The antecedents of sustainable shipping management and organisational performance: resource accumulation and orientation perspectives

Received 2 March 2020
Revised 21 May 2020
3 August 2020
30 August 2020
Accepted 1 September 2020

Thi Minh Trang Tran
Department of International Trade and Logistics, Chung-Ang University, Seoul, Republic of Korea
Kum Fai Yuen
School of Civil and Environmental Engineering, Nanyang Technological University, Singapore, Singapore
Xueqin Wang
Department of International Logistics, Chung-Ang University, Seoul, Republic of Korea, and
Kevin X. Li
Ocean College, Zhejiang University, Hangzhou, China

Abstract

Purpose – Sustainable shipping management (SSM) has received much attention from shipping companies in recent years. Grounded on resource accumulation and orientation perspectives, this study aims to identify the antecedents of SSM and examine their effects on the performance (i.e. shippers' loyalty and financial performance) of shipping companies.

Design/methodology/approach – A model comprising a network of hypotheses that specifies the relationships between the antecedents, SSM, shippers' loyalty and financial performance was constructed. Subsequently, a survey questionnaire was designed. Survey data were then collected from 294 shipping companies located in Vietnam and analysed using structural equation modelling.

Findings – The findings indicate that the five antecedents have significant effects on the effectiveness of SSM. They are stakeholders' focus, strategic orientation, supply chain collaboration, sustainability resource development and sustainability technology development. Bootstrapping analysis indicates that SSM has significant direct and indirect effects on financial performance via shippers' loyalty.

Research limitations/implications – Applied perspectives are complementary and offer unique explanations to SSM. However, the orientation perspective offers stronger explanation. This study also improves the allocation of resources and capabilities in managing sustainability to enhance the organisational performance of shipping companies.

Originality/value – This study synthesises the sustainability and strategic management literature to identify the antecedents of SSM.

Keywords Sustainable shipping management, Loyalty, Organisational performance, Resource based-view theory, Antecedents, Sustainability

Paper type Research paper

1. Introduction

Shipping facilitates international trade because it carries 90% of the world trade in volume terms (UNCTAD, 2020). However, the shipping industry impacts widely and sizeably on the

This paper is part of the first author's PhD thesis with Chung-Ang University. The authors are grateful to the editors and the three anonymous reviewers for their valuable feedback and insightful comments.

International Journal of Physical Distribution & Logistics Management
Vol. 50 No. 9/10, 2020
pp. 833-854

0960-0035
DOI 10.1108/IJPDLM-03-2020-0066

environment, attributing to the scale of its operations. Shipping activities have contributed to global warming, the introduction of invasive marine species in oceans, and pollution which affect commercial activities as well as the health and quality of life of shoreline settlements (Yang, 2018). To address these issues, various maritime regulations such as IMO 2020 Sulphur Cap and MARPOL 2020 have been introduced in recent years. Further, the tightening environmental regulations and the public's increasing attention towards sustainability have led to a considerable amount of attention paid to sustainable shipping management (SSM) which refers to a set of organisational activities and principles adopted by shipping companies, with the aim of addressing societal and environmental issues in their operations (Yuen *et al.*, 2019b).

At present, most current studies have explained the motivation of SSM and its performance implications. For instance, the reasons for implementing SSM are often stemmed from the motives to improve the efficiency of resources and capabilities, differentiate services offering, enhance employee's satisfaction or reduce operation cost (Tran *et al.*, 2020). Other research has examined the antecedents of implementing SSM with the purpose of strengthening SSM and organisational performance. For instance, Lai *et al.* (2013) showed that resource conservation principles should be adopted to balance productivity and the environment and optimise operational decisions in shipping companies. Others have concentrated on continuous improvement principles (Yuen *et al.*, 2016) or stakeholder focus (Lun *et al.*, 2016).

However, although previous research has introduced several antecedents of SSM implementation and examined its effect on organisational performance, two research gaps are noted. Firstly, most researchers emphasise on examining the relationship between SSM and organisational performance by focussing on a single perspective (Chang and Danao, 2017; Pantouvakis *et al.*, 2017) rather than multiple perspectives that can confer shipping companies a more comprehensive competitive advantage over their competitors. Secondly, arising from the one-dimensional approach to examining SSM and performance of shipping companies, there is very little basis for comparing the effectiveness of each perspective. It is argued that organisational resources of each company are limited. Consequently, shipping companies face trade-off decisions and must allocate and accumulate their scarce resources for sustainability management. By considering the various antecedents of SSM and their link to performance, the accumulation and development of resources can be prioritised.

This study aims to advance existing research on SSM by drawing insights from the strategic management literature. The objectives of this study are two-fold. The first objective of this study is to identify the various antecedents of implementing SSM. This paper proposes two distinct perspectives: resources accumulation and orientation to operationalise the antecedents. Accordingly, the key antecedents of SSM are sustainability resource development, supply chain collaboration, sustainability technology development, stakeholders' focus and strategic orientation. Examining this objective has important theoretical and managerial implications because by simultaneously estimating the effects of the antecedents on SSM, the effectiveness of each antecedent can be determined and ranked.

The second objective is to examine the effects of the antecedents on SSM and performance. This would address the issue of resource allocation and accumulation in the management of sustainability, allowing shipping companies to prioritise the antecedents of SSM that maximise performance. In this research, two types of performance are examined: shippers' loyalty and financial performance. The former reflects the competitive position of a shipping company from implementing SSM, whereas the latter concerns return on investment, return on asset and profit. This study proposes mediation effects (i.e. shippers' loyalty mediates the effect of SSM on the financial performance of shipping companies). This is because increased loyalty from shippers can lead to repurchase intention and willingness to pay more for a shipping company's service. Consequently, this leads to increased financial performance. According to Carter and Rogers (2008), a practice is not sustainable if it has a negative impact

on financial performance, regardless of its positive influence on the environment on society. Hence, it is imperative to examine the influence of SSM on financial performance.

2. Literature review

The current paper proposes the theoretical model and its hypotheses (Figure 1). As shown in Figure 1, the antecedents of SSM are identified and developed from two perspectives: resource accumulation and orientation. Both resource accumulation and orientation perspectives can enhance SSM, which is proposed to be a capability (i.e. a strategic knowhow comprising a bundle of resources). Accordingly, SSM is argued to be underpinned by a shipping company's ability to accumulate valuable organisational resources and directing them in the management of sustainability.

The resource accumulation perspective refers to the development and deployment of valuable organisational resources to drive value creation and achieve a sustainable competitive advantage (Hart, 1995). This study proposes three types of sustainability resources that shipping companies can accumulate: internal (i.e. tangible and intangible), relational and technological resources. Accordingly, they are referred to as sustainability resource development, supply chain collaboration and sustainability technology development.

The orientation perspective is defined as the approach adopted by shipping companies that identifies their current competitive state and delineates its expected paths in the future (Nasereddin and Albadri, 2019). This perspective is suggested to comprise stakeholder focus that concerns meeting and satisfying stakeholders' sustainability requirements, and strategic orientation that focuses on achieving positive economic, environmental and social performances simultaneously.

According to the VRIN framework, SSM can be viewed as a capability that confers a sustainable competitive advantage to shipping companies, leading to superior organisational performance (Barney, 2012). Yuen *et al.* (2018) stated that a firm's performance can be evaluated by leading or lagging indicators. Lagging indicators refer to measuring end-state

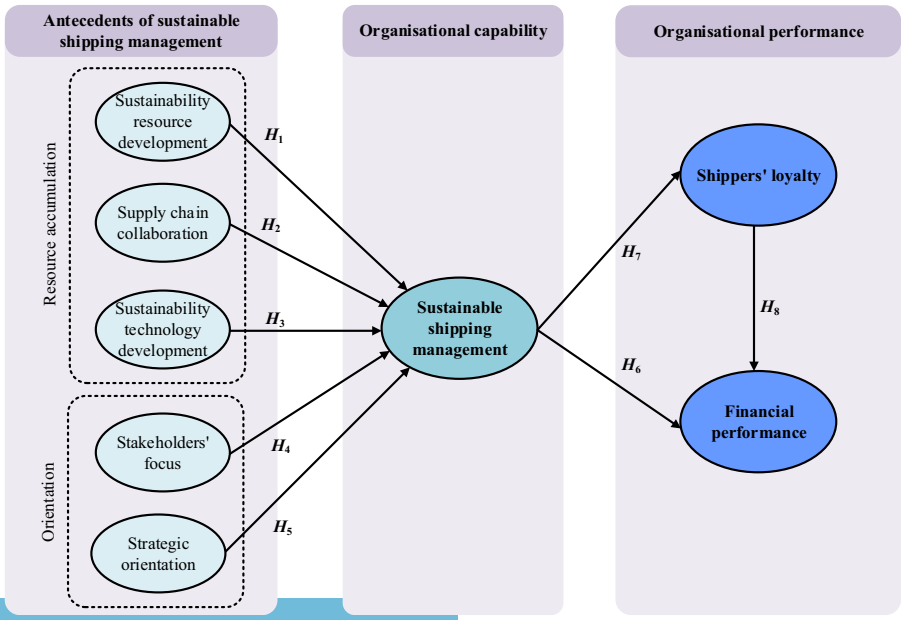


Figure 1.
The theoretical model

objectives such as financial performance metrics. On the other hand, leading indicators are metrics that predict financial performance. An important metric is shippers' loyalty, which reflects the strategic, competitive position of a shipping company. Consequently, this study hypothesises that SSM has both direct and indirect effects on financial performance via shippers' loyalty.

2.1 Antecedents of SSM

2.1.1 Sustainability resource development. Sustainability resource development concerns exploiting, using and accumulating internal resources to implement SSM. According to Jensen *et al.* (2016), these resources can be classified into tangible and intangible resources.

Firstly, tangible resources include physical assets (e.g. green building, vessels, and equipment) and financial resources (e.g. financial instruments and capital). The accumulation of tangible resources can offer shipping companies various environmental benefits (e.g. decreasing the fuel consumption and air, water and noise pollution from vessels and trucks; investing new eco-friendly facilities and technology); social benefits (e.g. increasing employee wage, improving workplace quality and safety) and economic benefits (e.g. enhancing the efficiency of assets and working productivity of employee) (Lirn *et al.*, 2019). In sizeable amount, tangible resources can enhance SSM because shipping companies would experience fewer financial constraints and would be able to acquire or develop SSM through recruitment or education and training of staff.

Secondly, intangible resources refer to sustainable knowledge and organisational culture that support SSM. Sustainable knowledge is viewed as a dynamic capability, which enables shipping companies to constantly achieve alignment between their sustainability strategies and operations (Yuen *et al.*, 2019b). Possessing strong sustainable knowledge enables a shipping company to identify and implement the best solutions to manage its sustainability activities more efficiently (i.e. lower cost) or effectively (i.e. meeting sustainability goals). Organisational culture towards sustainability is defined as "a set of norms and beliefs within an organisation that dictate sustainability behaviour in shipping companies" (Tran *et al.*, 2020). A culture that is committed to sustainability by integrating SSM into the vision, mission, objectives and goals of shipping companies can improve the commitment of employees towards sustainability, which is essential to SSM.

H1. Sustainability resource development has a positive impact on SSM

2.1.2 Supply chain collaboration. While sustainability resource development focuses on intra-firm resources, supply chain collaboration concerns accumulating and developing external relationships and interfirm resources to create a relation rent and achieve competitive advantages over rival supply chains (Dyer *et al.*, 2018). A relational rent is defined as "a supernormal profit jointly generated by either firm in isolation and only be created through joint idiosyncratic contributions of the specific alliance partners". The relational rents can create joint value for shipping companies and their partners (i.e. greater profit, high reputation on sustainability or better image in community) when they commit on implementing SSM. In this study, the sources of relational rents are generated from the relationships and resources that can be categorised into four factors: joint relationship management, knowledge sharing, supplementary resources and effective governance processes.

For instance, joint relationship management, which concerns establishing inter-firm safeguards and transactions can develop trust (Child *et al.*, 2019) and consequently partners' willingness to share sustainability information that supports shipping companies' sustainability planning and collaboration. Knowledge sharing which involves combining sustainability knowledge allows a more holistic understanding of the sustainability challenges faced by the value chain, which can support sustainability decision-making and

process control (Lee and Nam, 2017). Supplementary resources, which reflect pooling of inter-firm resources such as financial, equipment and labour can result in the formation of sustainability task force and greater availability of assets or capital to support SSM. Finally, effective governance processes, which refer to the use of collaboration agreements underline the responsibilities of the partnership, designate inter-firm risks and incentives and formalise information sharing (Dyer *et al.*, 2018). A higher level of formal arrangement reduces role ambiguity, which can drive collaboration, allowing partners to effectively meet sustainability laws and regulations and achieve joint sustainable goals and objectives.

H2. Supply chain collaboration has a positive impact on SSM

2.1.3 Sustainability technology development. Sustainability technology development refers to the accumulation and adoption of sustainable technologies in shipping company. Technologies, which are viewed as resources, play a critical role in enabling SSM. In the recent literature, sustainability technologies (e.g. scrubbers) have been centred on reducing energy consumption and NOx emissions through green technology initiative (Lee and Nam, 2017). Additionally, the potential of technologies are critical in supporting the informational aspects of SSM by standardising, monitoring, capturing and utilising data and information systems that help improve efficiency and effectiveness of operations or service processes. The technologies improve sustainable information flows between shipping companies and their partners that increase the involvement of stakeholders in the management of sustainability and employee training on managing sustainability issues (Bala *et al.*, 2017).

According to Schein (1994), technological resources are categorised into "automate", "informate", "transform", and "infrastructure" resources. "Automate" technology refers to sustainable resources that help shipping companies automate business process, reducing and eliminating manual processes. "Informate" technologies refer to resources that help shipping companies to make available timely and relevant data to their stakeholders (i.e. shareholders, vendors, shippers, employees). Such technologies can help these individuals better understand the work situations and carry out their work processes more effectively. "Transform" technologies refer to resources that help shipping companies re-structure business assets, capabilities, processes to develop new services, business processes and reposition themselves in the marketplace. Such technologies enable shipping companies to develop innovative capabilities through providing project management skills and experience, which are key inputs to successful SSM. Lastly, "infrastructure" technology resources comprise standardised technical services deployments to create platforms through which technologies are automated, informed and transformed to meet sustainability objectives in a shipping company. Such platforms enable shipping companies to optimise sustainability technology usage (i.e. energy consumption) and improve communication among supply chain partners in maritime transport (i.e. information sharing, coordination in innovation and improvement of new sustainable technology) (Ray *et al.*, 2005).

H3. Sustainability technology development has a positive impact on SSM

2.1.4 Stakeholders' focus. Stakeholders' focus explains shipping companies' motivation for engaging in sustainable management to satisfy various stakeholders including shareholders, shippers, vendors and employees (Yang, 2018). Stakeholders who can have legitimate interest or silent interest can have the ability to exert normative, mimetic and coercive pressure on a shipping company to manage sustainability (Lai *et al.*, 2013). Consequently, such abilities confer power to stakeholders who can influence productivity and financial outcomes by committing and withdrawing resources that are valuable to shipping companies. Therefore, it is necessary for shipping companies to fulfil the sustainability requirements of stakeholders and report their sustainability performance.

Shareholders who are owners of shipping companies possess the strongest legitimate interest in their companies. Their concerns include improving business performance (e.g. higher revenue and profit and better return on investment) and assuring viable economic practice (Yuen *et al.*, 2017a).

Vendors refer to shipping companies' suppliers who offer their services such as terminal operating service and feeder services. Their concerns consist of assuring fair transactions, forging stronger partnerships to reduce operating cost, increase market share or achieve certain sustainability standards and aligning sustainability and business strategies to create synergies in operation (Yuen *et al.*, 2017a).

Shippers refers to customers of shipping companies such as manufacturers or logistics service providers. Their concerns mainly relate to the quality of the service such as price, safety, privacy, trustworthiness and traceability of shipments (Tran *et al.*, 2020). Further, shippers might evaluate the performance of shipping companies in relation to managing sustainability (Skovgaard, 2018).

Employees in shipping companies mainly have concerns on the working environments such as health issues and safety, well-being and job satisfaction, skills training opportunities and social equity (Yuen *et al.*, 2017b).

Society refers to the natural environment, local authorities or governments and communities. Even though the relationship between society and shipping companies cannot be governed by contracts, managing this relationship can provide economic benefits for shipping companies. For instance, Yuen *et al.* (2017a) pointed out that these benefits consist of attracting local support from communities or local authorities, enhancing brand image and companies' reputation and achieving sustainable competitive advantage market.

Managing sustainability activities with the purpose of addressing stakeholders' needs creates a purpose for a shipping company. This prevents rudderless decisions concerning SSM, allowing shipping companies to channel their efforts, which improves the efficiency (i.e. minimising resource wastage on activities that do not address stakeholder needs) and effectiveness of SSM (i.e. concentrating on ways that best address stakeholder needs when managing sustainability activities).

H4. Stakeholders' focus has a positive impact on SSM

2.1.5 Strategic orientation. A shipping company can choose the altruistic orientation or strategic orientation when implementing SSM (McWilliams and Siegel, 2011). Additionally, altruistic orientation proposes enhancing environmental and social performance with little consideration for achieving positive economic performance. On the contrary, the strategic orientation aims to improve all three performances simultaneously. Previous studies have emphasised the business case of implementing sustainability where shipping companies should evaluate the economic implications of their sustainability investments before making a decision (Skovgaard, 2018). After all, a sustainable activity will not be sustainable if it is does not generate positive financial returns to a shipping company. Therefore, choosing the strategic orientation is preferred when implementing SSM.

Adopting a strategic orientation would improve SSM because it compels managers to make correct trade-off decisions (Lin and Wong, 2013). In this regard, shipping companies' criterion in the selection of sustainability activities would no longer be based on the activity that maximises social or environmental performance. Rather, their decisions should base on the criterion that an activity improves all three performances simultaneously. Consequently, adopting a strategic orientation improves the planning and selection of sustainability activities and hence SSM. In addition, strategic orientation emphasises the constant alignment of sustainable strategies or activities with a shipping company's resources and environment (Yuen *et al.*, 2017b). This constant realignment ensures the relevancy and superiority of a shipping company's SSM.

H5. Strategic orientation has a positive impact on SSM

2.2 SSM and organisational performance

The resource-based-view (RBV) is a framework that explains a company's development and deployment of resources (Li *et al.*, 2014). By extension, the RBV was also conceptualised to comprise various sustainability strategies to develop specific capabilities. For instance, Hart (1995) proposed natural resource–based view of the company which is developed upon a company's relationship with the natural environment by continuously improving operations in response to calling for social and environmental requirements. In this study, SSM can be viewed as a distinctive capability, which is considered rare, valuable, inimitable and non-substitutable. Consequently, being efficient and effective at SSM can lead to better organisational performance (Fernando *et al.*, 2019). Organisational performance can be assessed by leading and lagging indicators. In this context, lagging indicators refer to financial performance, whereas leading indicators refer to shippers' loyalty. Leading indicators predict financial performance.

This study proposes that SSM has a direct influence on financial performance because shipping companies, which are competent in managing sustainability, require fewer resources to meet sustainability goals or regulatory requirements. This translates to immediate cost savings for shipping companies. In addition, this study also proposes that SSM has an indirect influence on financial performance via shippers' loyalty. Shipping companies, which are proficient in managing sustainability, would be able to align their sustainability activities and practices with the requirements of their shippers. This would lead to greater satisfaction and hence loyalty (Balci *et al.*, 2019). Consequently, loyal customers are more likely to exhibit positive behavioural intentions such as positive word of mouth, willingness to pay and repurchase intention, which lead to positive financial performance.

The implementation of SSM in a shipping company can directly lead to the reduction of operation cost (e.g. using energy efficient ships, cold-ironing, using eco-friendly technologies) and also transaction costs (e.g. building higher level of trust with their partner and sharing knowledge and information) (Yuen *et al.*, 2018). It can also enhance the service quality and performance of shipping companies, for instance, by offering differentiated services (e.g. releasing sustainability involvement and applying cause-related marketing), upholding a positive sustainable image to engage the community and providing more responsive customer service (Lam and Wong, 2018).

H6. Sustainable shipping management has a positive impact on the financial performance of a shipping company

Maintaining and building a strong relationship with customers are essential for shipping companies' survival in the increasing competitive environment where there is a growing trend towards horizontal and vertical integration (Notteboom *et al.*, 2017). In recent years, several studies have shown that SSM is positively correlated with shippers' or customers' loyalty, which is reflected by increased willingness to repurchase, positive word-of-mouth and willingness-to-pay premiums (Shin *et al.*, 2017).

H7. Sustainable shipping management has a positive impact on shippers' loyalty.

Furthermore, this paper proposes that shippers' loyalty derived from SSM can result in better financial performance. According to Pawlik *et al.* (2012), shippers are using sustainability criteria such as ISO 26000 and ISO 14000 as a basis to award tenders to shipping companies (i.e. returns of investment, revenue, profit). Therefore, failing to satisfy shippers' requirements can exclude shipping companies from securing the tenders or may cause their current shippers to switch to more sustainable shipping services provided by

competitors (Yuen *et al.*, 2018). The loss of shippers to rivals could have a potential impact on the long-term competitiveness and profitability in shipping companies, thereby resulting in poor financial performance.

H8. Shippers' loyalty has a positive impact on financial performance of a shipping company.

3. Methodology

3.1 Measurement item development

Table 1 shows the constructs, their measurement items and supporting literature. The operationalised constructs consist of the five antecedents, SSM, shippers' loyalty and financial performance.

Sustainability resource development includes using, exploiting and accumulating internal resources to implement SSM (Yuen *et al.*, 2019a). Therefore, the measurement items are developed based on the types of resources, which include (RM1) sustainable assets, (RM2) financial capital, (RM3) sustainable knowledge and (RM4) organisational culture.

Supply chain collaboration concerns accumulating inter-firm resources and relationships that support SSM (Dyer *et al.*, 2018). These resources and relationships are related to (SCC1) joint relationship management, (SCC2) knowledge sharing, (SCC3) supplementary resources and (SCC4) effective governance processes via contractual agreements (Child *et al.*, 2019).

Sustainability technology development refers to accumulating and adopting sustainable technologies. It posits that employees' willingness to accept new sustainable technologies is influenced by five factors (Tran *et al.*, 2020). These factors are relative advantage (TA1), compatibility (TA2), complexity (TA3), trialability (TA4) and observability (TA5).

Stakeholders' focus suggests that there are five key groups of stakeholders that a company should consider when managing sustainability. Stakeholders' focus involves meeting the sustainability requirements of (SF1) shareholders, (SF2) vendors, (SF3) shippers, (SF4) employees and (SF5) regulators (Yang, 2018).

Strategic orientation posits that constant aligning sustainable strategies or activities with a shipping company's resources and environment dictates its success in implementing SSM (Yuen *et al.*, 2017b). There are four ways to achieve alignment. They include aligning sustainable activities with (SO1) the aim of making profits, (SO2) services, (SO3) the type of business and (SO4) competitive strategies.

SSM can be understood from managing five common dimensions of sustainable shipping activities (Yuen *et al.*, 2019a). These dimensions include the (SSM1) environment, (SSM2) community and society, (SSM3) employees, (SSM4) customers and (SSM5) governance and ethics, which are consistent with the dimensions used by the MSCI KLD social index. Accordingly, three measurement items specific to the shipping industry are adopted from the literature to operationalise each dimension.

For operationalising shippers' loyalty, the measured items were adapted from Lam (2015) that reflect considerable aspects governing loyalty such as (LO1) considering a shipping company as the first choice, (LO2) recommending shippers to the company, (LO3) encouraging shippers to use its services, (LO4) spreading positive word of mouth and (LO5) exhibiting no intention to switch to services of other companies.

Financial performance was measured by three common measurement items. They include return on investment, return on asset and profit (Yuen *et al.*, 2019b).

3.2 Survey design

Five experts from the academic or industry who specialised in maritime research and have many projects on sustainable shipping were requested to review the survey and offer

Construct	ID	Response anchors and measurement items	Source
Sustainability resource development (RM)	Strongly disagree (1)/ strongly agree (7)		Yuen *et al.* (2019a)
	RM1	My company invests in sustainable assets such as eco-friendly vessels, trucks, green buildings	
	RM2	My company prepares a large amount of financial capital for managing sustainable activities	
	RM3	My company supports sustainable knowledge intending to exploit existing processes and explore innovative technology	
	RM4	My company focuses on the support for sustainable vision and objectives of the company or communication among managers and employees	
Supply chain collaboration (SCC)	Strongly Disagree (1)/ Strongly Agree (7)		Child *et al.* (2019), Dyer *et al.* (2018)
	SCC1	My company focuses on building trust with its partners to improve relationship management with regard to sustainability	
	SCC2	My company organises frequent conferences and workshops with its partners in our supply chain to share sustainable practices and knowledge	
	SCC3	My company focuses on sharing capital, facilities and labour resources for sustainability management	
	SCC4	My company enters into contractual agreements with partners to meet sustainable goals and regulations	
Sustainability technology development (TA)	Strongly Disagree (1)/ Strongly Agree (7)		Bala *et al.* (2017); Tran *et al.* (2020)
	TA1	My company assesses and selects new technologies to improve sustainability management	
	TA2	My company assesses the integrability of new technologies with current technologies and business processes prior to adopting them	
	TA3	My company simplifies the application of sustainability technologies and offer courses to train staff in order to be familiar with the technologies	
	TA4	My company conducts test for new sustainable technologies before their full adoption	
	TA5	My company chooses new technologies that can be easily learned to implement sustainability	
Stakeholders' focus (SF)	Strongly disagree (1)/ strongly Agree (7)		Yang (2018)
	SF1	My company focuses on meeting shareholders' sustainable requirements	
	SF2	My company focuses on meeting vendors' sustainable requirements	
	SF3	My company focuses on meeting shippers' sustainable requirements	
	SF4	My company focuses on meeting employees' sustainable requirements	
	SF5	My company focuses on meeting regulatory sustainable requirements	
Strategic orientation (SO)	Strongly Disagree (1)/ Strongly Agree (7)		Yuen *et al.* (2019a)
	SO1	Sustainable activities in my company are adapted with the aim of making profits	
	SO2	Sustainable activities in my company are adapted to complement its service	
	SO3	Sustainable activities in my company are adapted to fit its business	
	SO4	Sustainable activities in my company are adapted to fit its competitive strategy	

(*continued*)

Table 1.
Construct, response anchors, measurement items, and source

Construct	ID	Response anchors and measurement items	Source
Sustainable shipping management (SSM)	Not at all effective (1) / extremely effective (7)		Shin and Thai (2015)
	SSM1	Environment	
		SSM1.1 Implement environmental-friendly materials and equipment (e.g. nontoxic paint, electric deck machine, ballast water system)	
		SSM1.2 Use clean fuels for ship engines	
		SSM1.3 Adopt environmental-friendly shipbuilding designs (e.g. improved engine design and waste heat recovery systems)	
	SSM2	Community and society	
		SSM2.1 Initiate community development programmes (e.g. donation and charity)	
		SSM2.2 Provide scholarship and internships	
		SSM2.3 Organise cultural and artistic events	
	SSM3	Employees	
		SSM3.1 Promote equal employment opportunities	
		SSM3.2 Promote work–life balance	
		SSM3.3 Provide training and education	
	SSM4	Customers	
		SSM4.1 Capture and handle customers' feedback and complains	
		SSM4.2 Respond to consumer disputes	
		SSM4.3 Provide accurate information about services	
	SSM5	Governance and ethics	
		SSM5.1 Provide full transparency of activities, structure, financial situation and performance to the public	
		SSM5.2 Apply high standards for disclosure, accounting, auditing and social and environmental reporting	
		SSM5.3 Complies with the tax laws and regulations in all operating countries	
Shippers' loyalty (LO)	Extremely unlikely (1) / extremely likely (7)		Lam (2015)
	LO1	Our customers view our company as our first choice	
	LO2	Our customers would suggest our company's services to other companies	
	LO3	Our customers would encourage others to use the service of our company	
	LO4	Our customers have positive things to say about our company	
	LO5	Our customers have never considered switching to other companies	
Financial performance (FP)	Much worse (1)/ Much better (7)		Yuen *et al.* (2019b)
	FP1	Return on investment	
	FP2	Return on asset	
	FP3	Profit	

Table 1.

suggestions on the readability and applicability of the measurement items. Then, the final version of the survey was developed. It contains three sections.

The first section offered information regarding the background and significance of the research. It also contained the survey's objectives, which focus on investigating the antecedents of SSM and examining their effects on SSM and performance of shipping companies. Additionally, in this section, the anonymity of respondents' identity was assured to obtain reliable answers.

The second section collected information of the respondents and their shipping companies. Information such as respondents' position, years of their working experience and their email address was obtained. Furthermore, regarding respondents' shipping companies, several questions relating to the firm's size and sector were also included. In the third section, it contains the measurement items shown in Table 1.

3.3 Sampling and data collection method

A survey questionnaire was designed and sent to the top managers of shipping companies in Vietnam. The shipping industry in Vietnam has been viewed as one of the booming industries. The shipping fleet consists of 1,568 vessels and a total capacity of approximately 7.8m DWT. Despite being ranked the 4th in ASEAN and 30th in the world (UNCTAD, 2020), there is inadequate research on Vietnam's shipping industry, particularly on SSM.

The sampling frame of this research was developed from the database of Ministry of Transportation and National Shipping Lines of Vietnam where information of shipping companies were obtained. A combined population size of 981 shipping companies was collected from the database. The survey invitation and questionnaire were sent using email to a contact person of each shipping company. It requested the contact person to forward the documents to their managers who should preferably be involved in SSM or strategic planning of the shipping company. After one month, a reminder letter was sent to the contact people who have not responded. In the case of non-response, an alternative email of the contact person was obtained from their companies or other online database. Consequently, a new invitation was sent to the updated email address. The survey was conducted between October to December 2019. At the end of December, 294 respondents completed the survey questionnaire. The response rate was approximately 29.97%.

Table 2 shows the information of the survey respondents and their companies. Most of the respondents (96.9%) are holding managerial positions and above. Additionally, about 73.5% of them are working in relatively small shipping companies with below 150 employees. Table 2 also shows that approximately 86% of respondents have been working for over five years in their shipping companies. This suggests that the respondents can represent their shipping companies to complete the survey.

3.4 Item parcelling

To reduce model complexity, all sub-measurement items are aggregated using item parcelling. This involves taking the mean value of all related sub-measurement items (e.g. SSM1.1 – SSM1.3) to represent a measurement item (i.e. SSM1). Conducting item parcelling will simplify the model, reducing it to a first-order structure model. This technique can be applied if the related sub-measurement items exhibit homogeneity (Coffman *et al.*, 2005). Prior to conducting item parcelling, an exploratory factor analysis using oblique rotation is conducted on all 15 sub-measurement items. The result yields a five-factor solution with the sub-measurement items possessing high loadings (>0.7) and low cross-loadings (>0.5). This suggests that item parcelling can be performed.

3.5 Non-response bias test

To examine non-response bias, this study calculated the time taken by respondents from receiving the invitation to completing the survey. The rationale is that the subjects who are slow in responding are more likely non-respondents (Podsakoff *et al.*, 2012). The respondents were divided into fast and slow groups using the mean of the time taken. Thereafter, the constructs' means were compared using *t*-tests. The results show no significant differences between fast and slow responses ($p > 0.05$), revealing little evidence of non-response bias.

3.6 Common method bias test

A marker variable technique was applied to test common method bias (Podsakoff *et al.*, 2012). Social desirability was chosen as the marker variable because theoretically, it should not have any correlations with the study' constructs. The analysis reveals that social desirability had little correlations (<0.10) with the constructs. Further, there were no considerable changes in

Profile information	Number of respondents (n = 294)	Percentage (%)
Job position		
Director and above	195	66.3
Manager	90	30.6
Non-manager	9	3.1
Working experience in the company (years)		
>15	36	12.2
10–15	75	25.5
5–10	144	49.0
<5	39	13.3
Sector		
Container	135	45.9
Bulk	63	21.5
Non vessel operating common carrier (NVOCC)	96	32.7
Firm's size (number of employees)		
>200	48	16.3
150–200	30	10.2
100–150	86	29.3
50–100	100	34
<50	30	10.2

Table 2.
Profile of respondents and companies

the magnitude of the correlations between the study's constructs with the presence or absence of the marker variable (Lindell and Whitney, 2001; Sheng *et al.*, 2011). Hence, common method bias is noted to be minimal in this study.

4. Results and discussion

This study employs covariance-based structural equation modelling to test its hypotheses. AMOS 19.0 was used to analyse the data. Structural equation modelling comprises confirmatory factor analysis (CFA) and structural model analysis (Hair *et al.*, 2010). Additionally, post hoc analysis is also conducted to generate more theoretical and managerial implications.

4.1 Measurement model analysis

The first step of structural equation modelling is to conduct the measurement model analysis. For this purpose, CFA was applied to test the reliability and validity of the measurement items (Shashi *et al.*, 2019). Table 3 below shows the CFA results.

4.1.1 Construct and indicator reliability test. To test construct reliability, the composite reliability (CR) of each construct is estimated. According to Hair *et al.* (2010), CR should be higher than 0.7. As presented in Table 3, the CRs of the constructs are above 0.8, which is higher than the benchmark. Therefore, all the constructs are considered reliable.

The measurement items' reliability is assessed by their standardised factor loadings. Hair *et al.* (2010) highlighted that the indicators are reliable if their factor loading values are higher than 0.5 and ideally, 0.7. In Table 3, all the factor loadings range from 0.69 to 0.95, which are above 0.5. This suggests that the measurement items' reliability is acceptable.

4.1.2 Model validity. The fit indices assessing the good-of-fit of the model are shown in Table 3. The indices are: (1) function chi-square/ degree of freedom (χ^2/df), (2) comparative fit index (CFI), (3) Tucker–Lewis index (TLI), (4) root mean square error of approximation

Construct (j)	Measurement items (i)	Standardised factor loadings (λ_i)	Average variance extracted (AVE_j)	Composite reliability (CR_j)
Sustainability resource development (RM)	RM1	0.851	0.630	0.872
	RM2	0.741		
	RM3	0.795		
	RM4	0.783		
Supply chain collaboration (SCC)	SCC1	0.852	0.698	0.902
	SCC2	0.772		
	SCC3	0.835		
	SCC4	0.880		
Sustainability technology development (TA)	TA1	0.805	0.580	0.873
	TA2	0.690		
	TA3	0.792		
	TA4	0.751		
	TA5	0.764		
Stakeholders' focus (SF)	SF1	0.885	0.704	0.922
	SF2	0.685		
	SF3	0.845		
	SF4	0.857		
	SF5	0.905		
Strategic orientation (SO)	SO1	0.888	0.695	0.901
	SO2	0.766		
	SO3	0.840		
	SO4	0.837		
Sustainable shipping management (SSM)	SSM1	0.935	0.702	0.921
	SSM2	0.747		
	SSM3	0.760		
	SSM4	0.811		
	SSM5	0.918		
Shippers' loyalty (LO)	LO1	0.930	0.711	0.924
	LO2	0.687		
	LO3	0.874		
	LO4	0.781		
	LO5	0.919		
Financial performance (FP)	FP1	0.949	0.868	0.952
	FP2	0.915		
	FP3	0.931		

Note(s): Model fit indices: $\chi^2/df = 1.32$ ($p < 0.05$); CFI = 0.957; TLI = 0.951; RMSEA = 0.074; SRMR = 0.032

Table 3. Factor loadings, average variance extracted and composite reliability of the model

(RMSEA) and (5) standardised root mean square residual (SRMR). According to Hu and Bentler (1999), χ^2/df should be lower than 3, CFI and TLI should be higher than 0.95, whereas RMSEA and SRMR should be lower than 0.08 and 0.10, respectively. The model's fit indices satisfy the required cut-off criteria, thus indicating that the measurement model possesses good fit.

4.1.3 Convergent validity. Convergent validity refers to the extent to which the measurement items of each construct strongly correlate with one another (Hair *et al.*, 2010). The convergent validity is evaluated by using three standards: (1) standardised factor loadings must be significant and more than 0.5, (2) CR must be more than 0.7 and (3) the constructs' average variance extracted (AVE) must be more than 0.5 (Shashi *et al.*, 2019). Accordingly, these values presented in Table 3 satisfy the above conditions. These findings illustrate that convergent validity is ensured.

4.1.4 Discriminant validity. Discriminant validity refers to the degree which the measurement items of different constructs are uncorrelated (Hair *et al.*, 2010). There are

two conditions: (1) the construct's maximum shared variance (MSV) should be lower than its AVE and (2) the construct's square root of AVE should be greater than its correlation values with other constructs. Table 4 presents the measurement model with AVE, MSV, square root of AVE and inter-construct correlations. As shown in the table, all of the conditions are satisfied. This indicates discriminant validity.

4.1.5 Detection of misspecifications. After examining the reliability and validity, modification indices were examined to evaluate the measurement model. Saris *et al.* (2009) mentioned that the commonly used fit indices depend on the model size, consequently leading to misspecification problem. Therefore, modification index (MI), expected parameter changes (EPC) and the power of MI test have been conducted to examine misspecification (Savalei, 2020). No correlated errors are found in the analysis of MI and EPC. This suggests that misspecification is not a concern in the measurement model.

4.2 Theoretical model estimation

Figure 2 depicts the estimated parameters in the structural equation model. Additionally, in this model, "firm's size" and "sector" were added in the model as control variables. "Sector" is treated as a dichotomous variable with "0" being "NVOCCs" and "1" being "container and bulk shipping companies".

Generally, all estimated parameters are positive and significant ($p < 0.05$). Therefore, all hypotheses in this model are accepted. Additionally, the squared multiple correlations (R^2) of the constructs range between 0.32 and 0.74. This suggests that the model fit is adequate.

The two control variables have significant, positive impacts on financial performance. Generally, large shipping companies have better financial performance. Consequently, these companies can allocate more capital for managing sustainability. In addition, large shipping companies facilitate labour specialisation. Therefore, some labour in these companies can focus solely on managing sustainable activities. This enables the efficient management of sustainability, which translates to better financial performance. Regarding "sector", the results indicate that shipping companies from the dry bulk or container sectors experience stronger financial performance than NVOCCs (Yuen *et al.*, 2019b).

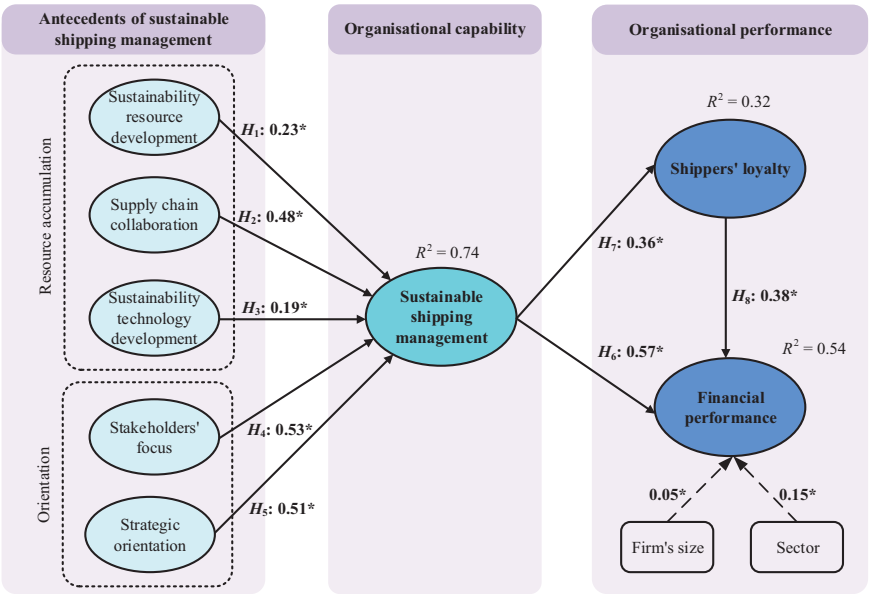
4.2.1 The impacts of five main antecedents on sustainable shipping management. As illustrated in Figure 2, all the antecedents have positive impacts on SSM. Therefore, H1–H5 are accepted. These antecedents explain 74% of the variance in SSM ($R^2 = 0.74$). Thus, the result highlights the importance of the antecedents to explain the effectiveness of SSM.

Among the five antecedents, stakeholders' focus has the largest impact on SSM ($\beta = 0.53$, $p < 0.05$). This supports the literature that shipping companies should meet social, economic and environmental requirements of their stakeholders (i.e. shareholders, suppliers, venders,

Table 4. Validating the measurement of CFA model

	AVE	MSV	RM	SCC	TA	SF	SO	SSM	LO	FP
RM	0.630	0.152	**0.794**							
SCC	0.698	0.348	0.21	**0.835**						
TA	0.580	0.25	0.10	0.30	**0.762**					
SF	0.704	0.423	0.24	0.29	0.35	**0.839**				
SO	0.695	0.384	0.26	0.12	0.50	0.62	**0.834**			
SSM	0.702	0.423	0.39	0.59	0.26	0.65	0.61	**0.838**		
LO	0.711	0.372	0.21	0.37	0.17	0.18	0.23	0.61	**0.843**	
FP	0.87	0.221	0.24	0.1	0.23	0.25	0.21	0.43	0.47	**0.933**

Note(s): AVE: Average variance extracted, MSV: Maximum shared variance
Bold values are square root of AVE. Values below the bold value are inter-construct correlations



Note(s): Model fit indices: $\chi^2/df = 1.52$ ($p < 0.05$); CFI = 0.952; TLI = 0.95; RMSEA = 0.08; SRMR=0.035. *indicates that the path estimate is significant ($p < 0.05$)

Figure 2.
Structural estimation of the theoretical model

employees and society) (Yang, 2018). Focussing on addressing stakeholders' needs when managing sustainability creates a cause for shipping companies, allowing them to concentrate their efforts on minimising resource wastage (i.e. efficiency) and finding the best solution to meet stakeholder needs (i.e. effectiveness).

The antecedent with the second largest impact on SSM is strategic orientation approach ($\beta = 0.51, p < 0.05$). This antecedent concerns the strategic orientation of a shipping company, which is consistent with the idea of Yuen *et al.* (2019b). The finding indicates that shipping companies focussing on achieving the simultaneous improvement of economic, social and environmental performance and adapting their sustainable activities and strategies to fit their environment and resources can lead to an effective SSM.

Supply chain collaboration has the third largest impact on SSM ($\beta = 0.48, p < 0.05$). This highlights that SSM can be enhanced by strengthening inter-firm relationships (i.e. inter-firm safeguards and transactions and contractual governance arrangements) and establishing inter-firm resources (i.e. shared knowledge, financial, equipment and labour resources) (Dyer *et al.*, 2018). These inter-firm relationships and resources foster greater collaboration on tackling sustainability issues, pooling of management expertise, creating inter-firm commitment towards sustainability, formalising and improving information sharing, which enhances SSM.

Sustainability resource development has the fourth largest impact on SSM ($\beta = 0.23$, $p < 0.05$). This antecedent reflects exploiting and accumulating the internal resources of shipping companies (Lirn *et al.*, 2019). Tangible resources comprising financial resources and physical assets allow shipping companies to recruit relevant sustainability management expertise and conduct training and education of their staff which improves their SSM. In addition, intangible resources, which include sustainable knowledge and organisational

culture enable shipping companies to optimise their sustainability decisions and garner organisational commitment which are input to effective SSM.

Sustainability technology development has the weakest but significant impact on SSM ($\beta = 0.19$, $p < 0.05$). Sustainability technologies allow shipping companies to optimise sustainability technology usage (i.e. energy consumption) and improve communication among supply chain partners in maritime transport (i.e. information sharing, coordination in innovation and improvement of new sustainable technology) (Ray *et al.*, 2005). This enhances SSM.

4.2.2 The impact of sustainable shipping management on financial performance. In this section, H6–H8 are discussed. They reflect the direct and indirect impact of SSM on financial performance.

Regarding the direct impact, it was found that SSM has a positive impact on financial performance ($\beta = 0.57$, $p < 0.05$), after considering the effects of the control variables. Thus, H6 is accepted. This result agrees with previous research that emphasises the mechanism of implementing SSM to attain financial goals (Fernando *et al.*, 2019; Yuen *et al.*, 2019b). Consistent with early study from Yuen *et al.* (2018), SSM implementation can directly reduce operation and transaction cost by applying green ship design or technology, building trust and commitment with shipping companies' partners and improving shared sustainable knowledge and information.

Regarding the indirect impact, the acceptance of H7 indicates a positive impact of SSM on shippers' loyalty ($\beta = 0.36$, $p < 0.05$). Additionally, SSM accounts for 32% of the variance in shippers' loyalty ($R^2 = 0.32$). The finding is consistent with existing study highlighting that SSM creates satisfaction and value for shippers, which consequently lead to shippers' loyalty (Lun *et al.*, 2016). Furthermore, it was noted that the loyalty of shippers has a positive impact on financial performance of shipping companies ($\beta = 0.38$, $p < 0.05$). Hence, H8 is accepted. Collectively, SSM and shippers' loyalty account for 54% of the variance in financial performance ($R^2 = 0.54$).

4.2.3 Post hoc analysis. A bootstrapping approach suggested by Bollen and Stine (1990) was applied to explore other constructs' correlations that were ignored. A sample with 294 responses was first created using random sampling with replacement on the original sample. Then, the created sample was used to examine all direct, indirect and total effects of the constructs. The above steps were reiterated 1,000 times. Thereafter, the distribution of each effect was constructed, and the 95% bias-corrected confidence interval and the two-tailed significance value of each effect were analysed.

From evaluating the two-tailed significance value of each effect, the findings indicate that the theoretical model proposed in Figure 2 is the most parsimonious. Paths that are not hypothesised are not significant. Therefore, modifications to the model are unnecessary because they would not improve model fit significantly. This result is consistent with the modification index analysis (Section 4.1.6).

Table 5 shows the direct, indirect and total effects of the constructs. According to the bias-corrected two-tail significance tests, all direct effects of the antecedents on SSM are significant ($p < 0.05$). In addition, all indirect effects of the antecedents on shippers' loyalty and financial performance are statistically significant ($p < 0.05$). This indicates that SSM fully mediates the effect on the antecedents on organisational performance. It also suggests that SSM is an important organisational capability that can convey a sustainable competitive advantage to shipping companies. Importantly, SSM can be developed from two perspectives: resource accumulation and orientation.

4.3 Further discussion

Compared with the previous literature, the results in our research have similarities and dissimilarities. Regarding the impacts of five antecedents on SSM, our findings are consistent

	Sustainable shipping management ($k = 1$)	Shippers' loyalty ($k = 2$)	Financial performance ($k = 3$)
Direct effects (a_{jk}) of			
Sustainability resource development ($j = 1$)	0.23 [0.12,0.29]	–	–
Supply chain collaboration ($j = 2$)	0.48 [0.24,0.62]	–	–
Sustainability technology development ($j = 3$)	0.19 [0.09,0.29]	–	–
Stakeholders' focus ($j = 4$)	0.53 [0.26,0.71]	–	–
Strategic orientation ($j = 5$)	0.51 [0.24,0.70]	–	–
Sustainable shipping management ($j = 6$)	–	0.36 [0.24,0.53]	0.57 [0.29,0.80]
Shippers' loyalty ($j = 7$)	–	–	0.38 [0.24,0.62]
Indirect effects (b_{jk}) of			
Sustainability resource development ($j = 1$)	–	0.08 [0.04,0.12]	0.16 [0.06,0.20]
Supply chain collaboration ($j = 2$)	–	0.17 [0.06,0.26]	0.34 [0.16,0.51]
Sustainability technology development ($j = 3$)	–	0.07 [0.03,0.11]	0.13 [0.05,0.18]
Stakeholders' focus ($j = 4$)	–	0.19 [0.09,0.29]	0.37 [0.15,0.52]
Strategic orientation ($j = 5$)	–	0.18 [0.07,0.28]	0.36 [0.14,0.50]
Sustainable shipping management ($j = 6$)	–	–	0.14 [0.06,0.20]
Shippers' loyalty ($j = 7$)	–	–	–
Total effects (c_{jk}) of			
Sustainability resource development ($j = 1$)	0.23 [0.12,0.29]	0.08 [0.04,0.12]	0.16 [0.06,0.20]
Supply chain collaboration ($j = 2$)	0.48 [0.24,0.62]	0.17 [0.06,0.26]	0.34 [0.16,0.51]
Sustainability technology development ($j = 3$)	0.19 [0.09,0.29]	0.07 [0.03,0.11]	0.13 [0.05,0.18]
Stakeholders' focus ($j = 4$)	0.53 [0.26,0.71]	0.19 [0.09,0.29]	0.37 [0.15,0.52]
Strategic orientation ($j = 5$)	0.51 [0.24,0.70]	0.18 [0.07,0.28]	0.36 [0.14,0.50]
Sustainable shipping management ($j = 6$)	–	0.36 [0.24,0.53]	0.71 [0.34,0.92]
Shippers' loyalty ($j = 7$)	–	–	0.38 [0.24,0.62]

Note(s): Values in brackets are the bias-corrected upper and lower 95% confidence interval of the estimates

Table 5.
Direct, indirect and total effects of the constructs

with Yang (2018) and Yuen *et al.* (2017a) who suggested that stakeholders' focus have a significant effect on implementing SSM in shipping companies. It is also partially parallel with findings of previous studies that concern strategic orientation for SSM by stressing the simultaneous improvement of economic, social and environmental performance (Lun *et al.*, 2016). Furthermore, most researchers only apply a single approach, while our research simultaneously examines five main antecedents for implementing SSM. Additionally, we found that our findings are not consistent with Yuen *et al.* (2019a), who found that internal resources have the most significant impact on SSM. The reason for this inconsistent result could be the influence of context. For instance, the research of Yuen *et al.* (2019a) is conducted in Singapore whereas this study is conducted in Vietnam.

As for the impacts of SSM on financial performance, our findings are parallel with Yuen *et al.* (2019b), who suggested that SSM has a positive impact on organisational performance.

In addition, the results of this research are relevant with the previous literature of Shin and Thai (2015), who demonstrated that SSM has a positive impact on shippers' loyalty. Consistent with Lirn *et al.* (2014), the findings confirm a positive impact of shippers' loyalty on financial performance in shipping companies.

5. Conclusion

5.1 Theoretical and managerial implications

5.1.1 Theoretical implications. This research has made several contributions to theory. Firstly, it has enriched the strategic and sustainability management literature by applying resource accumulation and orientation perspectives to explore the antecedents of SSM. The five main antecedents include sustainability resource development, supply chain collaboration, sustainability technology development, stakeholders' focus and strategic orientation. The research findings suggest that SSM is a valuable organisational capability (i.e. a know-how consisting of a bundle of resources), which can be strengthened by accumulating internal, external and technology resources and strategically marshalling the resources to address stakeholders' needs and achieve environmental, social and economic performance simultaneously.

Secondly, this research implies that the antecedents are complementary because each antecedent offers unique explanation to how SSM should be implemented. Overall, the results imply that the orientation perspective (i.e. stakeholders' focus and strategic orientation) strengthens SSM more than the resource accumulation perspective (i.e. sustainability resource development, supply chain collaboration and sustainability technology development). The reason could be that accumulating resources for SSM would serve little use if the resources are not directed to serve a strategic purpose such as satisfying stakeholders or finding synergies in environmental, social and economic performance. However, likewise, an effective orientation strategy is underpinned by the resources accumulated by a shipping company. Hence, it may be concluded that both perspectives are mutually reinforcing.

Finally, the third academic contribution of this research is that it links the antecedents of SSM with organisational performance. This contributes to a better nomological understanding of the interrelationships between the constructs examined in this research. Specifically, the findings suggest that SSM fully mediates the effects of the five antecedents and organisational performance. These antecedents mainly contribute to SSM but do not directly influence organisational performance. This indicates that a path dependent process of achieving superior organisational performance is directly through SSM, which is in turn, directly influenced by resource accumulation and orientation of the resources.

5.1.2 Managerial and policy implications. Considering managerial implications, the findings of this research can provide guidance for shipping companies to improve their financial performance by adopting five antecedents and policymakers to formulate specific policies to enhance SSM in the shipping industry.

From the shipping companies' perspective, firstly, they should prioritise the antecedents basing on their effectiveness and influence on organisational performance. This allows shipping companies to allocate their scarce resources to achieve optimum organisational performance. The findings suggest that more resources can be allocated to marshalling their resources to address stakeholders' needs and develop sustainability projects that yield positive financial returns while improving shipping companies' environmental and social performance. These stakeholders include shareholders, shippers, vendors, employees and the environment or community who can influence the outcomes of shipping companies. Hence, shipping companies should constantly seek to fulfil the expectations of their stakeholders and constantly review and improve their performance.

Next, investments can be made to accumulating resources. In descending order of priority, the accumulation of resource should focus on developing inter-firm relationships, intra-firm assets and sustainability technologies. Regarding inter-firm resources and capabilities, it involves establishing sustainability commitment between shipping companies and their core partners, which builds trust and minimises transaction cost by sharing knowledge and information on sustainability. Additionally, it also includes entering into contractual governance arrangements to manage sustainability. Regarding accumulating and managing the internal sustainability resources of shipping companies, the resources consist of green assets (e.g. green vessels and equipment) and financial capital, which can be used for implementing SSM. They also include developing sustainability knowledge and creating an organisation culture, where employees are committed to SSM. Finally, investments can also be focussed on sustainability technologies, which can improve information flow and enhance decision-making.

From the policymakers' perspectives, the findings suggest that specific sustainable policies can be formulated to improve the competitiveness of the shipping industry through supporting SSM. For example, regarding resources management, government can establish funds for the construction of sustainable infrastructure: provide financial support for shipping companies that intend to build green building and technologies or invest in green vessels. The government can also consider providing tax incentives for shipping companies that meet the sustainability standards. For strengthening the collaboration among shipping companies, conferences, workshops or forums can be organised by government to discuss sustainable issues and share best practices. In addition, training courses for employees and managers of shipping companies should be provided to update new sustainable technologies, sustainability laws and regulations. Consequently, shipping companies can leverage on these government support to achieve better financial performance and integrate sustainability with their supply chains.

5.2 Limitations and recommendations

This study acknowledges the following limitations. Firstly, this research has limited the scope to resource accumulation and orientation perspectives to identify and examine the antecedents' effects on SSM and organisational performance. Future research can examine the interconnectedness of the antecedents. Cluster analysis can also be conducted to group shipping companies basing on their level of antecedents.

Secondly, the collected data and results are generated from shipping companies in Vietnam, which mainly comprises relatively small shipping companies with below 150 employees. Further research can consider cross-validating the model with large companies or other countries' shipping industry.

Finally, this study highlights the importance of stakeholders' focus in implementing SSM, which results in better financial performance. For example, strengthening relationships with shareholders can have positive effects on accessing financial capital, while building relationship with vendors such as terminal operators can reduce operation or transaction cost. However, this research only investigated the relationship of SSM and financial performance via shippers' loyalty. Therefore, a future study can investigate the satisfaction of other stakeholders as mediators.

References

Bala, H., Massey, A.P. and Montoya, M.M. (2017), "The effects of process orientations on collaboration technology use and outcomes in product development", *Journal of Management Information Systems*, Vol. 34 No. 2, pp. 520-559.

Balci, G., Caliskan, A. and Yuen, K.F. (2019), "Relational bonding strategies, customer satisfaction, and loyalty in the container shipping market", *International Journal of Physical Distribution and Logistics Management*, Vol. 49 No. 8, pp. 816-838.

Barney, J.B. (2012), "Purchasing, supply chain management and sustained competitive advantage: the relevance of resource-based theory", *Journal of Supply Chain Management*, Vol. 48 No. 2, pp. 3-6.

Bollen, K.A. and Stine, R. (1990), "Direct and indirect effects: classical and bootstrap estimates of variability", *Sociological Methodology*, pp. 115-140.

Carter, C.R. and Rogers, D.S. (2008), "A framework of sustainable supply chain management: moving toward new theory", *International Journal of Physical Distribution and Logistics Management*, Vol. 38 No. 5, pp. 360-387.

Chang, Y.-T. and Danao, D. (2017), "Green shipping practices of shipping firms", *Sustainability*, Vol. 9 No. 5, p. 829.

Child, J., Faulkner, D., Tallman, S. and Hsieh, L. (2019), *Cooperative Strategy: Managing Alliances and Networks*, Oxford University Press, Oxford.

Coffman, D.L. and MacCallum, R.C. (2005), "Using parcels to convert path analysis models into latent variable models", *Multivariate Behavioral Research*, Vol. 40 No. 2, pp. 235-259.

Dyer, J.H., Singh, H. and Hesterly, W.S. (2018), "The relational view revisited: a dynamic perspective on value creation and value capture", *Strategic Management Journal*, Vol. 39 No. 12, pp. 3140-3162.

Fernando, Y., Jasmi, M.F.A. and Shaharudin, M.S. (2019), "Maritime green supply chain management: its light and shadow on the bottom line dimensions of sustainable business performance", *International Journal of Shipping and Transport Logistics*, Vol. 11 No. 1, pp. 60-93.

Hair, J., Black, B., Babin, B. and Anderson, R.J. (2010), *Multivariate Data Analysis 7th Pearson*, Pearson, Upper Saddle River, New Jersey.

Hart, S.L. (1995), "A natural-resource-based view of the firm", *Academy of Management Review*, Vol. 20 No. 4, pp. 986-1014.

Hu, L.T. and Bentler, P.M. (1999), "Cut-off criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modelling: A Multidisciplinary Journal*, Vol. 6 No. 1, pp. 1-55.

Jensen, J.A., Cobbs, J.B. and Turner, B.A. (2016), "Evaluating sponsorship through the lens of the resource-based view: the potential for sustained competitive advantage", *Business Horizons*, Vol. 59 No. 2, pp. 163-173.

Lai, K.H., Wong, C.W., Lun, Y.V. and Cheng, T. (2013), "Shipping design for compliance and the performance contingencies for shipping firms", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 55, pp. 74-83.

Lam, J.S.L. (2015), "Designing a sustainable maritime supply chain: a hybrid QFD–ANP approach", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 78, pp. 70-81.

Lam, J.S.L. and Wong, H.N. (2018), "Analysing business models of liner shipping companies", *International Journal of Shipping and Transport Logistics*, Vol. 10 No. 2, pp. 237-256.

Lee, T. and Nam, H. (2017), "A study on green shipping in major countries: in the view of shipyards, shipping companies, ports, and policies", *The Asian Journal of Shipping and Logistics*, Vol. 33 No. 4, pp. 253-262.

Li, Y.Y., Chen, P.H., Chew, D.A.S. and Teo, C.C. (2014), "Exploration of critical resources and capabilities of design firms for delivering green building projects: empirical studies in Singapore", *Habitat International*, Vol. 41, pp. 229-235.

Lin, S. and Wong, Y.D. (2013), "Greenhouse gas mitigation strategies for container shipping industry", *American Journal of Engineering and Applied Sciences*, Vol. 5 No. 4, p. 310.

Lindell, M.K. and Whitney, D.J. (2001), "Accounting for common method variance in cross-sectional research designs", *Journal of Applied Psychology*, Vol. 86 No. 1, p. 114.

Lirn, T.-C., Lin, H-W. and Shang, K-C. (2014). "Green shipping management capability and firm performance in the container shipping industry", *Maritime Policy and Management*, Vol. 41 No. 2, pp. 159-175.

Lirn, T.C., Wong, C.W., Shang, K.C. and Li, Y.T. (2019), "Identifying green assessment criteria for shipping industries", in *Environmental Sustainability in Asian Logistics and Supply Chains*, Springer, Singapore, pp. 21-44.

Lun, Y.V., Lai, K.H., Wong, C.W. and Cheng, T. (2016), *Green Shipping Management*, Springer, New York, pp. 17-29.

McWilliams, A. and Siegel, D.S. (2011), "Creating and capturing value: strategic corporate social responsibility, resource-based theory, and sustainable competitive advantage", *Journal of Management*, Vol. 37 No. 5, pp. 1480-1495.

Nasereddin, Y.A. and Albadri, F. (2019), "Strategic practices and crisis management: a state governance framework, strategic thinking, planning, and management practice in the arab world", *IGI Global*, pp. 156-181.

Notteboom, T.E., Parola, F., Satta, G. and Pallis, A.A. (2017), "The relationship between port choice and terminal involvement of alliance members in container shipping", *Journal of Transport Geography*, Vol. 64, pp. 158-173.

Pantouvakis, A., Vlachos, I. and Zervopoulos, P.D. (2017), "Market orientation for sustainable performance and the inverted-U moderation of firm size: evidence from the Greek shipping industry", *Journal of Cleaner Production*, Vol. 165, pp. 705-720.

Pawlik, T., Gaffron, P. and Drewes, P.A. (2012), *Corporate Social Responsibility in Maritime Logistics, Maritime Logistics: Contemporary Issues*, Emerald Group Publishing, Bradford, pp. 205-226.

Podsakoff, P.M., MacKenzie, S.B. and Podsakoff, N.P. (2012), "Sources of method bias in social science research and recommendations on how to control it", *Annual Review Psychology*, Vol. 63, pp. 539-569.

Ray, G., Muhanna, W.A. and Barney, J.B. (2005), "Information technology and the performance of the customer service process: a resource-based analysis", *MIS Quarterly*, Vol. 29 No. 4, pp. 625-652.

Saris, W.E., Satorra, A. and Van der Veld, W.M. (2009), "Testing structural equation models or detection of misspecifications?", *Structural Equation Modeling*, Vol. 16 No. 4, pp. 561-582.

Savalei, V. (2020), "Improving fit indices in structural equation modeling with categorical data", *Multivariate Behavioral Research*, pp. 1-18, doi: 10.1080/00273171.2020.1717922.

Schein, E.H. (1994), "Management of change: the case of information technology. Information technology and the corporation of the 1990s: research studies", in Kochan, T.A. and Useem, M. (Eds), *Transforming Organizations*, Oxford University Press, Oxford.

Shashi, Centobelli, P., Cerchione, R. and Singh, R. (2019), "The impact of leanness and innovativeness on environmental and financial performance: insights from Indian SMEs", *International Journal of Production Economics*, Vol. 212, pp. 111-124.

Sheng, S., Zhou, K.Z. and Li, J.J. (2011), "The effects of business and political ties on firm performance: evidence from China", *Journal of Marketing*, Vol. 75 No. 1, pp. 1-15.

Shin, Y. and Thai, V.V. (2015), "The impact of corporate social responsibility on customer satisfaction, relationship maintenance and loyalty in the shipping industry", *Corporate Social Responsibility and Environmental Management*, Vol. 22 No. 6, pp. 381-392.

Shin, Y., Thai, V.V., Grewal, D. and Kim, Y. (2017), "Do corporate sustainable management activities improve customer satisfaction, word of mouth intention and repurchase intention? Empirical evidence from the shipping industry", *The International Journal of Logistics Management*, Vol. 28 No. 2, pp. 555-570.

Skovgaard, J. (2018), *Response to Institutional Processes: A Study of Corporate Social Responsibility in Danish Shipping companies Corporate Social Responsibility in the Maritime Industry*, Springer, New York, pp. 279-293.

Tran, T.M.T., Yuen, K.F., Li, K.X., Balci, G. and Ma, F. (2020), "A theory-driven identification and ranking of the critical success factors of sustainable shipping management", *Journal of Cleaner Production*, Vol. 243, p. 118401.

UNCTAD (2020), *Review of Maritime Transport 2019*, (Sales No. E.19.II.D.20), United Nations Conference on Trade and Development, Geneva.

Yang, C.S. (2018), "The effect of CSR practices on organisational performance in the container shipping in Taiwan", *International Journal of Shipping and Transport Logistics*, Vol. 10 No. 2, pp. 181-201.

Yuen, K.F., Thai, V.V. and Wong, Y.D. (2016), "The effect of continuous improvement capacity on the relationship between of corporate social performance and business performance in maritime transport in Singapore", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 95, pp. 62-75.

Yuen, K.F., Wang, X., Wong, Y.D. and Zhou, Q. (2017a), "Antecedents and outcomes of sustainable shipping practices: the integration of stakeholder and behavioural theories", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 108, pp. 18-35.

Yuen, K.F., Thai, V.V. and Wong, Y.D. (2017b), "Corporate social responsibility and classical competitive strategies of maritime transport firms: a contingency-fit perspective", *Transportation Research Part A: Policy and Practice*, Vol. 98, pp. 1-13.

Yuen, K.F., Wang, X., Wong, Y.D. and Zhou, Q. (2018), "The effect of sustainable shipping practices on shippers' loyalty: the mediating role of perceived value, trust and transaction cost", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 116, pp. 123-135.

Yuen, K.F., Li, K.X., Xu, G., Wang, X. and Wong, Y.D. (2019a), "A taxonomy of resources for sustainable shipping management: their interrelationships and effects on business performance", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 128, pp. 316-332.

Yuen, K.F., Wang, X., Wong, Y.D. and Ma, F. (2019b), "A contingency view of the effects of sustainable shipping exploitation and exploration on business performance", *Transport Policy*, Vol. 77, pp. 90-103.

Corresponding author
Kum Fai Yuen can be contacted at: kumfai.yuen@ntu.edu.sg