Conceptualization of a Research Model for Sustainable Logistics Practices and Logistics Transport Performance
(*Konsep dan Model Rangkakerja amalan Kelestarian Logistik dengan prestasi pengangkutan logistik di Malaysia*)

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ABSTRACT

The paper aims to validate scale measurements of logistics execution practices, pricing practices, service offerings and labor practices as constructs for sustainable logistics practices for transporters. Furthermore, the paper intended to explore the influence of sustainable logistics practices on logistics transport performance. The variables are linked with triple bottom line (TBL) model and variables are clustered based on environmental, economic and social dimension. Further, the variables of sustainable logistics practices were tested on logistics transport performance. In total, five hypotheses are postulated. The model testing was executed by applying PLS-SEM application. The data collection was based on transport users, which cover manufacturers, third party logistics service provider and freight forwarders. The model testing utilized 194 transport users in Malaysia to prove the formulated hypotheses on sustainable logistics practices on logistics transport performance. The results of the analysis show logistics service execution, pricing practice, labor practices have a significant positive relationship with logistics transport performance. The finding of the research shows sustainable logistics practices have a strong effect on logistics transport performance of transporters. A proper adoption of sustainable logistics practices among transport service provider will help them to further enhance their logistics transport performance. Validation of scale measurement for sustainable logistics practices of transports is the first of its kind in the literature on sustainability. The items incorporated are selected based on extensive literature review and experts from the transport industry. The paper describes empirical research on sustainable logistics practices for developing countries.

Keywords: Logistics transport performance; sustainable logistics; transport users; transport service providers; practices

ABSTRAK

Kajian ini bertujuan untuk mengesahkan ukuran skala amalan pelaksanaan logistik, amalan penentuan harga, tawaran perkhidmatan dan amalan buruh sebagai konstruk amalan logistik

mampan untuk pihak yang terlibat dalam pengangkutan. Tambahan pula, kajian ini bertujuan untuk meninjau pengaruh amalan logistik mampan terhadap prestasi pengangkutan logistik. Pembolehubah yang berkaitan dengan model Triple Bottom Line (TBL) dan pemboleh ubah telah dikelompok berdasarkan dimensi alam sekitar, ekonomi dan sosial. Di samping itu, pembolehubah amalan logistik lestari telah diuji terhadap prestasi pengangkutan logistik. Secara keseluruhannya, lima hipotesis diandaikan dalam kajian ini. Model kajian ini diuji dengan menggunakan aplikasi PLS-SEM. Pengumpulan data dilakukan terhadap pengguna pengangkutan, yang meliputi pengeluar, pihak ketiga dalam membekalkan perkhidmatan logistik dan penghantar kargo. Model ini telah diuji dengan mengambil pendapat daripada 194 pengguna pengangkutan di Malaysia untuk membuktikan hipotesis yang digubal dalam amalan logistik mampan terhadap prestasi pengangkutan logistik. Keputusan pelaksanaan perkhidmatan logistik analisis menunjukkan, amalan penentuan harga, amalan buruh mempunyai hubungan positif yang penting dengan prestasi pengangkutan logistik. Keputusan kajian menunjukkan amalan logistik mampan mempunyai kesan yang berpengaruh terhadap prestasi pengangkutan logistik pengangkutan. Pengadaptasian yang betul dalam amalan logistik lestari di kalangan pembekal perkhidmatan pengangkutan akan membantu mereka untuk mempertingkatkan prestasi pengangkutan logistik mereka. Pengesahan pengukuran skala untuk amalan logistik mampan pengangkutan kajian ini merupakan perintis dalam kajian literasi dalam bidang kemampanan. Perkara-perkara yang digolongkan untuk dikaji ini dipilih berdasarkan kajian literasi yang luas dan daripada pendapat pakar-pakar dari industri pengangkutan. Kertas kerja ini menerangkan penyelidikan empirikal mengenai amalan logistik mampan bagi negara-negara membangun.

Kata kunci: Prestasi pengangkutan logistic; kelestarian logistik; pengguna perkhidmatan pengangkutan; pembekal perkhidmatan pengangkutan; amalan

INTRODUCTION

Sustainability in logistics may be considered either as a practice or performance in supply chain management (SCM) and is gaining popularity among researchers and practitioners in the recent past in the day-to-day operations. Recently, the problems like unpredictable climate change, financial crisis, unnecessary hikes in oil and raw material price, the fear on depletion of natural resources, growing public interest towards environment, immense pressure exerted from law and regulation as well as mass media (Teuteberg & Wittstruck 2010) have changed the buying behavior and strategies of customers. More and more business customers are sustainable conscious and shifted interest to look for a sustainable manufacturer or suppliers to be a part of their supply chain.

The application of sustainability in logistics and transportation and the term "sustainable logistics" predominantly origins from Dey, LaGuardia and Srinivasan (2011) research and logistics function need to be sustainable to meet the current conscious customer (buyer). Sustainability in logistics helps logistics/transport managers to overcome the misuse of resources, maintaining brand value and to meet international standards and regulations set by government agencies. However, whether sustainability can improve logistics performance are less researched as Paziraneh and Jafari (2013) pointed the literature gap on how greening efforts does improves logistics performance, but there is limited consensus for support. Sustainability

measurements integrating social, environmental and economic dimensions are uncommon in the literature (Seuring & Müller 2008) and majority of publications did not concentrate on the tripartition of the sustainability concept, hence covering only environmental dimension (Kudla & Klaas-wissing 2012). A study involving all the three dimensions known as holistic model was given importance of late in empirical research (Brandenburg, Govindan, Sarkis & Seuring 2014).

The current article move forward to address the research gaps highlighted by Karia and Wong (2013), for a call on more theory driven research in logistics as there are limited research papers on theoretical development and applications in logistics research. Hence, the present article proposes a sustainable logistics practices framework from a holistic view by taking into consideration LSPs transport services, to measure how sustainable practices in their services influences their transport performance from the manufacturer's perspectives. Therefore, the paper aims for two research objectives. Firstly is to present the most suitable measurement items for sustainable logistics practices and logistics transport performance for transporters. Secondly, to examine the influence of sustainable logistics practices on logistics transport performance from the views of transport users. This paper is interested to incorporate transport users' views, as they are individuals who are able to provide valid judgments on specific practices and performance of what is being practiced in the industry by transporters in terms of sustainability (Amran, Zainuddin & Zailani 2013). To proceed with a first research objective, the paper presents conceptual framework as shown in Figure 1. The research framework covers sustainable practices based TBL model. The variables undertaken in the study reflects on transporters practices and transporter's logistics performance. The following sections will include discussion on constructing definition and propositions (Section 2). In section 3, the methodologies applied are explained, followed by discussion on the analysis and findings presented in Section 4, based on data collected from Malaysian logistics industry. Lastly, section 5 concludes the research with conclusion, future research and limitation.

CONCEPTUALIZING SUSTAINABLE LOGISTICS PRACTICES

The measurements on sustainable logistics practices covering the three dimensions (environment, social, and economics) are crucial as Pazirandeh and Jafari (2013) and Rao and Holt (2005) claimed that sustainability improves performance of firms. The conceptual linkage between sustainable logistics practices and performances were highlighted by Marchet, Melacini, and Perotti (2014); Pazirandeh and Jafari (2013). Sustainability practices are merely a prerequisite for downstream or upstream suppliers to serve the global market (Abbasi & Nilsson 2012). Sustainable practices are part of the resource-based view (RBV) theory, whereby firm's resources are regarded as practices that a firm implements to achieve better performance. However, there is limited papers available highlighting the variables and most suitable indicators measuring the TBL dimensions. Thus, the present paper gathered the variables and their indicators from literature to best suit the proposed model. The model was tested to prove the chosen scale and measurement fits well with the research model pertaining to sustainable logistics performance. The execution of scale validation are clearly explained in Section 3, research methodology.

Sustainable practices are part of the resource-based view (RBV) theory, whereby firm's resources are regarded as practices that a firm implements to achieve better performance. The current paper imperatively at this juncture identifies the relevant sustainable logistic practices

most appropriate for the transportation sector. The dimensions are environmental sustainability, social sustainability and economic sustainability. The theoretical framework includes variables for each dimension to gauge the current sustainable logistics practices adopted by the transport service provider in developing countries to achieve better logistics transport performance.
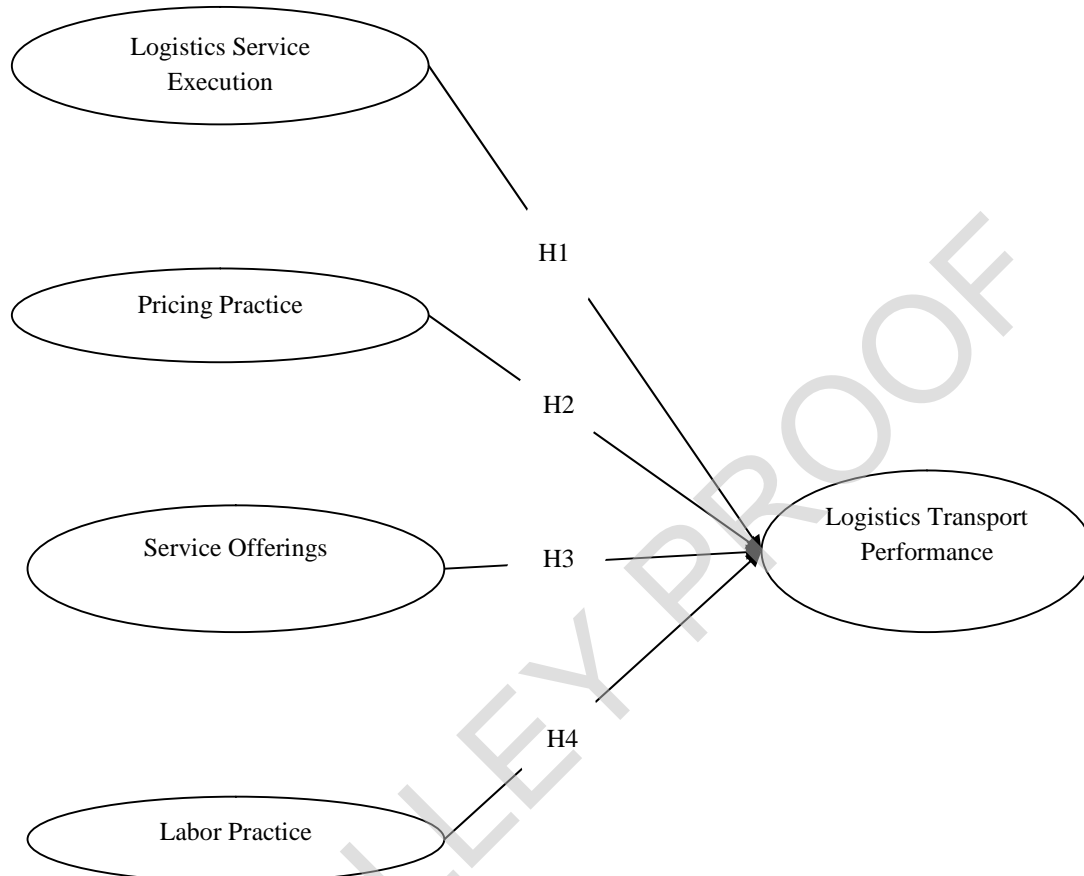

FIGURE 1. Research model

ENVIRONMENTAL SUSTAINABILITY

The study by Colicchia et al. (2013), Evangelista (2014) and Lieb and Lieb (2010) on environmental sustainability have pointed out the investigation on environmental sustainability adoption among companies operating logistics and transportation activities based on case study method. These papers summarized the environmental sustainability efforts adopted by LSPs based on secondary data of environmental reporting and no empirical testing is performed. There is no proper set of predictors available to test the model on any kind of industries. Thus, the environmental sustainability previously was generally studies across the macro and micro areas of logistics and freight transportation activities without in-depth study on one particular area. Therefore, under environmental sustainability, the paper proposes logistics service execution as a construct to measure logistics transport performance (Tang, Amran & Goh 2014). *Logistics*

service executions are pertinent practices offered by TSPs to transport users. Failing which, Francés-Gómez and Del Rio (2008) stated that the customers may switch over to some other TSPs and this will lead to termination of existing business agreements. With all explanation given, we thereby conceptualize that:

H_1 Logistics service execution is a suitable construct under environmental sustainability to measure logistics transport performance of TSPs.

ECONOMIC SUSTAINABILITY

In a logistics context, literature rarely explains on economic sustainability practices. To date, research papers found in the literature are related to measuring the economic performance using sustainability notion rather than highlighting economic dimension of sustainability from the view of practices. However, does LSPs practices economically responsible and how their transport service delivery practices remains unanswered. In literature, economic sustainability mostly linked with costing, profit margin and investment factors whereby a value of computation is needed to portray (Tay et al. 2015) economics of sustainability. Apparently, the present article introduces price practice as one of the factor for economic sustainability to be further explored especially in the context of LSPs. With all explanation given, we thereby conceptualize that:

H_2 Pricing practice is a suitable construct under economic sustainability to measure logistics transport performance of TSPs.

Service offerings are regarded as service practices offered by TSPs to their transport users in a sustainable way. Ghadimi and Heavey (2014) included service delivery as criteria under economic sustainability for supplier selection in medical devices industry. Thus service offerings is conceptualized as attributes like reliability, flexibility, follow-up and prompts response practices offered by LSPs in their transport service offerings to shippers (Banomyong & Supatn 2011). In this study, service offerings refer to attributes such as reliability, flexibility, follow-up and prompt response practices offered by TSPs in their transport service offerings to clients (Banomyong & Supatn 2011).With all explanation given, we thereby conceptualize that:

H_3 Service offerings are a suitable construct under economic sustainability to measure logistics transport performance of TSPs.

SOCIAL SUSTAINABILITY

In operations research, supply chain management and logistics, research on social issues lag far behind (Klassen & Vereecke 2012; White & Lee 2009). Social sustainability dimension is recognized as the weakest pillar' of sustainable development, especially when it comes to its analytical and theoretical underpinnings (Lehtonen 2004) and has recently gained attention among researchers. Social issues in supply chain focuses on human safety, welfare, community development, and protection for stakeholders from any kind of harm and it is the duty of each and every company to take pre and post cautionary measures when there is any kind disruption related to social practices (Klassen & Vereecke 2012). The aspect of social sustainability received less attention compared to the other two areas of TBL approach (environmental and

economic issues) in sustainable supply chain (Hutchins & Sutherland 2008; Ahi & Searcy 2015; Brandenburg et al. 2014). The present paper proposes labor practices to portray ethical practices concerning drivers and personnel's working on the behalf of the transport service provider to fulfill a delivery request from transport users. With all explanation given, we thereby conceptualize that:

H$_4$ Labor practice is a suitable construct under social sustainability to measure logistics transport performance of TSPs.

LOGISTICS TRANSPORT PERFORMANCE

The constructs and measurement scale for TSPs performance is another important focus in this paper. In the existing literature on supply chain management, triple bottom line (TBL) approach has been used a response variable (Colicchia et al. 2013; Lai & Wong 2012; Laosirihongthong et al., 2013; Zhu et al., 2008). Hence, in this study logistics transport performance alone forms the response variable and TBL sustainable logistics practices forms the predictor variables which are the real novelty of this paper. Some research work on logistics performance was done by Karia and Wong (2013); Pazirandeh and Jafari (2013). Karia and Wong (2013) operations and measures logistics resources acquired by logistics service providers (LSPs) in Malaysia and tested the impact of such logistics resources on logistics performance in terms of customer service innovation and cost leadership. Good delivery performance ensures clients are happy and satisfied. The delivery performance of service provider raises clients' reputation and enhances the market share of clients. Many problems may arise when clients' transportation service providers (TSPs) did not practice sustainability in their operation regardless of any type of logistics operations. Thus, there is no evidence to show the influence of sustainable practices on performance from the logistics transportation perspectives. In our research, logistics transport performance is chosen to measure the performance of TSPs, and believe that sustainable logistics practices have a direct relationship with logistics transport performance.

RESEARCH METHODOLOGY

SCALE MEASUREMENT AND ITEMS GENERATION

This paper employed research methodology involving three stages (Hofer & Knemeyer 2009) and the conceptualization of the research framework was carried out based on Taghizadeh et al. (2016). The first stage requires extensive literature review of from past research work and the second stage was testing the identified variables for good validity and reliability. Firstly, a strong foundation of theoretical knowledge and extensive literature review which covers the establishment of appropriate domain for the construct to ensure the number of items generated to measure a particular construct measures the conceptualization of the variable with clearly. Next, the instrument used to test the variable should be stable and replicable for the similar context of study and the measurement items should converge with differentiation between other measurement items in the study (Taghizadeh et al. 2016; Li et al. 2005). Followed by clarification on pool of items covering a particular construct with field expert, face validity and content validity assessment. The third stage is finalized on the items under one constructs with proper scale measurement as proposed in the literature review (Punniyamoorthy, Thamaraiselvan

& Manikandan 2013) through pretesting to refine the measurement items before the final stage of accessing the credibility of the instrument through large survey.

In total, 42 items were accomplished to measure the framework (Logistics service execution_7; Pricing practice_9; Service offerings_9; Labor practice_7; Logistics Transport Performance_10). To gauge transport users (clients) opinion on sustainable logistics practices of the transport service provider, the study adapted 5- point Likert scale anchored with Low Extent (1) to High Extend (5) to measure the sustainable logistics practices commonly adopted by transport providers in developing countries. The scale of low extends to a high extend is used in studies related to supply chain and logistics measuring practices (Zailani et al. 2015); Zailani et al. 2012). The transport users were asked to indicate their agreement on to what extent transport service providers adopt sustainable logistics practices. For logistics transport performance, the study employed Strongly Disagree (1) to Strongly Agree (5) scale to measure the effects of higher level ustainable logistics practices by the transport service providers (TSPs) will lead to better logistics transport performance

CONTENT VALIDATION

The aspect of content validation does not involve any numerical value; however, it is based on judgmental. The process of content validation comprises of a through literature review to select the most appropriate items to form a construct. Then the items will be validated with industrial practitioners and academic researchers for its completeness and appropriateness. This study used questionnaire as an instrument for measurement. A total of five experts in the area of logistics and transport perspective were consulted for their expert opinion. The experts were requested to check on the questionnaire items in terms of relevancy, arrangement, consistency, preciseness and clear language. The expert's comments were very crucial and useful to enhance the questionnaire items to be more practical to suite the current sustainable logistics perspective. Based on the expert opinion received, questionnaire items were modified further. A total of 42 items from the initial stages was reduced to 30 items after experts review.

PRETESTING OF THE MEASUREMENTS

A pretest is a process aimed to scrutinize the questionnaire before the final version is distributed to the respective respondents decided as the unit of analysis. Pretest helps the researchers to refine the measurement instruments to ensure the questionnaire covers the research objective of the study. This method also assists researchers to discover errors in terms of instructions, formatting, spellings and wording. This is one of the established ways to discover error in the questions (Synodinos 2003; Taghizadeh et al. 2016). The revised questionnaire with 30 items was distributed to eight transport users covering manufacturers, third party logistics service providers, freight forwarders. All the respondents were given a set of questionnaire and evaluated the questionnaire in term of word clarity, sentences, command of language, instructions, is the questionnaire content, exhaustive, a scale used to measure the respondent's agreement, whether the items in the questionnaire a good representation of the variables.

PILOT STUDY

A pilot study is also commonly referred as a 'feasible study' or it is also known as a replication of a mini version to complete the actual study. The researcher performed a pilot study with a sample size of 20 firms for medium to large organizations before the final version of data collection. The study collected 32 samples for pilot test and based on previous pilot test reported in literature, 32 firms is a sufficient number to represent the population of the study. The variables identified in this study were tested for reliability using SPSS version 22. Reliability can be used to determine whether the data collection technique and statistical analysis will yield consistent findings (Saunders, Lewis & Thornhill 2009). Under the mainstream of data collection, in total, 800 questionnaires were segregated and a total of 207 data (hard copy) was collected from the respondents and the response rate was 25.8 %. However, only 194 questionnaires were usable for analyzing the research framework and 13 questionnaires were omitted from the analysis due to incomplete responses. The frequencies for industries are food (50.5%), chemical (29.9%), medical /pharmaceutical (19.6%). Most of the respondents (clients) whom seek transport service are manufacturers directly appointing third party logistics providers with various types of logistics services including transportation to perform their delivery services which are (46.4%), followed by manufacturers engaging transport service providers with services related to delivery only (33.5%), next is freight forwarders appointing transporters on their behalf to perform delivery services are found to be lesser (12.4 %) and manufacturer seeking transport services from freight forwarders is only 11.9%. This reflects, for developing countries, engaging third party logistics service providers for delivery services is a popular channel compared to the rest. Under the list of services offered by the transport service provider, most of the respondents primarily expressed that their transporter offers service to distribute their goods to end customer directly, 100 (51.5%), deliver the goods to the respective location, 93 (47.9%), packaging and repackaging, 68 (35.1%), dealing with shipping agent/forwarders, 55 (28.4%), customer clearance, 32 (16.5%), provide storage area, 25 (12.9%), just in time delivery, 18 (9.3%). Most clients seek transport services to deliver their products to end customer, 112 (57.7%), deliver to the warehouse, 102 (52.6%), deliver to sea port, 49 (25.3%) and deliver to air cargo depot, 44 (22.7%).

TABLE 1. Summary of Cronbach's Alpha results

Construct	No. of Items	Cronbach's Alpha
Environmental Practices		
Logistics Service Execution	6	.899
Economic Practices		
Pricing Practice	5	.870
Service Offerings	7	.908
Social Practices		
Labor Practice	3	.827
Logistics Transport Performance	9	.936

FINDINGS AND DISCUSSION

The study used PLS-SEM approach using SMART PLS 3.0 software to test the research model. The PLS path model is defined based on two sets of linear equation which is known as a measurement model (outer model) and structural model (inner model). The measurement model defines the relations between a construct and its observed indicators, on the other hand, structural model defines the relationships between the constructs (Henseler, Hubona & Ray 2016). Hence, to achieve the research objective the study incorporated assessment and structural model from PLS-SEM to prove the hypotheses formulated.

ASSESSMENT OF THE MEASUREMENT MODEL

In order to ensure, the study included proper measurement items for all the variables a proper validation under PLS testing was carried out by using convergent validity and discriminant validity as a test to measure constructs validity. The study followed the rule of thumb suggested by Hair et al. (2016) as criteria to validate convergent validity. Convergent validity can be examined using AVE value. AVE is considered, established, well when each of the construct is higher than 0.5 or more and criteria applied to reflective model measurement as well (Hair et al. 2016). Other than, the average variance extracted, factor loadings of items and composite reliability (CR) are also used to check convergent validity of the data, whereby factor loadings are referred as outer loadings of the model and the loading should be higher than 0.70. As composite reliability is used to assess the consistency of the measurement and the study followed, Hair, Ringle and Sarstedt (2011) thumb rule which explains that composite reliability should be higher than 0.70. The analysis shows that, all the items loading was more than 0.6 (Hair et al. 2011), thus no items were dropped from the latent variable. The composite reliability (CR) value for each latent variable was ranged between 0.947-0.897. Followed by AVE value for all the five constructs has ranged from 0.743-0.661. The composite and AVE values are all above the recommend thumb rule of (Hair et al. 2011). The measurement model established has adequate convergent validity and reliability, implying all the indicators chosen is a good and reliable representation of the latent variable (Table 2). Next, discriminant validity was tested. The examination of discriminant validity is crucial to validate the construct measured to ensure it is empirically unique and each one of the construct measures the correct phenomena of interest that other measure does not capture in the research model (Henseler, Ringle & Sarstedt 2015). In this study, the discriminant validity is assessed using Hetero-Trait-Mono-Trait (HTMT). The latest approach from Henseler et al. (2015) to access discriminant validity, which follows the thumb rule of value of the ratio should not exceed 0.9 (Table 3). This clearly explains that all the latent variables undertaken in this research are distinct between each other and fulfills the discriminant validity assessment.

ASSESSMENT OF THE STRUCTURAL MODEL

Under PLS-SEM analysis, structural model evaluation was conducted to test the proposed hypotheses and to determine the relationship between the latent variable. The value of R^2 represents the model's predictive accuracy and reflects the quality of the PLS model. The acceptable range of R^2 and satisfactory level can be described based on the thumb rule given by Hair et al. (2016), R^2 with 0.75 values as substantial, 0.50 as moderate and 0.25 as weak. The path coefficient actually explains the direction of the hypotheses framed in the study and how it

is linked to the entire construct chosen for the sustainability study. A path coefficient value closer to + 1 represents strong positive relationship and path coefficient closer to -1 indicates a stronger negative relationship. The research model has four independent variables; logistics service execution (LSE), pricing practices (PP), service offerings (SO) and labor practice (LP). Table 4 displays the direct effects results for PLS-SEM testing for logistics service execution (LSE), pricing practices (PP), service offerings (SO) and labor practices on logistics transport performance (LTP). The R^2 value of logistics transport performance (dependent variable) is 0.345, which explains 34.5% of the variance in logistics, transport performance can be explained by LSE, PP, SO and LP (exogenous variables in the study). Based on Hair et al. (2016), the model value for R^2 for this study shows moderate level.

TABLE 2. Result of measurement model

Variable	Items	Loading	AVE	CR
Logistics service execution (LSE)	LSE1	0.820	0.665	0.922
	LSE2	0.834		
	LSE3	0.825		
	LSE4	0.832		
	LSE5	0.820		
	LSE6	0.767		
Pricing practice (PP)	PP2	0.800	0.661	0.907
	PP4	0.786		
	PP6	0.840		
	PP7	0.827		
Service offerings (SO)	SO2	0.775	0.645	0.927
	SO4	0.808		
	SO6	0.815		
	SO7	0.805		
	SS7	0.800		
	SS8	0.817		
	SS9	0.803		
Labor practice (LP)	LP 2	0.869	0.743	0.897
	LP 3	0.858		
	LP 5	0.859		
Logistics transport performance (LTP)	LTP2	0.757	0.665	0.947
	LTP 4	0.770		
	LTP 5	0.827		
	LTP 6	0.861		
	LTP 7	0.871		
	LTP 8	0.806		
	LTP 9	0.819		
	LTP 10	0.809		
	LTP 11	0.810		

Notes: CR composite reliability; AVE average variance extract

TABLE 3. Heterotrait-Monotrait Ratio (HTMT Ratio)

Constructs	LP	LSE	LTP	SS	PP	SO
Labor Practice						
Logistics Service Execution	0.723					
Logistics Transport Performance	0.567	0.534				
Pricing Practice	0.687	0.773	0.566	0.583		
Service Offerings	0.772	0.808	0.478	0.565	0.795	

Then, we proceed to evaluate the structural model for hypotheses. As shown in Figure 2, and Table 5, three hypotheses was supported out of the four. Logistics service execution of logistics transport performance (=0.183, p<0.05); pricing practice on logistics transport performance (=0.288, p<0.01); labor practice on logistics transport performance (=0.264, p<0.05) is significant. Therefore, hypothesis H_1, H_2, and H_4 are supported. As a result, with a total of four main hypotheses, three were accepted and only one hypothesis which is H_3 was rejected. In addition to R^2, Q^2 value is known as predictive relevance was developed which is one of the ways to access the model fit. Predictive relevance (Q^2) reflects the model's predictive power and examines if a model accurately predicts the hypothesized relationship despite the execution of drop items in the latent variables during the validation and reliability process (Hair et al. 2016). In the present study, Q^2 value of 0.268 was obtained for logistics transport performance. The value is greater than zero and exhibits fit of measurement for the research model.

The focus of this paper was to provide validate the scale measurements for sustainable logistics transportation under TBL model. Secondly, to examine the influence of sustainable logistics practices on logistics transport performance from the views of transport users. The conceptualization and empirical testing found a significant relationship between sustainable logistic practice and logistics transport performance of transporters. To our best knowledge, the exploration of sustainable logistics practices on logistics transport performance is rare in the literature (Figure 1). The empirical results shows that logistics service execution, pricing practice, labor practice is significantly positive with logistics transport performance. Therefore, the results show that sustainable logistics practices covering logistics service execution, pricing practice and labor practice are important for transporters to achieve better logistics transport performance.

The research findings revealed that, from the transport user's perspective (clients), a sustainable logistics practice used by the transport service provider significantly helps to improve their logistics transport performance. In addition, Dey et al. (2011) highlighted the importance of incorporating sustainable logistics practices for logistics service providers. Proper practice of sustainable logistics helps in reducing carbon footprint, reduces travel time, increases truck load utilization and improves proper planning on resource usage. At the same time, sustainable logistics practice creates an opportunity for transport service providers to reduce logistics, crisis such as cargo theft, damage of cargo/products and mishandling of chemical substances and valuable medical devices instruments. Clients often request their transporters to increase the security measures to avoid cargo theft that results in multimillion dollar loss to their manufacturing plants.
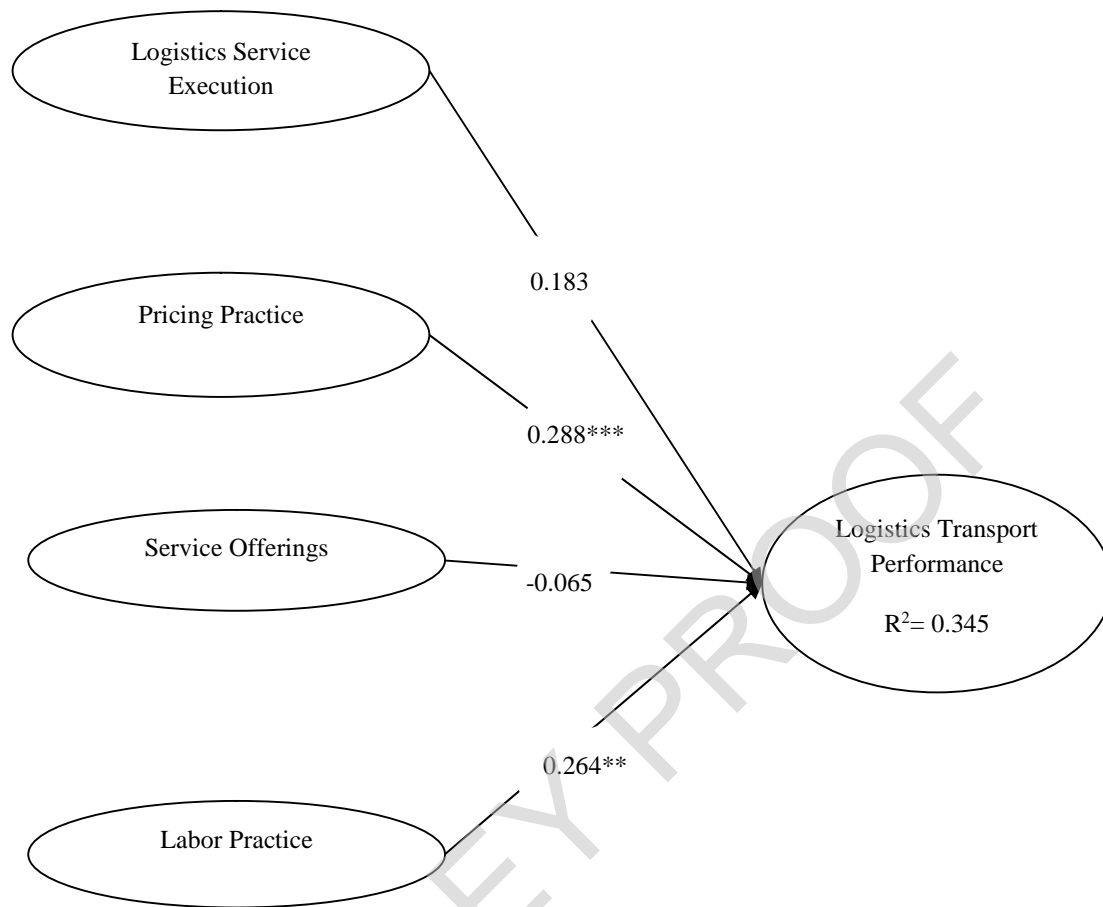
FIGURE 2. Measurement Model

TABLE 5. Path coefficient and hyphothesis testing

Hypothesis	Relationships	Std. Beta	SE	t-value	Decision
H_1	Logistics service execution→ Logistics transport performance	0.183	0.087	2.094*	Supported
H_2	Pricing practices→ Logistics transport performance	0.288	0.076	3.760**	Supported
H_3	Service offerings→ Logistics transport performance	-0.065	0.091	-0.717	Not Supported
H_4	Labor practice→ Logistics transport performance	0.264	0.083	3.172**	Supported

Note: * Significance at $p<0.05$, **$p<0.01$; bootstrapping (n=1000). Beta = regression weight, *t* values are computed through bootstrapping procedure with 194 cases

The structural model assessment proves that transport service provider with the proper practice of logistics service have better logistics transport performance (H_5). This finding further supports and elaborates the study performed by Pazirandeh and Jafari (2013). Transport users prefer to use transport service providers who provides drivers whom are trained with eco-capabilities, delivery services with proper environmental certifications, vehicles with proper maintenance and good protection of their goods. The transport users believe green measures practiced by the transport service provider will contribute to their better performance, as well as the provider's performance by enhancing customer satisfaction through reduction in lead time, lesser loss and damage and timely delivery. From the transport user's point of view, transport service provider operating in Malaysia generally maintains a good environmental logistics. Under environmental aspect, weather plays an important role in sustainability practices for transporters.

Goods that are transported are exposed to external environment and transporters need to pay serious attention to the climate change in Malaysia. The unpredictable weather change in Malaysia is one the important reasons why transporter emphasizes on this practice. The finding indicates transport users (clients) feel satisfied with the efforts taken by service providers in protecting their goods from poor weather conditions. Economic sustainability under logistics context is conceptualized as economic related responsibility practices adopted by the transport service provider (TSPs) while serving their clients. Pricing practice and service offerings are the two dimensions used under economic sustainability logistics practices to measure logistics transport performance. Transportation is one of the highest logistics costs users may need to spend to transit their goods from origin to the desired destination. Freight cost and other related charges to move the goods are borne by the clients. Good pricing is one of the factors transports users consider when any firms decide to outsource the transport services from transporters. Pricing is frequently related to revenue management in most industries, but it is also a useful tool for cost management. In logistics, especially for transportation, pricing is often linked with demands, empty equipment repositioning cost, quantifying certain value for payment or charges and inventory replenishment. In the scenario of outsourcing transportation services, Mesa-Arango and Ukkusuri (2014) stated that price is an important attribute client will consider when they decide to procure transport services. Therefore, the inclusion of price as a construct under sustainability logistics practices is well suited. However, from sustainability perspective, pricing is not just profit maximization or monetary value creation but referred as responsible practices related to price or monetary value carried out by transport service provider.

Labor practice was found to have a positive relationship with logistics transport performance. The paper by Brandenburg et al. (2014) clearly highlighted on the lack of empirical evidence to support the social facets of sustainability. The social aspect was studied in depth through labor practice of transport service provider. Labor practice is an important variable to measure social aspect of transport service provider. Labor practice point outs mainly on discipline and ethics of drivers and other personnel working on the behalf of transport service providers to serve clients in the present research. Some of the measures include aspects of protection against child labor, ethical billing transaction, delivery of only authorized goods and complying with wage procedure for their employers (Carter & Jennings 2004). Thus, this study proves and supports the social sustainability study by Vachon and Mao (2008). The paper studied the link between social sustainability and supply chain strength and reported that fair labor practice and corporate citizenship contributes positively to supply chain strength. One of the most important labor practices which clients acknowledge as sustainable logistics practice by the transport service provider is their effort to pick up and deliver only authorized goods. Clients are highly satisfied with this practice, as this gives confidence that their goods will be safely delivered to the respective destination on scheduled time. In addition, this practice has contributed to lesser customer complaints and ensures transport service providers execute services as per contract terms. The above discussion implies the importance of sustainable logistics practices in the transportation industry. Based on the results, the study is able to infer that logistics service execution, pricing practice and practice allows transporters to achieve better logistics transport performance. However, on the contrary, service offering is not a good practice to be classified under sustainable logistics. Service offering is a reflection on what type of services, transport service provider offers to their clients and it is an important term emerged in logistics literature from 1990s. The study incorporated service offering as a variable to understand what type of sustainable logistics practices transport service provider crafted for their clients (Martikainen, Niemi & Pekkanen 2013). The insignificant relationship reflects that certain practices under service offering given by transporters do not reflect sustainable logistics practices and lesser in green, thus do not contribute in logistics transport performance.

CONCLUSION

The aspect of sustainability was applied in the field of logistics focusing on the transportation industry. The scale measurement for sustainable logistics model were developed and tested for its validity and reliability, which is the novelty of this study. In literature, there is no model for sustainable logistics for transportation industry. The questionnaire items are adapted and adopted from supply chain management and other logistics related literature, an extensive discussion was carried out with academician, freight forwarders, shipping agent, manufacturers and transport service providers to ensure only relevant questions are included for model testing. The measurement model was further confirmed using SMART PLS 3. The direct effect of sustainable logistics practices on logistics transport performance was further tested for Malaysian logistics sector. The empirical finding draws several valuable insights for theoretical and practical contributions which can be generalized for developing countries. The empirical results are obtained from 194 usable responses from transport users from Malaysia. The collection mainly includes, content validity, pre-testing, pilot study and main data collection. The study found out that logistics service execution, pricing practices and labor practices are predictors for logistics

transport performance, meanwhile service offerings is not a good predictor of logistics transport performance. New players who aim to be a successful transport service provider should incorporate sustainability practices throughout their logistics services to obtain and retain transport contract services for the users. Björklund and Forslund (2013) claimed that buyers of transport services are encouraging service provider to include environmental criteria in the contract agreements.

ACADEMIC IMPLICATIONS

This paper contributes to the sustainable logistics literature particularly by analyzing all three dimensions of triple bottom line from transportation point of view. In addition, the study contributes to the literature on the purchase of transport and application of triple bottom line in logistics. The novelty of thesis underlies the first pioneer study investigating on sustainability logistics practiced by incorporating environmental, social, and economics of transporters under one research model and consequently their influences on transporters logistics performance in Malaysia. Through this research, it confirms that sustainable logistics practices can bring value to TSPs and better improves their delivery performance and customer satisfaction.

MANAGERIAL IMPLICATIONS

Testing the relationship between sustainable logistics and logistics transport performance are new in literature. Thus, the result from the study proves that proper adoption of sustainable practices is able to contribute to transport performance of transporters. On the other hand, perception and reputation of transport users not only depends on their own operations, but to certain extent it depends on their transport service providers mainly. By using sustainable transporters, firms operating under food and non-food industries gets an opportunity to claim their firms products and brands as fully green, which will minimize the stakeholders' concern (Awaysheh & Klassen 2010). The awareness on sustainability practices for Malaysian transporters helps sourcing managers awarding the contract to the most suitable service provider. This study helps transport users to make the right investment on transporters who are able to give appropriate resources for delivery services.

In this study, logistics service execution, pricing practice and labor practice found to be influencing logistics transport performance of transport service providers. For future study, the insignificant results of service offerings on logistics transport performance can be further investigated with modified measurement items. Moving on, the similar model can be tested in other areas of logistics functions such as warehouse and storage, packaging, labeling, inventory management, and reserve logistics.

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APPENDIX

TABLE AI. Scale measurement for sustainable logistics practices

Constructs	Measurement items
Logistics service execution	Meets the speed control regulations set by the local authorities (e.g. spad, puspakom) Skilled drivers with eco driving techniques Protect goods from poor weather conditions Periodically inspects working conditions of vehicles Proper vehicle selection for delivery as per product requirement (e.g. frozen food will use cold chain trucks) Proper environmental practices adopted
Pricing practice	Provide reasonable service charges compared to competitors No exorbitant charges to support ad hoc request Quotes price based on product value No price increase on special delivery arrangements Good service level in relation to pricing rate Keeps documentation record for each delivery
Service Offerings	Optimizes space storage in vehicle while loading Offers stage delivery upon request (e.g. transshipment) Offers charter basis delivery upon request Safety of goods is the priority Executes safety measures to secure the products (cargo) Engages competent drivers
Labor practice	Never demands gifts/money for urgent shipments No manipulation in billing charges (e.g. impose extra charges for services not offered) Engages disciplined workers
Logistics Transport Performance	Is punctual in delivering our goods to end customer Delivers the exact quantity of goods as stated in the invoice Has sufficient manpower Has less customer complaints Practices timely response to any of our requests Compensates for damages on timely manner Provides services that are expected based on contract terms Offers satisfactory logistics services Execute services within custom procedures