

Double matching service preference for promoting short sea shipping: evidence from Taiwan

Received 22 April 2020
Revised 25 July 2020
11 October 2020
13 December 2020
4 February 2021
Accepted 5 February 2021

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Abstract

Purpose – The attributes of services can be categorised as service quality and service preference. While studies have addressed the importance of service quality, shippers' service preference and its relationship to perceived value and purchase intentions remain unexplored. Therefore, the purpose of this study is to propose a causal model in the context of short sea shipping services to investigate the influence of purchase intention through the shipper's service preference and perceived value.

Design/methodology/approach – Structural equation modelling is applied to assess the empirical strength of the relationships in the proposed model. The model is validated through empirical testing by taking samples from shippers in Taiwan.

Findings – The results show that service attributes, namely, timing related, pricing related, warehousing, sales, door-to-door, information and advertising, positively affect shippers' service preference. Service preference significantly affects customer perceived value as well as purchase intentions. Moreover, perceived value strongly affects purchase intentions.

Originality/value – Matching between the product offered and the diversified customer need is key to the business operation's success. This study suggests that carriers should position themselves to both self-competence and market values.

Keywords Short sea shipping, Coastal shipping, Purchase intention, Perceived value, Service preference

Paper type Research paper



1. Introduction

Short sea shipping (SSS) has been regarded as an economical transport alternative in carrying an excellent volume freight along with countries' coastal areas or between nearby

regional ports (Medda and Trujillo, 2010). Ship operators use this “transport mode” with higher capacities to reap the economies of scale benefits offered by the hub-and-spoke transit mechanism. In addition to its excellent loading capacities, SSS reveals operational cost savings (i.e. fuel consumption, human employment and maintain and repair) (Konstantinus *et al.*, 2019), high feasibility in realising unmanned ships (Ghaderi, 2019) and pollution reduction advantages relative to road transport (Paixão and Marlow, 2002; Sambracos and Maniati, 2012; Harald, 2014; Walsh *et al.*, 2017; Vierth *et al.*, 2019; Christodoulou and Cullinane, 2020). The objective is that a modal shift takes place from road to sea to remove the existing truck fleet to alleviate congestion (Arof, 2015; Suárez-Alemán, 2016). Paixão Casaca and Marlow (2005) state that using SSS as an alternative means of freight movement reduces not only the number of trucks that daily congest on the road networks located at the heart of Europe and focal points, such as The Netherlands and Belgium, but also associated social costs, which cannot be removed or improved unless huge investments in infrastructure are made at the expense of yet more social cost. Grama and Patache (2011) reported that shipping performs 40% of European Union (EU)-internal transportation and is the only transport mode that grows as fast as road transport, which significantly reduces road congestion, enhances regional connection and promotes sustainable development among this region.

From the perspective of integrated supply chain services, logistics services providers are capable of offering door-to-door transport services to meet the customer’s logistics requirements by achieving the network efficiency in terms of seamlessly integrating SSS into multimodal transport chains. Saldanha and Gray (2002) indicate that managers in coastal shipping companies are in favour of multimodal developments, in particular cooperation between coastal shipping and road haulage. Lindstad and Uthaug (2003) suggest that when analysing logistics chain performance, the shippers are searching for an optimum balance between service level and cost position of such system considering the use of multimodal transportation mode. SSS should not be viewed in isolation but rather treat as part of a network of transport (Marlow and Paixao Casaca, 2004). Shippers advocate a modal shift in favour of SSS if cost and lead time reduced significantly exceeding 20% of total transportation expenditure (Paixão Casaca *et al.*, 2012). Paixão Casaca *et al.* (2017) state that for providing better services, SSS users now enhance the integration of logistics between transport modes and to adopt modal shift strategies.

In the Asian region, Japan is increasing its use of SSS to transport cargo, which has accounted for about 8% of domestic freight (ISL, 2000; Medda and Trujillo, 2010). Ports located in three countries of the Association of Southeast Asian Nations (ASEAN) sub-region, namely, Brunei, Malaysia and the Philippines, are competing with each other for the interstate freight business by using roll-on roll-off (Ro-Ro) SSS (Arof, 2018). The above evidence shows that SSS is quite attractive for countries with the limited domestic territory or numerous adjacent markets (Brooks and Frost, 2004; Arif, 2015).

Taiwan, a trade-oriented economic country, is an island with distinct regional characteristics. Due to its land limitation (less than 400 km from north to south), accompanied by a dense population and a scarcity of natural resources, its economy is highly dependent on foreign trade. Taiwan’s total foreign trade continues to influence critically the gross domestic product (GDP) performance, which accounted for nearly 80% of GDP on average (ISL, 2000). Most of the seaborne cargo is handled through its primary international commercial port (Kaohsiung Port) located in southern Taiwan, which accounted for 68% of container volume (Taiwan International Ports Corporation [TIPIC], 2019) and dispatched to their northbound destination by inland road systems. However, the imbalance cargo handling requirement often causes road congestion and environmental

pollution. Thus, using SSS is a rather appropriate alternative to move cargo around the island.

In the EU, the shipping industry had begun to provide similar SSS services, which at a later stage, would be supported by the “blue highway” (ISL, 2000) and “motorways of the sea” concepts (Baindur and Viegas, 2011) and “green port” programs to implement energy conservation and carbon reduction policy (TIPC, 2017) (Vejvar *et al.*, 2019). The adoption of SSS radically mitigates the transshipment volume of southern/northern bound long-haul transport on the highway. This not only mitigates the road congestion situation but also overcomes the existing difficulties of truck fleet scheduling and solves the problem of the insufficient driving workforce. However, reports have shown that SSS carries less than 2% of the cargo volume in Taiwan despite the benefits mentioned above (TIPC, 2019). Studies observed that the transport volume carried by SSS slightly increased when compared with road haulage. The reason may be attributed to the port authority not being active in the promotion of SSS, which may have led to the poor service quality offered by carriers and to which should be added the influence of shippers’ willingness in adopting SSS (Chang, 2004; Lai, 2011). Therefore, the carriers should re-design SSS services, considering the attributes relevant to their customers’ service preference and then increase shippers’ perceived value and motivation to use SSS service.

Service preference refers to the preference perceived by customers when they experienced a selection process (O’Cass and Lim, 2001). Customers’ service preferences vary depending on service activities provided to cargo shipment. For example, shippers care more about low shipping freight and quality protection rather than a dedicated transport service when looking for a sea-way shipping service. Previous research has identified numerous of service-related factors in the context of shipping (Lu, 2003; Paixão Casaca and Marlow, 2005; Paixão Casaca and Marlow, 2009), such as availability of cargo space, reliability of sailing and on-time pick-up. Researches also examined the influence between these service-related factors and transport mode selection (Lu, 2003; Paixão Casaca *et al.*, 2017). Lu (2003) stressed the impact of carrier service attributes on shipper–carrier partnering relationships from a shipper’s perspective. Paixão Casaca *et al.* (2017) indicated that ship operators could enhance the integration of logistics between transport modes if the cabotage users perceive better service, such as a real-time information system, shorter transit times and freight offered on a door-to-door basis.

It is worth noting that even though preferential behaviours have been an on-going fascinating research field (Muthitacharoen *et al.*, 2006), there is minimal discussion addressing the freight shipment’s service preference. Previous researches mainly explored the effect of the service quality on shippers’ satisfaction from investigating roles, such as maritime carriers, shipping agencies and freight forwarders instead of shippers (Paixão Casaca *et al.*, 2017). Ho *et al.* (2017) used a decision-making trial and evaluation laboratory analysis to identify 12 influencing factors of maritime service. However, few studies were found to deal with the issue of evaluating the effects of shippers’ perceived value as well as their actual behaviour on adopting SSS service.

To fill this research gap, our study attempts to:

- identify the crucial Taiwanese SSS service attributes;
- evaluate shippers’ relationship between identified service attributes, service preference and perceived value; and
- further investigate the relationship between perceived value and purchase intentions.

Several hypotheses are proposed to verify the following ideas: What service attributes have significant effects on shippers' service preference? Is shippers' perceived value a significant determinant to purchase intentions? Is service preference a crucial factor to have effects on perceived value and purchase intentions separatory?

2. Theoretical background and research hypothesis

2.1 *Short sea shipping*

The numerous SSS service definitions identified from previous research suggest the complexity of this shipping concept (Paixão and Marlow, 2002; Medda and Trujillo, 2010). From integrated logistics perspectives, SSS mainly focused on providing various shipping services in economically highly-dependent neighbouring areas from conventional to innovative ones as well as working together with diverse cargo handling techniques, ports operation, networks linkage and information systems platform. SSS is also grouped according to freight classification transported (Perakis and Denisis, 2008):

- with containers feeder vessels or barges; and
- inland trailers fleets.

A common point proposed by Douet and Cappuccilli (2011) is that SSS delivers seaborne freight that does not cross an ocean. Related research regarding service attributes can be observed in Paixão Casaca and Marlow's (2005) research which indicated that different types of SSS service providers could offer their customers a variety of services based on the capability and attributes of vessels they owned. In our research, SSS is defined as a type of seaborne shipment transport between ports of a country and intraregional traffic or foreign countries having a coastline on the enclosed seas (Medda and Trujillo, 2010).

2.2 *Short sea shipping service attributes*

The concept of service quality refers to the customer's expectation of what a service should provide and the needs it can fulfil (Goldstein *et al.*, 2002). This approach of defining the nature of a service in terms of its constituent parts has also applied in the marketing fields, which involves understanding the needs of customers in the target market and aligning this with the organisation's strategy and competitive intentions. Dibb *et al.* (1997) used the notion of the "marketing concept" as an attempt to encourage organisations to understand and satisfy customers' needs as well as fulfil the organisation's goal. Lovelock and Wright (1999) divided this concept into two parts: one is the "service marketing concept" as the benefits to the customer and the other is the "service operations concept" as the specification of how the service will be delivered. Goldstein *et al.* (2002) summarised that service concept served as the foundation for developing the marketing content, and operations content of a service, which brings strategic intent into service design planning.

As regards the implication of service concept in maritime fields, Lu (2003) identified how service attributes influence service quality from the perception of ship owners/operators. Brooks and Frost (2004) also identified crucial determinants affecting the container carrier choice of shippers. Balci and Cetin (2017) constructed a segmentation framework for container shipping operators under a novel service concept in developing effective customised marketing offering, including effective price discrimination and customised marketing communications. As not all service attributes are regarded as uniformly critical for firms, SSS operators have to realise the influence of the diverse service attributes based on the service preference of shippers to improve their competitive advantage.

In exploring integrated multimodal transport services comprising a sea leg, Paixão Casaca and Marlow (2007) evaluated the SSS market by examining the trans-European transport networks. In their research, three service types are identified (dedicated services, systems and standard operations), which explained the service preference towards the shippers. Ng (2009) indicated that SSS attributes, such as economic benefits, revealed a competitive advantage against road haul. Besides, Paixão Casaca and Marlow (2009) constructed 13 functional-related strategies to be adopted by SSS operators. In their research, 75 service attributes grouped into these strategies are found to positively improving SSS service quality. Medda and Trujillo's (2010) showed that the use of SSS practically alleviated traffic congestion and improved economic development by enhancing freight flow efficiency. Their research concluded that SSS is regarded as one of the most sustainable and economically competitive transport modes. Therefore, the study implies that if transport mode owns the advantages of offering the identical service quality but fewer cost, it can provide enough inducement to replace road transport.

SSS presents unique service characteristics. Sambracos and Maniati (2012) indicated that SSS offers lower operation costs, less accident frequency and light environmental impact advantages when compared with inland truck systems (Harald, 2014). Likewise, Rahman *et al.* (2016) discovered that SSS's unique attributes, such as high reliability, high frequency and short transit times, are critical to the successful operation in Canada and the USA (Arof and Nair, 2017). Ho *et al.* (2017) grouped 12 service-related items into four service constructs to examine the service effects of ocean freight forwarders' decision to adopt maritime shipping services. The services include transport reliability, integrated logistics, transport security, freight tariffs, transit time, timely delivery, service attitude, maritime expertise, direct access, convenient shipping, sailing frequency and customs clearance efficiency. Besides, Aruf (2018) adopted a decision-making model to investigate three interstate Ro-Ro SSS routes within the ASEAN sub-region connecting ports (Brunei, Malaysia and the Philippines). The result indicated five factors have a significant influence on SSS service. These are government assistance at the initial period, adequate port facilities and equipment, suitable ship's type concerning the payload capacity, distance and speed, good port access and coordinated administrative and customs, immigration, quarantine and security facilities.

2.3 Service preference

Service preference indicates a greater liking by individuals for one service alternative over another. Individuals prefer services consistent with their interests and reflect the choice of their ultimate behaviour (O'Cass and Lim, 2001; Wang *et al.*, 2016). Caplan (2003) found that customers' positive feelings influence their cognition of service preferences, which can be measured by service accessibility and service variety in the context of individuals' online socialisation behaviour. From previous studies, numerous researchers explore the relationships of SSS service attributes and SSS service preference simultaneously, in which the links are summarised in Table 1. Daniels *et al.* (2005) noted that service attributes greatly influence shippers' preference for the purchase of shipping service and are usually used by shippers in selecting shipping alternatives. Brooks and Trifts (2008) created a transport mode choice model to investigate the adoption of SSS from the perspective of the cargo stakeholders in North American. Paixão Casaca *et al.* (2017) identified 59 service attributes in 13 groups from examining the cabotage users' perception of excellent services. The study revealed that the information system has significant influences on logistics practices and plays a vital role in customers' transport mode decisions.

Constructs Items	Authors Measures	O'Casey and Lim (2001)	Brooks and Frost (2004)	Brooks and Trifts (2008)	Daniels <i>et al.</i> (2005)	Muthitacharoen (2006)	Voss <i>et al.</i> (2006)	Medda and Trujillo (2010)
Service attributes (<i>HI</i>)		-	-	-	-	-	-	-
Timing/reliability (<i>HIa</i>)	On-time pick-up	-	✓	✓	✓	-	✓	-
	Short transit time	-	✓	✓	✓	-	✓	✓
	High frequency of sailing	-	✓	✓	✓	-	✓	✓
	Freight rates	-	✓	✓	✓	✓	✓	✓
Pricing related (<i>HIb</i>)	Price and discount structure	-	✓	-	✓	-	✓	✓
	Willingness to negotiate	-	-	-	-	-	-	-
Warehousing (<i>HIc</i>)	Customs clearance service	-	-	-	-	-	-	-
	Storage service	-	-	-	✓	-	-	-
	Packaging/labelling service (to avoid cargo damages)	-	-	-	✓	-	-	✓
Sales (<i>HId</i>)	Frequency of sales representatives' calls to shippers	-	-	-	-	-	-	-
	Knowledgeability of sales personnel	-	-	-	-	-	-	-
	Ability of sales representatives to handle problems	-	-	-	-	-	-	-
Door-to-door service (<i>HIe</i>)	One-stop logistics service	-	-	-	-	-	-	-
	Seamless logistics service	-	-	-	-	-	-	✓
Information (<i>HIf</i>)	Computer EDI interface	✓	-	-	-	-	✓	✓
	Computerised cargo tracing	✓	✓	-	-	-	✓	✓

Source: This research

(continued)

Table 1.
Items and sub-items
of the service
attributes in short
sea shipping

Table 1.

Constructs Items	Authors Measures	Baidur and Viegas (2011)	Tapaninem <i>et al.</i> (2012)	Yang <i>et al.</i> (2014)	Suarez-Aleman <i>et al.</i> (2015)	Paixão Casaca <i>et al.</i> (2017)	Arof (2018)
Service attributes (HI)		-	-	-	-	-	-
Timing/reliability (HIa)	On-time pick-up	✓	-	✓	-	✓	-
	Short transit time	✓	-	-	-	✓	-
	High frequency of sailing	✓	-	✓	-	-	✓
Pricing related (HIb)	Freight rates	✓	✓	✓	-	-	-
	Price and discount structure	-	✓	-	-	-	-
	Willingness to negotiate	-	-	-	-	-	-
Warehousing (HIc)	Customs clearance service	-	-	-	-	-	✓
	Storage service	-	-	-	-	-	-
	Packaging/labelling service (to avoid cargo damages)	-	-	-	-	-	-
Sales (HI d)	Frequency of sales representatives' calls to shippers	-	-	✓	✓	-	-
	Knowledgeability of sales personnel	-	-	✓	✓	-	-
	Ability of sales representatives to handle problems	-	-	-	✓	-	-
Door-to-door service (HIe)	One-stop logistics service	-	-	-	-	✓	-
Information (HI f)	Seamless logistics service	-	✓	-	✓	✓	-
	Computer EDI interface	-	-	✓	-	✓	-
	Computerised cargo tracing	-	-	-	-	✓	-

However, there is a lack of empirical work to measure customers' service preferences from the perspective of the shipper's view. Our study, therefore, attempts to explore the relationship between service attributes and the shippers' actual preference to adopt SSS services. This study indicated that attributes, such as perceived reliability, price of service, transit time, frequency, perception of SSS service quality, situational variables and requirements from buyers, radically affect the shippers' mode choice.

Based on the previous paragraphs, our research posits the following hypotheses:

- H1.* Service attributes have positive effects on service preference.
- H1a.* Timing-related service attributes have positive effects on service preference.
- H1b.* Price-related service attributes have positive effects on service preference.
- H1c.* Warehousing services attributes have positive effects on service preference.
- H1d.* Sales services attributes have positive effects on service preference.
- H1e.* Door-to-door service attributes have positive effects on service preference.
- H1f.* Information services attributes have positive effects on service preference.

2.4 Perceived value

The value indicates that when someone takes a decision, the satisfaction from this choice is better than any other alternatives. Value can be regarded as the perception of a trade-off between benefits and expenses (Kotler, 2003). Therefore, the services provided by companies need to ensure that their customers perceive the value being delivering. However, previous studies claimed that the contents of value are more complex to explain and need to be identified from considering various factors.

The concept of "perceived value" derives from the concept of equity, referring to the evaluation of fairness, rightness or perceived benefits offered by services. However, it is difficult to give a precise definition of what "perceived value" is due to its subjective cognitions, which vary widely from one to another. Because customers hold a variety of value concepts, a comparative practical evaluation approach is needed to examine the validity of a measure. Parasuraman and Grewal (2000) proposed four types of perceived values: transaction, acquisition, redemption and use to evaluate customer's loyalty. Petrick (2004) contends that customers feel equitably treated if they perceive their efforts are equivalent to their rewards. Customers expect to receive more value if all service attributes provided by SSS service providers meet their requirements (Kuo *et al.*, 2009). When shippers are receiving SSS services, they often expect more value from a psychological evaluation aspect associated with these offerings. Hence, the observation mentioned above is included in the following hypothesis:

- H2.* Service preference has positive effects on perceived value.

2.5 Purchase intention

Numerous studies related to behavioural intention (Bhattacharjee, 2001; Mcknight *et al.*, 2002; Suh and Han, 2003) have explored topics, such as customer loyalty, positive recommendation behaviour and repurchase intentions (Cronin *et al.*, 2000). Cronin *et al.* (2000) demonstrated that perceived value serves as a premise of behavioural intentions

that have practical effects on purchase intentions. Besides, [Etzel et al. \(2001\)](#) stressed that service characteristics are associated with intangibility, inseparability, heterogeneity and perishability, whereas service preference characteristics relate to accessibility and variety, which enlarges the ability to provide various services that satisfy the diversity requirements ([Muthitacharoen et al., 2006](#)).

The theory of planned behaviour (TPB) has been applied to the shipping industry to explain when shippers experienced a high quality of service from service providers; a favourable attitude emerges towards the providers' service ([Yuen et al., 2018](#)). The theory suggests that once the service providers enforce a well behavioural control over shippers, the results lead to developing a higher intention to purchase more services ([Pavlou and Fygenson, 2006](#)). [Kuo et al. \(2009\)](#) indicated that service quality is a vital factor that has practical effects on consumers' purchase intentions in the service industry. On the basis of the discussion of the TPB and the empirical research aforementioned, our study categorised nine measures into three dimensions (i.e. service preference, perceived value and purchase intention) and summarised in [Table 2](#). Based on the inference mentioned earlier, the following hypotheses *H3* and *H4* are deposited:

H3. perceived value has a positive effect on purchase intentions.

H4. service preference has a positive effect on purchase intentions.

Summarising *H1~H4*, the research concept model is displayed in [Figure 1](#). Service attributes affect service preference, which produces perceived value. Finally, purchase intentions emerge.

3. Method

The research framework is established following the research purpose as well as literature review results. Based on the TPB, the service-related attributes, service preference, perceived value and purchase intentions are incorporated into the constructing model in terms of examining relevant hypotheses simultaneously.

To meet the objective of this research and to explore the relationship between service attributes, service preference, perceived value and purchase intentions in the context of SSS operations, this study uses several statistical methods to verify our hypothesis. Two stages of experiments were conducted in the research.

3.1 Stage 1 – survey questionnaire

The questionnaire comprising 25 items was designed under the adopted framework and its contents were adjusted to the interviews being carried out with personnel working in the shipping industry. This survey was used to collect data to investigate the research model. Five experts were inquired to verify the correctness of the questionnaire content and wording used in each question item. As summarised in [Table 2](#) and followed the approach suggested by [Iacobucci and Churchill \(2018\)](#), we developed our questionnaires by combining and extending previous survey questions for the first question items. According to experts' advice and suggestions, several minor modifications were made. Respondents were required to give their levels of agreement of each measurement item. Further, a pilot test was conducted with 30 experienced potential shippers to whom the questionnaire was sent. Their feedback regarding questionnaire contents and structure was collected, which enhanced the validity of the construct.

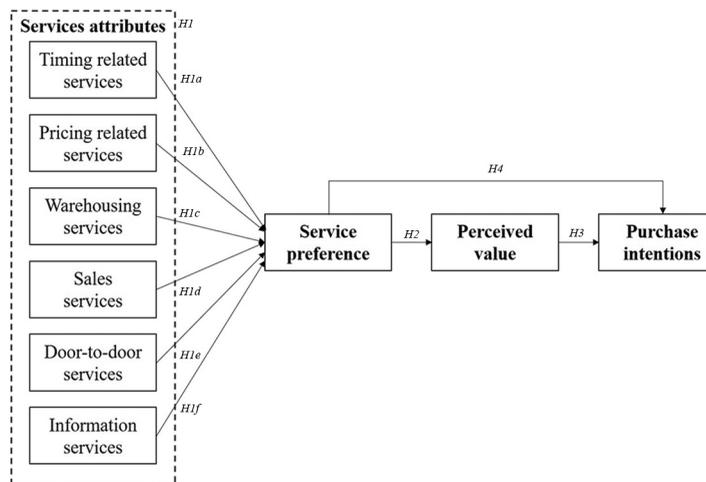
Constructs	Authors Measures	Paixão and Marlow (2007)	Rahman <i>et al.</i> (2016)	Caplan (2003)	Caplan (2003)	O’Cass and Lim (2001)	Daniels <i>et al.</i> (2005)	Muthitacharoen <i>et al.</i> (2006)	Muthitacharoen <i>et al.</i> (2006)
Attitude: service preference (SP)	Transaction cost preference	✓	-	✓	-	-	-	-	-
Norm: perceived value (PV)	Product preference	-	✓	-	-	✓	-	-	-
	Social interaction preference	-	-	✓	-	-	-	-	-
	The service would be economical	-	-	-	-	-	-	✓	✓
	Value for money compared with that of major competitors	-	-	-	-	-	✓	✓	✓
Behavior: purchase intention (PI)	The choice of transacting with the firm is a right decision	-	-	-	-	-	✓	✓	✓
	I intend to transact with the firm in the near future	-	-	-	-	-	-	-	-
	I plan to purchase the service from the firm in the near future	-	-	-	-	-	-	-	-
	I consider purchasing service from the firm in the near future	-	-	-	-	-	-	-	-

(continued)

Table 2.
Nine measures of the three constructs in the theory of reasoned action

Table 2.

Constructs	Authors Measures	Daniels <i>et al.</i> (2005)	Parasuraman and Grewal (2000)	Petrick (2004)	Hsu and Lu (2007)	McKnight <i>et al.</i> (2002)	Bhattacharjee (2001)	Suh and Han (2003)
Attitude: service preference (SP)	Transaction cost preference	-	-	-	-	-	-	-
	Product preference	-	-	-	-	-	-	-
	Social interaction preference	-	-	-	-	-	-	-
Norm: perceived value (PV)	The service would be economical	✓	-	-	-	-	-	-
	Value for money compared with that of major competitors	-	✓	-	-	-	-	-
	The choice of transacting with the firm is a right decision	-	✓	✓	-	-	-	-
Behavior: purchase intention (PI)	I intend to transact with the firm in the near future	-	-	-	✓	-	-	-
	I plan to purchase the service from the firm in the near future	-	-	-	✓	-	✓	-
	I consider purchasing service from the firm in the near future	-	-	-	-	✓	-	✓



Source: Adopted from the summarised studies in Table 1

Figure 1.
Research concept model

A total of 200 candidate firms were randomly selected from the members' list of the International Ocean Freight Forwarders and Logistics Association in Taiwan. Subsequently, the firms were contacted through an introductory letter and a follow-up phone call describing the goal of the study and confirming the knowledge of logistics and transportation of participants. At the end of the screening, 130 individuals confirmed their willingness to participate in this research. Finally, a total of 105 responses were returned and 86 questionnaires responses (81.9%) were validated and deemed to be useful in the analysis.

Because this research obtained data by using a self-report questionnaire method, a common method variance (CMV) problem may occur and jeopardise the analysing results (Yang and Chao, 2017). When measuring items that are collected from the same source, the CMV problem can bias the research findings. Hence, this study adopted procedural remedies for mitigating the influence of CMV problem. Respondents were assured of the anonymity and confidentiality of their responses; because, there were no right or wrong answers, respondents were asked to provide their ideas as honestly as possible. Accordingly, the standard method variance problem does not be present in the study.

3.2 Stage 2 - statistical analysis

Initially, EFA was used to identify the categorised factors in the model under principal components analysis. Factors were extracted by using the orthogonal axis method provided by the SPSS 21 statistical analysis software in terms of the maximum variation method (Varimax). Then, a confirmatory factor analysis was introduced to examine reliability and validity for each construct (Table 2). As this study attempts to construct an explanatory model to explore the relationships between service attributes, service preference, perceived value and purchase intentions, this study used structural equation modelling (SEM) to examine the interrelationships. Moreover, the SEM allows verifying the goodness of fit of the research model and describing the relationships among constructs.

Next, the average variance extracted (AVE) approach is used to assess the discriminant validity of each construct. AVE value is considered substantially higher than the squared correlation between the construct and all others. Discriminant validity is found to exist when each item shares a more common variance with their specific construct than any variance (Hair *et al.*, 2014).

4. Data analysis and research results

4.1 Respondents' collection

After collecting the questionnaire data, a descriptive analysis of the respondents' details is initially presented. Concerning age, more than half (50.1%) of respondents are between 36 and 45 years old, whereas 24% are over 46 years old, 15.2% are between 26 and 35 years old and 10.7% are younger than 25 years old. The numbers indicate that the short sea operation faces an employee ageing issue. About education level, more than 92% of the samples have obtained a bachelor's degree or above and nearly 8% of respondents have obtained a master's degree or above, which indicates that most of the SSS service's employees in Taiwan have sufficient educational background and learning capability. Concerning the job position, around 55% of respondents are specialists. In comparison, 32% are senior specialists, 8% are titled as a supervisor with first-line management experience, 4.2% are managers and 0.8% are senior managers. Concerning work experience, 32.5% of respondents have more than 16 years of work experience, 39.2% have 11–15 years and 28.3% have less than 10 years. The distribution indicates that most of the respondents have abundant work experience and thus the survey results are considered reliable.

4.2 Exploratory factor analysis

Table 3 displays the factor loading of each service attributes that influence the shippers' preference regarding SSS. After conducting factor analysis, eight factors are categorised with 65.254% of the accumulated explanatory variance and each factor's Cronbach α is larger than 0.8. The details of each factor are described as follows:

Factor 1: timing-related services: three-question items belong to this factor, including "on-time pick-up", "short transit time" and "high frequency of sailing". The explanatory variance is 38.126%, the eigenvalue is 9.251 and the factor loadings are between 0.89 and 0.92. Besides, most of the items are time-related items and therefore this factor is named timing-related services.

Factor 2: pricing-related services: three-question items are identified in this factor, including "freight rates", "price and discount structure" and "willingness to negotiate". The explanatory variance is 14.28%, the eigenvalue is 6.872 and the factor loadings are between 0.86 and 0.90. Also, most of the items are related to pricing-related services and therefore this factor is clarifying as "pricing-related services".

Factor 3: warehousing services: three-question items are also found in this factor, including "customs clearance service", "storage service" and "packaging/labelling service". The explanatory variance is 11.36%, the eigenvalue is 5.132 and the factor loadings are between 0.75 and 0.82. Also, most of the items are related to warehousing related services and therefore this factor is clarifying as warehousing services.

Factor 4: sales services: there are three question items under this factor, namely, "frequency of sales representatives", "calls to shippers", "knowledgeability of sales personnel" and "ability of sales representatives to handle problems". The explanatory variance is 9.688%, the eigenvalue is 3.122 and the factor loadings are between 0.79 and 0.85. Besides, most of the items are related to sales-related activities. This factor is therefore named "sales service".

Construct/factor	Attribute	Measure	Factor loading
Timing-related services (TS)	TS1	On-time pick-up	0.92
	TS2	Short transit time	0.95
	TS3	High frequency of sailing	0.89
Pricing-related services (PS)	PS1	Freight rates	0.88
	PS2	Price and discount structure	0.90
	PS3	Willingness to negotiate	0.86
Warehousing services (WS)	E1	Customs clearance service	0.75
	E2	Storage service	0.92
	E3	Packaging/labelling service	0.82
Sales services (SS)	S1	Frequency of sales representatives' calls to shippers	0.79
	S2	Knowledgeability of sales personnel	0.85
	S3	Ability of sales representatives to handle problems	0.83
Door-to-door services (DS)	DS1	One-stop logistics service	0.78
	DS2	Seamless logistics service	0.80
	IS1	Computer EDI interface	0.77
Information services (IS)	IS2	Computer cargo tracing	0.91
	SP 1	Transaction cost preference	0.94
	SP 2	Product preference	0.88
Service preference (SP)	SP 3	Social interaction preference	0.79
	PV1	The service would be economical	0.80
	PV2	The service is value for money compared with that of major competitors	0.88
Perceived value (PV)	PV3	The choice of transacting with the firm is the right decision when price and other expenses are considered	0.82
	PI1	I intend to transact with the firm in the near future	0.82
	PI2	I plan to purchase the service from the firm in the near future	0.89
	PI3	I predict that I would consider purchasing the service from the firm in the near future	0.92

Source: This study

Table 3.
Exploratory factor analysis of short sea shipping service attributes

Factor 5: door-to-door services: two factors are loaded into this construct, namely, “one-stop logistics service” and “seamless logistics service”, which account for factor loading of 0.80 and 0.78 separately. The explanatory variance of this construct is 9.21% with an eigenvalue of 2.016. Most of the items are related to end delivery fulfilment. Therefore, this construct is named as door-to-door services.

Factor 6: information services: two factors are classified into this construct, namely, “computer electronic data interchange interface” and “computer cargo tracing”. The explanatory variance of this construct is 6.21% with eigenvalue of 1.892 and the factor loadings are between 0.77 and 0.91. Most of the items are related to information application activities. Therefore, this construct is named as information services.

Factor 7: service preference: there are three factors for this construct, namely, “transaction cost preference”, “product preference” and “social interaction preference”. The explanatory variance is 4.217%, the eigenvalue is 1.553 and the factor loadings are between 0.79 and 0.94. Moreover, most of the items are explored with customers’ service preference items. Therefore, this factor is named services preference.

Factor 8: perceived value containing three items, namely, “the service would be economical”, “the service is value for money compared with that of major competitors” and “the choice of transacting with the firm is the right decision when price and other expenses are considered”. The explanatory variance is 1.632%, the eigenvalue is 1.112 and the factor loadings are between 0.80 and 0.88. Besides, most of the items are related to customers’ perceived value. This factor is therefore named perceived values.

Factor 9: purchase intentions contained three items: “I intend to transact with the firm in the near future”, “I plan to purchase the service from the firm in the near future” and “I predict that I would consider purchasing the service from the firm in the near future” separately. The explanatory variance is 1.278%, the eigenvalue is 1.015 and the factor loadings are between 0.82 and 0.92. Besides, most of the items are related to the identification of customers’ purchasing intention. This factor is, therefore, named purchase intentions.

4.3 Reliability and validity examining

The validity of reliability, convergent and discriminant was frequently used for suggesting the model’s explanatory capability and completeness. [Iacobucci and Churchill \(2018\)](#) suggest that a reliable construct should have both factor loading and construct reliability exceeding 0.7. [Table 4](#) displays the analysing results and shows that all reliability indicators were above 0.7, confirming the reliability of the research construct.

[Hair et al. \(2014\)](#) suggest the convergent validity can be ensured if either loadings are higher than 0.7 or the values of AVE exceed 0.5. All constructs in the analysis gained their loading over 0.7 and AVE greater than 0.5, providing evidence of acceptable item convergence.

Construct reliability of each item was between 0.85 and 0.92 and the AVE values of each construct were all above or close to 0.7. Therefore, the model constructed in our research for convergent validity all achieve the requirements.

Further, discriminant validity was assessed and compared for each construct ([Iacobucci and Churchill, 2018](#)). A rigorous test of examining discriminant validity is to compare the AVE values between any two constructs ([Hair et al., 2014](#)). The AVE for a construct is considered substantially higher than the squared correlation between the construct and all other constructs. Evidence of discriminant validity is provided by the AVE analysing results presented in [Table 4](#). As indicated in [Table 5](#), the results listed the correlations between each construct with the AVE square root value. Discriminant validity is deemed to exist because the results revealed that each factor’s AVE square root value is higher than that of their inter-construct correlation.

Construct	Attributes	Factor loading	Construct reliability (CR)	Average variance extracted (AVE)
Timing-related services (TS)	TS1	0.92	0.91	0.75
	TS2	0.95		
	TS3	0.89		
Pricing-related services (PS)	PS1	0.88	0.93	0.86
	PS2	0.890		
	PS3	0.86		
Warehousing services (WS)	WS1	0.75	0.82	0.71
	WS2	0.92		
	WS3	0.82		
Sales service (SS)	SS1	0.79	0.87	0.79
	SS2	0.85		
	SS3	0.83		
Door-to-door services (DS)	DS1	0.78	0.91	0.75
	DS2	0.80		
Information service (IS)	IS1	0.77	0.94	0.83
	IS2	0.91		
Service preference (SP)	SP1	0.94	0.85	0.80
	SP2	0.88		
	SP3	0.79		
Perceived value (PV)	PV1	0.80	0.91	0.85
	PV2	0.88		
	PV3	0.82		
Purchase intentions (PI)	PI1	0.82	0.92	0.69
	PI2	0.89		
	PI3	0.92		

Table 4.
Confirmatory factor analysis

Source: This study

	TS	PS	WS	SS	DS	IS	SP	PV	PI
TS	<i>0.87</i>	–	–	–	–	–	–	–	–
PS	0.82	<i>0.93</i>	–	–	–	–	–	–	–
WS	0.35	0.15	<i>0.84</i>	–	–	–	–	–	–
SS	0.24	0.44	–0.23	<i>0.89</i>	–	–	–	–	–
DS	0.45	–0.35	–0.12	–0.65	<i>0.87</i>	–	–	–	–
IS	0.16	–0.26	–0.19	0.72	–0.43	<i>0.94</i>	–	–	–
SP	0.28	–0.17	–0.04	0.36	–0.23	0.28	<i>0.89</i>	–	–
PV	0.60	–0.50	–0.34	0.38	–0.38	0.40	–0.08	<i>0.92</i>	–
PI	0.29	–0.39	–0.20	0.78	–0.46	0.73	–0.26	0.56	<i>0.83</i>

Table 5.
Discriminant analysis between constructs

Notes: Italic values in the main diagonal represent the average variance extracted of the nine constructs; non-italic values represent the coefficients of the correlation between the constructs

Source: This study

4.4 Structural equation modelling

Ahead of examining the relationship of each factor, an F-test technique is used to exploring whether any deferent perception exists among sample drawn from different SSS service roles. The result shows no different perception between the different departments, which indicated that the sample is suitable for this research. The second phase conducts the

confirmation of the impact of service attributes, service preference, perceived value and purchase intention. Then this study initially analyses the relationship between service attributes and service preference, perceived value and purchase intentions based on a SEM technique, respectively. The model identification results show that the standardised residual value exceeds the recommend value larger than ± 1.96 (Hair *et al.*, 2018), which indicates that no item of the modification indices needs to be amended and all *t-values* for tested variables are significant (*t-values* $> \pm 1.96$). The argument reveals that this model achieves coherent and convergent validity (Hair *et al.*, 2018) for proceeding. The proposed SEM is displayed in [Figure 2](#).

In terms of the goodness of fit of the SEM model, the χ^2/DF is 1.74 (which is less than 2), GFI = 0.90, AGFI = 0.91, TLI = 0.92, NFI = 0.90 (all of which are larger than 0.9), RMR = 0.02 (which is very close to 0) and RMSEA = 0.01. On the basis of the results, it can be concluded that this model has goodness of fit in terms of the cause-and-effect relationship between the latent variables of safety marketing, safety climate, safety attitude, safety behaviour and supervisor's commitment. This study uses the β value to test the research hypotheses and uses the *t-values* and *p-value* to test whether there are significant correlations between each pair of variables

The results initially examine the effect of attributes on service preference. Empirical findings showed that all service attributes (timing related pricing related, warehousing, sales, door-to-door, information and advertising) revealed significant effects on shippers' service preference. Our study found that although the service attributes mentioned above have positive effects on service preference, they account for a light influence compared to that of the other attributes do. The hypotheses *H1a-H1f* are therefore supported in this research. The results present some discrepancies from [Lu \(2003\)](#) findings that both door-to-door and information services were not discovered a significant correlation with the shippers' satisfaction. Our study explains the reason that it differs from [Lu \(2003\)](#) whose study focused on the shippers' satisfaction towards shipper-carrier partnerships rather than

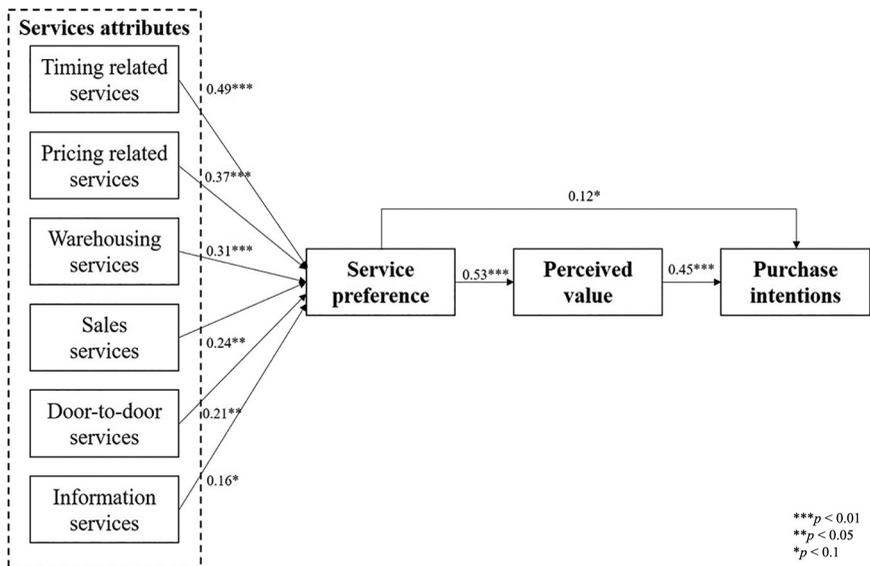


Figure 2.
Structural equation
modelling analysing
results

merely investigating the effect of the service attributes on service preference from the perspective of shippers. The results also showed that service preference significantly affects perceived value ($p < 0.01$). *H2* was therefore supported in our study. Besides, the analysis results also showed that perceived value has a significant effect on shippers' purchase intentions. It follows that *H3* is also supported, which represents that shippers perceived value significantly influences purchase intentions. The results are consistent with previous research (Cronin *et al.*, 2000). Finally, service preference was found to exist both, directly and indirectly, effects on purchase intentions ($p < 0.01$), which validates *H4*. The results show that service preference has a direct effect on perceived value totalled to 0.53, whereas perceived value gained a direct effect value of 0.45 linked to purchase intentions. The result also reveals that service preference exists a total effect (0.359) from a direct effect (0.12) as well as an indirect effect ($0.53 \times 0.45 = 0.239$) on purchase intention.

The implications of the study for the industry are versatile. Shipping costs were deemed the dominating factor for the SSS shippers. However, this study reveals that the shippers paid for the perceived values, but different people perceive different value for the same service. This study suggests that the value generated from timing- and operation-related services may compensate for the domination role of pricing-related services. With the matching between values and preferences, purchase intention will be secure for the SSS providers.

5. Conclusion and discussion

The adoption of SSS services has become a cost-efficient and environment-friendly transport mode selection (Yang *et al.*, 2014) in solving problems on increasing shipment costs, environmental pollution and road congestion. Most SSS operators focus on offering excellent service quality while ignore conveying service contents to meet shippers' service preference, which leads to a low desire to use SSS. Thus, this study contents that SSS service providers should maintain not only excellent service quality but also find effective ways to connect customer's service preference towards fulfilling their value perception and purchase intentions. However, researchers paid minimal attention to investigate the importance of service preference perception, which has a crucial influence on the willingness of selecting SSS service. This study strives to explore the effects of perceived value on purchase intentions empirically and identifies the relationship between service attributes and service preference in the SSS context.

Initially, this study identifies several influential service preference attributes, which assist SSS service providers to manage relationships with their customers (shippers). The findings show that timing-related services, pricing-related services, warehousing services, sales services, door-to-door services, information services and advertising services have positive effects on shippers' service preference. Further, through our research, this study identifies and constructs service preference that affects customer purchase intentions. Lastly, from the SEM examining results, service preference strongly affects perceived value, which indicates the more significant the shipper's preference is, the greater the value perceived by the shipper regarding the SSS providers' service. Results also explain that service preference has a mediating effect on purchase intentions because it presents both direct and indirect effects. Moreover, perceived value strongly affects purchase intentions, which is consistent with previous research observation (Cronin *et al.*, 2000).

In short, shippers perceive that value significantly influences purchase intention transactions. Other than the above-mentioned theoretical application, our research provides managerial implications for ship operators, who engage in identifying and assessing appropriate SSS service attributes based on a service concept constructed. Ship operators

should strive to link service attributes to customers' service preferences effectively. Further, a business positioning framework based on this study can be developed for SSS providers. This research results provide useful information on a previously uninvestigated area under the construction of a framework to better understanding the linkage between service preference, perceived value and the critical attributes of service preference in the context of SSS. On the multiple attributes of service preference and perceived value, the findings also bring a clear awareness of the broader issues of the mechanisms whereby shippers are attracted to continue the use of SSS.

Several limitations noted in the study provide meaningful directions for further research in the SSS field. Firstly, this study investigates the perception merely from the perspective of shippers. Other potential SSS users, such as third-party LSPs, are also be considered in the research. Secondly, this study mainly focused on SSS operation service in Taiwan; it could be argued that the identified factors and contributed results may not apply to other areas. Thirdly, this study's conceptual model emphasises on the relationship between one antecedent of perceived value and purchase intentions, which does not consider other essential factors together in the analysing model. The assumption may affect the explanatory ability of the conceptual model.

Our study's findings provide suggestions for future research. This study was based only on a cross-sectional survey and sought to construct a model in explaining the interaction between service attributes, customers' service preference, perceived value and purchase intention. The importance of service attributes and perception of customers' service preferences may change over time.

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