

Digitalization in container shipping: Do perception and satisfaction regarding digital products in a non-technology industry affect overall customer loyalty?

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Abstract

Like many other non-tech industries, container shipping services and operations have recently started being digitalized through various digital products and technologies. Despite several proven and projected benefits of digitalization, the impact of digitalization on customer loyalty in non-tech industries has not been fully investigated. Following the recent digitization trend, this research paper examines the relationship between perception and satisfaction on recently implemented digital products and overall customer loyalty in container shipping. Anchored on the technology acceptance model (TAM), a partial least squares-structural equation modelling (PLS-SEM) is applied based on the survey conducted on freight forwarders who are major customers of container lines. Results indicate that digital satisfaction and digital trust positively affect overall customer loyalty, while perceived ease of use, perceived usefulness, and digital trust positively influence digital satisfaction. Results of the study show that those digitalized services and operations of container lines have already started to influence overall customer loyalty. This paper provides important theoretical and managerial implications regarding digitalization in container shipping and other non-tech industries.

Keywords: Digitalization, shipping, non-technology industry, digital satisfaction, customer loyalty, digital trust.

1. Introduction

Digitalization has been shaping many non-technology industries in which the core product or service is not a digital one as it is in gaming, technology products, or electronic libraries. In recent years, non-technology industries such as agriculture, transportation, and energy have been transforming their operations and services into digital ones. As also indicated by Digital Transformation of Industries initiative launched by the World Economic Forum in 2015, non-tech industries, and ultimately the society, can enjoy the benefits of digitalization in different ways including increase in efficiency (Løberg, 2020), achievement of firm agility (Škare & Soriano, 2020), value creation (Li et al., 2020), and enhancement of organizational

performance (Martínez-Caro et al., 2020). Despite these proven benefits, the role of digitalization on overall customer loyalty in non-technology industries has not been fully investigated.

Container shipping is a non-technology industry that plays a vital role in the globalization of the economy and the realization of supply chains thanks to its reliable and efficient transportation at a lower cost (Bernhofen et al., 2016). Recently, the container shipping market has been transforming into a digital era that is projected to be facilitated by applying blockchain, internet of things, and artificial intelligence (Lambrou et al., 2019; Pu & Lam, 2020; Yang, 2019). The digital transformation in shipping has particularly accelerated following disruptions caused by COVID-19 (Mishra, 2020). Digital transformation in shipping presents ample benefits such as better integration of intermodal transport (Altuntaş Vural et al., 2020), better information exchanges between stakeholders (Vairetti et al., 2019), performance improvements of supply chains through reduction of papers and unnecessary time (Di Vaio & Varriale, 2020), and efficiency and effectiveness advancements in custom clearance and tracking systems (Yang, 2019). Given these benefits, container lines have already started digital transformation and transferred their manual operational processes to digital platforms, including container booking (Zeng et al., 2020), freight quotation, demurrage calculations, and even bill of lading issuance.

Despite its significant benefits, such as efficiency gains and smoothness in operations, digitalization in container shipping is also a challenging journey that requires constant improvements and attention to the voice of customers (Kahraman, 2020). Mustafa et al. (2020) suggest that the success of digital transformation depends highly on the effectiveness and quality of digital products as well as satisfaction of users towards these products. Considering how logistics companies lag behind those in the media, banking, and retail industries regarding digital transformation (Cichosz et al., 2020) and how stakeholders in the shipping industry may demonstrate a reluctant attitude on digital innovations (Papathanasiou et al., 2020), it is essential in container shipping to investigate satisfaction towards digital products.

While the container shipping market is progressing through a digital transformation, the market has also been facing harsh challenges such as fluctuating profitability levels and commoditization (Balci et al., 2018; Maloni et al., 2016). Despite recent consolidations in the market, the competition between container lines remains fierce (Hirata, 2017) whilst very little differentiation space exists among them to gain a competitive edge. In such a market where the competition is high and profitability levels are unstable, it is imperative to retain customer loyalty to survive in the market in addition to cost reduction, efficiency gaining, and capacity adjustment methods (Balci et al., 2019). Digital transformation may help global players in container shipping achieve numerous efficiencies (Yang, 2019). Still, it is unknown whether or not the perception and satisfaction of users towards digital products positively affect overall customer loyalty.

Literature in container shipping indicates that customer satisfaction, perceived service quality, and service attributes are imperative determinants of customer loyalty and retention (Chao & Chen, 2015; Chen et al., 2017; Jang et al., 2013). However, most service attributes, such as personal selling, responsiveness, accurate documentation and freight quotation, are now being transformed due to digitalization. For instance, Chen et al. (2017) found personal selling as the most important determinant for increasing the likelihood of customer retention but the

elements of personal selling are eroding due to the digitalization of service attributes. Interaction between container lines and their customers is evolving into more automated online exchanges. The structure of business practices and service attributes are also converting into digital ones. The literature clearly indicates conventional service attributes and satisfaction towards them positively influences the loyalty of customers. However, it is unknown whether customers' perception and satisfaction towards digital products in container shipping affect overall customer loyalty.

This research aims to investigate the relationship between users' perception and satisfaction regarding digital products and overall customer loyalty in container shipping. More specifically, the main objective of this research is twofold: First, to find out whether perceived ease of use, perceived usefulness, and trust towards digital products (digital trust) influence satisfaction towards digital products (digital satisfaction) of container lines: Second, to find out whether digital trust and digital satisfaction influence overall customer loyalty in container shipping. The theoretical lens of the paper is underpinned by the technology acceptance model (TAM). The original model of TAM is modified by replacing "intention to use" with "digital satisfaction" and by incorporating a new construct, namely "digital trust" to the model. To test hypothesised relationships, the paper conducts a survey research on freight forwarders and applies Partial Least Squares Structural Equation Modelling (PLS-SEM) based on 156 valid responses.

The paper presents original contributions to both literature and practice. The study presents original findings regarding digitization in container shipping which would also guide other non-tech industries adopting digitalization. The significant effect of digital products on overall customer loyalty justifies the importance of digitalization in the shipping industry. This study is original as it measures the impact of digitalized products on overall customer loyalty in a non-digital and non-technology industry. Previous studies have investigated the relationship between user satisfaction and loyalty in digital services and products in which technologies themselves are core products and services (Calvo-Porrall et al., 2017; Xu & Du, 2018). In container shipping, on the other hand, digital products are used to perform and facilitate the core service, transportation of goods from point A to point B. This study shows that those digitalized services and operations of container lines have already started to influence overall customer loyalty. The paper also contributes to the theory by testing TAM in a relatively mandatory adoption situation. Explanation and justification of this contribution is presented in the theoretical background section and in the theoretical and managerial implications section.

The rest of the paper is organised as follows. First, the theoretical background is explained, and the theoretical model is introduced. Then, each hypothesis illustrated in the theoretical model is justified by theory and practice. The third section explains the methodology in which the sampling, data collection, measurement items, and profile of respondents are introduced. The results of the hypothesis testing and measurement model are given in the fourth section. The last section presents a discussion of findings, theoretical and managerial contributions, limitations, and future studies.

2. Theoretical Background and Hypotheses Development

This paper adopts and extends TAM to underpin the theoretical background of the research. TAM – propounded by Davis (1989) – is a well-recognized model that is validated in different industries in regard to explaining the usage of information technology (IT). TAM has been designed based on the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and aims to explain why people accept or reject a new technology (Lee & Park, 2008). TRA suggests that the predecessor of individuals' behaviour in action is actually the intention to implement that behaviour. Echoing TRA in new technology adoption, TAM posits that the actual usage of new technology depends on the intention of use of that particular technology.

TAM is developed to test volitional behaviour in regard to using new technology. That is, the model is designed to measure whether potential users voluntarily prefer to use the new technology or not. However, individuals may have to use a new technology regardless of their voluntarily acceptance. The mandatory adoption of new technology is particularly common in business-to-business (B2B) contexts (Lee & Park, 2008). In container shipping, for instance, employees and customers of container lines, particularly freight forwarders, must adopt new digital products introduced by lines to be able to carry out operations such as booking, freight quotation, and shipment instructions. Although digital product adoption is not entirely compulsory yet, the nature of usage is mandatory as some of the services such as booking are not offered in conventional ways anymore. For instance, Hapag-Lloyd allows their customers to buy extra demurrage-free time through the digital product named “additional freetime”. Moreover, lockdown and social distance measures that arose due to COVID-19 have also pushed many customers to use digital products of container lines. In such mandatory adoption environments, the intention to use in TAM does not correspond to users' attitudes towards the technology. In mandatory environments, measuring user satisfaction better reflects if a user has a positive attitude on the new technology (Hwang et al., 2015). Although the adoption of technology is mandatory, measuring user satisfaction plays a vital role as user satisfaction enables more effective use of IT with its fullest potential (Hwang et al., 2015). Thus, this paper replaces the intention to use construct in TAM with digital satisfaction.

TAM postulates that core antecedents of intention to use of new technology are perceived ease of use (PEOU) and perceived usefulness (PU). Although PEOU and PU are originally introduced to examine the volitional acceptance of IT (Davis, 1989), the two constructs are proven to be significant determinants of positive or negative attitudes towards new technologies (Dalcher & Shine, 2003; Sachan et al., 2018). Hence, due to their predictive power in the technology context, these two constructs are used in technology studies that utilize satisfaction instead of intention to use (Amin et al., 2014; Ramkumar et al., 2019; Xu & Du, 2018). Similarly, this study also hypothesises PEOU and PU as antecedents of satisfaction towards digitalized products of container lines.

The literature has well investigated the relationship between customer satisfaction, trust, and loyalty. Studies in digital technology businesses such as digital libraries confirm the positive impact of user satisfaction on the loyalty of digital technology users or buyers. Several studies have also found that digital trust positively impacts the satisfaction and loyalty of digital product users (Calvo-Porrall et al., 2017; Xu & Du, 2018). Container shipping, on the other hand, is not a technology business. The core product of container lines is the transportation of goods from point A to point B. However, we theorize that user satisfaction and trust towards digitalized services may positively impact the loyalty as most services and interaction between container lines and their customers are started to be performed through digital products. This

view is parallel to the findings of Nguyen et al. (2020), who found that overall customer perceived value can be enhanced by digital technology in a non-technology business (insurance). The findings of Hirata (2019) also support our view that digital satisfaction positively affects overall customer satisfaction in container shipping. It is, of course, a question mark whether or not and to what extent digital satisfaction and digital trust influence overall customer loyalty in container shipping. Following this theoretical background, a theoretical model is developed (see Figure 1). Hypotheses are presented in the following paragraphs.

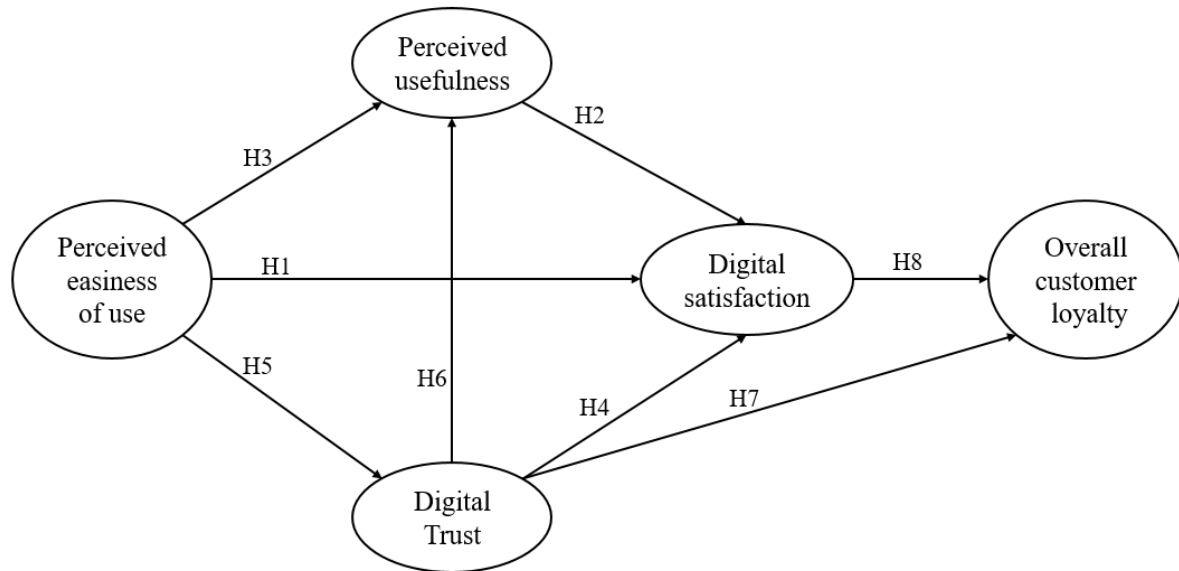


Figure 1: Theoretical model of the study

Perceived ease of use, perceived usefulness, and digital satisfaction

In TAM, PEOU means “the degree to which a person believes using an IT will be free of effort” while PU means “the extent to which a person believes that using an IT will enhance his or her job performance” (Venkatesh & Bala, 2008, pg. 275). It is worthwhile to explain the differences between these two constructs within the context of this research. PEOU measures whether an individual thinks it is effortless and easy to use new technology. PU, on the other hand, measures if a new technology is believed to be useful and provides benefits, such as an increase in performance and effectiveness, to the individual or organization (Ramkumar et al., 2019). Considering the literature (Amin et al., 2014; Lee & Park, 2008; Xu & Du, 2018), variables of PEOU in individual use and organization use do not differ much as easiness to use is measured at individual level in both cases. Variables are usually phrased as “it is easy to use”, “it is easy to learn”, and “it is free of effort”. However, some differences regarding PU are observed between individual and organizational contexts. In individual technology adoption, PU is measured with variables such as “my performance”, “my life efficiency”, and “my work”. In organizational technology adoptions, PU is mostly measured in terms of performance, productivity, and effectiveness (Ramkumar et al., 2019), and it can be either “my performance” or “our, my organization’s performance” (Lee & Park, 2008).

The literature presents strong evidence that PEOU and PU have a positive impact on the intention to use new technologies in various areas B2B markets (Swani, 2020), B2C markets (Xia et al., 2018), and other individual usages such as e-portfolio acceptance of students (Abdullah et al., 2016). The impact of PEOU and PU is also examined to measure continuance

intention. For instance, Lin & Filieri (2015) have found that PU and PEOU positively affect continuance intention of airline passengers' online booking usage. In the logistics industry, Jain et al. (2020) documented the positive influence of PEOU and PU in the adoption of blockchain technology.

Several studies have also demonstrated a positive impact of PEOU and PU on user satisfaction. Calisir & Calisir (2004) have found that PU has a direct positive impact on ERP users' satisfaction while PEOU has an indirect positive impact. The same direct and indirect positive relations are pinpointed by Sachan et al. (2018), who investigated e-government services and by Xu & Du (2018), who examined user satisfaction in digital libraries. Amin et al. (2014), on the other hand, found that both PEOU and PU positively influence user satisfaction in mobile website usage. Similarly, Lee & Park (2008) also indicated a positive impact of PEOU and PU on satisfaction of mobile technology usage in B2B context. Dalcher & Shine (2003) suggested a positive relation between PU and PEOU and information system satisfaction in the banking industry.

This paper also hypothesises that PEOU and PU have a positive effect on digital satisfaction in container shipping. Digital satisfaction in this study refers to the degree of how much users of technology are satisfied with digital products of container lines. It has replaced intention to use in the TAM in our study. Container shipping is a complex industrial service that involves numerous operations, interactions, and exchanges of critical information and documents before, during, and after the actual freight transportation. Considering the complexity of the service and the criticality of information exchanges and transactions, it is of significant importance to ensure that customers are satisfied with digital products. The services offered by container lines are also becoming more complicated as container lines are heavily investing to become logistics service providers. In such a complex environment, PEOU about digital products is anticipated to have a positive impact on digital satisfaction. Being efficient and effective is also critical for customers of container lines. Gil-Saura et al. (2018) found that perceived value has a positive impact on freight forwarder's satisfaction. Since many services and operations are now being digitalized, it is of critical importance that freight forwarders and shippers perceive digital products as useful for their organizations. Thus, PU is also expected to influence digital satisfaction in container shipping services positively.

Among very few studies that examined PEOU and/or PU in container shipping IT, Lu et al. (2007) demonstrated that PEOU positively affects shippers' intention to use internet service of container lines as well as PU. Hsu et al. (2009) tested the impact of PU, alongside promotions and service qualities, on shippers' intention to use electronic commerce in liner shipping and indicated a positive impact. Although PU and PEOU are not explicitly tested, Yang (2019) indicated a positive impact of standardization (as PEOU) and customer clearance management (as PU) on the adoption of blockchain technology in shipping. Thus, we build hypotheses as:

H1: PEOU has a positive effect on digital satisfaction in container shipping.

H2: PU has a positive effect on user digital satisfaction in container shipping

Considering the relationship between PEOU and PU, on the other hand, an abundant number of papers, including one paper in container shipping (Lu et al., 2007), indicate that PEOU positively influences PU (Calisir & Calisir, 2004; García et al., 2019; Sachan et al., 2018). This study also posits that freight forwarders may perceive digital products useful if they consider

them free of effort to use. Thus, the less effort the digital product takes, the more benefits users perceive.

H3: PEOU has a positive effect on PU on digital products in container shipping

Digital trust and digital satisfaction

Trust is a key construct for the adoption of new technology and open innovation (Mubarak & Petraite, 2020). Trust was not involved in the original TAM (Davis, 1989), but it has been incorporated into the model by various studies in which the positive impact of trust on satisfaction or intention to use has been documented (Wu et al., 2011). For instance, Gefen et al. (2003) documented that trust has a significant effect on the online shopping intention of users. Amin et al. (2014) found that trust positively influences user satisfaction in mobile website usage. Akbari et al. (2020) found that trust positively mediates the relationship between PEOU, PU and 5G technology adoption. Trust is a multi-dimensional construct consisting of competence, integrity and benevolence (Oliveira et al., 2017). The complexity of trust construct is well manifested by Gefen et al. (2003). Our research considers trust in the technology environment, digital trust (DT) in other words, as the belief of an individual towards a digital system regarding its reliability and punctuality in performing commercial and operational transactions. This definition is similar to Akbari et al. (2020), who defines DT as “specific beliefs about the way that technology operates through a work environment”. Our DT definition also mirrors the competence and integrity dimensions of trust.

In container shipping, every single shipment requires numerous transactions such as booking, shipping instruction, and free-time requests. Correctness and timeliness of operations highly depend on those transactions. Digital products enable the accomplishment of container shipping operations by transferring the data in an automated way. Any error or delay occurring due to a problem in digital products may easily cause serious disruptions in shipment operations. Thus, DT plays a vital role in container shipping. Accordingly, we postulate that DT positively influences user satisfaction towards digital products.

H4: Digital trust has a positive effect on digital satisfaction in container shipping

Perceived ease of use, perceived usefulness, and digital trust

Previous research has documented that PEOU and PU have a significant impact on trust in digital environments. Zhou (2012) documented that PEOU has a significant effect on trust in mobile bank user adoption. Gefen et al. (2003) found that PEOU positively influences trust while trust positively influences PU in e-commerce. Similarly, Wu et al. (2011) conducted a meta-analysis on the TAM literature, studying the impact of trust in technology acceptance. Based on the results of a total of 128 empirical papers, the authors demonstrate that trust is positively affected by PEOU, particularly in the commercial context, while it positively affects PU. This study also theorizes that trust has a positive impact on PU and digital satisfaction while it is positively affected by PEOU. We argue that if individuals perceive digital platforms as effortless to use and simple, and not complex, then their digital trust will increase. The complexity of digital platforms can lead to confusion for users and eventually makes it more difficult to trust the system. The simplicity of digital products also indicates that the container line is investing and paying attention to their digital platforms, which eventually enhances DT of customers. On the other hand, DT can increase PU of customers as the more customers believe their transactions are fulfilled correctly and on time, the more they perceive digital

products are useful for their jobs. The positive impact of trust on PU is also validated in the literature (Mou et al., 2017). Accordingly, the following hypotheses are built.

H5: PEOU has a positive effect on DT in container shipping

H6: DT has a positive effect on PU in container shipping

Digital trust, digital satisfaction, and overall customer loyalty

Customer loyalty is a customer's willingness and commitment to purchase a service or a product repeatedly from a specific supplier. Customer loyalty can result in positive outcomes such as increased customer sales, profitability and financial performance (Balci et al., 2019; Hong-kit Yim et al., 2004). The impact of customer satisfaction and trust on customer loyalty has been well documented in the literature. Trust and customer satisfaction have been considered vital factors that help build and enhance relationships, especially those B2B ones (Chai et al., 2020). Literature in shipping and logistics also demonstrates that trust (Jang et al., 2013; Yuen et al., 2018) and customer satisfaction (Balci et al., 2019; Chao & Chen, 2015; Shin & Thai, 2015) are determinants of customer loyalty. Trust also significantly affects the intention to adopt new technology in the supply chain (Alsaad et al., 2017). We argue that, since operational and commercial transactions are started to be accomplished through digital products, the elements of satisfaction and trust are also becoming more digitalized. Accordingly, we theorize that digital satisfaction and digital trust in container shipping have a positive impact on overall customer loyalty.

H7: DT has a positive impact on overall customer loyalty

H8: Digital satisfaction has a positive impact on overall customer loyalty

It is worth to note that the extent of the relationships depicted in Figure 1 might vary when certain factors, such as experience and age of the respondent, are controlled. These factors are of methodological concern and will be discussed in detail in methods section.

3. Methodology

Survey design, sampling, and data collection

This study conducted a self-administered online survey on freight forwarders in Turkey to test hypotheses. Only freight forwarders were included in the survey because some shippers do not use digital products of container lines as they work through forwarders. Due to the unavailability of a complete list of forwarders in Turkey, we used freight forwarder list of a major container line. The purpose of using a container line's forwarder list was to reach a list with a maximum possible number of freight forwarders as no other complete list of freight forwarders was found. These forwarders are not exclusive customers of the container line and the survey was not distributed through the line, but instead by the researcher of the paper through directly contacting with forwarders in the list. It is also worth to mention this study does not ask forwarders to evaluate digital products of this container line. Instead, they were asked to choose any container line that they would like to evaluate.

A total of 418 freight forwarders were identified. Data collection was carried out in August and September 2020. We achieved a total of 156 valid responses, which correspond to 37% of the total population. The survey consisted of three sections. The first section describes the objective of the study, the second section includes questions regarding demographics of respondents, and

the final section includes Likert-style measurement item questions ranging from 1 (Strongly disagree) to 5 (Strongly agree). Since digital product quality and progress of container lines are not equal, the respondents were asked to select a particular container line when answering questions. This selection helps testing the relationship between perceived digital product attributes and loyalty to a particular container line. The selection does not necessarily mean forwarders choose a container line to which they are loyal. Respondents were asked to choose any container line that they wanted to evaluate its digital services, whether they feel loyal or not to the selected line. This is also evident in results that mean value of loyalty construct in the survey is 3,54.

Container shipping has been rapidly growing in Turkey as the total number of containers handled has grown from 3.3 million twenty-foot equivalent unit (TEU) in 2005 to 5.7 million TEUs in 2010, and then to 11.6 million TEUs in 2020 (UAB, 2021). As a country trading various industrial and agricultural products with countries from all around the world and with around 390 billion USD total trading volume 2020, Turkey has a well-established container shipping network. The largest global container lines, including Maersk, MSC, COSCO, CMA CGM, Hapag Lloyd, Evergreen, and global logistics and forwarding companies such as DHL, Kuehne-Nagel, Ceva, DSV, and Geodis are actively operating in Turkey.

Measurement Items

Items of measurement scales in this study were achieved from the relevant literature with minor modifications to accommodate the container shipping industry. The content of measurement items is also asked to five freight forwarders to validate their appropriateness to the practice. These five forwarders are all managerial levels and have at least ten years of experience. Necessary revisions were made following the comments of interviewees. PEOU, PU, and digital satisfaction measures are well established in the literature utilizing TAM. Regarding PEOU and PU items, as Lee & Park (2008) also suggest, this study uses phrases of “is free of effort” and “increases our performance” rather than “will increase” since satisfaction is measured instead of the intention to use. Trust measure is gathered from IT studies that incorporate trust into TAM. Overall customer loyalty measure is also a well-established one in the marketing and logistics literature. Table 1 illustrates items of each measure and their resources.

Survey questions about measurement items are carefully adopted based on the literature review and hypotheses build. For instance, we have adopted measures of Lee & Park (2008) and Ramkumar et al. (2019) who study TAM in organizational levels. Particularly, Lee and Park (2008) use PEOU and PU in a mandatory B2B context. While selecting digital satisfaction variables, in addition to Lee & Park (2008), Amin et al. (2014)’s variables are also evaluated as they also assess the relationship between satisfaction and trust in a digital environment. Digital trust variables are selected from studies assessing the importance of trust in TAM. Particularly Hallikainen et al. (2019)’s study is quite relevant as they use it in B2B digital services context, like container shipping.

Table 1 Measurement Items

Measurement Items	Source(s)
PEOU	
1) It is simple to use this line’s digital products	(Lee & Park, 2008;
2) Interfaces of this line’s digital products are user friendly	Ramkumar et al., 2019)

3) It is easy to learn how to use this line's digital products	
4) It is free of effort to use this line's digital products	
PU	
1) Digital products of this line increase our effectiveness	(Lee & Park, 2008;
2) Digital products of this line increase our productivity	Ramkumar et al., 2019)
3) Digital products of this line increase our performance	
Digital satisfaction	
1) I am satisfied with digital products of this line	(Amin et al., 2014; Lee &
2) This line's digital products meet our expectations	Park, 2008)
3) Digital products of this line are close to ideal	
Digital trust	
1) My transactions via digital products of this line are performed as promised.	(Akbari et al., 2020;
2) My transactions via digital products of this line are performed on time.	Hallikainen et al., 2019;
3) I do not need to make my transactions confirmed manually when I use digital products of this line	Zhou, 2012)
Overall customer loyalty	
1) It is our first choice to work with this line	(Balci et al., 2019; Lam et
2) We say positive things about this line to other companies	al., 2004)
3) We intend to do more business with this line in coming years	
4) We do not consider changing this line	
5) We consider this line as a partner	

Apart from these measurement items, control variables are also asked in the survey. These control variables consist of age of respondent, the experience of respondent, department of respondent, and the number of employees in the company. Details of these variables are presented in the next section. Effects of these control variables on DS and Loyalty are tested to understand whether they have any impact on the satisfaction and loyalty of respondents. Testing control variables also allows to see whether these control variables are as important as independent constructs explaining DS and Loyalty. This is particularly important as previous studies in similar subjects show that firm size (Lorenz et al., 2020), age and experience as well as the department of respondents (Yang, 2019) may have a significant impact on digitalization perception. Literature also indicates that age, experience, and firm size can have a significant impact on user satisfaction, perceived value, and loyalty in digital contexts (Nguyen et al., 2020; Xu & Du, 2018).

Profile of respondents

The results of the survey indicate that over 50% of respondents are aged between 26-34 while almost 50% of them are working in operations-related job positions. Only 13.5% of respondents have experience between 1-3 years while over 55% of respondents have 7 and more years of experience. Regarding size of companies, around 50% of respondents' companies employ 50 and more people in Turkey. The sample is believed to represent the freight forwarding sector in Turkey considering high rate of young employees (26-34 years old) in our sample. Although demographics statistics of the forwarding industry in Turkey is not available, it was indicated by interviewees in this research that the forwarding industry involves a large number of young employees, which makes it relatively easier to adopt new technologies. The variety in number of employees in the sample also shows that the survey is answered by small, medium, and large freight forwarders, thereby representing different size

of forwarders. The sample also involves a good mixture regarding department of employees as they work in operations, sale & marketing, or at top managerial positions – not involved in a specific department – such as country manager, regional manager, or founder.

Table 2 Profile of respondents

Profile	Frequency	Percentage
<i>Age</i>		
18-25	20	12.8
26-34	82	64.5
35-44	41	26.3
45 and more	13	8.3
<i>Department</i>		
Operations	75	48.1
Sales & Marketing	53	34
Top managerial level*	28	17.9
<i>Experience</i>		
1-3 years	21	13.5
4-6 years	44	28.2
7-9 years	41	26.3
10 and more years	50	32.1
<i>Employees</i>		
1-24	54	34.6
25-49	22	14.1
50-99	37	23.7
100 and more	43	27.6

* These are managers, such as country managers, regional managers, or founders, not being a part of a specific department.

4. Data Analysis and Results

PLS-SEM method is used to test the conceptual model by using SmartPLS 3 software. PLS-SEM, also known as variance-based SEM, is a multivariate statistical method that explains relationships among endogenous and exogenous variables. Compared to covariance-based SEM, PLS-SEM is more suitable when the sample size is relatively smaller as sufficient statistical power can be achieved for sample sizes as small as 100 (Reinartz et al., 2009). PLS-SEM should also be preferred when the statistical objective is prediction rather than theory confirmation (Hair et al., 2018). Accordingly, considering our relatively modest sample size as well (156), PLS-SEM is considered to be more appropriate for our research.

4.1. Measurement Model

The measurement model is examined by analysing the estimate of indicator loadings and their significance, composite reliability, convergent validity, discriminant validity of measures (Hair et al., 2019). Table 3 indicates that standardized indicator loadings of each construct are over 0.708, which is the threshold value (Hair et al., 2020). P-value of standardized loadings is also less than 0.001, indicating a desired significance level.

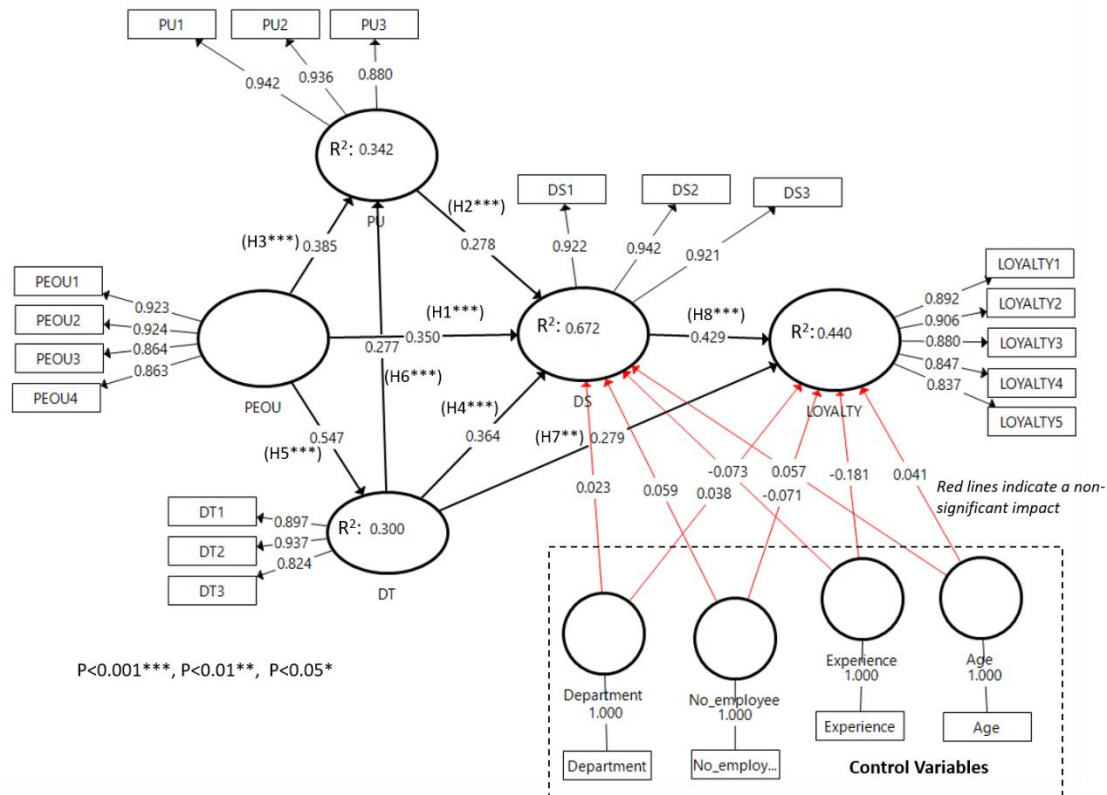


Figure 2: PLS-SEM Results: Path Coefficients of constructs and control variables, indicator loadings, and R^2 of constructs.

Note: The results show control variables do not have a significant impact on DT and Loyalty

Cronbach's alpha and composite reliability are used to test the internal consistency (composite) reliability of measures. As shown in Table 3, all the constructs in our model have greater than 0.7 internal consistency reliability levels (Bagozzi & Yi, 2012). Average variance extracted (AVE) values are assessed to check the convergent validity of measures. AVE values of all measures are higher than the minimum threshold point (0.50) suggested by (Hair et al., 2018).

Table 3 Reliability, convergent validity, and standardized indicator loadings

Construct	Cronbach's Alpha	Composite Reliability	AVE	Standardized indicator loadings	No of items
PEOU	0.916	0.941	0.799	0.863 – 0.924*	4
PU	0.908	0.943	0.846	0.880 – 0.942	3
DT	0.865	0.917	0.787	0.824 – 0.937	3
US	0.920	0.949	0.862	0.921 – 0.942	3
OL	0.922	0.941	0.762	0.837 – 0.906	5

*All indicator loadings of each construct are significant $P<0.001$

For ensuring discriminant validity, as suggested by Fornell & Larcker (1981), we checked whether the squared root of each construct's AVE value is higher than correlations with other constructs as shown in Table 4. In addition to the Fornell-Larcker criterion, the heterotrait-monotrait ratio of the correlations (HTMT) is also assessed for assessing discriminant validity.

As shown in Table 5, all ratios are lower than the threshold value of 0.85 (Hair et al., 2018; Henseler et al., 2016), thereby demonstrating strong evidence for discriminant validity.

Table 4 Fornell-Larcker discriminant validity results

	Digital satisfaction	Overall Loyalty	PEOU	PU	DT
DS	0.928				
OL	0.615	0.873			
PEOU	0.696	0.468	0.894		
PU	0.634	0.405	0.537	0.920	
DT	0.689	0.567	0.547	0.488	0.887

Diagonal values show squared root AVE values of each construct

Table 5 HTMT discriminant validity results

	DS	OL	PEOU	PU	DT
DS					
OL	0.664				
PEOU	0.752	0.509			
PU	0.692	0.441	0.587		
DT	0.761	0.617	0.601	0.544	

Unlike covariance-based (CB) SEM, PLS-SEM does not rely on the concept of model fit (Hair et al., 2019; Sarstedt et al., 2014). Some goodness of fit indices are also available for PLS-SEM, such as SRMR and rms Theta, but the literature suggests avoiding presenting these indices as no thorough assessment of these indices are carried out (Hair et al., 2019). Thus, this research does not present goodness of fit indices for the model. Goodness of fit indices are usually required when the main purpose is theory testing, in which cases it is suggested to use CB-SEM (Hair et al., 2011; Sarstedt et al., 2014). Although we underpin our research through TAM, the purpose is not to test the theory but to predict digital satisfaction and customer loyalty with the help of well-established TAM constructs.

4.2. Structural Model

Path coefficients may be biased if multi-collinearity exists in the structural model. The multi-collinearity issue is checked by evaluating each indicator's variance inflation factor (VIF), which should not exceed 5 (Hair et al., 2011). The results indicate that the VIF value of all indicators in the model is below 5, which indicates a non-collinearity. Bootstrapping with 5,000 sub-samples is employed to examine path coefficients, their significance levels, and t values. The results demonstrate that all path coefficients are significant and therefore supporting our hypotheses (See Table 6). Both digital satisfaction and digital trust have positive impacts on overall customer loyalty, the former having a larger impact. Digital satisfaction is also positively affected by PEOU, PU, and DT. Path coefficients also indicate that PEOU has a positive effect on PU, DT, and user satisfaction. The largest coefficient value exists in the relationship between PEOU and DT. The results also indicate that the structured model has a moderate explanatory power for loyalty ($R^2 = 0.44$) and almost a substantial explanatory power

for digital satisfaction ($R^2 = 0.67$) as it is closer to the suggested 0.75 threshold value (Henseler et al., 2016). Age, department, experience, and employee size are tested as control variables. No significant relationship is identified between control variables and satisfaction and loyalty as shown in Figure 2 and Table 7

Table 6 Hypotheses results and path coefficients

Hypotheses	Path	Coefficient	t values
H1 (Supported)	PEOU → Digital Satisfaction	0.353 ***	4.259
H2 (Supported)	PU → Digital Satisfaction	0.265 ***	4.317
H3 (Supported)	PEOU → PU	0.385 ***	4.240
H4 (Supported)	DT → Digital Satisfaction	0.367 ***	5.741
H5 (Supported)	PEOU → DT	0.547 ***	8.943
H6 (Supported)	DT → PU	0.277 ***	2.579
H7 (Supported)	DT → Overall loyalty	0.279 **	3.201
H8 (Supported)	Digital Satisfaction → Overall Loyalty	0.429 ***	5.391

Overall Loyalty R^2 : 0.44, Digital satisfaction R^2 : 0.67

$P < 0.001$ ***, $P < 0.01$ **, $P < 0.05$ *

Table 7: Effects of control variables on digital satisfaction and loyalty

	Path value to loyalty	Path value to digital satisfaction
<i>Control variables</i>		
Age	0.041 ^{NS*}	0.027 ^{NS}
Department	0.038 ^{NS}	0.095 ^{NS}
Experience	-0.181 ^{NS}	-0.017 ^{NS}
Employees	-0.071 ^{NS}	-0.039 ^{NS}

NS: Non-significant

Endogeneity is an important issue that should be addressed in all regression-based methods, including PLS-SEM (Sarstedt et al., 2019). Endogeneity in PLS-SEM usually occurs when an independent construct, which has correlations with one or more independent constructs and the dependent construct, is omitted from the model (Hair et al., 2019) or when “a predictor construct is correlated with the error term of the dependent construct to which it is related” (Sarstedt et al., 2019; p:537). In this study, it means that DS and/or DT constructs not only explains Overall Loyalty, but also its error term. If that is the case, path results of PLS-SEM may be misleading.

One way to assess endogeneity is to implement an instrumental variable (Hult et al., 2018), but the non-existence of an instrumental variable eliminates this approach. Instead, to assess if an endogeneity issue exists in our model, we followed the procedure of Hult et al. (2018) which is designed to tackle endogeneity in PLS-SEM. Authors underpinned their guideline based on Park & Gupta (2012)’ Gaussian copula approach which is used when an instrumental construct does not exist. This approach “controls for endogeneity by directly modelling the correlation between the endogenous variable and the error term by means of a copula (Sarstedt et al., 2019; p:538)”.

Gaussian copula approach is tested in Rstudio by the R code¹ developed by Hult et al. (2018). Standardized composite scores of DT, DS, and Overall Loyalty are used to compute Gaussian copula score, which should be insignificant ($p > 0.1$) to ensure endogeneity is not at the critical level. Three different models are built: The first one includes the copula of DS, the second one includes the copula of DT, and the last one involves copulas of DS and DT together. The first model is shown here as an example (please refer to Hult et al. (2018) for methodological details): “LOYALTY ~ DS + DT + DS_star + 0”. In this regression model, DS_star, the copula, is included as an additional independent variable that controls the correlation between the error term and DS. The coefficient of the copula (DS_star) should be insignificant to determine there is no critical endogeneity issue in the model. Table 8 indicates that all copulas in the three models are insignificant ($p < 1$), which indicates that our PLS-SEM model does not suffer from a serious endogeneity issue.

Table 8: Coefficient values and significance of variables in Gaussian copula models

Variable	Model 1 (DS as endogenous independent variable)		Model 2 (DT as endogenous independent variable)		Model 3 (DS and DT as endogenous independent variables)	
	Value	P-Value	Value	P-Value	Value	P-Value
DS	0.46166	6.49e-05 ***	0.42491	1.62e-06 ***	0.433584	0.000726 ***
DT	0.27484	0.00155 **	0.32709	0.0049 **	0.322047	0.012092 *
DS_star	-0.01900	0.62242			-0.004528	0.925119
DT_star			-0.02679	0.4847	-0.024103	0.614988

Significance codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’

5. Conclusions and Discussion

This paper analyses the impact of users’ perception towards digital products of container lines on the overall loyalty of their customers. TAM is adopted to the container shipping context by revising intention to use in the original model as digital satisfaction and by incorporating digital trust as an antecedent of digital satisfaction and overall customer loyalty. A survey is conducted on freight forwarders in Turkey and PLS-SEM methodology is employed to test the conceptual model. Reliable and valid constructs are achieved – perceived ease of use, perceived usefulness, digital trust, digital satisfaction, and overall customer loyalty. All hypotheses are accepted in the conceptual model.

The results demonstrate that overall customer loyalty is positively influenced by customers’ perception of digital products of container lines. More specifically, both digital satisfaction and digital trust have a positive impact on overall loyalty of customers. This result presents significant implications as it indicates that those digitally transformed operations and services of container lines are already affecting overall customer loyalty. This makes sense because many operations and services are being digitalized, and a rational freight forwarder is expected to stay loyal to a container line if the line’s digital products satisfy expectations of freight forwarders and if freight forwarders perceive digital products as trustable. However, this result should also be read cautiously as the R^2 value of customer loyalty is 0.440, which means that

¹ <https://www.pls-sem.net/pls-sem-academy/gaussian-copula-files/>

our model has moderate power in explaining overall customer loyalty. Although perception on digitalized services significantly affects customer loyalty, there are other factors further explaining loyalty of freight forwarders, such as financial incentives and relationships (Balci et al., 2019).

Results indicate PEOU has a greater impact than PU on digital satisfaction. This result can be partly explained by the mandatory nature of digital product usage by freight forwarders in container shipping. The previous literature indicates that PEOU has a stronger influence than PU in mandatory environments (Dalcher & Shine, 2003). However, this assumption is not confirmed by all studies in the literature as the study of Lee & Park (2008) found PU has a higher impact on user satisfaction. The greater impact of PEOU can also be justified by the traditional structure and resistance of some stakeholders in the shipping industry to digital innovations. Despite some pioneering examples of digital applications in the industry, such as TradeLanes, some stakeholders might still be reluctant to adopt new digital applications (Papathanasiou et al., 2020). Under such circumstances, relative easiness and effortless adoption can play a greater role than perceived usefulness in regard to user satisfaction.

PEOU does not only have a greater impact on digital satisfaction compared to PU, but also significantly affects DT. The path coefficient from PEOU to DT is the highest among all path coefficients between constructs in the model. This is not surprising as users may develop more trust on digital products when they perceive them as easy to use. This result is parallel to findings of previous literature as well (Akbari et al., 2020; Wu et al., 2011). Findings in this study underline the significant role of PEOU in digital transformation in the container shipping industry. However, it should also be noted that digital transformation in the shipping industry is in its preliminary stages and this result may change over time when digitalization gets matured as users become more experienced, i.e., the relative importance of PU can be greater.

According to our results, digital trust positively influences PU, digital satisfaction, and overall loyalty of customers and implementing it on-time and in an assuring way so that users do not need to confirm transactions in a conventional way such as by e-mailing to container lines. A failure or delay of an operation can be too costly for customers of container lines. In this context, the significant impact of DT is not surprising as timeliness and accuracy of transactions as well as the performance of them as promised, are of crucial importance in container shipping. The positive relationship between DT and PU can be explained by the fact that these digital products of container lines are new to users, and they can perceive these tools as useful if they believe they trust the technology. This result is also in parallel with the findings of Mou et al. (2017) and Wu et al. (2011).

The paper also tested the impact of individual and firm-level control variables – age, department, experience, and company size – on digital satisfaction and customer loyalty. Accordingly, the results indicate that age, department, experience, and company size of respondents do not have any significant impact on digital satisfaction and customer loyalty. This shows that these control variables are not as important as PEOU, PU, and DT for explaining DS and CL. This result contradicts the findings of Yang (2019), who found that people in more senior positions are less likely to have the intention to use blockchain technology in container shipping. This contradiction may arise because this paper investigates digital satisfaction rather than intention to use. The contradiction can also be explained by the fact that our sample consists of relatively young people (less than 10% of respondents are aged

over 45). The result is also contradicting the qualitative findings of Zeng et al. (2020) who suggest that firm size can play an important role in the adoption to open platforms for container bookings. This contradiction may arise from the volitional nature of Zeng et al. (2020)'s study which investigates adoption decision. This study, on the other hand, measures satisfaction and perception on digital products in a more mandatory context.

Our results are consistent with the literature in other industries as well. For instance, the positive impact of PEOU on trust is also observed in the banking industry (Zhou, 2012), in which the trust issue is vital. Another example from the banking industry also confirms the positive impact of PEOU and PU on user satisfaction (Dalcher & Shine, 2003). Pousttchi & Dehnert (2018) also suggest that characteristics of digital services affect the purchase decisions of retail banking customers. Our results are also in line with the findings of Neuts et al. (2013), who conduct a research in the travel industry and state that characteristics of electronic services positively influence the satisfaction and destination loyalty of tourists. This result is in line with the findings of Nguyen et al. (2020) who find that a better quality of digital technology implementation results in a higher overall customer perceived value. These findings from other industries also confirm the impact of superior performance and satisfaction in digitalization on the loyalty of customers.

5.1. Theoretical and managerial implications

The paper presents various theoretical and managerial implications. Regarding theoretical implications, the paper contributes to theory and literature in several aspects. First, this study has developed and tested a theoretical framework for measuring the impact of users' perception towards digital products on overall customer loyalty in a non-technology business. This is a unique contribution because . previous studies investigating the relationship between digital product-related constructs – i.e., user satisfaction, PEOU, and PU – and loyalty have focused on technology products or services such as mobile phones, IT services, and digital libraries (Calvo-Porrà et al., 2017). For instance, (Xu & Du, 2018), found the positive impact of PU and PEOU on user satisfaction and loyalty in digital libraries. The authors did not attempt to find out whether digital services of a physical library impact the overall loyalty of users. Our study, in contrast, demonstrates that these digital product-related attributes can significantly affect customer loyalty in non-technology businesses as well. This result is expected to trigger the research on the impact of digitalization in non-technology businesses, particularly marketing studies related to loyalty, brand reputation, and engagement of customers.

To the best knowledge of author, this is also the first study investigating the satisfaction of users towards recent digital products in the container shipping market. Digitalization studies in the shipping literature are being heavily investigated recently as the industry is on the edge of transition to a smarter and more digital environment that is surrounded by various digital innovations, including blockchain adoption and the use of Internet of Things. Earlier studies found that digitalization in shipping contributes to better integration if intermodal transport (Altuntaş Vural et al., 2020), performance improvements (Di Vaio & Varriale, 2020), and various efficiency and effectiveness gains (Yang, 2019). However, the extant literature is silent on the impact of digitalization on satisfaction and customer loyalty. Our study contributes to this recent research phenomenon by explaining factors affecting digital satisfaction and customer loyalty in the shipping context. This paper also validates the importance and

relevance of digitalization studies in the shipping industry by proving the significant impact of digital products on overall customer loyalty.

This study contributes to TAM research as well. First, significant relationships between PEOU, PU, and digital satisfaction help validation of TAM. Second, this study also presents implications regarding the utilization of TAM under mandatory environments. This paper revised “intention to use” in TAM with digital satisfaction, which is parallel to earlier studies employing TAM in mandatory contexts such as Lee & Park (2008) who study mobile technology adoption in the Korean alcoholic beverage industry and Dalcher & Shine (2003) who investigated information system’s in a bank’s treasure. Results of our study contribute to the mandatory adoption area by incorporating digital trust construct to the TAM and revealing its impact on digital satisfaction and overall customer loyalty. These modifications – digital satisfaction and digital trust - resulted in successful findings as the significant positive relationship between these constructs are confirmed. Results indicate that the modified model in this research has a relatively high moderate explanatory power (almost substantial) for digital satisfaction.

Results of this paper also offer managerial implications for container lines. Container lines are heavily investing in digitization, and this study demonstrates that these investments do not only offer operational efficiencies and cost reductions, but also contribute to loyalty of customers. The results indicate a positive impact of PEOU on PU, DT, and digital satisfaction. Hence, managers in container lines should seek for ways to ensure that users perceive their products as easy to use. One way to accomplish this would be training given to customers prior to and after the introduction of digital products to allow customers to become familiar with features of products and keep them up-to-date. These trainings would also help increase PU and DT of customers towards digital products. As customers are more trained and become more knowledgeable regarding how the digital system works, they may develop more trust towards digital products of container lines, which eventually increase digital satisfaction and overall customer loyalty. This assumption of course requires further validation by another future study.

PEOU, PU, and DT – antecedents of digital satisfaction – can also be enhanced by instant online communication tools that allow freight forwarders to get in touch instantly with an employee from the container line. These instant communication tools would enable forwarders to ask minor questions that employees in forwarders might hesitate to ask by e-mail. In this way, forwarders can get the support they need in a convenient and comfortable way. The e-mail traffic can also be significantly reduced thanks to instant messaging. Considering the fact that digitization is in its early stages in container shipping, instant chat tools will function as an important medium of customer support. This kind of convenient chat tools can also nourish the communication and thereby the relationship between forwarders and container lines. Thanks to nourished communication and relationship, forwarders’ engagement with container lines can also be increased.

The results of this study highlight the importance of digital trust by demonstrating its positive impact on PU, digital satisfaction, and overall customer loyalty. The measurement items in the trust construct are related to successful and on-time implementation of online operational and business transactions. Container lines must, therefore, constantly monitor and measure the performance and functionality of their digital products to ensure successful and on-time accomplishments of transactions ordered by forwarders. Increasing DT of customers to digital

products can also accelerate the adoption of other new digital solutions. Acceleration in adoption is of critical importance as container lines are planning to implement more digitalized solutions such as electronic negotiable bill of lading usage through smart contract feature of blockchain technology. Building trust towards in-house digital products of container lines may enhance adoption to more complex inter-organizational digital solutions such as blockchain.

Container lines should read these results carefully as although our results indicate that PEOU, PU, DT, and digital satisfaction affect overall customer loyalty, their explanatory power is at a moderate level. To ensure overall customer loyalty, container lines should pay effort in other factors influencing customer loyalty such as personal relationships, customer service, and financial or operational incentives. Operational incentives may include priority in empty container supply and space on board which are currently cumbersome following the COVID-19 pandemics. Those instant chat tools suggested in previous paragraphs can also increase overall perceived customer service and thereby customer loyalty.

Managerial implications indicated here can also be applicable to some degree in other industries such as banking and travelling considering some similarities with previous empirical studies in those industries (Dalcher & Shine, 2003; Neuts et al., 2013). Some suggestions may not be practical in travel and banking, though. For instance, digital training at individual level would not be feasible considering the very large number of customers in these industries. However, these industries are already quite advanced in online communication tools and the shipping industry can examine the experiences of organizations in banking, travel, and similar industries.

5.2. Limitation and future studies

Although objectives of this study are met, the paper suffers some limitations which can be addressed by future studies. First, this study does not investigate antecedents of PEOU in the container shipping context, which is an important determinant of digital satisfaction and adoption of new technology. PEOU significantly affects PU, DT, and DS in our model as well. Considering the importance of PEOU, a future exploratory study should be conducted to find out antecedents of PEOU within the shipping context. Second, this study only focuses on freight forwarders as customers of container lines and do not involve beneficial cargo owners who are ultimate customers of both container lines and freight forwarders. The reason behind this selection was the fact that not all shippers use digital products of container lines as some of them work through freight forwarders. Nonetheless, a future study can also investigate satisfaction level and intention to use of cargo owner shippers towards digital products introduced by container lines. Third, although the trust has multiple dimensions, trust construct has only one dimension in this study. Trust in this study is considered as the belief of an individual towards a digital system regarding its reliability and punctuality in performing commercial and operational transactions. Security has not been included in our model but its impact on digital satisfaction or intention to use should be investigated by future research especially considering IT security incidents that some container lines experienced in recent years. The sampling of the study was based on a forwarder list of a major container line. Although this was the most extensive list available to the researcher, it is not guaranteed that the entire population – all freight forwarders in Turkey – is identified in this study. Results

could also be more interesting and representative if other parties such as shippers and partners of container lines also evaluate digital products of container lines.

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