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Port service quality assessment using a ROPMIS modeling: seaports scenario in a Gulf country

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Abstract

Purpose – This paper aimed to assess the service quality of the main seaports in Oman, which were Sohar, Ad Duqm and Salalah. The aim was to come up with ways to enhance the port service quality (PSQ) in Oman so that it could align with the Sultanate of Oman Logistics Strategy (SOLS) 2040 goals and achieve excellent and efficient operations.

Design/methodology/approach – To evaluate the service quality level of the port operators, this paper used a descriptive research design with Resources, Outcome, Process, Management, Image/reputation and Social (ROPMIS) modelling.

Findings – The findings indicated that the overall PSQ rating was currently between "satisfactory" and "very satisfactory" levels. However, the study also found that by empowering resources, outcomes, processes, management, image and social responsibility aspects, the port operators could provide a "high" quality of service, making their seaport operations more effective and efficient.

Practical implications – The study offers recommendations for improving port services in Oman, including investment in modern seaports, upgrading infrastructure and facilities, ensuring safety and efficiency of cargo operations, meeting and exceeding customer expectations, adopting new technology and automation, hiring policies that attract diverse talents, implementing environmentally friendly practices and improving governance. Overall, this study contributes to the literature and managerial practices in PSQ aspects and its contribution to the SOLS 2040 in Oman.

Originality/value – The originality and novelty of this study lie in its comprehensive assessment of the service quality of Oman's ports and the identification of areas for improvement to achieve outstanding service levels.

Keywords Port service quality (PSQ), ROPMIS, Port operations, Seaports, Systematic literature review (SLR)

Paper type Research paper

1. Introduction

The Sultanate of Oman is a country with diverse geography, abundant natural resources and a peaceful, independent and stable population. The country's geography is a combination of deserts, inland mountain ranges and associated valleys, with very fertile soil in the south and a strategically located coastline. These factors provide Oman with the potential for a

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relatively rich agricultural and fish processing industry, as well as unique sea routes to India and the Far East, as well as Africa and Europe. This information comes from a 2019 report by the Ministry of Commerce and Industry, the Sultanate of Oman and the United Nations Industrial Development Organization (2019).

Oman's location on the Strait of Hormuz and its deep-water ports in the Gulf of Oman and the Indian Ocean are attractive for the growth of its logistics infrastructure and connectivity (Figure 1). According to the US International Trade Administration (2021), the Salalah Port has a container terminal with seven berths and a general cargo terminal with 12 berths. The Port of Duqm has four dedicated terminals for containers, general/project cargoes, bulk goods and liquids (Port of Duqm, 2022), while Sohar Port is ideal for the import and export of dry, break and liquid bulk as well as container shipping (Sohar Port and Free Zone, 2022). These ports are expected to attract more international shipping traffic and cargo trade to boost Oman's economy.

Ports have global significance and economic potential, and they can be a source of government revenue. The efficiency and service quality of ports are essential to boost economic growth and reduce logistical costs while contributing to higher passenger convenience (United Nations Conference on Trade and Development, 2020). Oman has made courageous efforts to upgrade its ports and related infrastructure in Duqm, Salalah and Sohar. To achieve its economic goals, Oman needs a powerful policy to sustain its efforts, which can be costly and time-consuming (Aljabri, 2012). This study evaluates the service quality of major seaports in Oman and formulates new inputs for improving PSQ towards excellent and efficient operations. The study aims to provide valuable insight to port stakeholders and proposes recommendations for improvement. The paper is organized into sections that review relevant literature, present the conceptual framework, methodology, results and discussions, and propose recommendations for improvement.

2. Literature review

2.1 Service quality perspectives of Omani ports

Omani ports had assistance from their logistics networks to connect with 86 ports in 40 countries (US International Trade Administration, 2021). The logistics performance index

Figure 1.
Geographical location of Oman

Source(s): World Atlas (2022)

(LPI) ranked Oman 43rd out of 160 countries worldwide with a score of 3.20 out of 5 (The World Bank, 2018). Compared to the logistics performance study of 2016, Oman improved slightly in logistics performance by ranking 48th in the biennial report. The highest mean rating was given to the "timeliness" indicator, which received a score of 3.80, while the "customs" indicator received the lowest mean rating of 2.76, indicating a need to improve customs and border management clearance to expedite the release of cargoes from the customs office (The World Bank, 2018).

The supply chain and procedures underwent significant changes due to continuous progress, and technological and industrial revolutions and these changes resulted in a wide-scale domino effect. The shortage of qualified logistics personnel posed a severe threat to the country's economic progress, creating acute suffering (Benayoune, 2018), particularly for ports, which derived demand facilities (OECD, 2008).

Port operations have become a focus of discussion and research among expert groups and individuals, primarily due to their potential in a competitive trade area. Nguyen *et al.* (2022) emphasized that the enhancement of PSQ is considered the primary benchmark of a nation's competitive capacity, which was also supported by Schøyen *et al.* (2018). Without excellent service quality provided at a port, port users may choose other ports and terminals, thereby impacting the business efficiency of port operating companies (Nguyen *et al.*, 2022).

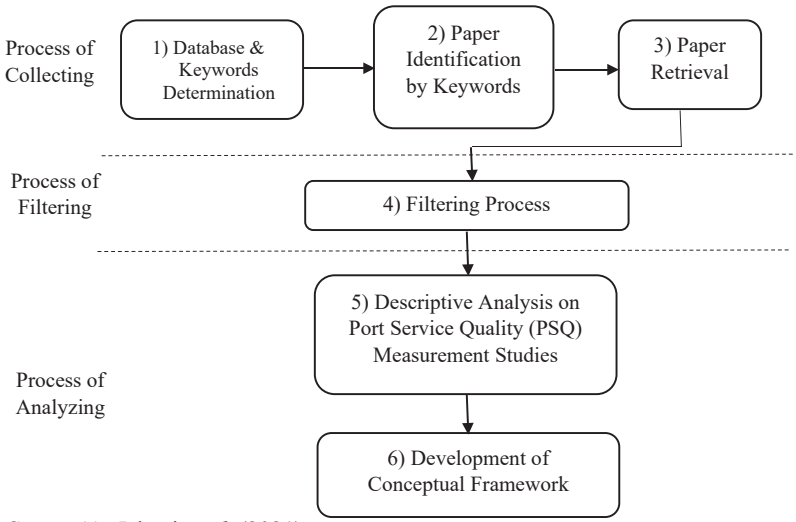
However, as no previous service quality research had been conducted on Omani ports, this study aimed to evaluate the service quality of the three major Omani seaports mentioned using the most comprehensive PSQ measurement model.

2.2 Systematic literature review of port service quality (PSQ) measurement models

The quality of ports in a country can be evaluated in various ways, as seen in the studies conducted by Yeo *et al.* (2015), Thai (2016), Limbourg *et al.* (2016) and Onyemechi *et al.* (2017). Yeo *et al.* (2015) found a direct link between PSQ and customer satisfaction, while Thai (2016) and Yeo *et al.* (2015) contributed to the actual management practices within ports by constructing a reliable PSQ scale to measure customer satisfaction. Limbourg *et al.* (2016) used the five dimensions of the Service Quality (SERVQUAL) model to measure PSQ and identified the importance of logistics service providers (LSPs) in delivering commendable services. Meanwhile, Onyemechi *et al.* (2017) reported positive changes in port services following the transfer of terminal operations from public to private terminal operators, which introduced competition and forced operators to provide quality services to attract and retain customers. Private investments in constructing new facilities have also resulted in positive outcomes regarding SERVQUAL dimensions.

Although various industries have been studied extensively to measure service quality, the research on this topic in the maritime industry, particularly in ports, has been limited. Most maritime-related literature concentrates on carrier and port selection rather than the thorough measurement of service quality in this sector (Thai, 2016). According to Phan *et al.* (2021), research on service quality in the maritime sector and ports has not been widely conducted in the literature. The first studies on evaluating port services were conducted in the late 20th century by Foster (1979), Slack (1985) and Murphy and Ross (1987), who merged the concepts of PSQ and port selection by asking survey participants to identify the key factors for selecting a port.

To get a comprehensive understanding of the PSQ studies in global academic literature, this study employed a systematic literature review (SLR) approach to collect, filter and analyze relevant journal papers. The approach consisted of several key steps: (1) defining and determining appropriate keywords and databases, (2) identifying relevant papers based on the keywords, (3) retrieving the relevant papers, (4) filtering the papers, (5) analyzing the selected papers and (6) developing the conceptual framework of this study, illustrated in Figure 2.



Source(s): Jahani *et al*. (2021)

Figure 2. Systematic literature reviewing process applied in this study

According to Figure 2, the first step involved determining the appropriate literature databases and keywords to cover the scope of the study. The keywords were divided into two categories: Category 1 included keywords related to PSQ, ROPMIS model and port operations, while category 2 included keywords related to service quality, seaports and port geography. The inclusion criteria for the paper selection were based on these keywords. The literature searching process was conducted using Google Scholar, Scopus and Web of Science (WoS), but only papers indexed in Scopus and WoS were selected for the review process to ensure their quality. In the second step, the relevant papers were identified through the selected literature database system using the determined keywords. The third step involved retrieving and screening the relevant papers based on the study's quality and scope, and only the good-quality papers that matched the study's scope were selected. The selected papers were analyzed in the fifth and sixth steps to develop the conceptual framework of the study, where a review of statistics was conducted PSQ measurement studies were recognized and a conceptual framework was developed to highlight related gaps or issues found. Similar processes were used by other studies, such as Mehdiabadi *et al.* (2020), Toorajipour *et al.* (2021) and Xi and Hamari (2021).

After completing the filtering process, this study was able to find only 24 papers out of 35 papers retrieved from the selected databases that covered the topic of PSQ between the years 2004–2022 (See Appendix). Eleven (11) papers were excluded from this study as they did not meet the indexing and inclusion criteria set for this study. Based on the review of those 24 selected papers (See Appendix), it can be concluded that previous studies focused on four (4) different scopes, as shown in Figure 3. The scopes that most studies covered were (1) identifying PSQ determinants, (2) determining/comparing the level of PSQ, (3) developing new structural PSQ models and (4) evaluating the effects of service quality on customer satisfaction, loyalty or referral intentions.

In addition to the research on the above scopes, various PSQ measurement models were applied in the studies reviewed, including the SERVQUAL model, ROPMIS model, Kano's model, importance-performance analysis model, customer-based PSQ model and structural PSQ model. The analysis of these PSQ measurement models used in the studies reviewed is summarized in Figure 4.

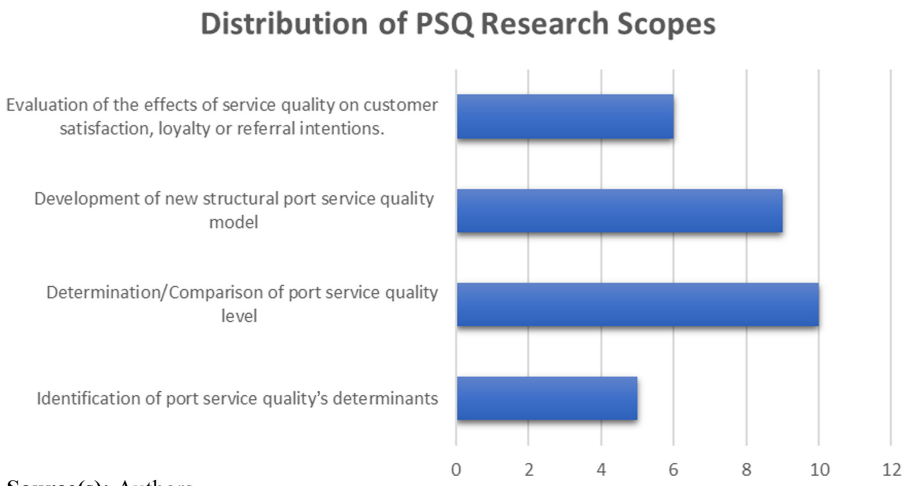


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Figure 3. Scopes that most previous studies covered related to PSQ

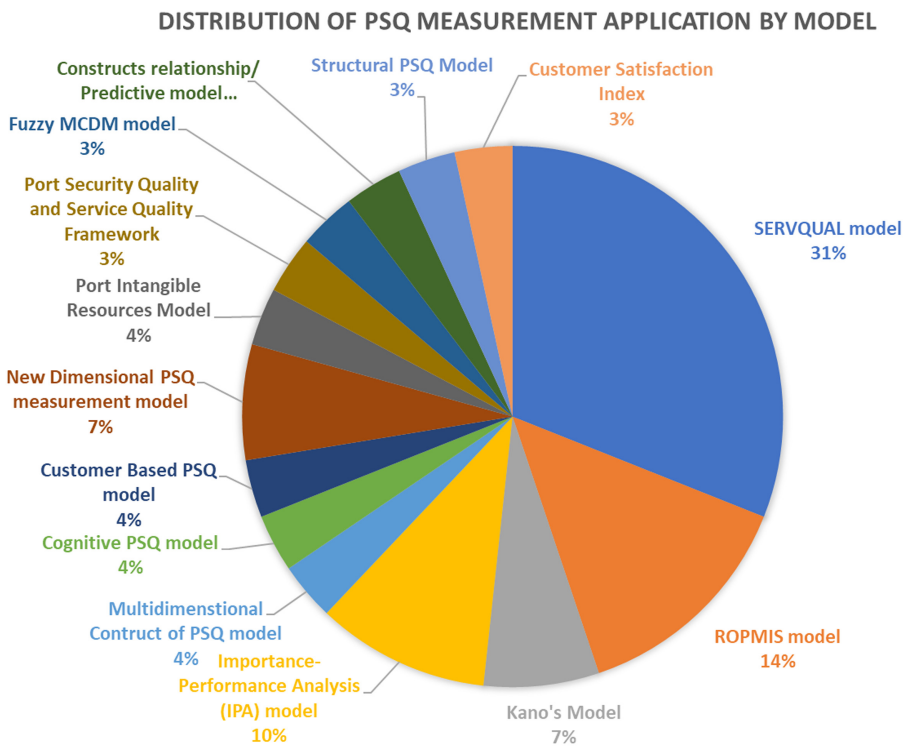

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Figure 4. PSQ measurement models applied in previous studies

In addition, the review process summarized the distribution of PSQ research by country. Figure 5 indicates that 17% of the studies on PSQ were conducted from the Korean ports' perspective, while 14% were from the Vietnamese ports' perspective, 12% from the Chinese ports' perspective and 9% from the African, Taiwanese and Singaporean ports' perspectives, among others.

However, the review process showed that no comprehensive study was conducted in the past to assess or evaluate the service quality level at the ports of Oman. This knowledge gap could be detrimental to the Omani ports, potentially hindering their opportunities to achieve the goals of Sultanate of Oman Logistics Strategy (SOLS) 2040 sustainably. Port operating companies must understand factors that satisfy their customers to ensure customer satisfaction, which is a significant output that portrays service quality in maritime transport, including the port sector (Thai, 2008, 2016; Yeo *et al.*, 2015; Phan *et al.*, 2021). Obtaining a high degree of customer satisfaction is essential for each port to maintain customer loyalty. According to Cho *et al.* (2010) and Yeo *et al.* (2015), customer satisfaction, loyalty and referral intention are the outcomes of good service quality. This study aims to address the gap in the literature on PSQ studies, particularly from the perspective of Omani ports.

2.3 ROPMIS model

Thai (2008) introduced ROPMIS, a PSQ measurement model that explored service quality in the maritime transport sector. The model focused on six dimensions of measurement, which were resources, outcomes, process, management, image and social responsibility. These dimensions were developed based on a comprehensive review of service quality dimensions and factors in previous studies. The ROPMIS model was found to be more applicable to the maritime industry because it included image and social responsibility, which are critical in the industry, compared to the dimensions used in the SERVQUAL model. Thai (2008) also suggested that the dimensions could be revised for specific subsectors in the maritime industry, such as ports, as the dimensions used in the ROPMIS model were relevant to the port sector. Thai (2016) identified six quality dimensions in this model.

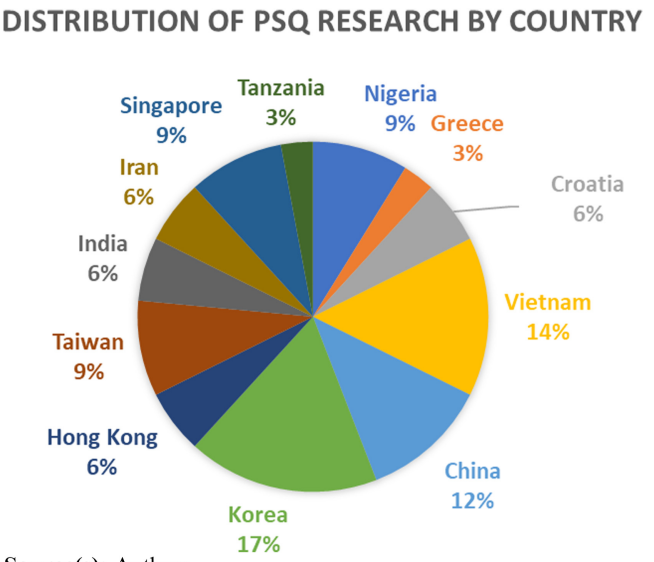

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Figure 5.
PSQ research areas based on previous studies

(1) *Resources-related:* concerns physical and financial resources, facilities and equipment conditions, location, infrastructure and other related resources.

(2) *Outcome-related:* involves the services provided to customers, including on-time delivery of shipments and service pricing.

(3) *Process-related:* pertains to the interaction between employees and customers, including how staff behavior is perceived by customers, their knowledge of customer needs and the use of technology to improve service.

(4) *Management-related:* involves the efficient selection and deployment of resources to meet and exceed customer needs and expectations, employee knowledge, skills and professionalism, and transforming customer requirements into reality.

(5) *Image/reputation-related:* relates to customers' overall perception of the service organization.

(6) *Social responsibility-related:* concerns an organization's ethical practices and operations in behaving in a socially responsible manner.

Apart of their advantages, which are useful to be applied in the maritime industry, researchers should also be noted on their weaknesses, such as in terms of simplification and flexibility. In terms of simplification, the ROPMIS model simplifies the assessment of service quality by categorizing it into six dimensions. While this simplicity can be useful, it somehow may oversimplify the complex nature of service quality in maritime transport, where numerous factors influence the overall customer experience. On the other hand, as the model follows a predetermined set of dimensions, it may not be easily adaptable to a unique characteristics or requirements of different maritime transport operations. This lack of flexibility can limit its applicability in diverse service settings or emerging trends within the industry (Thai, 2008, 2016; Yeo *et al.*, 2015). Due to that, any revision made for specific subsectors in the maritime industry or other industries may not produce the actual output measured. Therefore, to avoid the reliability of the data being compromised after any revision made to the model; a proper verification process should be made accordingly by including reviews of qualified field experts to validate the measurement items under each parameter involved. In addition, Cronbach Alpha's consistency test can also be conducted in the verification process to calculate the reliability of the measurement items. This verification process helps to ensure the relevancy and adequacy of measurement items under each parameter are maintained (Le-Hoang, 2020).

3. Methodology

In the previous section, we used the ROPMIS model created by Thai (2008) to assess PSQ. We chose this model because it is more relevant than other PSQ models for evaluating service quality in the port sector, as it can highlight specific problem areas that require immediate attention once analyzed. Furthermore, it is a valuable tool for measuring service quality and benchmarking across maritime industry organizations (Thai, 2008, 2016; Yeo *et al.*, 2015).

To fill the gap in knowledge about PSQ studies from the perspective of Omani ports, we developed a new conceptual model specifically for this study, as shown in Figure 6. This model is an extension of Thai's (2008) model and has been adapted to fit the perspectives of Omani ports.

3.1 Research methodological framework

A framework was created for the study, which is illustrated in Figure 7, to organize research activities and outline important stages. Drawing from Figure 6, the framework provides a

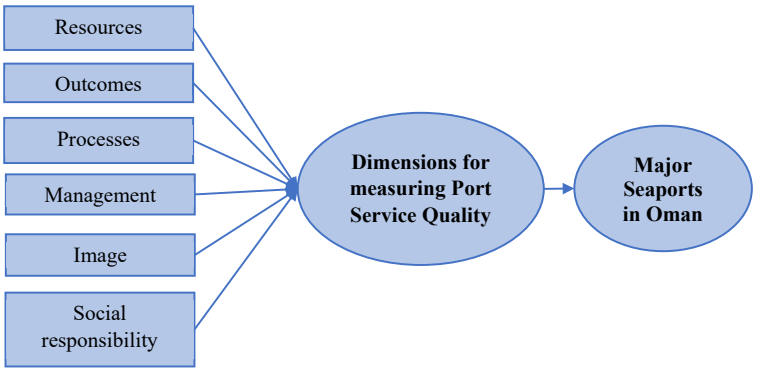

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Figure 6. Conceptual framework of this study

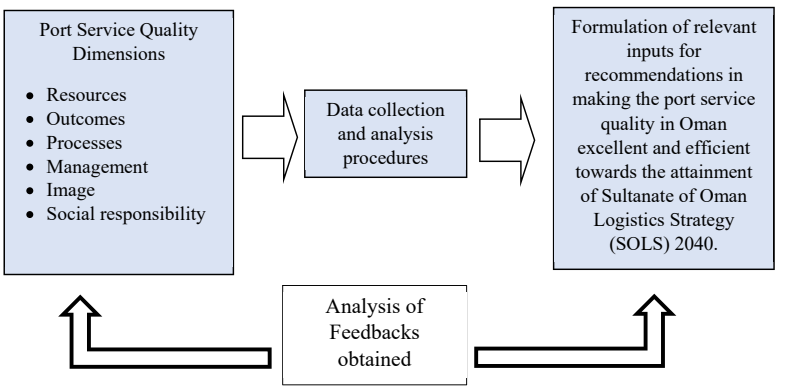

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Figure 7. The research methodological framework of this study

summary of how the dimensions of PSQ were utilized to develop relevant strategies for improving PSQ in Oman in line with the SOLS 2040.

During the research process, this study relied on qualitative information to collect quantitative data from the respondents. Qualitative information was used to verify the initial parameters or constructs in the model adopted and ensure that they were suitable for Oman's port industry perspectives. Through interviews, a final set of constructs for measurement was determined to collect quantitative data. Expert sampling technique has been applied to select only qualified experts with appropriate experience and background to validate the parameters. The main criteria of the qualified experts are the respondents should be currently working in the port industry, and in terms of experience, they should have more than 10 years of experience of services in the industry. Based on these criteria, five experts have been selected as qualified respondents to verify the parameters. Table 1 summarizes the qualitative constructs and measurement items that were finalized to facilitate the quantitative data collection process. Subsequently, a survey was conducted to collect the required quantitative data.

The study designed questionnaires to collect quantitative data, which incorporated the Likert scale to measure the responses of the participants. To ensure ease of data interpretation, this paper followed a certain procedure in determining the cell measurements for the Likert

Research variables and measurement items	Labels
Resource-related PSQ	
1. The port that we are using always has available equipment and facilities to meet our requirements	E1
2. The equipment and facilities of the port that we are using are modern and always function properly	E2
3. The port that we are using has strong and stable financial stability	E3
4. The port that we are using has excellent shipment track and trace capability	E4
5. The port that we are using has excellent physical infrastructures such as berths, yards, warehouses, distribution centers and hinterland connection networks	E5
Outcome-related PSQ	
1. The port that we are using always provides fast service	E6
2. The port that we are using always reliably provides service	E7
3. The port we are using always provides service in a consistent manner	E8
4. The port that we are using always ensures safety and security for our ships/shipments	E9
5. The port that we are using always produce error-free invoice and related documents	E10
6. The port that we are using always offers a competitive price of service	E11
7. The port that we are suing can always meet our service requirements anytime and anywhere we want	E12
Process-related PSQ	
1. The staff in the port that we are using always demonstrate a professional attitude and behavior in meeting our requirements	E13
2. The staff in the port that we are using always respond quickly to our inquiries and request	E14
3. The staff in the port that we are using always demonstrate good knowledge of our needs and requirements	E15
4. The level of information and communication technology (ICT) applications in customer service at the port that we are using is comprehensive	E16
Management-related PSQ	
1. The level of ICT applications in port operations and management at the port that we are using is comprehensive	E17
2. The port that we are using demonstrates a high level of efficiency in operations and management	E18
3. The management in the port that we are using always demonstrate good knowledge and competence, including incident-handling capability	E19
4. The management in the port that we are using always demonstrates a good understanding of our needs and requirements	E20
5. The port that we are using always collects our feedback about their services and reflect on their improvement	E21
6. The port that we are using continuously improves its customer-oriented operation and management processes	E22
Image and social responsibility-related PSQ	
1. The port that we are using demonstrates a good relationship with other ports and land transport service providers	E23
2. The port that we are using possesses a positive reputation for reliability in the market.	E24
3. The port that we are using always emphasized on operations and work safety	E25
4. The port that we are using demonstrates a good record of operations and work safety	E26
5. The port that we are using fulfills good social responsibility to their employees and other stakeholders	E27
6. The port that we are using always emphasizes environmentally responsible operations	E28
7. The port that we are using has in place an environmental management system	E29

Source(s): Adopted from Thai (2008) and Yeo *et al.* (2015)

Table 1. Constructs and measurement items

scoring. They used a range of scores from 1 to 5, giving a range of 4 (5–1 = 4). Then, they divided the range by the number of cells, which was 5, resulting in a cell length of 0.8 (5/4). As a result, the first cell length was 1 + 0.8 = 1.8, as shown in Table 2.

Using stratified and snowball sampling procedures, a total of 102 respondents were obtained for this study. These 102 respondents were selected from several cargo owners, logistics companies, freight forwarders and shipping companies because they have adequate experience of utilizing Oman's port services, which is necessary for this study to ensure that their feedback are valid and reliable for assessing the PSQ. In addition, their selections in the filtering process are also based on their working experience and background, which includes more than 5 years of experience and currently active engagement with port services in Oman. Their wide experience engaging in various port services allows them to have proper insights for evaluating the level of services provided by each port, respectively.

Based on the stratified sampling technique, the respondents have been segregated into three different backgrounds, which are the managers, supervisors, and ship navigating officers, in order to gather feedback by combining different angles of perspectives. The managers and supervisors provided their evaluations based on their experiences from the perspectives of cargo companies or freight forwarders using the port services, but from two different angles, from the management and operational sides, respectively. Meanwhile, the ship officers provided their evaluations based on their experiences in the aspects of the marine sides (i.e. ship traffic management, waiting time, turnaround time, etc.). Nevertheless, due to certain restrictions to access the respondents, especially the ship navigating officers such as port and ship security policy, a snowball sampling technique is also incorporated to support the stratified sampling process so that proper access to qualified respondents can be realized. This was successfully done with cooperation from the related company and port representatives.

Table 3 provides a breakdown of respondents by the main seaports in Oman. According to the records, 51% of the total respondents provided feedback on the service quality of Ad Duqm port, while 39.2% were for Sohar port and 9.8% were for Salalah port.

The collected data were analyzed using statistical methods after the questionnaires were retrieved. To evaluate the responses, frequency analysis and percentage distribution were used, as stated in previous studies (Abdul Rahman *et al.*, 2016; Othman *et al.*, 2019). Moreover, the level of PSQ was analyzed using a weighted mean. The weighted mean calculates the average of the mean of all the groups based on their respective weight (the N in each group), as shown in Eq. (1) in the article. Bluman (2012) describes the weighted mean as the weight

Table 2. Likert scale interpretations

Evaluation scale	Mean	Qualitative evaluation	Level of interpretation
1	1.00–1.80	Needs improvement	Very low
2	1.81–2.60	Fair	Low
3	2.61–3.40	Satisfactory	Neutral
4	3.41–4.20	Very satisfactory	High
5	4.21–5.00	Outstanding	Very high

Source(s): Adopted from Nyutu *et al.* (2021) and Aletaiby *et al.* (2021)

Table 3. Breakdown of respondents

Port	No. of respondents	Percentage (%)
Ad Duqm	52	51.0
Sohar	40	39.2
Salalah	10	9.8
Total	102	100.0

Source(s): Authors

arithmetic means of the given data groups. The sum of the mean of each group multiplied by its respective weight is divided by the total weight.

$$X_i = \frac{\sum_{i=1}^{n} (w_i x_i)}{\sum_{i=1}^{n} (w_i)} \quad (1)$$

where X is the weighted mean, wi is the calculated weight value and xi is the observed value.

4. Empirical analysis and discussions

4.1 Demographic profile

Table 4 presents the demographic profile of the participants who took part in the study. The data gathered revealed that the highest percentage (40.2%) of respondents fell within the 41–50 age group. The age group of 31–40 constituted 34.3%, while only 11.8% were between 21 and 30 years old. This suggests that the respondents were mature enough to assess the PSQ and provide appropriate feedback for the survey. Concerning gender, 95.1% of the respondents were male, and only 4.9% were female. In terms of educational background, most of the respondents (73.5%) were college graduates, while only 3.9% had a high school education. In terms of job positions, 40.2% were managers, 30.39% were supervisors and 29.41% were navigating officers.

4.2 Evaluation of port service quality

The questionnaire used in this study consisted of 29 sub-variables that were combined into five variables related to the quality of port services. The values for these five criteria are shown in Table 5.

Referring to Table 5, the analyzed data can be explained as follows:

Resources: Five questions were used to measure this indicator, and a mean score of 3.59 was obtained, which was the second-highest score. The score indicates that the respondents strongly agreed that the main ports in Oman had various port resources available. They believed that the ports had modern equipment and physical infrastructure that could cater to the required services and meet the needs of their clients. Having modern facilities and

Characteristic	Category	Frequency	Percentage (%)
Age	21–30	12	11.8
	31–40	35	34.3
	41–50	41	40.2
	51 and above	14	13.7
Gender	Male	97	95.1
	Female	5	4.9
Educational attainment	High school	4	3.9
	Vocational	9	8.8
	College	75	73.5
	Postgraduate	14	13.7
Job position	Manager	41	40.2
	Supervisor	31	30.39
	Navigating officer	30	29.41

Source(s): Authors

Table 4. Demographic profile of respondents

Variables	Sub-variables	Mean value	Std. Dev
Resources	E1	3.59	0.57
	E2		
	E3		
	E4		
	E5		
Outcome	E6	3.51	0.54
	E7		
	E8		
	E9		
	E10		
	E11		
	E12		
Process	E13	3.50	0.58
	E14		
	E15		
	E16		
Management	E17	3.49	0.56
	E18		
	E19		
	E20		
	E21		
	E22		
Image and social responsibility	E23	3.68	0.56
	E24		
	E25		
	E26		
	E27		
	E28		
	E29		

Source(s): Authors

Table 5. Statistical analysis value of "port service quality" criteria

equipment is important for port operators to provide efficient and excellent services that can satisfy their client's needs and wants. However, being rated "high" means that there is still room for improvement for the port operators to enhance the quality of the port services.

Outcomes: Seven questions were presented to the respondents for their assessment. After analyzing the results and referring to the summary in Table 5, it was found that the mean score for the outcome indicator was 3.51. This suggests that the respondents agreed that the port operators provided fast and reliable services, ensuring that the goods were in good condition and documents were handled properly, thereby satisfying their clients. Nonetheless, since the mean score was 3.51 out of 5, it indicates that there is still room for improvement in the reliability of service provision. This improvement is necessary for the port operators to establish solid trust among their customers and enhance customer loyalty.

Processes: Four questions related to the port process aspect were used to measure this indicator for the respondents who utilized the related services at the ports. The result is summarized in Table 3 and shows that the mean score obtained was 3.50, indicating that the respondents agreed that the port operators always responded to their inquiries and requests with good knowledge and a professional attitude. Customers look for port servicing companies that can adequately respond to their requests and solve their problems as soon as possible. However, the rating also revealed a gap of 1.5 (5.00–3.50 = 1.50), indicating that a lot needs to be done to improve the processes within the port to make it outstanding and attract more users. For instance, port servicing companies need to pay serious attention to improving

their timeliness by responding quickly to customers' requests with proper manners to ensure their satisfaction with the services given.

Management: Six questions were used to measure this indicator, which recorded the lowest mean score of 3.49 compared with the other four indicators. Respondents indicated that the port operators were capable of achieving a high level of efficiency in their operations and management through the use of comprehensive ICT applications. The application of advanced technology in the port management system could make tasks and processes much easier to organize and coordinate. It also improved efficiency and accuracy in port management. The score obtained showed a gap of 1.51, which meant that companies needed to make necessary changes to improve their management systems to progress further in the global logistics network. To identify critical improvement areas in the management aspect, port operators had to collect appropriate feedback from their clients to analyze and assist in making the right decisions.

Image and social responsibility. Seven questions were used to measure this indicator, and it had the highest mean score of 3.68. According to the results, the respondents thought that the port operators in Oman presented a "very satisfactory" image and social responsibility, although there were still some areas that needed improvement. Therefore, the ports had to pay attention and be committed to achieving an excellent image and social responsibility standard.

Table 5 shows the overall evaluation of "Port Service Quality" for the three Omani ports involved. The analysis showed that all three ports in Oman had a "high" quality of port services according to the overall average rating in Table 5. However, the respondents believed that the port operators should focus on improving their services to keep up with the latest trends in global logistics development, such as advanced technological facilities and systems in the port sector. This is because the overall average rating obtained was only 3.55, indicating that there is room for improvement to make seaport operations more effective and efficient.

5. Recommendations and conclusions

The results of the study suggest that the services offered in Oman's three ports are above standard, as they were rated "high" and "very satisfactory" by users in terms of service quality. However, given the increasing competition and the Sultanate's goal to become the best logistics hub in the region, it was felt that improvements were needed in several areas, such as resource utilization, results, processes, management and image and social responsibility, to achieve outstanding service levels. Several recommendations are made to improve port services in Oman, which could be used as inputs to achieve the objectives of the Sultanate of Oman logistics strategy (SOLS) 2040.

In terms of resources, port operators need to invest in building modern seaports with state-of-the-art facilities. They need to upgrade outdated systems, facilities and infrastructure to improve port operations. In addition, they must ensure the safety of cargoes and their employees while improving the efficiency of cargo operations to avoid port congestion.

When it comes to outcomes, it is crucial to not only meet but exceed customers' expectations by delivering services that are responsive and efficient. Additionally, having a robust strategy in place to effectively plan workforce shifts is recommended to ensure clients' needs are accommodated.

In terms of the process aspect, the port operators need to possess the necessary skills to respond to the requirements of their clients, as appropriately addressing the needs of the customers can improve their satisfaction level. Increased satisfaction levels can help build customer loyalty, resulting in the continued use of port services. This, in turn, helps sustain the annual port revenue.

In terms of management, it is recommended that port operators adopt new technology and automation systems to improve their management and operation systems. By doing so and properly allocating expertise, it will enhance the efficiency and effectiveness of the ports and lead to cost minimization, thus improving competitiveness. Furthermore, port recruiters should review and improve their hiring policies to ensure that the right people are hired for the right job regardless of their diverse backgrounds. To attract diverse clients, ports should have a strategic operational management and marketing plan to help them achieve their goals and stay on track despite any distractions. This strategy will increase the confidence of clients and investors as they will see that the port management team has a clear vision and a solid plan to deliver the best services.

In terms of the port's image, port operators need to implement a good governance system that is in line with their guiding principles. This will increase stakeholders' confidence and build a positive reputation. Additionally, port operators can utilize social media and other online platforms to promote their services, and port activities, and gather customer feedback. This will increase the ports' global visibility and allow for the analysis of market demands.

As for social responsibility, port management should implement environmentally friendly practices in their operations to preserve natural resources, protect the environment and promote resource efficiency within the organization.

This study provides important managerial implications for the main port operators in Oman, such as the Oman Dry Dock Company, Salalah Port Services Company and Sohar Industrial Port Company. The findings highlight areas that the port management can improve to enhance the quality of their services and establish long-term relationships with their clients. Additionally, the study can guide stakeholders in re-engineering the logistics infrastructure and services to achieve the SOLS 2040 goals and establish Oman as a global logistics hub while promoting the general welfare. This research can also assist future studies in this area.

The study provides several policy implications that suggest revising policies related to diverse workforce hiring, modern seaport development, exceeding customer expectations, upgrading operator skills, taking measures to minimize work-related risks, using technology and automation to improve port management and operations, and improving governance to align with guiding principles.

In the future, it is recommended that studies focus on evaluating the impact of each policy on improving PSQ in Omani's ports through in-depth analysis processes. In this way, the effectiveness of each policy can be recognized, and additional insights from these studies can contribute to better decision-making.

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(The Appendix follows overleaf)

Appendix

Table A1. The theoretical models applied in literatures related to port service quality (PSQ)

No.	Authors	SERVQUAL	ROPMIS	Kano	Importance-Performance Analysis (IPA)	Multidimensional PSQ	Cognitive PSQ	Customer Based PSQ	New Dimensional PSQ	Port Intangible Resources	Port Security Quality and Service Quality	Fuzzy MCDM	Constructs relationship/ Predictive	Structural PSQ	Customer Satisfaction Index
1	Ugboma, Ibe and Ogwude (2004)	x													
2	Pantouvakis (2006)					x									
3	Ugboma *et al.,* (2007)	x													x
4	Kolanović, Skenderović and Zenzerović (2008)													x	
5	Thai (2008)		x												
6	Cho, Kim and Hyun (2010)						x								
7	Kolanović, Dundović and Jugović (2011)							x							
8	Lee and Hu (2012)	x		x											
9	Lee, Tongzon and Chang (2013)								x						
10	Jafari, Saeidi and Karimi (2013)				x										
11	Yeo *et al.* (2015)		x												
12	Park *et al.* (2015)									x					
13	Thai (2016)		x												
14	Chang and Thai (2016)										x				
15	Sayareh *et al.* (2016)	x													
16	Hu and Lee (2017)	x		x	x										
17	Hemalatha *et al.* (2018)	x													
18	Pham and Yeo (2019)											x			
19	Sakyi (2020)	x													
20	Bakari and Subriadi (2020)												x		
21	Le *et al.* (2020)	x													
22	Hemalatha, Dumpala and Balakrishna (2020)								x						
23	Phan *et al.* (2021)		x												
24	Nguyen *et al.* (2022)	x			x										
		9	4	2	3	1	1	1	2	1	1	1	1	1	1

Source(s): Authors

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