motorcycle to school or educational institution. Next, (29.9%) respondents said to use a motorcycle to work purpose. Lastly, (20.8%) respondents recorded use motorcycle to travel or to shopping. In addition, more than half of the respondents (62.5%) stated 0-5 years of riding experience. Meanwhile, (30.7%) respondents stated have 6-10 years motorcycle riding experience and remaining (6.8%) respondents recorded have more than ten years of riding experience. Based on the survey that involves 384 respondents, more than half of the respondent (59.4%) said they had been involved in a motorcycle road accident and the remaining (40.6%) respondents said they had not been involved in a motorcycle road accident.

Correlation analysis to establish the possible connections between variables and to study the strength of the relationship between variables (Table 2).

Table 2
Correlation analysis.

	Road accident among young adult motorcyclist	Self-Factor	Other-Driver's Factor	Vehicle Factor	Environment Factor
Road accident among young adult motorcyclist	1	.682**	.685**	-.091	.463**
Self-Factor		1	.395**	-.123*	.513**
Other-Driver's Factor			1	-.167**	.790**
Vehicle Factor				1	-.220**
Environment Factor					1
	384	384	384	384	384

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

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

Based on Table 2, from the correlation analysis, the p-value for three independent variables against the dependent variable is .000, which is smaller than the α value of .001. Significant results are found between road accident among young adult motorcyclist and self-factor ($p < .000$), road accident among young adult motorcyclist and other-driver's factor ($p < .000$) and between road accident among young adult motorcyclist and environment factor ($p < .000$).

Multiple linear regressions are to test how the dependent variable is affected by two or more independent variables. This statistical test also pointed out the relationship between the variables discussing the total variance between the items (*Table 3, Table 4, Table 5*).

Table 3.
Multiple linear regression analysis: Model summary^b.

Model Summary^b				
Model	R	R Square	Adjusted R Square	Std.Error of the Estimate
1	.74 ^a	.54	.54	.35

a. Predictors: (Constant), Self-factor, Other- Driver's factor, Vehicle Factor, Environment Factor

b. Dependent Variable: Road accident among young adult motorcyclist

Based on the model summary Table 3, R-value shows that .74 shows a strong relationship between four independent and dependent variables. R² value shows .54. Taken as a set, the predictor's self-factor, other driver's factor, vehicle factor and environment factor account for (54%) of the variance in the road accident among young adult motorcyclist This model is considered good. This model only explains (54%) of the dependent variable variance, road accident among young adult motorcyclists. Meanwhile, (46%) of the road accident variance among young adult motorcyclists is unknown.

Table 4.
Multiple linear regression analysis:ANOVA^a.

Anova^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.35	4	13.59	113.12	.000 ^b
	Residual	45.52	379	.12		
	Total	99.87	383			

a. Dependent Variable: Road accident among young adult motorcyclist

b. Predictors: (Constant), Self-factor, Another Driver's factor, Vehicle Factor, Environment Factor

From Table 4. the ANOVA results indicate p-value .000, which is less than .005, showing that the regression model is significant. It means, at least one of the predictors accounts for a significant amount of variance in the road accident among young adult motorcyclist.

ANOVA Table (Test using alpha = .005). The overall regression model was significant,

$$F(4, 379) = 113.12, p < .000, R^2 = .54$$

The regression analysis's coefficient values are analyzed to determine which of the independent variables are strongly related to the dependent variable.

Table 5.
Multiple linear regression analysis: Coefficients^a.

Model		Unstandardized Coefficients		Standard Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.790	.230		3.43	.001
	Self- Factor	.262	.053	.305	4.99	.000
	Other Driver's Factor	.364	.533	.391	6.90	.000
	Vehicle - Factor	.061	.035	.061	1.72	.087
	Environment - Factor	.154	.039	.161	3.98	.000

a. Dependent Variable: Road accident among young adult motorcyclist

Based on the coefficient Table 5, three predictors are significant influences with the dependent variable. These predictors are the self-factor which significant value is ($p < .000$), other driver's factor value is ($p < .000$) and environment factor value is ($p < .000$) that is less than $\alpha .001$. This shows that, out of four predictors, there are significant differences in three predictors in the road accident among young adult motorcyclist. In this case, the road accident among young adult motorcyclist influenced by the self-factor, other driver's factor and environment factor. These three variables explained (54%) of the variances. Therefore, the regression coefficient equation will be:

$$\hat{y} = .79 + .262 (\text{Self Factor}) + .364 (\text{Other Driver's Factor}) + .154 (\text{Environment Factor}) + \varepsilon$$

The largest beta coefficient is found in another driver's factor ($\beta = .364$) and followed by the self-factor ($\beta = .262$) and third is the environment factor ($\beta = .154$). It shows that, out of three predictors, other driver's factor seems the stronger influence in the young adult motorcyclist road accident, followed by self-factor and then by environment factor. Hence, the hypothesis testing results are as summarized as self -factor H_{01} rejected, other drivers-factor H_{02} rejected, vehicle-factor H_{03} could not be rejected, and environment factor H_{04} rejected.

DISCUSSION

In this study, the self-factor among young adult motorcyclists was observed to contribute to road accidents. This finding is consistent with previous researchers who have seen self-factor as an essential factor in predicting the contribution to road accidents. Research by Özkan & Lajunen (2005) shows that self-factor is an indicator of active accidents, offences and traffic violations that have led to road accidents. The self-factor results also consistent with the result of Sun et al. (2020) research self-factor was a strong predictor of risky, angry, and cautious driving styles that lead to road accident among Chinese drivers. Meanwhile, self-factor in the present study result was contrasted to Montag & Comrey (1987) research about internality and externality driving involvement in a fatal accident where internal driving factors or self-error are not significantly associated with engagement traffic fatalities.

The present analysis, consistent with previous research, found that the other driver's factor has a positive and important contribution among young adult motorcyclists to road accidents. The element of other drivers is positively linked to the total measure of traffic offences that lead to traffic accidents, as studied by Măirean et al. (2017). However, the other-driver factor outcome is not compatible with the Özkan & Lajunen (2005) research report. Özkan & Lajunen (2005) suggested that other driver variables negatively affected accident-related traffic errors, number of injuries, active accidents, passive accidents, number of violations, violent breaks and ordinary violations with T-LOC subscales.

Apart from that, this study's outcome indicates that the vehicle factor does not affect road accidents among young adult motorcyclists. The vehicle factor's outcome is not consistent with Özkan & Lajunen (2005) arguments where the vehicle factor categorized in their research as an external factor leading to the traffic accident. The outcomes of vehicle scores in their study had a positive relationship with the number of traffic violations and errors. Besides, Măirean et al. (2017) show that in the measurements of traffic collisions and traffic offences among Romanian drivers, the vehicle factor under the T-LOC Romanian version is not relevant. The vehicle factor results were consistent with the present study outcome, which did not impact young adult motorcyclists in road accidents.

On the other hand, the environmental factor significantly predicts road accidents among young motorcyclists in this study. The study outcome is consistent with the previous Özkan & Lajunen (2005) research result, where the environmental factor classified in their analysis as an external factor leading to the traffic accident. However, this study's environment factor contrast with previous findings of Măirean et al. (2017) where used environment variable as an external factor to examine traffic accident and traffic offences among the Romanian drivers.

CONCLUSION

In conclusion, this study concerned the road accident influences Traffic Locus of Control attributes such as self, other-driver, vehicle and environment factors on the road accident among young adult motorcyclists. The purpose of this study project to examine the relationship between dependent and independent variables of T-LOC. Concerning that, this study's key findings are the self, other-drivers, and environment factors are significantly related to the influences of road accident among Malaysian young adult motorcyclists. This study able to identify the factors that contribute to the road accident among young adult motorcyclist in Malaysia.

Additionally, this study would help the Malaysia road transport authorities to improve their implementation and practices of road safety policies to reduce motorcycle accidents in Malaysia and making motorcycle to be a more sustainable mode of mobility especially for the youth in terms of contributing less to no mortalities in the future. Although this study had contributed to the field of road transport, the limitation persists on this research requires future research to broaden the knowledge on the road accident and road safety. In a nutshell, the researchers also prove some essential prospect elements for future research related to this topic.

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THE HIGHWAY USERS PERSPECTIVE TOWARDS ELECTRONIC TOLL COLLECTION

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INTRODUCTION

The first ETC system deployed by Technology was a 2.45GHz microwave in 1994 and another highway operator adopted the same technology in 1997. The system was further upgraded in 2001 to reach the global 5.8GHz standard. An ETC contactless smartcard was launched in 1997 as well as the system was further improved with the launch of two modules of connectivity Technology Implementation in Malaysia 97 On-board Tolling System for ETC in 1998. This system was later introduced as a single ETC system for Malaysia. Set of electronic tolls is an Intelligent Transport System (ITS).

The purpose of this study is to look at the perspective of the highway users on Electronic Toll Collection (ETC) in Malaysia .ETC is supposed to be helping overcome unresolvable traffic flow issues in Malaysia by eliminating the length of time spent in traffic congestion.at toll plaza at Highways in Malaysia.This study will focus on the perspective of highway users in using of Electronic Toll Collection in mitigating traffic issues at highway. It involved to know the relationship between perceived ease of use, time saving, perceived usefulness and behavioural intention on Electronic

LITERATURE REVIEW

According to (Harun & Mustafa, 2016) the degree to which a person has formulated consciousness to perform or not perform some specified future behavior is called behavioral intentions. Moreover, the performance of the Technology has made the user's behavioral intention to accept or not accept the Technology (Hassan et al., 2016). In the previous studies technology acceptance model has validated and perceived ease of use and perceived usefulness has the positive effect of the consumer's intentions to use a technology (Ahn et al., 2007; Hassan et al., 2016). Behavioral Intention is described as a type of procurement goal that is used to envision users accepting Technology. This will impact the individual choice to get Technology or not to grasp Technology later on (Brown & Venkatesh, 2005). Furthermore, the intention is influenced by the attitude towards an object and it also influences the behavior with respect to the object which is the use of it (Ajzen & Fishbein 1980).

Davis et al. (1989) found that behavioral intention to use the system is significantly correlated with usage, and that behavioral intention is a major determinant of user behavior while other factors influence user behavior indirectly through behavioral intention. Hill, Smith, and Mann (1987) also indicated that behavioral intentions significantly predict action. In summary, several prior studies either suggested or indicated that behavioral intention to use the system is a reasonable indicator of future system usage. The literature also suggests that the

determination of factors affecting behavioral intention to use a system is important to our understanding of their role in the successful implementation of information systems.

Previous studies by Davis (1989) also indicate the behavioral intention as the level to which an individual has developed plans that is conscious to accomplish or not accomplish some specific future behavior. Moreover, a person's intention to use is important in the real implementation of new technology (Davis, 1989). In addition, the famous theory for Technology which is Technology Acceptance Model Theory (TAM) suggests users that the Behavioral intention does shape the use of the technology for them Li et al (2012). Li (2012) also revealed that perceived ease of use, self-efficiency, perceived usefulness directly affects the system functionally.

The technology system also impacts on users' intentions towards use of electronic systems. Behavioral intention is also defined as a person's subjective probability that he or she will perform some behavior (Fishbein and Ajzen, 1975). According to Ajzen, behavioral intentions are factors that capture how much effort a person is about to make to complete a behavior. However, McCort (2001) argued that motivating a better understanding of consumer's behavioral intention is kept being a primary concern for researchers. Fishbein and Ajzen (1975; Ajzen & Fishbein, 1980) define behavioral intention as the agent's subjective probability that he or she will perform the behavior. Warshaw and Davis (1985) argue that this concept differs from the concept of intention as it is understood in everyday language. They also characterize Fishbein and Ajzen's original concept of behavioral intention as behavioral expectation.

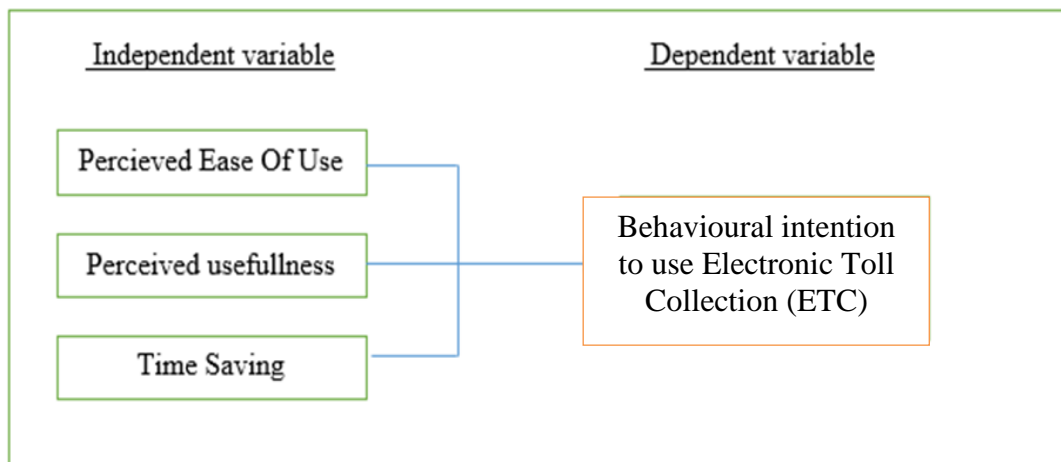


Figure 1
Research framework.

METHODOLOGY

The key role of quantitative analysis is to concentrate on collecting knowledge while continuously evaluating quantitative evidence utilizing specific statistical techniques (Apuke, 2017). To complete this study, quantitative methods being adopted to examine the determinant factors of road user's perspective towards Electronic Toll Collection (ETC).

A random sample size of 384 highway users was selected for this study. The study was conducted in a natural environment where the researcher's interference was minimal. Finally,

the design is known to be simple, inexpensive and allows for data collection. A convenience sampling procedure and a cross-sectional survey method being used for data collection. Unit of analysis is individual highway user. Google form. questionnaire being used. The questionnaire will use basic and simple wording so that the respondents will understand the questions clearly.

RESULTS AND DISCUSSION

Research of correlation to define the potential similarities between variables and to research on the relation between variables (Table 1).

Table 1
Correlation Table.

		DV	IV1	IV2	IV3
DV	Pearson Correlation	1	.923**	.891**	.907**
	Sig. (2-tailed)		.000	.000	.000
	N	397	397	397	397
IV1	Pearson Correlation	.923**	1	.913**	.927**
	Sig. (2-tailed)	.000		.000	.000
	N	397	397	397	397
IV2	Pearson Correlation	.891**	.913**	1	.922**
	Sig. (2-tailed)	.000	.000		.000
	N	397	397	397	397
IV3	Pearson Correlation	.907**	.927**	.922**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	397	397	397	397

Table 1 shows the correlations analysis results from the research of the dependent variable (Behavioural intention), the independent variable (time saving), second independent variable (Usefulness), and third independent variable (Perceived Ease of use). Timing influences more the behavioural intention with the highest correlation ($r=0.923$, $p<0.01$) compared to perceived usefulness which is ($r=0.891$, $p<0.01$) and Perceived ease of use ($r=0.907$, $p<0.01$). Based on the value shown in the table, significant value 0.000 which is less than 0.05. Therefore, this research can reject HO and accept H2 in this data.

Multiple linear regressions are designed to measure how two or even more independent variables influence the dependent variable. The relationship between the two variables was also

pointed out by this form of statistical test to analyze the overall variation between all the items. (Table 2, Table 3, Table 4).

Table 2
Multiple linear regression analysis: Model summary^b.

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.935 ^a	.874	.873	.34960

- a. Predictors: (time saving , perceived usefulness, perceived ease of use)
b. Dependent variable: (Behavioural Intention on Electronic Toll Collection)

Table 3
Multiple linear regression analysis: Anova^a.

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	336.658	13	25.897	221.282	.000
	Residual	44.823	383	.117		
	Total	381.481	396			

- a. Dependent variable: Behavioural intention on Electronic Toll Collection
b. Predictors: (Constant), (time saving , perceived usefulness, perceived ease of us)

Table 4
Multiple linear regression analysis:Coefficients^a.

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		Beta	Std. error	Beta		
1	(Constant)	0.179	.072		2.496	.013
	Time saving	0.527	.053	.521	9.967	.000
	usefulness	0.163	.050	.165	3.260	.001
	Ease of use	0.268	.054	.272	4.959	.000

- a. Dependent variable: (Behavioural Intention on Electronic Toll Collection)

Based on the table 2, R-square (R2) value shows the dependent variable explained by independent variables. In this study, shows that R2 is 0.874 which means time saving, Perceived usefulness, and perceived ease of use highlighted 87% of behavioral intention towards Electronic Toll Collection (ETC). The model is significant with $F(13, 383) = 221.282$ and p-value smaller than 0.001. Based on the result from the multiple linear regressions analysis, the p-value for all the independent variables is smaller than α value of 0.01. Therefore, the null hypotheses are rejected. Each of the predictor variables is significantly related to the dependent variable. Therefore, the regression coefficient equation will be:

Behavioural Intention on Electronic Toll Collection (ETC) score = 0.179 + 0.527 (time saving) + 0.163 (usefulness) + 0.268 (perceived ease of use) + e

The table above shows the value of the coefficients that have a positive relationship between the dependent variable and independent variables. If the significant value increases by 1%, the time saving also increases B value by 53%, while for perceived usefulness 1% of rise impacts the surge of B value and 16% and if the significant value increases by 1%, the perceived ease of use also increases B value by 27%.

Table of correlation, the significant value is (0.000) which is less than 0.05. Hence, we can reject H₀ and accept H₁ in this data. H₁ is the relationship between behavioural intention on electronic toll collection and time saving, perceived ease of use and perceived usefulness. Hence, there is a positive relationship between behavioural intention on electronic toll collection and time saving, usefulness and perceived time saving. Hence, the highest influencing factor on Highway users in Malaysia towards Electronic Toll Collection is the time saving variables with highest correlation value. The proceeding next influencing variables are perceived ease of use and lowest correlation of perceived usefulness variable.

CONCLUSION

This study established the Electronic Toll Collection (ETC) perspective from the highway users based on the underlying concept of Technology of Acceptance Model (TAM). The time saving, perceived usefulness and perceived ease of use of ETC were being assessed from the highway users and all of them were highly significant.

The highway users had perceived the usage of ETC as time saving, usefulness and ease of use. Even though this study had highlighted positive perspectives on Electronic Toll Collection (ETC), this study requires future research in order to better understand the effectiveness of Highway Electronic Toll Collection (ETC) in Malaysia. At the same time this study helps the Highway Electronic Toll Collection (ETC) stakeholders to improve their services that provided to the consumer and make them feel satisfy with the services that provided by them.

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EVALUATION ON DELIVERY SERVICE QUALITY OF E-COMMERCE: CASE STUDY UNIVERSITI UTARA MALAYSIA

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INTRODUCTION

At present, internet and e-commerce technology are developing more rapidly in Malaysia, and the numerous e-commerce providers are the key drivers of the growth in use. According to data from Malaysia Communications and Multimedia Commission, (2020), the percentage of internet users in Malaysia in 2020 is 88.7%, which is an increase of 1.3% compared to 87.4% in 2018. However, internet users have grown a lot among young people. The increasing number of Internet users in Malaysia represents the emerging trade situation in the modern Internet era which contribute to acceleration in trade and supply chain in any industry such as construction, energy and food (Zakaria, Ibrahim, Othman, 2017). The emergence of virtual online stores also enables customers to purchase goods or services in a faster and simpler way. At present, the development of technology not only greatly improves the possibility of purchasing goods through the Internet, but also makes the internal process of enterprise logistics system more efficient. The highly competitive e-commerce sector largely depends on the ability to provide final products to customers (Gupta, et al., 2019). Previously, the e-commerce industry and courier companies did not have such close contact and cooperation. The main reason was that the e-commerce industry was still in the development stage at that time, and the sales performance through the Internet was still relatively low, and the delivery was also dispersed. Some customers have individual special requirements, these reasons have led to e-commerce companies not paying attention to express delivery services.

Since 1995, Internet connection technology has continued to improve, and global trade has also continued to expand. Therefore, more advanced express delivery services have been available, which has also allowed the e-commerce industry to develop faster (Gulc, 2020). The influence of express delivery service on e-commerce customer satisfaction and potential key factors in the future. One of the main components that influence customer satisfaction is in the aspect of service quality (Kawa, Pierański, & Zdrenka, 2018). The quality of the delivery service is closely correlated with the end customer's perception and expectations. The quality of the service provided may be described as a consequence of a comparison between the expectations of the end-user of the delivery service received and the perception of the process in receiving the delivery service. The sovereignty of the verification and evaluation of the delivery service is on the customer. The customer is a resource and the center of transportation services. Therefore, it is necessary to use the verification, expectations and needs of customer service as basic information to improve service quality (Pralhad & Ramaswamy, 2004).

Driven by the development of the e-commerce industry and the advancement of Internet

technology, express delivery services have developed rapidly. Therefore, further research on the quality of express delivery services from the perspective of customers seems to be crucial (Gulc, 2020). According to Mitchell (1999), the risk is a subjective loss expectation. The greater the likelihood of a customer's expected loss, the higher the perceived risk. This is an important motivation to reduce the use of express services by customers. Therefore, we can find that there will be some problems in the process of service delivery, which will affect consumers' views and opinions on service delivery, for example, delivery speed, safety issues, after-sales service and quality of the courier. The purpose of this study is to examine the evaluation of e-commerce delivery service quality by UUM university students. The research objectives are to identify the effect of reliability on delivery service quality of e-commerce, to identify the effect of assurance on delivery service quality of e-commerce, to identify the effect of responsiveness on delivery service quality of e-commerce and to identify the effect of empathy on delivery service quality of e-commerce.

LITERATURE REVIEW

E-commerce and logistics have a complementary relationship. Fulfilment and delivery services are elements of the value chain of e-commerce. It can influence customers' intention to online shopping. The rapid advancement of online shopping has forced to a rise in the demand for frequent shipments in small batches, which has brought hope and challenges to the logistics industry (Lim & Shiode, 2011). The delivery service is a link in the supply chain that directly affects the customer and helps them to be pleased and fulfilled (Hedin, Jonsson, & Ljunggren, 2006). Vasić, Kilibarda, and Kaurin (2019) indicate that shipping in e-commerce can affect customer satisfaction in the study. Delivery service is one of the main factors driving e-commerce customer satisfaction (Rajendran, Wahab, Ling, & Yun, 2018; Hua & Jing, 2015). E-commerce companies and logistics providers must emphasize the quality of delivery services (Upadhyay, Shukla, & Tarangini, 2019). Siali, Wen, and Hajazi (2018) measure customer satisfaction towards courier service using SERVQUAL model. Li and Lu (2019) explain customer perception of reverse logistics service efficiency in B2C e-commerce based on the SERVQUAL model and the Logistics Service Quality (LSQ) model. Limsomkiat and Vanichchinchai (2019) discuss the delivery service quality of freight forwarders in aspects of assurance, tangibles, benefits, empathy, responsiveness, reliability, and cost of service. Valaei, Rezaei, and Kalantari Shahijan (2016) investigate the quality of courier service components and the effect of the service quality received on the overall quality of service.

METHODOLOGY

This study implements quantitative primary data research. According to Brigham (2010), the quantitative testing approach is a technique that utilizes experimentation to evaluate the problem. Other researchers, Mangan, Lalwani and Gardner (2004) said that the technique of quantitative research can help to efficiently develop logistic research because it is essential to point out the problem of research. In this quantitative research study, we will use a survey questionnaire to collect the respondent's data information. In order to express the dependent and independent variable, this form of quantitative analysis is used to analyses the relationship between these variables and to figure out the relation between cause and effect between dependent and independent variables. Conceptual framework adopts from SERVQUAL model. The service dimension of tangible hasn't been used in service quality measurement in this study. It is because the customer does not have physical facilities or equipment that are used

throughout the delivery of the parcel (Siali, Wen, & Hajazi, 2018). In study result of Valaei, Rezaei, and Kalantari Shahijan (2016) proves that tangible dimension is less significant in courier service. Please refer to figure one for conceptual framework.

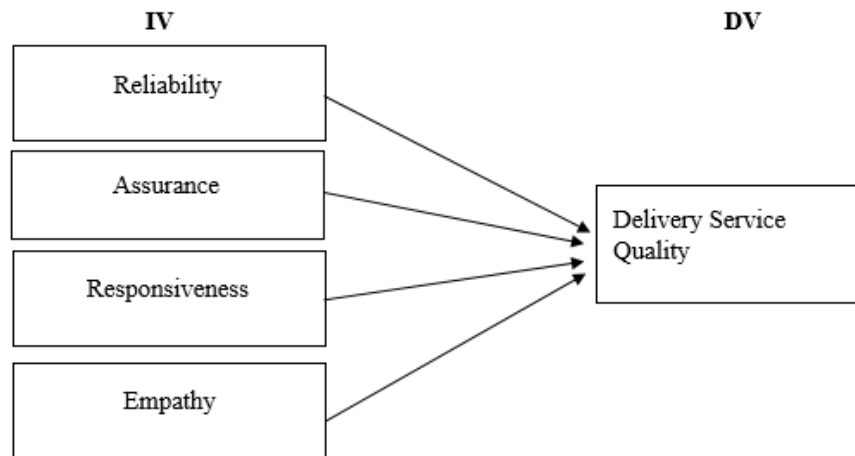


Figure 1
Theoretical Framework

Reliability as the ability to offer efficient, timely and promised customer support and the ability to cope with customer complaints (Ennew, Waite, & Waite, 2013). Reliability has been described by Parasuraman, Zeithaml, and Berry (1985) as the capability of the company to implement the service, dependently and independently. Liu and Liu (2014) and Meng and Zhou (2016) measure the express delivery service quality with reliability dimensions. Operationalization of variables means how a particular variable is defined and measured as used in the study (Tariq, 2015). Questionnaires are divided into six parts, which is section A, B, C, D, E, F, G. The questionnaire's design in this study involved five variables such as reliability, responsiveness, assurance, empathy and delivery service quality. According to Section A, the questions are about the students' background. The nominal scale is used to measure the student's background involved in this section. On the other hand, for Section B, C, D, E, F, the questions are based on the five variables of the factors that affect the quality of the delivery service among UUM students. These sections were measured by using the interval scale to allow respondents to express views that they agree or disagree with the particular item in the questionnaires. Five-point interval scale is displayed by using the following scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

After developing the draft of the questionnaire, we create our own questionnaire in the google form. We shared the google form link to Facebook and WhatsApp Group that active with UUM students. After that, we also will direct message the UUM student to fill in the form in which the response rate is low with only sharing in the social media group. Before filling in the form, we will inform you that this form only for UUM students. It took us about a week to collect back the questionnaire. Descriptive Analysis. The demographic profiles of the respondents were illustrated in order to facilitate the understanding of the data, primarily using descriptive statistics for comparison. Descriptive statistics are useful because, particularly if there were a lot of data, it might be difficult to imagine what the data revealed when we merely viewed the raw data. Therefore, descriptive statistics help us to interpret the data more concisely, providing a clearer analysis of the data. Exploratory Factor Analysis (EFA). The study used Principal Axial Factoring (PAF) to identify latent dimensions that what the items share in common. Factor analysis is the analysis that determines the underlying answers to a series of questions

from the more general dimensions (factors). It helps to define the structure of behaviors, reduces data and assists in the growth of scales.

By analyzing patterned ways in which collections of items are addressed, Exploratory factor analysis attempts to define certain higher-level variables or factors. The underlying factor is believed to trigger the inter-correlations between a series of (related) attitude responses (De Vaus, 2002). Reliability Analysis. All factors used in the study will be tested for reliability with Cronbach's Alpha to measure the internal consistency of each factor. Reliability of a measure was carried out where the Cronbach's alpha was tested. It is an indication of consistency and stability. Correlations Coefficient. Coefficient of correlations typically utilized by the index to quantitatively convey the degree of association between two sets of variables measurements. The formulas return a value between -1 (indicating perfect negative correlation) and +1 (indicating perfect correlation). The higher the value, the stronger the relationship between the variables. A higher value also indicated the correlation coefficient is close to each other. There would be no relationship at all in the situation that the correlation coefficient is zero or negative. Regression Analysis. It is an effective mathematical instrument that helps scientists to analyses the relationship in the model between two or more variables. The regression also can simultaneously look at the influence of several independents variables towards the dependent variable. In the study, linear regression will be used to examine the relationship between assurance, reliability, responsiveness and empathy with delivery service quality.

RESULTS

H1: There is a positive relationship between reliability and delivery service quality.

Parasuraman, Zeithaml and Berry (1994) state the assurance demonstrates the attitudes and actions of the employees and the willingness of the employees to provide friendly, confidential, courteous and professional services. Meng and Zhou (2016) stated that the result for the assurance dimension is satisfied by customer and influence to express delivery service quality.

H2: There is a positive relationship between assurance and delivery service quality.

The responsiveness is connected to the willingness and capacity of the company to assist customers and provide rapid service with proper timeliness (Parasuraman, Zeithaml, & Berry, 1985). Responsiveness is mainly concerned with how service providers, through their employees, react to customers. Service quality will be increase when the employees paid the attention to the customer who facing the problem then a fundamental change occurs when this happens. MCMC (2020) stated that responsiveness has influence the delivery service quality.

H3: There is a positive relationship between responsiveness and delivery service quality.

In communicative contexts, the empathy component of service quality includes being sensitive, knowing customer wishes, displaying friendly actions and personally taking care of the needs of a customer (Ennew, Waite, & Waite, 2013). Liu and Liu (2014) measure the empathy dimension in the delivery service quality and the result is it can influence service quality.

H4: There is a positive relationship between empathy and delivery service quality.

The undergraduate UUM student will be our population for this study. According to the latest data retrieved from BKP, 2021. It indicated there is 28,603 undergraduate UUM students in

Jan 2021. In a way to carry out this research, we use the non-probability sampling technique because we do not have the sampling frame which is a complete list of everyone in our population and to provide a means when choosing the respondents of the target population that involved in this survey. In addition, through this non-probability sampling technique, we use the convenience sampling techniques type. Sample size is 377 UUM students which refer to Krejcie and Morgan (1970) sample size table for population sizes 20,000. 400 questionnaires were distributed to the public.

Demographic Profiles

The table below shows the demographic profile of the respondent for this study. The total respondent is 361. It consists of the respondent demographic information such as gender, race group, age group, semester group, online shopping experience, online shopping frequency group and online shopping duration group.

Table 1
Background of the respondents

	Information	Frequency	Percent (%)
1)	Gender Group		
	Male	115	31.9
	Female	246	68.1
	Total	361	100
2)	Age Group		
	19 years old and below	13	3.6
	20 years old	61	16.9
	21 years old	98	27.1
	22 years old	66	18.3
	23 years old and above	123	34.1
	Total	361	100
3)	Race Group		
	Chinese	139	38.5
	Indian	33	9.1
	Malay	185	51.2
	Other	4	1.1
	Total	361	100
4)	Semester Group		
	1-2	124	34.3
	3-4	67	18.6
	5-6	64	17.7
	7 and above	106	29.4
	Total	361	100
5)	Online Shopping Experience Group		
	Last 6 months	92	25.5
	6 months – 1 years	78	21.6
	1-3 years	95	26.3
	3-5 years	52	14.4
	More than 5 years	44	12.2

Total	361	100
6) Online Shopping Frequency Group		
Rare (Only 1 time within 6 months)	30	8.3
Occasional (1-3 times within 6 months)	140	38.8
General (1-3 times in a month)	109	30.2
Often (4-10 times in a month)	67	18.6
Frequent (more than 10 times in a month)	15	4.2
Total	361	100
7) Online Shopping Duration Group		
Less than 1 hour	73	20.2
1 hour	111	30.7
2 hours	97	26.9
3 hours	31	8.6
More than 3 hours	49	13.6
Total	361	100

Table 1 shows that nearly two-thirds of the interviewees are female, accounting for a total of 246 persons (68.1%). Then, slightly less than one-third (31.9%) of the respondents were male, accounting for 115 in total. And it shows that most of the respondents (34.1%) are from the 23 years old and above age group, followed by the 21-year-old age group, accounting for 27.1% of the respondents. The age group from 19 years old and below accounted for the least proportion, only 3.6%. And it shows that half of the respondents are Malays, accounting for 51.2%. Followed by the Chinese, accounting for 38.5%. Indians also accounted for 9.1%. The rest are Indian Muslim, Iban and Siamese. And it shows that there are more respondents from semester 1-2 and semester 7 and above, accounting for 34.3% and 29.4% respectively. The semesters 3-4 and 5-6 accounted for 18.6% and 17.7% respectively.

Table 1 as well shows that respondents with 1-3 years of online shopping experience accounted for the largest proportion, accounting for 26.3%. Followed by the respondents of the last 6 months, accounting for 25.5%. Respondents that have online shopping experience more than 5 years accounted for the smallest proportion, accounting for 12.2%. And it shows that Occasional respondents accounted for the largest proportion, accounting for 38.8%. Then the respondents of Frequent and Rare accounted for a relatively small proportion, 4.2% and 8.3% respectively. And it shows that 30.7% of respondents will use 1 hour each time for online shopping. The second is the use of 2 hours of respondents, accounting for 26.9%. Only 8.6% of respondents spend 3 hours shopping online.

Rate of Delivery Service Quality

Table 2
Descriptive Statistics of Variables

Variables	N	Mean	Std. Deviation
Reliability	361	3.97	0.65
Assurance	361	3.91	0.72
Responsiveness	361	3.90	0.67

Empathy	361	3.80	0.77
Delivery Service Quality	361	4.06	0.70
Valid N (listwise)	361		

Table 2 shows that descriptive statistics of Reliability, Assurance, Responsiveness and Empathy with the dependent variable of this research study. The highest mean among the variables is Reliability with a mean of 3.97. The second Assurance with a mean of 3.91. The third Responsiveness with a mean of 3.90. The fourth Empathy with a mean of 3.80. These data indicate that Reliability may be the most relevant variable because most respondents agree.

Table 3
Pearson Correlation (n=361)

		Reliability	Responsiveness	Assurance	Empathy
Service Quality	Pearson Correlation	.673	.757	.798	.762
	Sig.	.000	.000	.000	.000

Since $P < 0.05$ (0.000), in Malaysia, there is a significant relationship between Reliability, Responsiveness, Assurance, Empathy and service quality. Therefore, these four independent variables all have a positive correlation with Malaysia's express service quality.

Table 4
Results of Pearson's Product-Moment Correlation

Variables	RA	RS	AS	EM	CS
Reliability (RA)	1				
Responsiveness (RS)	.655**	1			
Assurance (AS)	.622**	.793**	1		
Empathy (EM)	.589**	.771**	.804**	1	
Service Quality (CS)	.673**	.757**	.798**	.762**	1

Note. One-tailed test. Significant at $p < .05^*$, $p < .01^{**}$

Table 4 shows all the research variables, which are Responsiveness (RS), Assurance (AS), Empathy (EM) and Service Quality (CS). These variables are all significantly correlated with Reliability (RA) when p at least $< .05$. Among these factors, the strongest correlation with Service Quality is Assurance ($r = .798$), Followed by Empathy ($r = .762$), Responsiveness ($r = .757$) and reliability ($r = .673$). These results interpret that there is a linear relationship between the independent variable and the dependent variable in the study. Therefore, it is appropriate

to perform multiple linear regression to test the research hypothesis.

Table 5
Results of multi-collinearity and autocorrelation

Variables	VIF	D
Reliability	1.853	
Responsiveness	3.411	1.748
Assurance	3.664	
Empathy	3.289	

When VIF is greater than 1.0, it means that multicollinearity may bias the regression model, and when VIF is equal to or greater than 10, there is a serious multicollinearity problem (Pallant, 2016). The VIF values in Table 5 are all slightly higher than 1.0, but still lower than 10. Therefore, it is concluded that multicollinearity is not a serious problem and may cause bias in the regression model. In the regression model, the lack of autocorrelation is needed to achieve independence of observation. The value of the Durbin-Watson statistic D should be approximately 2.0 to indicate that there is no autocorrelation problem. The result obtained is $D = 1.748$ (so $D \approx 2.0$), which indicates that there is an autocorrelation problem and a result independent of the observed value is obtained (George & Mallery, 2016).

Table 6
ANOVA for Relationship between Independent Variables and Service Quality

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	126.641	4	31.660	231.206	0.000
	Residual	48.749	356	0.137		
	Total	175.390	360			

a. Dependent Variable: Service Quality

b. Predictors: (Constant), Empathy, Reliability, Responsiveness, Assurance

Perform multiple linear regression to determine the best set of predictors in predicting customer service quality. The ANOVA table indicates that the corresponding p-value is very significant ($p = 0.000$). This shows that there is a linear relationship between the customer's service quality and these four predictive variables (Empathy, Reliability, Responsiveness, Assurance). Therefore, it determines the applicability of the model.

Table 7
Result of multiple linear regression

Relationship	β	T	Sig.	R^2	Decision
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Reliability → Service Quality	.212	5.583	<.001		Accepted
Responsiveness → Service Quality	.160	3.096	.002	.719	Accepted
Assurance → Service Quality	.358	6.689	<.001		Accepted
Empathy → Service Quality	.226	4.468	<.001		Accepted

According to the coefficient table, it can be found that the four independent variables (Reliability, Responsiveness, Assurance, Empathy) are all great significance in explaining customer service quality, because their P values are all between <0.001 and 0.002, and all P values are less than 0.001. On the contrary, all independent variables significant predictors of service quality at $p < .05$. In sum, these results supported all hypothesized relationships in this study. All factors explained 71.9% ($R^2 = .719$) of variance in delivery service quality. It shows that variation is substantial which $R^2 > 0.67$ (Chin, 1998). According to the beta value (β) in the standard coefficients, the beta value of Reliability is .212, Responsiveness is .160, Assurance is .0358, and Empathy is .226. This will enable more people to obtain better express service quality. According to the result, it shows that there is a strong relationship between the 3 independent variables, namely Assurance (35.8%), Reliability (21.2%) and Empathy (22.6%).

DISCUSSIONS AND CONCLUSIONS

This study aimed to examine the influencing of assurance, reliability, and responsiveness towards delivery service quality of e-commerce among University Utara Malaysia (UUM) undergraduates. A research framework was developed to answer and to provide answers to the research questions and research objectives. This study involved 361 respondents from the UUM. The first research objective (ROs1) is to identify the effect of reliability on delivery service quality of e-commerce. In the dimension of reliability have deleted on item (RA5) which factor loading value is low than 0.40. After factor analysis and reliability test, we conducted Pearson correlation and result show that reliability has a positive correlation with delivery service quality which correlation of 0.673. According to multiple linear regression table (Table 13) shows that reliability is accepted which it is a positive relationship with delivery service quality. Reliability has a strong relationship with delivery service quality which beta of 0.212. The effect of reliability on delivery service quality is positive and can influence the service quality. The increase in reliability will make the service quality also increasing. In the study of Limsomkiat, N. and Vanichchinchai (2019), also indicated that reliability needs to be more concern about it.

The second research objective (ROs2) is to identify the effect of assurance on delivery service quality of e-commerce. The relationship between assurance and delivery service is positive and assurance can influence the level of service quality. Delivery service quality and assurance have the strongest correlation among these independent variables with a correlation of 0.798. It also is the most significant dimension that influencing delivery service quality with a beta value of 0.358. Assurance is the dimension that has a high effect on delivery service quality. The study of Siali, Wen, and Hajazi (2018) stated that assurance is the critical dimension in influencing customer satisfaction. This proves that assurance is important for customers with the questionnaire question for independent variables is adopted from this study and we get the same result that assurance is critical in-service quality to satisfy the customer. Phiri and Mcwabe (2013) and Cook (2000) also indicate assurance are the critical dimension in service quality in their result studies. The third research objective (ROs3) is to identify the effect of responsiveness on delivery service quality of e-commerce. A positive correlation between

responsiveness and delivery service quality. It can positively influence delivery service quality. For the effect of responsiveness toward service, quality is less compared with another independent variable with beta value is 0.16. In the survey of MCMC (2020) states that responsiveness in reply customer can increase competitive advantages for courier company. The fourth objective (ROs4) is to identify the effect of empathy on delivery service quality of e-commerce. Empathy also has a positive relationship with delivery service quality and it also significant in delivery service quality with beta value is 0.226. The result of Bahadur, Aziz, & Zulfiqar (2018) stated that empathy has a positive effect on perceived service quality.

IMPLICATIONS

Students are the young people who use online shopping the most. Students are also classified as technophilic. That is, individuals who feel like they are related to the development of technology. When ordering goods online, one of the important things that customers want is timely courier service. However, there are other things that can increase customer satisfaction among UUM students. The findings from this study can be used by online merchants, courier service companies and UUM parcel management center to improve the delivery service of online purchases.

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THE ROLES OF ARTIFICIAL INTELLIGENCE (AI) TO ENDURE THE RISK OF COVID-19 IN WAREHOUSING MANAGEMENT

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INTRODUCTION

On late of December 2019, the world shocked by a cluster of cases that caused by a virus in Wuhan, China. The cases got global attention since it was a new type of virus known as Corona Virus (COVID-19). It became worst when the World Health Organization (WHO) announced that the virus could be transmitted by human-to-human. Started from there, several cases found out in many other places around the world. Day by day the cases got increased and WHO identified the spread of COVID-19 as a pandemic on March 2020. Hence, several countries made a drastic decision by restricted a movement order and lockdown to across boundaries. During the lockdown, certain industries were obligated to shut down their business or work from home. These situations affect the global economic included in logistic industries. Warehousing management mostly affected by these lockdowns. The difficulty to work without human resources giving an impact on daily basis routine in the warehouse itself.

LITERATURE REVIEW

Warehouse is a part of supply chain in logistic. Generally, warehouse play a significant role as storage place. The raw materials, half manufactured goods and a product need to be stored at the warehouse before distribute to the suppliers or to the customers. As a warehouse is a huge building, there are a lot of aspects need to be care of. Starting from arrangement, data, safety and more. Here, a well warehousing management is required in order to make sure that all the warehousing process is smooth and well managed. A warehouse management system consists of software and process that allow organization to control and administer warehouse operations from the time goods or materials enter a warehouse until they move out for delivery or next process of manufacturing (Margaret, 2018). According to Solistica (2019), there are five major tasks that involve in warehouse management process which are:

- I. Reception – the employees will record the goods and material once they arrive at the warehouse and update the ID data in the software system.
- II. Storage – the recorded goods and materials will be placed in available space in the warehouse.
- III. Control of Inventories – the employees also need to have a clear information about where the goods and materials will be distributed at.
- IV. Picking – the goods and materials that need to be deliver will be collected and gathered before moved out.

- V. Shipping – here the goods and materials will be move out from warehouse for delivery purpose to the customer with several procedure.

Based on the tasks listed above, there are a lot of human resources needed to accomplish all the work. After the lockdown been enforced, the employees were obligated to stay at home and the management process cannot be done manually. As that, the demand of smart warehouse is increased and internet of things (IoT) is an alternative to do all the process in the warehouse (Sunol, 2020). One of IoT that fit to solve the difficulty in warehousing management is Artificial Intelligence (AI). Artificial Intelligence (AI) often related to an improvement on computer things align with advanced technology that developed to enhance the efficiency on certain task. It also can change the manual task to automatic mode with robotic technology. AI is a branch of computer science that aims to make machines that can mimic the functions and reactions of a human as closely as possible (Jake, 2020). Other than that, AI also defined as the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions (Copeland, 1993). It has ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings (Ray, 2019).

Alternatively, some tasks which previously assumed required human intelligence can easily be done by computers now (Li, Zhu & Shi, 2015). This show, that AI have a capability to do the tasks similar with human do accurately. Based on data recorded in the Mitsubishi Heavy Industries (MHI) Industry Report on 2020, only 12% of warehouse companies are currently using AI technology to perform the management tasks. However, most of them believe that AI has the advantage to improve their management (Jake, 2019). Dispute on the low percentage of AI use in warehouse management, many companies are trying to find out how to utilize new AI-enabled warehouse technology today (Veridian, 2019). Result from the interest, in last four to five years, the market for robotics in the warehouse industry has grown significantly (Naveen, 2019). For example, Amazon leads the way followed by carriers such as FedEx and DHL are testing and developing robotic-based systems to improve the operations (Naveen, 2020). In addition, Alibaba's warehouse use AI robots that perform 70% of the tasks in their management similar with Amazon that has AI robots deployed at their warehouse that able to sort, transport and arrange goods and materials at the warehouse (Vitaly, 2019). Research from Harvard Business Review found that managers expend most of their workday on administrative, coordination and 84% of the managers believe that AI technology can help them do the management process effectively (Companik, Gravier, & Farris, 2018).

ROLES OF ARTIFICIAL INTELLIGENCE

Based on the scenario on pandemic nowadays, the warehouse companies should have an initiative planning to make sure that management of warehouse still under process even though during the movement control order. There is high probability of risk to get infected with the virus when the employees perform all the tasks like usually basis. Therefore, the AI can endure the risk by play their roles in certain task. The roles are stated below:

HUMAN DRIVEN VEHICLES

According to China statement, other than transmitted human-to-human, the COVID-19 also

can transmit by the goods or parcel. Basically, most of the warehouse management used traditional manual-based. Thereby, the employees were exposed to the risk of being infected by the COVID-19 while handling the goods or materials since it may have been travelled from many places before. Based on the situation, there is a low possibility of the goods or materials being transmitted by virus. Hence, a risk control plan is the best technique that the warehouse management could apply to overcome the issue. AI will play a role exactly similar to human resources. In this case, the AI will act as human-driven vehicles that will give way to automated vehicles such as small carts that come equipped with warehouse management software or 3PL systems, or smart trucks that can assist with surveillance of parcel management (Jamie, 2019). The operations of a warehouse such as ID data collection, inventory process, tracking process and more would be done automatically without any human resource involvement (Companik, Gravier, & Farris, 2018). AI robots can be deployed to scan digital tags that are able to control the inventory. Not just that, AI has a special ability where it can determine the shortest possible routes to place items and even avoid bumping into each other (Vitaly, 2019). Hence, the risk exposure towards the employees whom need to manage the goods and parcel that arrived at the warehouse could be controlled with the use of AI robot-based. AI works in robot-based mode. The robot does not need to have two-way communication when working like how human resources should do. Besides that, if they also need to work together, the virus also cannot be transmitted straight away. This will prevent the spread of COVID-19 at the parcel to human and could be a risk control in warehousing management.

DRONE-DELIVERY

As we know, the goods and materials placed at the warehouse have to be distributed or delivered to the supplier or the customers in certain places. Regardless of where the destination will be, the warehouse companies are responsible to fulfil the tasks safely to the receiver. Here the issue is when the employees need to deliver the goods or the materials at the place that already spread by the COVID-19. Not just that, the anonymous receiver also exposes the employees to the risk of COVID-19. Risk is defined as the uncertainty of the possible outcome resulted from an activity. Applied to these cases, the objective is to make sure the employee that performs the task is in a safe condition after delivering the goods or materials. The uncertainty is whether the employee is negatively affected by the virus which is the opportunity of the risk, or the employee would be infected by the virus which means it is the threat of the risk. To overcome the issue, the warehouse management can use to replace the employee with the drone to deliver the goods and materials. In concept of risk management technique, this is known as a prevention step. Meanwhile, for certain big companies in logistics, they already used drones in their management. For example, Amazon recently announced about opening physical locations that have some referring to these stores as their drone airports as well as Walmart who has been filing a lot of drone patents over the past few years (Companik, Gravier, & Farris, 2018). Next, logistic companies like DHL and organizations like Google are developing and experimenting with drones to do just delivery within 30 minutes, especially for lightweight consumer goods (Vlahovic, Knezevic, & Batalic, 2016). Practically, the drone delivery technology operates autonomously, taking off and landing from the same location automatically and avoids many obstructions in its flight path (Companik, Gravier, & Farris, 2018). These characteristics of drones will prevent the spread of virus. Besides that, drone delivery, it also can perform other tasks in a warehouse such as inventory, goods or materials arrangement, moving boxes and else.

THE ADVANTAGES OF ARTIFICIAL INTELLIGENCE

Other than AI can reduce the risk exposure of COVID-19 in warehouse, there are other benefits or advantages that could improve the warehouse management process. The advantages are:

IMPROVE EFFICIENCY

The robotic-based systems that programmed correctly can work excel than human manual based. These will prevent any error like how human easily do when performing the tasks. This is because robot is more dexterous, flexible and scalable than human resources and it able to improved warehouse productivity. The robots also can measure variables in making any decision that will resulting in increased accuracy of orders picked, packed and shipped (Gary, 2018). In addition, the AI can work 24/7 non rest. It definitely can increase the productivity of the warehouse (Vitaly, 2019). For example, with the use of drone in inventory, the drone can reduce the needs of forklifts or possibly replacing the conveyor systems that often used to transport boxes around the warehouse (Gary, 2018).

CREATE COMPETITIVE ADVANTAGE

Resulted from improvement of efficiency and productivity increasing, the warehouse management that used AI robot-based also can create a competitive advantage. Depending on the ability to learn and train based on data, AI can offer numerous insights into how to market, who to market, when and where to market and even why to market. This make the AI know a customer on a personal level that human resources unable to do (Companik, Gravier, & Farris,2018). The customer satisfaction is the key for companies to success. A good relationship with customer will giving a huge advantage for company to be at front than other companies.

DECREASE LABOR COSTS

The using of AI will eliminate certain human resources. The numbers of worker could decrease. There are limited of hiring new employees, limited of training programmed will lead to endure of labor costs (Naveen, 2020). The decrease of labor costs can be led to cost efficiency. It also can be uses to pay other costs such as utilities costs, maintenance costs and more.

CONCLUSION

The objective of this study is to explain the roles of artificial intelligence in warehouse management to reduce the risk during COVID-19. The fact that the COVID-19 is pandemic that experienced globally. In the concept of risk, pandemic classified as emerging risk which mean it is unexpected event happen. As we cannot avoid the virus from spread everywhere, a risk management is a must to endure the effect of the COVID-19. For warehouse management

the artificial intelligence (AI) or internet of things (IoT) is the best equipment or initiatives that could help to maintain the process sustain in management. To the date, the uses of artificial intelligence is still under development and observing, yet there are a lot of study or research paper that related to artificial intelligence. This show that the artificial intelligence has a high potential or a bright future to take a place and play a significant role in supply chain and logistics management generally and warehouse management specifically. With improvement and other development align with emergence of new technology, artificial intelligence will be a huge advantage to industry that have an interest to use it.

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