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The Effect of Sustainable Shipping Practices on Shippers' Loyalty: The Mediating Role of Perceived Value, Trust and Transaction Cost

ABSTRACT

This study investigates the role of perceived value, trust, and transaction cost in mediating the effect of sustainable shipping practices (SSP) on shippers' loyalty. Theoretical and alternative models were proposed and compared using survey data collected from 289 shippers. The results show that the relationship between SSP and shippers' loyalty is mediated by shippers' perceived value of SSP, shippers' trust towards a shipping company's commitment towards sustainability, and sustainability-related transaction cost. This study offers an alternative theoretical explanation to the relationship and provides important managerial insights to strengthen shippers' loyalty through implementing SSP.

Keywords: sustainable shipping; perceived value theory; social exchange theory; transaction cost theory; model comparison; shipping industry

1. Introduction

Maintaining and building a strong base of loyal customers are imperative for the survival of shipping companies in view of growing competition, which is reflected by aggressive market consolidation, alliances, horizontal integration, and competition with other transport modes (Notteboom et al., 2017). There has been growing consensus in the recent literature that implementing sustainable shipping practices can be viewed as a strategy to nurture shippers' loyalty, which is associated with positive word-of-mouth, willingness to pay more, and repurchase intention (Lun et al., 2015; Shin et al., 2017; Yuen et al., 2016a).

In this study, sustainable shipping practices are referred to as a set of organisational activities aimed at the integration of societal and environmental concerns with the business operations of shipping companies and in the interaction with stakeholders on a voluntary basis (Yuen et al., 2017b). The stakeholders of a shipping company primarily include its shareholders, employees, customers or shippers, suppliers, societies and the environment (Skovgaard, 2014).

Existing theoretical research suggests that sustainable shipping practices can positively influence shippers' loyalty based on institutional theory (Vejvar et al., 2017; Yang, 2017). Institutional theory posits that organisations strive for legitimacy and stability, which can be attained by conforming to regulative, normative, and coercive pressures exerted by stakeholders. For instance, driven by the increasing demand from their downstream supply chain partners and end-consumers to reduce businesses' societal and environmental impacts,

shippers are also exerting coercive pressures on shipping companies to practise sustainability (Skovgaard, 2014). According to Pawlik et al. (2012), ISO 26000 (i.e. social responsibility certification) and ISO 14000 (environmental management certification) are increasingly being used by shippers as indicators of shipping companies' sustainability performance and the basis for awarding shipping tenders. In this regard, failing to conform to such pressures from shippers may exclude shipping companies from securing the tenders, or cause existing shippers to switch loyalty by choosing greener services offered by other shipping companies. The loss of shippers to competitors could potentially affect the long-term profitability and survivability of a shipping company.

Although institutional theory has provided a means-to-an-end explanation for adopting sustainable shipping practices i.e. to gain shippers' loyalty, there is currently a lack of understanding as to how sustainable shipping practices lead to the formation of shippers' loyalty. Furthermore, a majority of the existing research is conducted on industries that have a direct contact with consumers i.e. business-to-consumer (B2C). To some extent, their findings are not applicable to the shipping industry which involves business-to-business (B2B) transactions. There are arguments in the literature stating that customers' evaluation of and response to sustainable practices are to some extent different between B2C and B2B settings (Yuen et al., 2016b). Firstly, B2B industries are positioned further away from end-consumers. As a result, their sustainable activities are concealed from and less scrutinised by the end-consumers, public, and media. Secondly, product and service evaluations are more complex and rational in B2B settings due to the myriad of stakeholders' concerns to be accounted for during the evaluation process.

There are presently very few studies that examine the decision-making process of shippers i.e. the various intermediary mechanisms that exist between sustainable shipping practices and shippers' loyalty. With the deliberate consideration that the shippers' behaviours are rational and are hence profit-maximisers, this study argues that shipping companies' sustainable shipping practices should provide benefits to shippers and hence, incentivise them to exhibit loyalty to a shipping company in the form of continued patronage (i.e. loyalty). For instance, such benefits could be derived from the enhancement of utility, development of a relational contract, and reduction in overall cost from using a particular shipping service.

Based on reviewing the extant literature, this study summarises three organisational theories that underpin the above considerations and arguments. Specifically, it combines (1)

perceived value theory, (2) social exchange theory, and (3) transaction cost theory, to model the relationship between sustainable shipping practices and shippers' loyalty. Based on the theories, the intermediary constructs of sustainable shipping practices and shippers' loyalty were identified, and their interconnections were specified.

The rest of the study is organised as follow. Firstly, the theoretical model which illustrates the network of hypotheses and their associated theory is introduced. Thereafter, each hypothesis is discussed. Next, measurement items are developed to operationalise the constructs in the theoretical model. Subsequently, survey data are collected from shippers located in Singapore. Based on the data, the theoretical model is examined using structural equation modelling. The results are then presented and discussed. Finally, conclusions are drawn.

2. Theoretical Model, Theories and Hypotheses

The central argument of this study is that sustainable shipping practices implemented by shipping companies can lead to shippers' loyalty only when such practices provide benefit to shippers, who are profit-maximisers. Compared to B2C industries, the objective of profit-maximising is especially pronounced in the shipping industry since shippers are also producers. From reviewing the literature, the benefits of sustainable shipping practices can be segmented into the enhancement of utility, strengthening of relational contract, and reduction of transaction cost. Accordingly, this study proposes three theories to represent each segment. They are perceived value theory, social exchange theory, and transaction cost theory.

Figure 1 depicts the theoretical model of this study. The model specifies the network of hypotheses linking the constructs "sustainable shipping practices", "shippers' perceived value", "shippers' trust", "transaction cost", and "loyalty". As shown in Figure 1, each hypothesis is supported by an underpinning theory. H₁ and H₂ are underpinned by perceived value theory. H₃ and H₄ are supported by social exchange theory while H₅, H₆, and H₇ are grounded on transaction cost theory. Accordingly, the addition (+) or subtract (-) sign beside each hypothesis indicates that the relationship is proposed to be positive or negative.

Figure 1: The Theoretical Model

This study distinguishes itself from existing studies by synthesising and applying three pertinent organisational theories to develop its model. Table 1 summarises the characteristics and contributions of the theories.

Table 1. A Synthesis of Theories Applied in the Model

Theory's Characteristics	Perceived Value Theory	Social Exchange Theory	Transaction Cost Theory
Paradigm	Customer Utility	Social Psychology	Institutional Economics
Perspective	Cognitive-Affect	Relational	Behaviour; Cost Minimisation
Basic Assumption	Customers behave rationally to maximise the value or utility of their choices and account for alternative market offerings.	Relational interdependence or relational contract develops over time through the interactions of the exchange partners.	All costs, including the cost of performing a transaction, are considered when making a decision, and not just market prices.
Specific Contributions to Model	The theory can explain how sustainable shipping practices contribute to the value creation process and subsequently, may result in loyalty.	The theory can explain how sustainable shipping practices strengthen shippers' loyalty by building on past transactions, and forging relationships through trust.	The theory can explain how sustainable shipping practices reduce sustainability-related transaction cost, and hence, may attract shippers to the shipping company.

In the subsequent subsections, each of the theories is reviewed and hypotheses are developed.

2.1 Perceived Value Theory

Customers' value perceptions result from an evaluation of the benefits and sacrifices associated with a product or service. The evaluation has been argued to include both cognitive and affective assessment (Zauner et al., 2015). In general, the literature suggests that value can be derived from four dimensions. They are economic (e.g. prices), functional (e.g. quality or performance), emotional (e.g. feelings and affection), and social utility (e.g. self-concept) (Grace and Lo Iacono, 2015).

In the context of shipping, value is constantly being created through the management of marketing and logistics functions. For example, shipping companies are focusing on digitalisation, and integrating their supply chains horizontally and vertically via partnerships, mergers, and acquisitions to reduce operating costs and improve logistics performance such as enhanced reliability and speed (Notteboom et al., 2017). They are also practising relationship marketing by emphasising on branding and service quality such as providing customised sales and customer services, after-sales support, and prompt service recovery to enhance shippers' experiences, satisfaction, and identification with a shipping company (Chen et al., 2017).

Apart from these traditional approaches to value creation, there are various evidences in the literature suggesting that value can also be generated from shipping firms' involvement in sustainable shipping practices. Although sustainable shipping practices can be viewed as peripheral to the core function of shipping services which involves transporting goods from places of low prices to high prices (Yuen et al., 2017a), sustainable shipping practices can create economic, functional, emotional, and social utility.

Firstly, it has been reported that sustainable shipping practices have the potential to create economic utility (i.e. lower prices) for shippers due to the use of more efficient ship engines, cold-ironing, biodegradable anti-fouling paints or cheaper, renewable energy (Lam, 2015). This could translate to lower prices. Secondly, sustainable shipping practices have also been reported to improve the quality of shipping services, wherein an aspect involves being socially or environmentally responsible (Thai, 2008). Reliability of shipping services can be improved from practising slow-steaming while the responsiveness and speed of supporting customer services can also be improved from enhancing employee satisfaction. Thirdly, sustainable shipping practices can also evoke positive emotions from shippers and social utility due to shipping firms' participation in social and environmental causes, which enhances their image

and reputation (Green and Pelozo, 2015). For instance, participation in sustainable shipping practices can augment stakeholders' perceptions of the shipping company's ability to produce quality services, as well as the prominence of the shipping company in the minds of stakeholders (Yuen et al., 2018). This can contribute significantly to price premiums for having a favourable reputation and brand identification (Bhattacharya et al., 2009; Rindova et al., 2005), which resonates with the principle of sustainability.

Based on the above arguments, the following hypothesis is proposed.

H₁: Sustainable shipping practices have a positive effect on shippers' perceived value of a shipping service

This study further posits that the value generated from sustainable shipping practices can lead to shippers' loyalty. Shippers' loyalty can be defined from either the attitudinal or behavioural perspective which involves an intention of continual usage or repeated patronage of services from a specific shipping company (Yang and Chao, 2017). According to perceived value theory, value created by a service is often evaluated with reference to alternative market offerings provided by competitors (Zauner et al., 2015). Hence, a key motivation for a shipper to remain loyal to a specific shipping company could be when its services are perceived to provide superior value, relative to alternative offerings.

In addition, previous studies have argued that customer value is a superordinate goal while customer loyalty is a subordinate goal (Chang, 2015). In this regard, the former regulates or motivates the latter as long as the service continues to provide superior value for customers (through implementing sustainable shipping practices in this study). Therefore, the following hypothesis is developed.

H₂: Shippers' perceived value of a shipping service has a positive effect on shippers' loyalty

2.2 Social Exchange Theory

In addition to perceived utility or value, which can positively influence shippers' loyalty, this study further argues a positive link between sustainable shipping practices and shippers' loyalty from a relational perspective, based on social exchange theory.

In some studies, sustainable shipping practices have been conceptualised as a relationship marketing tool (Shin and Thai, 2015; Shin and Thai, 2016), which resonates with this stream of literature.

In this regard, sustainable shipping practices can be viewed as a concept that focuses on establishing and maintaining mutually beneficial and valuable long-term relationships with shippers rather than facilitating transactions which is based on providing superior value. The objective is to seek long-term profitability over short-term profitability.

Social exchange theory postulates that exchange interactions result in economic and social outcomes (Huang et al., 2016). Each party in an exchange compares the outcomes with those from other alternatives, which determines their level of dependence. Consistent positive outcomes increase both parties' trust and commitment to maintaining the relationship. In addition, it produces relational exchange norms that govern the exchange partners' interactions. In essence, social exchange theory can be argued to extend perceived value theory by positing that the accumulation of value (i.e. economic, functional, emotional, and social values) from previous transactions results in the formation of trust.

In this study, trust is defined from both the shipper and sustainability perspectives. It refers to the belief that a shipping company will implement sustainable shipping practices in a manner consistent with expectations regarding its expertise, integrity, and social benevolence. This study suggests that the shippers' perceived value of sustainable shipping practices have positive effects on all three dimensions of trust (Park et al., 2014).

Firstly, expertise trust refers to a shipper's belief that a company has the competence and technical skills to produce and deliver specific services, and that it can perform necessary business functions effectively. This form of expertise arises from shipping company's abilities and knowledge to implement sustainable shipping practices (Peloza and Shang, 2011; Yuen and Thai, 2017). In this context, such corporate abilities and knowledge reflect the economic and functional utility produced from implementing sustainable shipping practices.

Secondly, integrity trust refers to a shipper's belief that the shipping company demonstrates consistency between their values and behaviour concerning sustainability and adheres to the moral principle of fairness. A shipping company's principle of fairness can be enhanced from the social value produced by sustainable shipping practices, which include promoting equal employment opportunities, treating employees and shippers fairly, and promoting gender equality (Pawlik and Neumann, 2015).

Finally, social benevolence trust refers to shippers' belief that a shipping company is genuinely concerned with the preservation and enhancement of the welfare of society i.e. the shipping company's motivation is altruistic rather than strategic. This is also reflected in the social utility of sustainable shipping practices related to philanthropical and environmental protection activities (Lai et al., 2013; Lam, 2015; Lu et al., 2009). Therefore, the following hypothesis is proposed.

H₃: Shippers' perceived value has a positive effect on shippers' trust in a shipping company's commitment towards sustainability

Collectively, the trust gained from creating value through sustainable shipping practices can have a positive effect on shippers' loyalty. The positive relationship can be explained from two perspectives. Firstly, the relationship is supported by reciprocity principles. When there is trust between both parties, the perceived credibility of the shipping company increases. This reduces relational (e.g. opportunistic behaviour) and emotional risk which allows shippers to make confident predictions about the shipping company's future behaviour concerning its sustainable practices. As a result, there is greater commitment towards continual usage of the shipping company's services.

Next, trust can also increase shippers' perception of congruence in values with shipping companies. In this regard, trust in a shipping company's sustainable shipping practices enhances the identity between both the shippers and shipping companies. To maintain identity or trust, shippers are inclined to demonstrate behavioural evidence of their loyalty. Based on the above arguments, which relate to building and maintaining a relational contract, the following hypothesis is developed.

H₄: Shippers' trust in a shipping company's commitment towards sustainability has a positive effect on shippers' loyalty

2.3 Transaction Cost Theory

Contrary to social exchange theory which aims to garner loyalty from a relational lens through the formation of norms, personal relationships or trust, transaction cost theory adopts the goal of total cost minimisation and suggests that purchasing behaviour or loyalty can be enforced from minimising the direct and opportunity costs of an exchange (Lambe et al., 2001). Collectively, these costs are referred to as transaction costs, which can arise from three

dimensions related to (1) information-seeking, (2) bargaining, and (3) enforcement cost (Tate et al., 2011).

The current study posits that shippers' perceived value of the sustainable shipping practices of a shipping company can reduce sustainability-related transaction costs. According to Pawlik et al. (2012), these costs are sizeable given that shippers are increasingly auditing or evaluating shipping companies' sustainability performance as part of their criteria in awarding shipping tenders or contracts.

An important aspect in generating value from sustainable shipping practices concerns their disclosures (Drobetz et al., 2014). According to Yuen et al. (2016b), sustainable shipping practices are often detached from shipping services. As a result, their values must be articulated or advertised to shippers via various communication channels such as in the financial or sustainability reports, webpages, stakeholder meetings, written tender, or bid presentation. The availability of such information eases shippers' search for information on a shipping company's sustainable shipping practices. As a result, the information-seeking cost associated with searching, benchmarking, and evaluating the shipping company's sustainability performance reduces.

In addition, when values are clearly communicated to shippers, it can reduce ambiguity concerning a shipping company's sustainable shipping practices. Consequently, this reduces additional costs arising from bargaining and enforcement of a shipping company's sustainable performances.

Therefore, the following hypothesis is proposed.

H₃: Shippers' perceived value of a shipping service has a negative effect on sustainability-related transaction cost

This study further argues that shippers' trust in a shipping company's commitment towards sustainability can reduce sustainability-related transaction cost, in particular on bargaining and enforcement cost. Both bargaining and enforcement costs arise from uncertainties in the relationship between both parties or the outcomes of a transaction.

In the context of this study, bargaining cost relates to the direct costs of negotiating, documenting, and enforcing an agreement between a shipper and shipping company for the latter's involvement in sustainable shipping practices. On the other hand, enforcement cost refers to the development of measurements and controls related to the sustainability practices

or performance of a shipping company. When a shipping contract is to be granted or payment is to be made based on a certain level of sustainability performance, performance monitoring and measurements are essential to restrain opportunistic behaviour and hidden action. In this regard, the more measurements and controls that are built into the contract, the costlier will be a transaction.

Trust has been proposed as the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 2006). Applying the above to this study, trust can be viewed as a less costly alternative of control or measurement mechanisms that reduces the uncertainties in a relationship, outcomes, or intentions. This can be explained from the perspective of social decision heuristics. Social decision heuristics suggest that in trust dilemma situations, decisions are made based on heuristic assumption (e.g. behavioural rule of thumb and intuitive judgement) rather than calculated risks grounded on economic models (Evans and Krueger, 2016; Kramer, 1999). The heuristic nature of trust conditions both parties to mutually enrich and benefit each organisation's ability to compete and overcome unexpected problems. This minimises the incorporation of control or measurement mechanisms, and subsequently, the cost of a transaction. Therefore, the following hypothesis is proposed.

H₆: Shippers' trust in a shipping company's commitment towards sustainability has a negative effect on sustainability-related transaction cost

Finally, lower sustainability-related transaction cost is argued to be able to increase shippers' loyalty. In addition to the price of a shipping service, lower transaction cost reduces the overall cost for a shipper to engage a shipping company. From the behavioural or economics perspective, a rational shipper would continue to engage a shipping company if using its services results in the least opportunity cost. On the contrary, increased transaction cost would increase the opportunity cost of using the shipping company's service, which increases the likelihood of a shipper to switch to other alternatives in the market. Therefore, the following hypothesis is proposed.

H₇: Sustainability-related transaction cost has a negative effect on shippers' loyalty

3. Research Methodology

3.1 Measures

Since this study involves the examination of the relationships between latent constructs, measurement items were developed to operationalise each construct. All measurement items were adopted or adapted from the previous literature (Table 2).

Table 2. Construct, Response Anchors, Measures, and Source

Construct	Response Anchors & Measures	Adapted Source
Sustainable shipping practices (SSP)	<p><i>Strongly disagree (1) / Strongly agree (7)</i></p> <p>SSP1. The shipping company provides complete and accurate information about its services to shippers</p> <p>SSP2. The shipping company provides training and education to develop its employees' skillsets</p> <p>SSP3. The shipping company applies high standards for disclosure, accounting, auditing, and social and environmental reporting</p> <p>SSP4. The shipping company donates to charitable organisation</p> <p>SSP5. The shipping company complies with the tax laws and regulations in all operating countries</p> <p>SSP6. The shipping company uses environmental-friendly materials and equipment (e.g. nontoxic paint, electric deck machine, ballast water system)</p> <p>SSP7. The shipping company adopts environmental-friendly shipbuilding designs (e.g. improved engine design and waste heat recovery systems)</p>	<p>Lu et al. (2009)</p> <p>Shin and Thai (2015)</p> <p>Yuen et al. (2017b)</p>
Shippers' perceived value (VAL)	<p><i>Strongly disagree (1) / Strongly agree (7)</i></p> <p>VAL1. The shipping company's sustainable shipping practices have enhanced the performance of its services (e.g. societal, environmental, reliability, and speed performance)</p> <p>VAL2. The shipping company's service is reasonably priced considering its involvement in sustainability</p> <p>VAL3. The shipping company's involvement in sustainability is pleasant</p> <p>VAL4. The shipping company's service has left a positive social and environmental impression on our stakeholders</p>	<p>Sweeney and Soutar (2001)</p> <p>Zauner et al. (2015)</p>
Shippers' trust (TRU)	<p><i>Strongly disagree (1) / Strongly agree (7)</i></p> <p>TRU1. The shipping company is competent and effective in implementing sustainable shipping practices</p> <p>TRU2. The shipping company is knowledgeable with respect to implementing sustainable shipping practices</p> <p>TRU3. The shipping company is truthful in its disclosure of sustainable shipping practices</p> <p>TRU4. The shipping company is sincere and genuine in implementing sustainable shipping practices</p>	<p>McKnight et al. (2002)</p> <p>Park et al. (2014)</p>

	TRU5. The shipping company's involvement in sustainability is altruistic rather than guided by self-interest	
Transaction cost (TCT)	<p><i>Strongly disagree (1) / Strongly agree (7)</i></p> <p>TCT1. My company has to make significant effort to gather sustainability information about the shipping company</p> <p>TCT2. My company's negotiation with the shipping company to fulfil our sustainability requirements is time-consuming</p> <p>TCT3. My company requires significant effort to monitor and ensure that the shipping company complies with our sustainability requirements</p>	Tate et al. (2014)
Shippers' loyalty (LOY)	<p><i>Extremely unlikely (1) / Extremely likely (7)</i></p> <p>LOY1. My company considers the shipping company as our first choice</p> <p>LOY2. My company would recommend the shipping company's services to other companies</p> <p>LOY3. My company would encourage others to use the service of the shipping company</p> <p>LOY4. My company has positive things to say about the shipping company</p>	Zeithaml et al. (1996)

Note: All response anchors are italicised and calibrated on a 7-point scale with bipolar adjectives

For the operationalisation of a shipping company's sustainable shipping practices, seven measurement items were developed from the stakeholders' perspectives. This approach has been commonly adopted by existing consultancy and academic research studies (Schreck, 2009; Wolf, 2014). Accordingly, the stakeholders of a shipping company include customers (i.e. shippers), employees, shareholders, public or society, regulators, and the environment. The measurement items, which reflect the sustainable shipping practices targeted at each stakeholder, were directly adopted from Lu et al. (2009), Shin and Thai (2015), and Yuen et al. (2017b). The selected items have been tested to be reliable and valid in the context of shipping. The respondents are requested to rate the sustainable shipping practices of their main shipping company.

For the operationalisation of shippers' perceived value that was generated from a shipping company's sustainable shipping practices, four measurement items were developed with reference to the proposition that value consists of four subdimensions (Sweeney and Soutar, 2001; Zauner et al., 2015). They are functional, economic, emotional, and social value. Accordingly, a measurement item was developed to represent each subdimension of value and modified to fit the context of this study. The respondents are requested to rate the perceived value of the main shipping company's sustainable shipping practices..

For the operationalisation of shippers' trust in a shipping company's commitment towards sustainability, five measurement items were developed to reflect the three commonly

accepted facets of trust related to a shipping company's expertise, integrity, and social benevolence (McKnight et al., 2002; Park et al., 2014). Two measurement items related to a shipping company's competency and knowledge in implementing sustainable shipping practices were used to reflect a shipping company's expertise. Another two measurement items related to a shipping company's truthfulness and sincerity in disclosing and implementing sustainable shipping practices were developed to reflect its integrity. Lastly, a measurement item related to the motive of implementing sustainability shipping practices i.e. altruistic or self-guided interest is used to reflect a shipping company's social benevolence. The respondents are requested to rate their trust in their main shipping company's commitment towards sustainability.

For the operationalisation of sustainability-related transaction cost, three measurement items were developed to represent information-seeking, bargaining, and enforcement costs. The items were adopted from Tate et al. (2014) and modified to fit the context of this study. The respondents are requested to rate the sustainability-related transaction costs associated with their main shipping company.

Finally, to operationalise shippers' loyalty, four measurement items relating to loyalty commitment and recommendations were used (Zeithaml et al., 1996). These items are commonly used by existing research, including those on transport, to measure behavioural intentions (Chen, 2016; Schniederjans and Starkey, 2014). The respondents are requested to rate their likelihood of performing the intentions or behaviours with their main shipping company.

3.2 Sampling and Data Collection Method

This study defines shippers as entities that buy maritime transport services for the carriage of goods by sea. In this regard, there are generally two types of shippers: (1) exporting manufacturers that own cargoes and engage a shipping company for the carriage of goods by sea, and (2) freight forwarders which do not own cargo but engage a shipping company for the carriage of goods by sea on behalf of an exporting manufacturer. To test the hypotheses, survey data were collected from the populations of exporting manufacturers and freight forwarders in Singapore. The sampling frame of this study was constructed from the online database of The Green Book Directory (<http://www.thegreenbook.com/>) where information such as company name, contact person, and e-mail address, was obtained from the directory. A list of 2,433 companies was extracted from the directory.

The survey was administered electronically between the periods from June 2016 to August 2017. Invitation letters were electronically sent to the contact person of each company. The letter provides background information about the research, informs the methods to complete and return the survey, and assures the anonymity of participants and their affiliation. The letter also requests the recipients to forward it to a colleague who manages the logistics, strategy, or CSR of their firm.

Bi-weekly reminders were sent to the companies which have not responded. In the event of non-response after four months from the date of invitation, an alternative e-mail address of the company was sourced from its website or other online directories. Thereafter, a new invitation was sent to the company using the updated e-mail address.

At the end of August 2017, 289 completed surveys were received, and a response rate of 11.88% was achieved. The number of responses received between each invitation was recorded. Accordingly, there were 132, 94, 45, and 18 responses. In addition, the time taken from the invitation to completing the survey was also recorded. The median (i.e. 35 days) was used to separate the sample into two subgroups: early and late respondents. Thereafter, test of mean differences of each construct presented in Table 2 was conducted. The t-tests show that there are no significant differences in the responses, which suggests that non-response is not a major issue in this study (Armstrong and Overton, 1977).

The sample comprises 159 manufacturers and 130 freight forwarders. Approximately 75% of the respondents held managerial titles, and 67% of them possessed at least five years of working experience in their respective companies. These statistics indicate that the respondents are reasonably qualified to answer the survey questions on behalf of their companies.

The representativity of the sample is also evaluated. Since the population of shippers (i.e. exporting manufacturers and freight forwarders) in Singapore is unknown, this study assumes the list of 2,433 companies extracted from the Green Book Directory to be the population of shippers. The assumption is conservative and reasonable since the directory has been reported to be the leading industrial, commercial, and consumer directory in Singapore. Therefore, most companies would register themselves in the directory. According to Alreck and Settle (2003), a minimum sample size of 100 is required to provide meaningful results and a maximum sample size of around 10% of the population will normally yield fairly accurate results. Both criteria have been fulfilled in this study. Furthermore, based on the size of the

population and sample, the margin of error in this study is estimated and is approximately 5%, which is acceptable in organisational studies. Hence, the collected sample can fairly represent the population of shippers in Singapore.

3.3 Factor Analysis

A factor analysis was conducted to examine the goodness-of-fit of the measurement model as well as the reliability and validity of the measurement items. Table 3 shows the standardised factor loadings (λ), t-values of the loadings (t), average variance extracted (AVE), and composite reliability (CR) of the constructs.

With reference to the fit indices presented at the bottom of Table 3, the chi-square fit index (χ^2) of the measurement model is 343.07 with 220 degrees of freedom (df). The measurement model is significant ($p < 0.05$), indicating significant difference between the theoretically-specified measurement model and the data-driven measurement model. However, it was stated that the chi-square fit index is sensitive to sample size and should not be used as a yardstick for accepting or rejecting a model (Vandenberg, 2006). Accordingly, the remaining fit indices which include comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR) are 0.98, 0.98, 0.036, and 0.033. The values are within the threshold recommended by Hu and Bentler (1999), indicating good model fit.

All standardised factor loadings and composite reliabilities are above the recommended value of 0.70, suggesting that the measurement items are reliable (Hair et al., 2010). In addition, the AVEs of the constructs are above 0.50, suggesting convergent validity. Lastly, to examine discriminant validity, the AVEs of the constructs are compared with their respective squared correlations. The results are presented in Table 4. In general, the squared correlations of the constructs are less than their AVEs. This supports discriminant validity. Overall, the results from factor analysis shows that the measurement model possesses good fit, and its measurement items are both reliable and valid.

Table 3. Factor Analysis Results

Construct (j)	Measure (i)	Standardised Factor Loadings (λ_i)	Average Variance Extracted (AVE _j)	Composite Reliability (CR _j)
Sustainable shipping	SSP1	0.70	0.551	0.896
	SSP2	0.80		
	SSP3	0.75		

practices (SSP)	SSP4	0.78		
	SSP5	0.70		
	SSP6	0.70		
	SSP7	0.76		
Shippers' perceived value (VAL)	VAL1	0.75	0.583	0.848
	VAL2	0.71		
	VAL3	0.80		
	VAL4	0.79		
Shippers' trust (TRU)	TRU1	0.74	0.563	0.865
	TRU2	0.75		
	TRU3	0.73		
	TRU4	0.76		
	TRU5	0.77		
Transaction Cost (TCT)	TCT1	0.83	0.690	0.870
	TCT2	0.87		
	TCT3	0.79		
Shippers' loyalty (LOY)	LOY1	0.72	0.540	0.825
	LOY2	0.73		
	LOY3	0.75		
	LOY4	0.74		

Note: Model fit indices: $\chi^2=343.07$ ($p<0.05$, $df=220$); CFI=0.98; TLI=0.98; RMSEA=0.036; SRMR=0.033

Table 4. Average Variance Extracted and Squared Correlations of Constructs

	SSP	VAL	TRU	TCT	LOY
SSP	0.55^a	0.29 ^c	0.02	0.08	0.12
VAL	0.54 ^b	0.58	0.16	0.25	0.27
TRU	0.13	0.40	0.56	0.29	0.23
TCT	-0.29	-0.50	-0.54	0.69	0.42
LOY	0.34	0.52	0.48	-0.65	0.54

Note: ^avalues along main diagonal are AVEs, ^bvalues below main diagonal are correlations, ^cvalues above main diagonal are squared correlations.

3.4 Common Method Bias Analysis

Since this study involves the use of cross-sectional, survey questionnaire for data collection, the data might be subjected to common method bias. Harman's single factor test was employed to determine if a single factor accounts for the majority of the variance (i.e. > 50%) in the measurement model (Podsakoff et al., 2003). An exploratory factor analysis was conducted, and the loadings of the measurement items were constrained to only one factor. The variance of the one factor model accounts for approximately 37%. This indicates that common method bias is not a major concern in this study.

4. Results and Discussion

4.1 Robustness Test

To examine the robustness of the theoretical model, the model was compared against two alternative models which were suggested to be feasible by the existing literature (Table 5). As shown in Table 5, in addition to those hypotheses presented in the theoretical model, the first alternative model (M_{A1}) suggests that sustainable shipping practices have direct positive effects on shippers' trust, transaction cost, and shippers' loyalty. All three links bypass shippers' perceived value, indicating a partial-mediation relationship. As for the second alternative model (M_{A2}), its only difference with M_{A1} is the omission of a direct relationship between sustainable shipping practices and shippers' loyalty. M_{A2} suggests that sustainable shipping practices only have indirect effects on shippers' loyalty.

Since all three models are nested, chi-square difference tests can be employed to examine the superiority of the model (Diamantopoulos and Siguaw, 2000; Kline, 2010). Chi-square difference tests involve a pair-wise comparison of nested-models in a sequential fashion, starting from the model with the lowest degrees of freedom to highest degrees of freedom. In the event when the result of a comparison is significant, the more parsimonious model (i.e. the model with higher degrees of freedom is rejected while the less parsimonious model (i.e. the model with lower degrees of freedom) is accepted. On the other hand, when the result of a comparison is not significant, the more parsimonious model is accepted while the less parsimonious model is rejected. In this regard, the more parsimonious model is viewed to be superior than the less parsimonious model.

As shown in Table 5, both alternative models (i.e. M_{A1} and M_{A2}) were first compared due to their relatively lower degrees of freedom. Their chi-square difference test ($\Delta\chi^2 = 1.52$, $\Delta df = 1$) is not significant ($p > 0.05$), indicating that the removal of the link between sustainable shipping practices and shippers' loyalty does not result in a significant loss of model fit. Hence, based on the principle of parsimony, M_{A1} is rejected while M_{A2} is accepted. To some extent, the result is consistent with Shin and Thai (2015) who showed that the effect of a shipping company's corporate social responsibility on shippers' loyalty is not direct but fully-mediated by other variables such as customer satisfaction and relationship maintenance. In the context of this study, the effect of sustainable shipping practices on shippers' loyalty is fully-mediated by shippers' perceived value of sustainable shipping practices.

Table 5. Alternative and Theoretical Models Comparison

Model	Graphical Illustration	Chi-square fit (χ^2)	df	Nested model comparison	$\Delta\chi^2$	sig. $\Delta\chi^2$	Decision
M _{A1} (Alternative Model 1)		343.07	220	-	-	-	-
M _{A2} (Alternative Model 2)		344.59	221	M _{A1} – M _{A2}	1.52	p > 0.05	reject M _{A1} accept M _{A2}

M_T (Theoretical Model)	<pre> graph LR A([Sustainable Shipping Practices]) --> B([Shippers' Perceived Value]) B --> C([Shippers' Trust]) B --> D([Transaction Cost]) C --> E([Shippers' Loyalty]) D --> E </pre>	348.08	223	$M_{A2} - M_T$	3.49	$p > 0.05$	reject M_{A2} accept M_T
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Subsequently, M_{A2} is compared with M_T . The chi-square difference test ($\Delta\chi^2 = 3.49$, $\Delta df = 2$) is not significant ($p > 0.05$), indicating that the removal of the direct links connecting sustainable shipping practices with shippers' trust and transaction cost does not result in a significant loss of model fit. Therefore, on the account of the principle of parsimony, the less parsimonious model (i.e. M_{A2}) is rejected while the more parsimonious model (i.e. M_T) is accepted. The rejection of M_{A2} provides new insights to the literature i.e. sustainable shipping practices must provide utility to shippers, which consequently results in the formation of trust, and reduced transaction cost.

4.2 Theoretical Model Estimation

After ascertaining that the theoretical model is the most robust amongst the competing models and best fits the data obtained from the survey questionnaires, their parameters were estimated using maximum likelihood function. Figure 2 depicts the parameter estimates of the theoretical model and the coefficient of determination (R^2) of the endogenous variables.

Model fit indices: $\chi^2=348.08$ ($p<0.05$, $df=223$); CFI=0.98; TLI=0.98; RMSEA=0.036; SRMR=0.038

Figure 2: Parameter Estimation of the Theoretical Model

Note: * indicates that the path estimate is significant ($p<0.05$)

In general, the theoretical model shows good model fit ($\chi^2=348.08$ ($p<0.05$, $df=223$); CFI=0.98; TLI=0.98; RMSEA=0.036; SRMR=0.038). This is further supported by acceptable

R^2 of the endogenous variables (Cohen et al., 2013). Accordingly, the R^2 of shippers' perceived value, shippers' trust, transaction cost, and shippers' loyalty are 0.30, 0.15, 0.39, and 0.49.

As shown in Figure 2, sustainable shipping practices have a significant, positive effect on shippers' perceived value ($\beta=0.54$, $p<0.05$). Subsequently, shippers' perceived value has a significant, positive effect on shippers' loyalty ($\beta=0.24$, $p<0.05$). Hence, both H_1 and H_2 are accepted. This finding is consistent with perceived value theory which posits that customers' value perceptions result from an evaluation of the benefits and sacrifices associated with a product or service. In this context, the benefits or value generated from sustainable shipping practices can be categorised into economic (i.e. financial benefits), quality (i.e. service level improvement), emotional (i.e. positive psychological feelings), and social utility (reputation building and brand identification). Therefore, sustainable shipping practices enhance shippers' perceived value and explain approximately 30% of its variance. Next, sacrifices refer to the opportunity cost of selecting a service of a shipping company over other competitors. When a shipping company constantly provides superior value from implementing sustainable shipping practices, the opportunity cost of a shipper for choosing the service will be lower. Hence, it is conceivable that shippers will exhibit loyalty to the shipping company as its service provides the best value among other competitors. Therefore, shippers' perceived value of sustainable shipping practices enhances shippers' loyalty.

Next, it was found that shippers' perceived value of sustainable shipping services has a significant, positive effect on shippers' trust ($\beta=0.39$, $p<0.05$). In addition, the latter also has a significant, positive effect on shippers' loyalty ($\beta=0.15$, $p<0.05$). Therefore, both H_3 and H_4 are accepted. The findings suggest that apart from garnering shippers' loyalty through the creation of superior value from sustainable shipping practices, shippers' loyalty can also be enhanced from a relational lens. Supported by social exchange theory, the consistent creation of superior value from sustainable shipping practices over time enhances shippers' trust. In this study, shippers' trust is reflected by their beliefs in a shipping company's expertise in implementing sustainable shipping practices, integrity in maintaining its social and environmental values and attitude towards fairness, and lastly, social benevolence i.e. altruistic view on sustainability. Subsequently, shippers' trust leads to improved perceived credibility of the shipping company and reduced relational (e.g. opportunistic behaviour) and emotional risk. As a result, there is a higher tendency that shippers reciprocate their trust in the shipping company in the form of loyalty such as repurchase intention and positive word of mouth.

Lastly, both shippers' perceived value ($\beta = -0.34$, $p < 0.05$) and shippers' trust ($\beta = -0.40$, $p < 0.05$) have significant, negative effects on sustainability-related transaction cost. In addition, these transaction cost has negative effect on shippers' loyalty ($\beta = -0.45$, $p < 0.05$). Therefore, H₅, H₆, and H₇ are accepted. These findings are consistent with transaction cost theory which states that the decision to choose a market offering is not only based on its price but also the cost of performing a transaction i.e. total cost minimisation.

The findings of this study show that the value generated from sustainable shipping practices reduces sustainability-related transaction cost. In general, value created from sustainable shipping practices is intangible and often decoupled with shipping services. Hence, such values must be explicitly communicated or disclosed to shippers. Such disclosure reduces ambiguity, which subsequently decreases sustainability-related transaction costs that are associated with searching of sustainability information of a shipping company, negotiating the sustainability requirements of shippers with the shipping company, and enforcing the requirements through audits and checks.

In addition, when shippers' trust on a shipping company's expertise, integrity, and social benevolence regarding implementing sustainability is gained, sustainability-related transaction cost with the shipping company reduces. This relationship can be explained using social decision heuristics which suggest that in trust dilemma situations, decisions are made based on heuristic assumption (e.g. behavioural rule of thumb and intuitive judgement) rather than calculated risks grounded on economic models. In this context, a shipper's belief in the shipping company to reliably execute its sustainability obligations or promise can reduce unnecessary sustainability-related transaction costs related to searching, negotiating and inspecting. Subsequently, reduced transaction cost can enhance shippers' loyalty. From an economics perspective, when the total cost of a transaction reduces, a shipper is more likely to use the services of a shipping company among other alternatives since such decision results in the least opportunity cost for the shipper.

4.3 Direct, Indirect, and Total Effect Analysis

Table 6 summarises the direct (a_j), indirect (b_j), and total (c_j) effects of sustainable shipping practices, shippers' perceived value, shippers' trust, and transaction cost on shippers' loyalty.

<INSERT TABLE 6>

In increasing order of their total effects on shippers' loyalty, they are sustainable shipping practices ($c_1 = 0.28$), shippers' trust ($c_3 = 0.33$), transaction cost ($c_4 = 0.45$), and shippers' perceived value ($c_2 = 0.52$). Sustainable shipping practices have the smallest total effect ($c_1 = 0.28$) on shippers' loyalty. This is primarily due to the absence of a direct effect on shippers' loyalty. Its effect is fully-mediated by shippers' perceived value, shippers' trust and transaction cost. This finding indicates the lack of a direct relationship between sustainable shipping practices and shippers' loyalty. It also highlights the importance of considering the role of intervening variables that exist between sustainable shipping practices and shippers' loyalty. Specifically, sustainable shipping practices must be implemented in a manner that creates value for shippers, which subsequently leads to the formation of trust, reduction of transaction cost, and finally improved shippers' loyalty.

Compared to sustainable shipping practices, shippers' trust has a slightly stronger total effect ($c_3 = 0.33$) on shippers' loyalty. It has both direct ($a_3 = 0.24$) and indirect effect ($b_3 = 0.28$), which is channelled via transaction cost. Compared to shippers' trust, both transaction cost ($c_4 = 0.45$) and shippers' perceived value ($c_2 = 0.52$) have stronger total effects on shippers' loyalty. This observation is due to the relatively larger direct effects that transaction cost ($a_4 = 0.45$) and shippers' perceived value ($a_2 = 0.24$) have on shippers' loyalty. This suggests that perceived value theory and transaction cost theory are more effective in explaining shippers' loyalty rather than social exchange theory. A possible explanation might be due to the specific context that this study was conducted i.e. the shipping industry. The shipping industry is mainly a B2B industry. Hence, decisions made by customers are more pragmatic and are reinforced by the expectations of tangible business outcomes such as enhanced value or reduced cost. On the other hand, the reliance of relationship mechanisms such as trust to enhance loyalty is relatively less important in B2B settings.

5 Conclusion

5.1 Summary of Findings

The objective of this study is to analyse the intermediary roles of shippers' perceived value, shippers' trust, and transaction cost on the relationship between sustainable shipping practices and shippers' loyalty. Drawing on the theoretical insights from perceived value theory, social exchange theory, and transaction cost theory, a theoretical model that specifies the interrelationships between the aforementioned constructs was developed.

A survey questionnaire was administered on 2,433 shippers in Singapore. Using the collected data, the theoretical model was compared with a few competing models that propose alternative relationships between the constructs. The comparisons show that the theoretical model is the best fitting model while accounting for model parsimony. The theoretical model indicated that sustainable shipping practices positively influence shippers' perceived value. The latter has positive effects on shippers' trust and shippers' loyalty, and a negative effect on transaction cost. Shippers' trust has a positive effect on shippers' loyalty and a negative effect on transaction cost, while transaction cost has a negative effect on shippers' loyalty. In addition, the total effect analysis shows that shippers' perceived value has the largest total effect on shippers' loyalty. This is followed by transaction cost, shippers' trust, and sustainable shipping practices.

5.2 Theoretical and Managerial Implications

This study contributes to both theory and managerial practices in several ways. Firstly, from the theoretical perspective, this study has advanced the current understanding of the relationship between sustainable shipping practices and shippers' loyalty. The relationship is often explained from an institutional perspective, based on the need to alleviate or comply with the pressures exerted by shippers. This study offers alternative theoretical explanations by introducing and integrating perceived value theory, social exchange theory, and transaction cost theory in its research model. Accordingly, these theories are grounded on three diverse paradigms which are related to customer utility, social psychology, and institutional economics. In general, the findings imply that all three theories are complementary, mutually-reinforcing, and have contributed to the explanatory power of the theoretical model. Approximately 50% of the variance in shippers' loyalty can be explained by the theories proposed in this study.

Secondly, this study has contributed to enhancing the nomological understanding of the examined latent constructs. It has employed a novel approach by comparing the theoretical model with a few competing models which suggest feasible, alternative relationships between the constructs i.e. (1) sustainable shipping practices, (2) shippers' perceived value, (3) shippers' trust, and (4) transaction cost and (5) shippers' loyalty. This comparison has strengthened and clarified the role of shippers' perceived value, shippers' trust, and transaction cost concerning the relationship between sustainable shipping practices and shippers' loyalty. In particular, the results imply that implementing sustainable shipping practices is a necessary but insufficient condition for garnering shippers' loyalty. The practices must provide superior value in the form of economic, quality, emotional, or social benefits to shippers before they could result in the formation of shippers' loyalty either directly or indirectly via enhanced shippers' trust or reduced transaction cost.

Thirdly, this study has contributed to the theoretical development of B2B research in the field of sustainability management. Specifically, it stresses the importance of pragmatism and rationalism especially in the shipping industry where shippers are rational firms and profit-maximisers. Therefore, sustainability shipping practices must confer benefits to shippers in the form of enhanced utility, relationship, or reduced transaction costs. The findings also imply that tangible attributes such as value enhancement and cost reduction created from sustainability are considerably more important than relational mechanism such as trust in the formation of loyalty. The finding resonates with Lin and Wong (2013) who found that shipping companies favour implementing sustainable shipping practices that reduce operating cost. This can subsequently lead to reduced price, which financially benefits the shippers.

From the managerial perspective, this study has provided some directions to resource allocation. It is paramount that shipping companies recognise the strategic importance of sustainable shipping practices in garnering shippers' loyalty, which is increasingly crucial for shipping companies to survive or remain competitive in the market. Due to shippers' strong emphasis and orientation towards receiving value from sustainable shipping practices, shipping companies can regularly scan their competitive environment and obtain feedback from shippers regarding their priorities or expectations concerning the shipping company's sustainable practices. This would allow the shipping company to focus on allocating resources to implement those practices that are viewed to be important to shippers.

Next, shipping companies should also attempt to reduce sustainability-related transaction cost as it is the next strongest determinant of shippers' loyalty. While such transaction cost is to some extent influenced by shippers' perceived value and shippers' trust, shipping companies can potentially reduce shippers' cost of searching, negotiating, and enforcing shipping companies' sustainability performance through effective communication or disclosure of sustainability information. Sustainability disclosure remains as a key component in informing shippers about a shipping company's sustainable practices or performance due to the peculiarity of shipping services which are characterised by intangibility, inseparability, perishability, and variability. As a result, sustainability information of a shipping company must be explicitly communicated to shippers. Shipping companies can utilise various communication channels such as their financial or sustainability reports, webpages, stakeholder meetings, written tender, or bid presentation to disseminate their sustainability involvement to shippers. This could reduce shippers' cost of searching for the shipping companies' sustainability information. The widespread availability of sustainability information could also reduce ambiguity, which can decrease shippers' cost relating to negotiating and enforcing shipping companies' sustainability performance.

Lastly, shipping companies should also aim to foster shippers' trust in their commitment towards sustainability, which could strengthen their relationships with shippers and subsequently, their loyalty. As trust is generally accumulated from successive transactions, consistent provision of superior value from sustainable shipping practices for every transaction is vital. In addition, shipping companies should focus on building an image or reputation that highlights their expertise or knowledge in sustainability management, portrays their integrity on implementing sustainability, and displays altruistic behaviour towards sustainability.

5.3 Limitations and Recommendations

Despite the contributions of this study, there are limitations. First, this study is catered to a specific context i.e. the shipping industry. Therefore, the results may be only applicable to the shipping industry. Future research can consider cross-validating the results with other B2B industries or B2C markets to extend the generalisability of the results.

Another limitation of this study involves the inability of the employed survey system to determine whether the questionnaire is completed by the addressee or a colleague who has been referred to by the addressee. Future research can consider recording this information to enhance data traceability.

Next, this study has only focused on investigating the relationship between sustainability and loyalty from three theoretical perspectives related to cognitive-affect, relationships and behaviour. Future research can contribute by focusing on other perspectives that are not presently considered by this study. These may include perspectives from fairness theory, contingency theory, and resource-based view theory.

Thirdly, future research can examine shippers' willingness to pay higher freight rates in exchange for more sustainable shipping operations. Whilst it was found that certain consumers are willing to pay higher prices for more sustainable products or services in B2C sectors (Vecchio and Annunziata, 2015), such finding has not been validated in the B2B sectors. When transaction costs concerning the exchange of shipping services are lowered due to sustainable operations, shippers may be willing to transfer part of the savings to shipping companies in the form of higher freight rates. Conducting a study on this area will provide valuable insights for shipping companies to price their services and manage their sustainability practices with the objective of maximising their profits. Finally, the model of this study is empirically validated using survey data and is therefore subjected to various biases including sample, method and response bias. Hence, the use of objective data to test the model would be desirable. However, given that most of the constructs in the model can only be measured using survey questionnaire due to the cognitive and psychological nature of the constructs, future research can consider the use of quasi-experiments such as experimental auctions or case studies to validate the model.

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