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Strategies to Improve Intermodal Transportation Connectivity Services in North Maluku

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A B S T R A C T

Sea transport is one of the modes of transport providing great benefits such as a wide range, tariffs that are affordable to the public, safe and comfortable. To support the integration of the implementation of intermodal transport, it is necessary to integrate the service network, and the transportation infrastructure network. The purpose of this study is to determine the level of intermodal transportation services at Kupal Port, Bacan Island, South Halmahera Regency and the analysis method used was the Importance Performance Analysis (IPA) method and the Customer Satisfaction Index (CSI). The results of the study obtained the average satisfaction index value of Kupal Feeder Port service users on 16 (sixteen) service factors or attributes of 78.97 percent in the satisfied criteria.

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INTRODUCTION

Sea crossing is one of the most prominent modes to connect Bacan Island, South Halmahera to Ternate City. The increasing number of sea crossing transport services encourages the government to pay more attention to comfort and safety issues, especially the development of facilities for both passenger safety and ship safety. Feeder Ports are ports that primarily serve domestic sea transportation activities, transferring domestic sea transportation in limited quantities, are feeders of main ports and collecting ports, and as places of origin for passengers and/or goods, as well as crossing transportation with a range of services between districts or cities in the province (Regulation of the Minister of Transportation of the Republic of Indonesia No PM 57 of 2020).

To minimise roadblocks during intermodal movement, integration of intermodal services is one of the keys to success in its implementation. The government in the blueprint for intermodal or multimodal transport (2010-2030) confirms that the development of intermodal transport needs to be realised in the integration of services, service networks and transport infrastructure networks as a systemic whole (Ministry of Transportation, 2010).

THEORETICAL REVIEW

Concept of Intermodal Transportation

Intermodal transportation refers to the use of multiple transportation modes to deliver goods or people from one place to another. The implementation of intermodal strategies can improve transportation efficiency and flexibility in a region Tan, K. H. (2018).

Significance of Transportation Connectivity

Good transportation connectivity plays a key role in the economic and social development of a region. Research has shown that improved connectivity can increase the accessibility and competitiveness of a region Levinson, D. M. (2006).

Transportation Infrastructure Development

Coordinated and integrated development of transportation infrastructure is required to support intermodality. Case studies and empirical research on transportation infrastructure development experiences in regions with similar characteristics can provide valuable insights Rodrigue, J. P., Comtois, C., & Slack, B. (2013).

Transportation Policy Analysis

A review of transportation policies, especially those related to intermodality, can provide insights into the measures that have been taken by

the government or relevant agencies to improve transportation connectivity Giannopoulos, G. A., & Yannis, G. (2017).

METHODOLOGY

Time and Place of Research

This research was conducted on Bacan Island (Kupal Harbour), South Halmahera Regency. This research adopted descriptive quantitative research using the survey method, carried out to determine the perception of service users using questionnaires distributed to Sea Ship Passengers at Kupal Port. This study involved respondents by considering time, location, age, gender, occupation, income and origin of respondents.

Research Variables

In this study, there are two research variables used. The first variable reflecting the travel characteristics of sea transportation users on integrated intermodal transportation services and the second is a variable that describes the embodiment of integration in intermodal transportation in terms of network infrastructure integration, service network integration and service integration.

Analysis Methods

The analysis is carried out by descriptive-qualitative method with the aim of explaining the picture or phenomenon of conditions that occur in the field related to the implementation of integration services, especially in intermodal integration services in South Halmahera Regency.

RESULTS AND DISCUSSION

Characteristics of Respondents

The characteristics of respondents are represented by variables of gender, age, education level and monthly income.

No	Description of individual characteristics	Frequency	Percentage (%)
1	Gender		
	Man	146	56
	Woman	117	44
	Sum	263	100
2	Age		
	< 20 years	14	5
	20-30 years	68	26
	31-40 years	86	33
	41-50 years	65	25

	>50 years	30	11
	Sum	263	100
3	Recent Education		
	SMA	127	48
	Diploma	54	21
	Bachelor	82	31

Analysis of Service Quality Level and Port Service Level

Table 2. Port Service Quality Level

No	Service Attributes	Excellent	Good	Good enough	Not Good	Bad	Weight
1	2	3	4	5	6	7	8
a. Empathy (*Emphaty*)							
1	Ticket clerk etiquette	100	224	72	0	0	396
2	Port officer's attitude	60	160	144	0	0	364
3	Safety and comfort of the port area	0	208	144	0	0	352
4	The hospitality of the canteen waiters inside the port	0	112	216	0	0	328
b. *Responsiveness*							
5	Availability of supporting facilities in the waiting room	0	0	78	126	11	215
6	Information on boat arrival and departure schedules	0	0	153	98	0	251
7	Easy access to passengers	0	0	105	130	0	235
c. *Assurance*							
8	Port entry tariff	120	198	81	0	0	399

No	Service Attributes	Excellent	Good	Good enough	Not Good	Bad	Weight
1	2	3	4	5	6	7	8
	suitability						
9	Arrangement of the entry queue by the officer	110	228	63	0	0	401
10	Friendliness of port entrance attendants	50	148	159	0	0	357
d. Physical Display (*Tangible)*							
11	Passenger terminal cleanliness	250	152	36	0	0	438
12	Ship timetable/route information board	0	0	24	104	40	168
13	Port lighting system at night	0	4	75	118	15	212
e. *Reliability*							
14	Accuracy of ship departure schedule	0	0	141	106	0	247
15	Queue settings to buy tickets	170	212	39	0	0	421
16	Availability of vehicle parking space	285	152	15	0	0	452

Respondents' assessments in table 2 indicate that the service attribute of parking availability is the one service receiving the highest weight of 452 (predicated good), while the service attribute of the availability of supporting facilities in the waiting room gets the lowest weight of 196 (predicated not good). This means that the availability of vehicle parking lots has a good level of service quality or performance in serving users of sea transportation services, especially passengers and visitors, a form of service that is considered good is

the balance between adequate parking volume and capacity. The service attribute of the availability of supporting facilities in the waiting room is considered not good by respondents due to the lack of facilities provided by port managers such as audio/television facilities and information boards.

Table 3. Port Service Importance

No	Service Attributes	Very Important	Important	Quite Important	Less Important	Not Important	Weight
1	2	3	4	5	6	7	8
a. Empathy (*Emphaty*)							
1	Ticket clerk etiquette	215	208	15	0	0	438
2	Port officer's attitude	245	184	15	0	0	444
3	Safety and comfort of the port area	230	196	15	0	0	441
4	The hospitality of the canteen waiters inside the port	0	104	222	0	0	328
b. *Responsiveness*							
5	Availability of supporting facilities in the waiting room	240	208	0	0	0	448
6	Information on boat arrival and departure schedules	105	140	132	0	0	377
7	Easy access to passengers	320	140	0	0	0	460
c. *Assurance*							
8	Port entry tariff suitability	0	172	171	0	0	399
9	Arrangement of the entry queue by the	0	140	195	0	0	400

No	Service Attributes	Very Important	Important	Quite Important	Less Important	Not Important	Weight
1	2	3	4	5	6	7	8
	officer						
10	Friendliness of port entrance attendants	0	164	177	0	0	357
d. Physical Display (*Tangible)*							
11	Passenger terminal cleanliness	205	180	42	0	0	436
12	Ship timetable/route information board	245	184	15	0	0	444
13	Port lighting system at night	270	164	15	0	0	449
e. *Reliability*							
14	Accuracy of ship departure schedule	0	164	142	0	0	306
15	Queue settings to buy tickets	0	152	248	0	0	420
16	Availability of vehicle parking space	295	164	0	0	0	459

Respondents' feedback in Table 3 shows that the service attribute of ease of finding further access for passengers is the type of service that is considered very important to service users with the highest weight of 460. Meanwhile, the service attribute of the accuracy of the ship's departure schedule is considered less important by service users and gets a low weight of 306.

Table 4. Assessment Score Calculation (Infrastructure)

No	Service Attributes	Number of weights of performance level assessment	Number of importance assessment weights	Performance average score (X)	Average importance score (Y)

1	2	3	4	5	6
a. Empathy (*Emphaty*)					
1	Ticket clerk etiquette	396	438	3,96	4,38
2	Port officer's attitude	364	444	3,64	4,44
3	Safety and comfort of the port area	352	441	3,52	4,41
4	The hospitality of the canteen waiters inside the port	328	328	3,28	3,28
b. *Responsiveness*					
5	Availability of supporting facilities in the waiting room	196	448	1,96	4,48
6	Information on boat arrival and departure schedules	251	377	2,51	3,77
7	Easy access to passengers	235	460	2,35	4,60
c. *Assurance*					
8	Port entry tariff suitability	399	399	3,99	3,99
9	Arrangement of the entry queue by the officer	401	400	4,01	4,00
10	Friendliness of port entrance attendants	357	357	3,57	3,57
d. Physical Display (*Tangible)*					
11	Passenger terminal cleanliness	438	427	4,36	4,36
12	Ship timetable/route information board	168	444	1,68	4,44
13	Port lighting system at night	212	449	2,12	4,49
e. *Reliability*					
14	Accuracy of ship departure	247	306	2,47	3,06

No	Service Attributes	Number of weights of performance level assessment	Number of importance assessment weights	Performanc e average score (X)	Average importance score (Y)
1	2	3	4	5	6
	schedule				
15	Queue settings to buy tickets	421	420	4,21	4,20
16	Availability of vehicle parking space	452	459	4,52	4,59
Total		5217	6606	53,37	66,06
Average X and Y values				3,33	4,02

Table 5. CSI Calculation Results

No	Service Attributes	Number of weights of performance level assessment	Number of importance assessment weights	Degree of conformity	CSI value interpretation
1	2	3	4	5	6
1	Ticket clerk etiquette	396	438	90,41%	Very satisfied
2	Port officer's attitude	364	444	81,98%	Very satisfied
3	Safety and comfort of the port area	352	441	79,82%	Satisfied
4	The hospitality of the canteen waiters inside the port	328	328	100%	Very satisfied
5	Availability of supporting facilities in the waiting room	196	448	43,75%	Less Satisfied
6	Information on boat arrival and departure schedules	251	377	66,57%	Satisfied
7	Easy access to passengers	233	460	50,43%	Less Satisfied
8	Port entry tariff	399	399	100%	Very satisfied

No	Service Attributes	Number of weights of performance level assessment	Number of importance assessment weights	Degree of conformity	CSI value interpretation
1	2	3	4	5	6
	suitability				
9	Arrangement of the entry queue by the officer	401	400	100%	Very satisfied
10	Friendliness of port entrance attendants	357	357	100%	Very satisfied
11	Passenger terminal cleanliness	438	438	100%	Very satisfied
12	Ship timetable/route information board	168	444	37,38%	Less Satisfied
13	Port lighting system at night	212	449	47,21%	Less Satisfied
14	Accuracy of ship departure schedule	247	306	80,71%	Satisfied
15	Queue settings to buy tickets	421	421	100%	Very satisfied
16	Availability of vehicle parking space	452	459	98,47%	Very satisfied
Average				78,97%	Satisfied

Furthermore, the calculation of the average value is plotted into a cartesian diagram. The cartesian diagram of the port service level can be seen in figure 1.

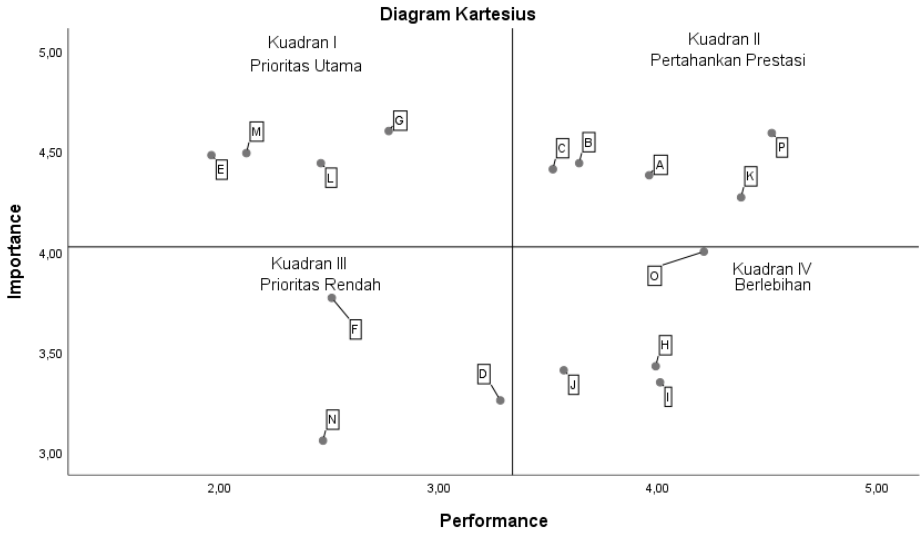

Figure 1. Cartesian Diagram of Importance and Port Service Quality

CONCLUSIONS AND RECOMMENDATIONS

The results of the analysis and discussion of the Customer Satisfaction Index (CSI) value, on the infrastructure network sub-criteria, normalization of the combined weighting of service network criteria to support the integration of intermodal transportation at Kupal port, it is known that the perception of Kupal feeder port service users based on the average satisfaction index value of 16 (sixteen) service attributes of 78.79 percent is included in the satisfied criteria. The availability of supporting facilities in the waiting room, ease of finding further access for passengers, information boards for ship schedules or routes and port lighting systems at night are included in the unsatisfied criteria

FURTHER STUDY

Suggestions for future research include conducting an in-depth evaluation of transportation needs and demands in the North Maluku region. This includes transportation demand analysis, identification of critical routes, and an in-depth understanding of transportation user profiles.

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