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The impact of the safety of passenger ship services on the development of water recreation: evidence from Indonesia

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This research aims to assess the safety of ship passenger services as one of the efforts to promote water recreation on the Musi River, South Sumatera. Rivers in Indonesia, through their role as a means of moving goods and people, greatly influence transportation and tourism, especially water recreation. Without safe transportation, there will be no travel and tourism industry. The accident rate of river transportation in Indonesia, including on the Musi River, today is still relatively high, and there still is no care about the assessment of riverboat services safety. The safety assessment was done with the analysis method using gap analysis with the analysis technique of Importance Performance Analysis. The research was conducted in Wharf 16 Ilir Palembang with a sample of as many as 264 people, including ship operators, passengers, and regulators. The study finds first that most users of riverboat services on the Musi River tend to be unsatisfied. Second, the need to improve the information on the safety equipment storage and the availability of safety equipment use instructions. Based on the findings, to develop water recreation on the Musi River, boat condition setting, and boat passenger safety are essential factors to be prioritized since the passengers or tourists mainly consider them in using sea transportation.

1. Introduction

The river is one of the primary tourist resources that provide opportunities for recreation, seaside landscape, and many exciting tourist locations, as well as essential water sources or transportation facilities for people to consume (Prideaux et al., 2009). Rivers in Indonesia are still open for the utilization of cargo transportation, passenger transportation, and tourism. They are very cheap, like the one that has been long developed in Kalimantan and Sumatra, which are so far utilized for cargo transportation. Therefore, the river transportation mode utilized for cargo transportation has a potential tourism attractiveness. However, it needs time and financial and managerial support from the government to promote its development as a tourist attraction, especially in water recreation (Hailuddin et al., 2022). The study of river transportation with the objective of water recreation has been conducted before by some researchers (An & Park, 2020; Kelana, 2021; Park et al., 2018 Tjahjono, 2020).). Venice is the second biggest port in Italy after Civitavecchia, where the cruise ship industry represents 3 percent of Venice's Gross Domestic Product (Pesce et al., 2018). The finding, in line with Rahmanita et al. (2020), states that tourism activities start to develop well or exist. A positive multiplier appears through the increase in revenue and job opportunities.

Referring to the study conducted by Risposte Turismo company for the Italian division of the Cruise Lines International Association (CLIA), the industry of cruise ships passing by the Venice river has contributed around Euro 410 million or $

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464.9 million a year, and job opportunities for more than 4,000 people as permanent employees (Mangano, & Ugolini, 2020). In addition, Łapko and Panasiuk (2019) find the interdependency between the tourist traffic resulting from water recreation participants and the service demand, especially in transportation services. The Province of South Sumatra is crossed by the Musi River as long as 750 kilometers. The river connects Palembang city to other cities or regencies around Palembang. As an alternative transportation mode, the boats operating on the Musi River are varied, such as Kapal Jukung (small traditional fishing boat) used for carrying cargo, Kapal Ketek (traditional canoe), and speedboats which are used for carrying passengers and their luggage, and tourist boats in the form of water bus used by tourists for visiting tourist places along the Musi River. The traffic in Musi River is heavy enough, and accidents occur very frequently, and based on many previous studies since 2016, there have been more than ten times of accidents due to human error or due to the design of river transportation safety (Apriani et al., 2020)

A tourist location on the Musi River, namely Tangga Buntung, needs English Language training for the citizen community members to enhance the value of local tourism (Ramadhan & Asmaruddin, 2016 Umarella et al., 2022). The finding of Nandana et al. (2021) explains the lack ness of activities tourists can do there, the blackness of synergy between the government and society in the development of this area, and the absence of specific Local Regulation in the area of Musi River for the concept of waterfront city. Meanwhile, the area of the Musi River has tourism potential. According to Rahmanita et al. (2020), the initiative and integrated measures from the government and interest groups need to be optimized to empower tourism to give the highest contribution to the local economy. Therefore, it needs to revitalize the Musi River to be a tourist destination as part of the seaside city of Palembang. An example of such a revitalization in China is the Yangtze River in the economic zone (Liu et al., 2018).

Previous research on ship safety has been conducted, but most are about sea or ferry transportation safety. River transportation is different from both sea transportation and ferry transportation. In general, Fan et al.(2016) research finds that land passenger shipment is one of the most comfortable ways of traveling by water. However, serious accidents happening to passenger ships in China have revealed specific weaknesses in the safety system of land passenger ships. Previous researchers Awal et al. (2014), Sakalayen (2006), and Uddin and Awal (2018) in Bangladesh state that although it is a river country, it still has some significant weaknesses in ensuring safety. Under the Indonesian Government Regulation, riverboats must fulfill the requirements of ship safety in terms of material, construction, machinery and electricity, stability, layout, and equipment, including auxiliary equipment, radio, and ship electronics. Every ship that sails must have a sailing approval letter issued by the Harbormaster. Based on those requirements, the five main objectives of this research concerning the criteria for assessing the safety of riverboat services are; (1) ship construction, (2) safety equipment, (3) navigation and communication devices, (4) seafarers' ability, and (5) safety instructions. Nevertheless, as the standard of speedboat passenger safety in the Musi River stream area, some Transportation Minister Regulations of the Republic of Indonesia still need to be implemented (Alam, 2020).

This research identifies the criteria for assessing the safety to improve the safety of riverboats and compares the differences in the perception of operators, passengers, and the government about their level of importance. Several main problems in this research are; (1) The accident rate of river transportation in Indonesia, including on the Musi River, today is still relatively high, (2) The low awareness of ship operators and river transportation users concerning the importance of fulfilling the factors of riverboat safety which can cause boat accidents resulting in fatalities, and (3) There is no awareness about the importance of assessing the safety of riverboat services.

2. Literature Review

2.1 Water Recreation

Water offers various opportunities for recreation and tourism activities (Solís & Zhu, 2015). Water resources such as coastline, lake, river, and waterfall are found to have attractiveness as tourist places. Various kinds of water containers can support various kinds of tours, like beach tours, river tours, reservoir tours, lake tours, natural pool tours, and hot spring tours (Hudson, 2013). Water recreation is a recreation and spare time activity with the objects that are natural or artificial water surfaces, riverside or lakeside, and its surroundings. Water recreation begins to reappear along with the development of some water transportation modes and various activities people do in their spare time around the water's surface. The study of Nezdoiminov and Andreeva (2017) finds that water passenger transportation is a factor that affects the speed of river tour development. Evaluation Li et al. (2019) indicate that water-based tourism has a performance that is economically and socially profitable in sustainable development and suitable for the development condition.

In the development of river transportation, the service factor is considered an essential component and has a significant influence on passenger satisfaction (Tanko et al., 2019; Widiyanto et al., 2021; Ricardianto et al., 2022; Ricardianto et al., 2023). One of Brun et al. (2011) findings is that tourists pay very much attention to their safety and security. This is in line with Krykavskyy et al. (2020), who find that security is one consideration for consumers to use water transportation. In addition, according to Łapko and Panasiuk (2019), there is an interdependency between the tourism traffic resulting from the water recreation participants and the service demand, especially transportation services.

2.2 Ship Construction

Shipping safety is not only seen from the ship's condition because many factors influence it, for example, the implementation of a planned maintenance system that can be done by the operators or shipyard (Tungkup, 2020). According to Sakalayen (2006), design and construction are the roots of ensuring security. Almost in every ferry accident, faulty construction is the primary or secondary cause. Failed ship construction is the leading cause of the loss of hall integrity, which in turn causes the loss of the ship and its passengers (Soares &Teixeira, 2001; Wang, 2001). According to the study by Wang (2001), there are four criteria to assess safety: general engineering and technical system, generic personnel sub-system, generic operational and managerial infrastructures, and generic operation environment. The variable dimensions used in this research are; (1) The material condition of the ship's hull, (2) The availability of an emergency exit for evacuation, and (3) The implementation of Plimsoll (ship loading line) to know the limit to load the ship, and (4) The availability of ship crash resistance system (tire rubber, sponge).

2.3 Navigation and Communication

Communication devices, according to Wonham et al. (2000), such as radar systems, spotlights, broadcasting systems, sonic signaling devices, and telemetry systems, enable the monitoring of the ship's position during its journey and the work instructions and the crew's ability to operate them correctly must be checked regularly. Cost-effectiveness evaluation of the new passenger monitoring system based on RFID technology is to be implemented in the passenger ship (Vanem & Ellis, 2010). Another research on the Chao Phraya River, Thailand, explains that the navigation in the canal system can be badly affected by the proposal of injecting water into the sediment (Olson & Kreznor, 2021). The result of research by Uğurlu et al. (2015) shows that the types of accidents happening to riverboats are the inefficient use of navigation devices and fatigue. The variable dimensions used in this research are; (1) Starboard hull lighting and left hull lighting, (2) White-colored surround lighting, and (3) Sound signal in the form of a horn.

2.4 Safety Equipment

The International Convention for Safety of Life at Sea (SOLAS) states that before the ship leaves the port and at any time during its journey, all the equipment for life safety must be in conditioned functioning and ready for immediate use. Wonham et al. (2000) in their study also explain that insufficient fire protection and ship instability are potentially harmful. Lois et al. (2004) state that fire, crash, and grounding become essential factors in assessing the safety of cruise ships. Another finding, according to Alam (2020), is the need to add a Mainland Water Sign in the Musi River shipping lane to support the safety, security, and necessity because of the incompleteness of inland water signs. In addition, according to the study by Alam (2020), the number of safety equipment such as life jackets and lifebuoys is only about 10% per boat, there is no passenger list as well, and passengers pay the transportation fee directly to the driver. The variable dimensions used in this research are; (1) The availability and sufficiency of life jackets or life vests, (2) The availability and sufficiency of lifebuoys, (3 The availability and sufficiency of fire extinguishers, and (4) The availability and sufficiency of equipment.

2.5 Seafarers' Ability

The findings of the research Wang and Shu (2021) may give a better outlook on the desire of students from the navigation department to work as Seafarers, as well as their attitudes and opinion about the job as a seafarer. Lois et al. (2004) state that when Seafarers professionally respond to an accident, this often prevents ship loss and fatalities. Seafarers' ability sums up their knowledge of safety communication systems, the lifeboats' location, and the survival procedures. In another research, Yuen et al. (2018) show that the transformational leadership of ship officers, team members' social support, and a balanced working system contribute directly to the Seafarers' psychological development. Retraining is also needed to renew the knowledge of the marine operation, life safety, practical navigation training, and the understanding of emergency announcements (Abiodun, 2021). The variable dimensions used in this research are; (1) Expertise in the ship operation, (2) Seafarers' compliance with regulations, (3) Seafarers' ability to respond to emergencies, and (4) Ship condition checking before sailing.

2.6 Safety Instructions

Based on the Government Regulation, riverboats must-have information on safety and health, namely: (1) Information on safety and medical facilities that is easy for passengers to see and read, (2) Information on security disruption, in the form of stickers mentioning the telephone number and complaint information which is attached on the place easy to see, and (3) Information on the disruption of journey. In their research in Bangladesh, Uddin and Awal (2020) also explain that the recommended implementation of safety requirements can effectively prevent the occurrence of the factors causing an accident and reduce accidents from happening to passenger ships. The objective ferry safety is to determine which party is responsible for the safety of the ferry at all the social orders, including the ferry owners, ferry local and national authorities, national trade and international business associations, and regulations (Lawson & Weisbrod, 2005). Another study by Lu and Yang (2011) also reveals a positive correlation between respondent age, ferry capacity, and compliance with safety. The

variable dimensions used in this research are; (1) Information on safety equipment storage, (2) The availability of safety equipment use instructions, and (3) Information on weather conditions.

Thus, this research analyzes the similarities and differences between the safety system of land passenger ships in domestic and overseas countries. This paper then describes the principles and proposes suggestions that underline the construction improvement and the implementation of the land ship system. Specifically, the latter is done by considering the ship design, construction, operation, regulation, emergency safety, practitioners, and related documents. This research aims to give recommendations for policymaking and scientific research of land passenger transportation from the life cycle perspective. Subsequently, the differences between expectation and performance are analyzed using the IPA (Importance Performance Analysis) method to determine whether the performances of the riverboat and lake ship are so far in line with the expectation and fulfill the safety requirements. Thus, the conceptual framework of this research is as follows (Fig. 1).

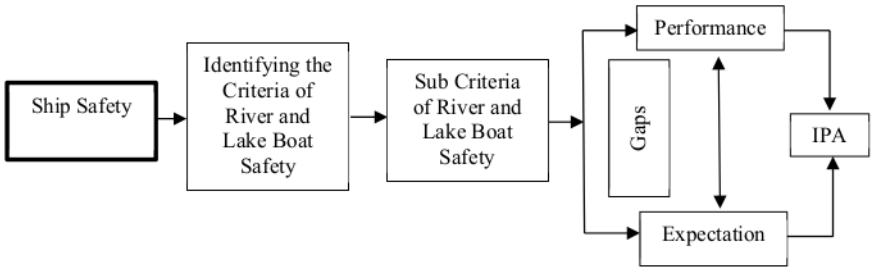

Fig. 1. Conceptual Framework

2.7 Hypotheses

1. Ho: the formula of the zero hypothesis states that there is no difference between the importance of safety attributes expected by the respondents and the performance of riverboat services.
2. Ha: The alternative hypothesis states a difference between the importance of safety attributes expected by the respondents and the performance of riverboat services.

3. Research Methodology

The research is conducted at Ward 16 Ilir Palembang, the node of river transportation in the water of Musi River. The location of Wharf 16 Ilir Palembang is near a market and water recreation and culinary area in Palembang City. This water recreation becomes the point of intermodal integration, namely mass transportation of Trans Musi, Light Rail Train, urban transportation, and river transportation. Wharf 16 Ilir Palembang serves 36 fixed routes connecting Palembang City and some regencies drained by the Musi River, namely Banyuasin, Musi Banyuasin, Ogan Ilir, and Ogan Komring Ilir. The population of this research consists of three categories of riverboat stakeholders: (1) Regulators in the Land Transportation Management Center, Palembang, who are government and non-government employees in the Section of River, Lake, and Ferry Transportation, and the officers at Wharf 16 Ilir as many as 42 people/day; (2) Ship Operators at Wharf 16 Ilir, who are the riverboat captains experienced in operating a ship with 53 people/day; and (3) Service users, the passengers of river transportation at Wharf 16 Ilir as many as 506 people/day. Therefore, based on the Slovin formula, the number of users to be the respondents in this research is at least 240 people. However, improve the data quality, and the sample is added by 10% of the minimum sample members, so this research uses 264 people.

In this research, the analysis of safety equipment on board the riverboats in Palembang city according to the prevailing regulations is conducted toward five variables which are subsequently broken down into 18 research dimensions. The analysis will show the gap's size, which becomes the difference between the average expected value and respondents' perceptions. Gap analysis is conducted to know how far the different importance of facility conditions is related to the safety of Musi River transportation in Palembang city at the perceived performance level. The average value of the assessed importance of expectation and the average value of performance level becomes the basis of calculation. If the average value of expectation is lower than the perceived satisfaction level, the sailing safety condition is considered satisfying. On the contrary, if the average performance level is lower, it can be concluded that the importance of implementation still needs to be fulfilled.

4. Results

4.1 Validity Test

In the validity test, this research compares the correlation value between product moment or r statistic and the value of the r

table. The criteria used here are that if the value the r statistic is higher than the value of the r table, then the dimensions being studied are valid dimensions, whereas if the value of the r statistic is lower than the value of the r table, then the dimensions being studied are not valid dimensions. Based on the number of samples being studied, as many as 264 respondents with a significance level of 5% or 0.05, then the value of the r table is 0.1381 (Table 1).

The results shown in Table 1 indicate that the criterion of ship construction consisting of four dimensions of performance and importance has the value of r statistic higher than the value of r table, that is 0.1381. This explains that the four dimensions used to explain the ship construction criterion are valid. Similar results are indicated by the four dimensions used to explain the criterion of safety equipment, three dimensions used to explain the criteria of navigation and communication, and four dimensions used to explain the criteria of Seafarers' Ability. In addition, three dimensions were used to explain the criterion of safety instructions which have the value of r statistic higher than the value of r table, that is 0.1381. Therefore, the 18 research dimensions used to explain the criteria of ship construction, safety equipment, navigation and communication, Seafarers' ability, and safety instructions are valid.

Table 1
Validity Test of Research Variables

Criterion	Dimension	Pearson Correlation (r statistic) of Performance	Pearson Correlation (r statistic) of Importance	r Table	Validity
Ship Construction	X1.1	0.534	0.4	0.1381	Valid
	X1.2	0.654	0.585	0.1381	Valid
	X1.3	0.595	0.496	0.1381	Valid
	X1.4	0.51	0.394	0.1381	Valid
Safety Equipment	X2.1	0.472	0.491	0.1381	Valid
	X2.2	0.702	0.709	0.1381	Valid
	X2.3	0.71	0.722	0.1381	Valid
	X2.4	0.543	0.596	0.1381	Valid
Navigation and Communication	X3.1	0.422	0.446	0.1381	Valid
	X3.2	0.474	0.483	0.1381	Valid
	X3.3	0.525	0.531	0.1381	Valid
Seafarers' Ability	X4.1	0.567	0.726	0.1381	Valid
	X4.2	0.566	0.717	0.1381	Valid
	X4.3	0.606	0.737	0.1381	Valid
	X4.4	0.464	0.578	0.1381	Valid
Safety Instructions	X5.1	0.584	0.65	0.1381	Valid
	X5.2	0.72	0.771	0.1381	Valid
	X5.3	0.591	0.637	0.,1381	Valid

4.2. Reliability Test

A reliability test is used to show the consistency of the 18 dimensions being studied in explaining the criteria: ship construction, safety equipment, navigation and communication, Seafarers' ability, and safety instructions. The reliability test is conducted using the criteria of Cronbach's alpha value higher than 0.6, so the instruments used are reliable.

Table 2
Reliability Test of Research Variables

Criterion	Number of Dimensions	Cronbach Alpha (Performance)	Cronbach Alpha (Importance)	Critical Value	Remarks
Ship Construction	4	0.771	0.684	0.6	Reliable
Safety Equipment	4	0.793	0.809	0.6	Reliable
Navigation and Communication	3	0.662	0.674	0.6	Reliable
Seafarers Ability	4	0.754	0.850	0.6	Reliable
Safety Instructions	3	0.789	0.827	0.6	Reliable

The results in Table 2 show that the value of Cronbach's alpha for the criterion of ship construction is higher than the critical value of 0.6. These results explain that the instruments used to explain the criteria of ship construction are reliable. The same result is also shown in the value of Cronbach's alpha for the criteria of safety equipment, navigation and communication, Seafarers' ability, and safety instructions which are higher than the critical value of 0.6. Therefore, all the instruments used in this research are reliable.

4.3 Gap Analysis

The analysis process conducted after knowing that the research instruments used are valid and reliable is the Gap analysis. Gap analysis is conducted to know the comparison between the performance and the importance according to the research respondents. This research uses a sample of service users, ship operators, and regulators from the Land Transportation Management Center of the South Sumatera Province on the existing condition of the riverboat services on the Musi River as

many as 264 respondents. The Gap analysis carried out in this research can show the satisfaction level of the research respondents on 18 research dimensions used to explain the safety criteria of riverboat services on the Musi River. After knowing the satisfaction level, the following analysis will determine the importance and priority of 18 dimensions using the Cartesian diagram analysis.

Gap analysis is carried out to compare the performances of 18 dimensions used to explain the six safety criteria of riverboat services on the Musi River with the importance or expectation from service users, ship operators, and regulators in the Land Transportation Management Center in Palembang. The five criteria to be studied include ship construction, safety equipment, navigation and communication, seafarers' ability, and safety instructions. The results of the gap analysis of 18 dimensions in the safety criteria of riverboat services on the Musi River are explained in the following tables.

4.4 Ship Construction Criterion

The ship construction criterion is explained through four dimensions that show the gap analysis results (Table 3).

Table 3
Gap Analysis of Ship Construction Criterion

Safety Criteria	Mean Performance (X)	Mean Importance (Y)	GAP (X – Y)	Remarks
Ship Construction Dimensions				
1. The material condition of the ship hull	3.73	4.28	-0.55	Unsatisfied
2. The availability of an Emergency Exit for Evacuation	3.71	4.31	-0.61	Unsatisfied
3. The implementation of Plimsoll (ship loading line) to know the limit of a shipload	3.75	4.30	-0.55	Unsatisfied
4. The availability of ship crash resistance systems (tire rubber, sponge, etc.)	3.78	4.26	-0.48	Unsatisfied

Table 3 shows that the four dimensions used to explain the criterion of ship construction show dissatisfaction. The dimension of the material condition of the ship hull has a lower performance value than the importance value, so the respondents are categorized as unsatisfied. Likewise, the dimension of the availability of emergency exits for evacuation is regarded by the respondents as having performance lower than the importance value, so the respondents are categorized as unsatisfied. The dimension of the plimsoll or ship loading line implementation to know the limit of shipload shows a lower performance value than the importance value, so the respondents are categorized as unsatisfied. The dimension of the availability of the ship crash resistance system also indicates a lower performance value than the importance, which explains why respondents are categorized as unsatisfied as well.

4.5 Safety Equipment Criterion

The safety equipment criterion is explained through four dimensions showing the result of the gap analysis (Table 4).

Table 4
Gap Analysis of Safety Equipment Criterion

Safety Criteria	Mean Performance (X)	Mean Importance (Y)	Gap (X – Y)	Remarks
Safety Equipment Dimensions				
1. The availability and sufficiency of life jackets or life vests	3.8	3.94	-0.14	Unsatisfied
2. The availability and sufficiency of lifebuoys	3.89	4	-0.11	Unsatisfied
3. The availability and sufficiency of fire extinguishers	3.87	3.98	-0.11	Unsatisfied
4. The availability and sufficiency of equipment	3.8	3.91	-0.11	Unsatisfied

The results in Table 4 show that the four dimensions used to explain the criterion of safety equipment indicate that the performance value is lower than the importance, so the respondents are categorized as unsatisfied. The dimension of the availability and sufficiency of life jackets shows the performance value lower than the importance, so the respondents are categorized as unsatisfied. The dimension of the availability and sufficiency of lifebuoys also shows the performance value lower than the importance, so the respondents are categorized as unsatisfied. The dimension of the availability and sufficiency of fire extinguishers shows the performance value lower than the importance, explaining that the respondents are categorized as unsatisfied, and the indicator of the availability and sufficiency of medical equipment shows the performance value lower than the importance, explaining that the respondents are categorized unsatisfied.

4.6 Navigation and Communication Criterion

The criterion of navigation and communication is explained through three dimensions indicating the gap analysis results (Table 5).

Table 5
Gap Analysis of Navigation and Communication Criterion

Safety Criteria	Mean (X)	Mean Importance (Y)	Gap (X – Y)	Remarks
Navigation and Communication Dimensions				
1. Starboard Hull Lighting (green) and Left Hull	3.83	3.97	-0.14	Unsatisfied
2. White-colored surround lighting	3.86	3.95	-0.1	Unsatisfied
3. Sound signal in the form of a horn	3.82	3.92	-0.11	Unsatisfied

The results in Table 5 explain that the three dimensions used to explain the criterion of navigation and communication show the performance value lower than the importance explaining that respondents are categorized as unsatisfied. The dimension of starboard and left hull lighting show the performance value lower than the importance explaining that respondents are categorized as unsatisfied. The dimension of white-colored surround lighting shows the performance value lower than the importance explaining that respondents are categorized as unsatisfied. Finally, the dimension of the sound signal in the form of a horn shows a performance value lower than the importance explaining that respondents are categorized as unsatisfied with the dimension.

4.7 Seafarers' Ability Criterion

The criterion of seafarers' ability is explained through four dimensions showing the gap analysis results (Table 6).

Table 6
Gap Analysis of Seafarer's Ability Criterion

Safety Criteria	Mean Performance (X)	Mean Importance (Y)	Gap (X – Y)	Remarks
Seafarers' Ability Dimensions				
1. Expertise in Ship Operation	3.48	3.7	-0.23	Unsatisfied
2. Seafarers' compliance with regulations	3.53	3.73	-0.2	Unsatisfied
3. Seafarers' ability to respond to emergencies	3.54	3.72	-0.18	Unsatisfied
4. Ship condition checking before ship departure	3.49	3.65	-0.16	Unsatisfied

The results in Table 6 show the four dimensions used to explain the criteria of Seafarer's ability indicating that the respondents tend to be unsatisfied. The dimension of expertise in ship operation shows the performance value lower than the importance explaining that respondents are categorized as unsatisfied with the dimension. The dimension of Seafarers' compliance with regulations shows the performance value, which is also lower than the importance explaining that respondents are categorized as unsatisfied with the dimension. The dimension of Seafarers' ability to respond to emergencies shows the performance value lower than the importance, and the dimension of Ship condition checking before ship departure also shows the performance value lower than the importance explaining that respondents are categorized as unsatisfied.

4.8 Instructions Criterion

The criterion of safety instructions is explained through three dimensions showing the results of gap analysis (Table 7).

Table 7
Gap Analysis of Safety Instruction Criteria

Safety Criteria	Mean Performance (X)	Mean Importance (Y)	Gap (X-Y)	Remarks
Safety Instructions Dimensions				
1. Information on the safety equipment storage	3.57	4.22	-0.65	Unsatisfied
2. The availability of safety equipment use instructions	Mar-58	4.19	-0.62	Unsatisfied
3. Information on weather condition	3.56	4.16	-0.59	Unsatisfied

The results in Table 7 show the three dimensions used to explain the criteria of safety instruction which tend to be unsatisfying. First, the dimension of information on equipment storage shows a performance value lower than importance, explaining that the respondents need instructions. The dimension of the availability of safety equipment use instructions shows the performance value lower than the importance, which also explains that the respondents are unsatisfied with the dimension. Finally, the dimension of information on weather conditions shows the performance value, which is also lower than the importance, explaining that the respondents are also categorized as unsatisfied.

4.9 Cartesian Diagram

The following analysis makes a Cartesian diagram to determine the priorities of 18 dimensions used to explain the safety criteria of riverboat services on the Musi River. The Cartesian diagram in this research is based on the mean value of each

dimension (Fig. 2). The making of the diagram is carried out with the assistance of SPSS version 22. The Cartesian diagram itself consists of four quadrants; quadrant 1 explains the variable dimensions with low performance and high expectation (importance), and quadrant 2 explains the variable dimensions with high performance and high expectation. Quadrant 3 explains the variable dimensions which have low performance and expectation. Finally, quadrant 4 explains the variable dimensions with high performance but low expectations.

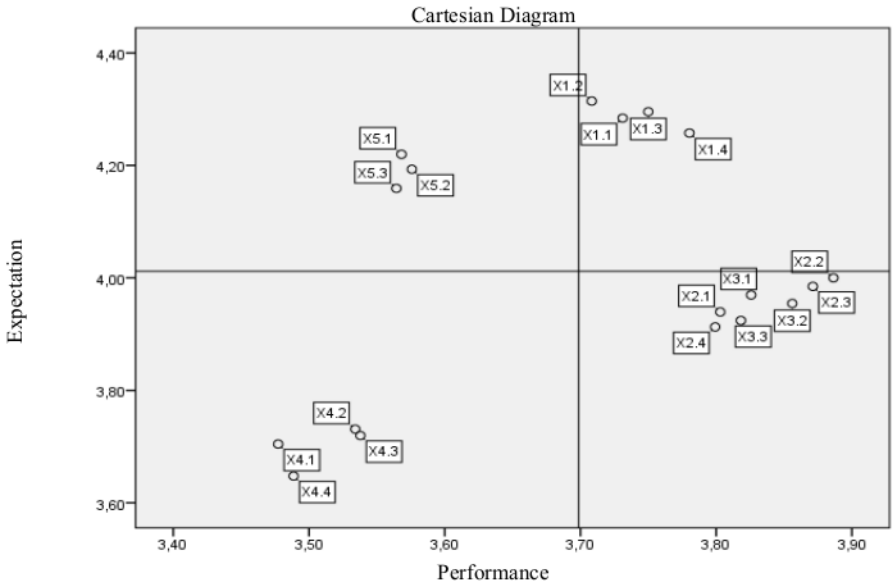

Fig. 2. The Results of the Priority Analysis of Safety Criteria

Based on the results shown in Figure 2, it is known that there are three dimensions included in quadrant 1, four dimensions in quadrant 2, four dimensions in quadrant 3, and seven dimensions in quadrant 4. The results explain that dimensions of information on safety equipment storage (X5.1), the availability of instruction to use safety equipment (X5.2), and information on weather conditions (X5.3) are the prioritized dimensions to be improved. This also explains that, according to the respondents, the four items need to show the performances as expected. However, they are essential in supporting the safety of riverboat services on the Musi River.

The dimension of the availability of emergency exit for evacuation (X1.2), the dimension of the material condition of the ship hull (X1.2), the dimension of plimsoll implementation (X1.3), and the dimension of the availability of ship crash resistance system (X1.4) are the dimensions necessary to be maintained. The results explain that the four dimensions are important factors and have performances that sufficiently fulfill the expectation of the users of riverboat services on the Musi River. Hence, they are necessary to be maintained. The dimensions of expertise in ship operation (X4.1), Seafarers' compliance with regulations (X4.2), Seafarers' ability to respond to emergencies (X4.3), and ship condition checking before departure (X4.4) are those with low priorities. The results explain that, according to most service users, every Seafarer has good compliance with regulations, an excellent ability to respond to emergencies, has checked the ship's condition before departure, and can operate well. Thus, these four dimensions are included in the low priorities to be improved. The dimensions of the availability and sufficiency of life jackets (X2.1), the availability and sufficiency of lifebuoys (X2.2), the availability and sufficiency of fire extinguishers (X2.3), the availability and sufficiency of equipment (X2.4), starboard hull lighting and left hull lighting (X3.1), surround lighting (X3.2), and sound signal in the form of a horn (X3.3) show good performances but, according to the service users, these are not the things to be paid attention. The results explain that service users have been satisfied enough with these seven dimensions, so they are not the priorities to be improved.

5. **Discussion**

5.1 Performance Gap between 18 Dimensions and Service User Expectation

Based on the results of the analysis which has been conducted, it is known that 18 dimensions used to explain the safety criteria of riverboat services on the Musi River show the gap between the performance and the service user expectation. The gap is that the performance of the 18 dimensions still needs to fulfill the service user expectation concerning the safety criteria of ship service. Nevertheless, the results of this analysis show a high expectation from the service users, service providers, and the regulator to experience quality riverboat services on the Musi River by putting forward the safety criteria.

The safety criteria of riverboat services on the Musi River are based on some Indonesian Government Regulations of 2015 and 2020, including the criteria of ship construction, safety equipment, navigation and communication, Seafarers' ability, and safety instructions. The analysis results show that the dimensions showing the widest gap between performance and expectation are in the criterion of safety instructions. This indicates a high expectation from the service users concerning the safety instructions provided by the boats on the Musi River. Such a condition requires every ship in the Musi River's riverboat services to provide reasonable safety instructions. The safety instructions are concerned with the information on safety equipment storage, the availability of safety equipment use instructions, and the information on weather conditions. This becomes important considering that in the last five years, there were always accidents in the riverboat services on the Musi River. The Local Transportation Agency of South Sumatra Province reveals that most accidents happen because of crashes. Therefore, it is essential for every boat in the riverboat services on the Musi River to provide safety equipment use instructions so that every passenger and ship operator can be more agile to anticipate the critical condition that occurs during the services.

5.2 Important Safety Dimensions and Priorities for Improvement

The results of the analysis that has been done using a Cartesian diagram show that among 18 dimensions of the safety criteria, there are three critical dimensions in the riverboat services on the Musi River, which become the priorities to be improved immediately. Those dimensions are related to the information on safety equipment storage, the availability of safety equipment use instructions, and information on weather conditions. Furthermore, the results explain that, according to the service users, those dimensions show performances that do not fulfill expectations. However, they have prioritized the importance of supporting the safety of riverboat services on the Musi River.

These results are relevant to the existing condition, which indicates the importance and necessity of information on safety equipment storage for boat passengers. As stated by Shiwakoti et al. (2016), the structure of a complex transportation system and passenger unawareness of the environment, as well as the availability of assistance to find ways or guidance in an emergency, are very important and need to be paid attention to, especially for the evacuation process. For them, the information and devices to find ways, such as evacuation maps, exit signs, emergency alarms, and short directions to the assembly point, can positively influence their route selection behavior and the process of passenger evacuation. In addition, based on the opinion of Chang and Liao (2009) and Hystad et al. (2016), the familiarization of passengers with the ship's environment affects their safety awareness, which can positively affect passenger behavior and behavior show knowledge about passenger safety. The performance that has yet to align with the passenger expectation is the availability of safety equipment use instructions. Baker (2013) explains the importance of providing safety equipment use instructions with the phenomenal cases of 'The Titanic' and a cruise ship in West Karibia, Central America, which not only has no lifeboats in the sufficient number for all the passengers, but also does not practice the exercise to use lifeboats, and the crew does not have sufficient training in loading and lowering the available lifeboats. Majid et al. (2022) also prove a significant direct effect of safety risk management on passenger safety performance. Wahyuni et al. (2020) the importance of improving the quality of the fleet where durability, fleet cleanliness, and safety facilities are expected to provide high safety guarantees.

Information on Weather conditions becomes the third matter considered necessary by the respondents. With such information and knowledge, passengers are prepared for an emergency due to the weather. The National Committee on Transportation Safety in Indonesia's findings explains that weather conditions' impact on passenger safety cannot be denied. The accident rate is proof. The sanction given to Sea Flyte in 2018 is explained where the process of ship departure was not accompanied by an accurate weather forecast, especially rainfall rate, the strength and direction of the wind, as well as the duration of bad weather. Then, when the accident occurred, there was no accurate weather forecast (KNKT, 2020). This indicates that all the Musi River riverboats have safety equipment. However, only some boat operators and service users understand how to use the available safety equipment. The monitoring and modifying of the human factor presented in this research can contribute to maritime safety performance (Hetherington et al., 2006; Saluy et al., 2021)

The dimensions included in quadrant one or prioritized to be improved immediately are those related to safety equipment storage, the availability of safety equipment use instructions, and information on weather conditions. The dimensions included in quadrant two or to be maintained are those related to the availability of an emergency exit for evacuation, the material condition of the ship hull, plimsoll implementation, and the availability of a ship crash resistance system (Ricardianto et al., 2022). Those included in quadrant three or having low priorities to be improved immediately are related to the expertise in ship operation, seafarers' compliance with regulations, seafarers' ability to respond to emergencies, and ship condition checking before departure. The dimensions included in quadrant four or which tend to be excessive are those related to the availability and sufficiency of life jackets, the availability and sufficiency of lifebuoys, the availability and sufficiency of fire extinguishers, the availability and sufficiency of medical equipment, starboard hull lighting and left hull lighting, surround lighting, and sound signal in the form of a horn. The results of this research show positive and significant influences on completing safety equipment for ship safety (Setiawan & Susanto, 2019).

Based on the results of the gap analysis that has been done, it is known that there is a gap between the performance and the expectation, which is shown in the 18 dimensions used to explain the safety criteria of riverboat services on the Musi River.

The gap is that the performances of the 18 dimensions used to explain the safety criteria tend to be lower than expected, so most service users of the riverboats on the Musi River tend to be unsatisfied. Related to the results of the analysis, the operators or owners of riverboats need to provide a storage place, safety equipment use instructions on board the boat, the devices for informing the weather condition to enable the service users to experience better boat services and to improve the satisfaction they will feel (Pahala et al., 2021; Mansur et al., 2021). The measure that can be taken is to make coordination among boat owners and boat operators. The regulator plans training or invites a speaker who is competent in sailing safety, such as a campaign on sailing safety, to deliver knowledge to the boat operators and owners about the benefits and ways of using safety equipment well and appropriately.

6. Conclusion

To develop water recreation on the Musi River, setting the boat condition and the safety of boat passengers are essential factors that need to be prioritized because those are the primary considerations made by passengers or tourists in water transportation. Based on the findings of this research and related to passenger safety, the riverboat owners or operators on the Musi River can make changes in the physical condition of the boat to provide a place for safety equipment storage on the boat and the instructions or warning to use life jackets before the boat departs. The aim is to anticipate if an accident occurs during the service of river transportation on the Musi River. The regulator from the Land Transportation Management Center of South Sumatra Province may hold socialization or training concerning the utilization of safety equipment reasonably and appropriately for the boat operators and routinely campaign for riverboat safety for all the service users. The aim is to increase the knowledge and awareness of every riverboat operator and service user to improve the service quality of riverboats on the Musi River.

Suppose every boat operating on the Musi River still needs to pay more attention to the availability of information on the safety of service users. In that case, the regulator, namely the Land Transportation Management Center of Palembang, can evaluate every boat that operates. The evaluation is to assign some staff to inspect the boat's condition related to the place for safety equipment storage, safety equipment use instructions, and information on weather conditions. Suppose both the boat operators and owners operating the boats on the Musi River need help understanding the safety of ferry services. In that case, the regulator may educate them. The Land Transportation Management Center of South Sumatera Province can help provide educational facilities and knowledge for boat owners to pay attention to the availability of equipment and safety equipment use instructions to anticipate the bad condition during the service delivery on the Musi River.

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