Penerbit Akademia Baru

Journal of Advanced Research in Social and Behavioural Sciences

Journal homepage: www.akademiabaru.com/arsbs.html
ISSN: 2462-1951

Passengers perception on safety level of ferry transport: A case study in Labuan island, Malaysia

Open Access

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ARTICLE INFO

Article history:
Received 24 October 2016
Received in revised form 14 December 2016
Accepted 16 December 2016
Available online 7 January 2017

ABSTRACT

In order to attract more people to use water transport especially tourist, the effectual and well-organized water transportation safety are crucial to overcome any issue like overloaded passenger problem, confusing route to catch, uncomfortable seats, uncomfortable surrounding, the smell of smoke that affects the breathing and etcetera. Water transportation in Malaysia especially ferry, facing various challenges in giving the best quality required by passenger. The aim of this study is to identify the passenger perceptions toward safety level of ferry transportation services in Labuan Island, Malaysia. Quantitative method was mainly employed and a survey was conducted among the passengers who frequently used the ferries services as their transportation to arrive at their destinations which was selected by using simple random sampling with sample size of 690 passengers. Knowledge, attitude and practices (KAP) concepts were used to measure the perception on safety. The results showed that the knowledge of the respondents on safety levels for express ferry, Ro-Ro ferry and speedboat are good while attitude of passengers is still need to be improved and the practices need to focus more. The express ferry has the highest frequency on safety level services as compared to RO-RO ferry and speedboat.

Keywords:
Safety level, Water transportations, Passengers' knowledge, Passengers' perceptions, Passengers' practices

1. Introduction

The peninsular of Malaysia, Sabah and Sarawak are surrounded by sea. Various islands become popular among tourists around the world. Water transportation is important in Malaysia to bring peoples from the mainland to places like Labuan, Sapi Island, Manukan Island, Lawas, Muara Brunei and other famous islands. Most of the water transportations used is high capacity ferry. In Malaysia, there are many types of water transportation such as cruise ship, daily commuter ferries, speedboat, passenger ferries, tourist boats and passenger express boats [1]. Passenger ships in operation today

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are subjected to a vast array of national and international regulations and standards covering every aspect of ship construction and operation especially the safety, high service quality, efficiently and satisfy the needs of user. Ferry services in Malaysia are at low safety level compared to the five-star ferry and this also supported by National newspapers that reported same things regarding the safety wherein needs substantial improvement especially with respect to safety features and facilities [2]. Nowadays, passenger ferries associated with various problems, including the overloaded passenger, confusing route to catch, uncomfortable seats, uncomfortable surrounding, the smell of smoke that affects the breathing and etcetera. Thus, the number of incidents over the year increases that led to revisions and improvements in safety requirements, including fire safety measures such as escape routes and fire protection systems for the large atrium typical of cruise ships, life-saving appliances and arrangements. In general, the issues of water transportation in Malaysia are becoming more extensive with services in platform below of required levels that still not satisfy the passenger needs and conviction.

2. Literature review

There are a number of cases dealing with passenger ships overload problem and using of unauthorized vessels (local boats) to carry passengers. More safety culture or awareness can reduce number of accidents and loss of life**.** The management does not aware on the cost incurred when any accident happens in their workplace [3]. Safety is defined as the state of being safe from the risk of experiencing, causing injury, danger, loss, device to prevent injury or avert danger (ISM Code). Safety also can be defined as the activity of ensuring that accidents are avoided. However, safety cannot be improved by looking to the past and taking precautions against the accidents that happened [4]. A decentralized approach to safety management was the most effective way to promote workforce safety motivation [5].

The lack of focusing and coordination at all stratums throughout the system become the main trouble on water transportation organization. Main causes accident on water transportation in Bangladesh are, overloading and inclement weather and it very common where maritime safety has become a severe issue [6]. Lack of intact stability caused by overloading, which was insufficient to withstand the strong winds and waves that the boat encountered be the factors that contributed to accident happen on water transportation [7]. Other example of issues faces by water transportation are poor safety and security due to lack of communications and SAR system, poor infrastructure at terminals, difficulties arising from seasonal blockages caused by water weeds that often close in land waterways routes and terminals as well as lack of modern fleet to provide reliable transport services [8].

2.1. Survey using KAP (knowledge, attitude and practice)

Model KAP consists of three main elements such as knowledge, attitude and practice of a community [9]. One of the components of KAP, knowledge, is the fundamental to the behaviour of an individual [10]. Without knowledge, one cannot act upon to any information or issues given to them. Furthermore, knowledge also serves as a terrace to the determination of attitude, intention and behaviour. If one's knowledge increases, then this knowledge will be a driving force to the changing of attitude. Therefore, a person with knowledge will be more concerned and alert towards the changes of the environment.

The second component of KAP, attitude, refers to the result of the act of seeing something with attentive. Besides that, one’s attitude change will influence on the change of behaviour. If there is

change of attitude, eventually, it will cause the change of the behaviour of a person. Practice, third component of KAP, is also known as a person's behaviour based on the knowledge that they had acquired. When a person has a better understanding of knowledge, the attitude and practice will ensure a better action to create a more efficient awareness process. Moreover, the relationship between the knowledge and practice shows that, a higher knowledge can transform a positive attitude of a person and act according to the knowledge acquired.

KAP scope is applied in safety to gauge the passenger awareness level. It is broadly being practiced in many areas including medical safety surveys such as cancer service [11], agriculture [12], Food handling [13], Earth Quake [14], risk education [15], Solid waste [16] and even family planning and population studies [17]. KAP is a representative survey conducted on a particular population to identify the extent of knowledge of specific topic based on standard data gathered including questionnaires to collect quantifiable information on the issue including behaviour, the KPA survey also allows for inclusion of general questions on practice and belief. This survey can identify the lack of knowledge on safety and procedure practices thereof. It can identify needs and problem, if there is obstacle, KAP can also provide solutions to improve quality [18].

2.2. Data collection

Data sample were collected using questionnaires that focusing on the passengers in Labuan and Mainland Borneo. The questionnaire was developed based on research questions. There are four main sections for this questionnaire to investigate the perceptions of the respondents. The first section gathers respondents' background. The second section seeks for the respondents' perceptions for the safety level on ferry board based on knowledge. The third section takes respondents' perceptions based on attitude. The last section collects the respondents' perceptions based on practices. The alternative answers for second and last section is yes and no while the third section is a 5-point Likert-scale (1=strongly disagree, 2=disagree, 3=exception, 4=agree and 5=strongly agree). The questionnaires were distributed among 690 passengers. The survey was conducted from August 13, 2012 to September 29, 2012 at Labuan board ferry services for thirty six (36) trips all together. The questionnaires were distributed to the respondents only on the board ferry departing from Labuan and vice versa route.

2.3. Statistical analysis

In order to analyze the results of these subjective evaluations for quantitative data analysis, statistical tools of SPSS software for Windows (version 20.0) was used for input data and appropriate tests were executed. Descriptive analysis is used to analyze the results obtained from this study. The statistical result was presented by table form with details description and analyzed in combination with qualitative data.

3. Results and discussion

3.1. Descriptive analysis in passengers' background of ferry services

The total questionnaires were collected from 690 respondents and that data are presented in table 1which show the background and demographic information of the respondents.

Table 3.1
Background of Respondents

Variable	Frequency	Percent (%)
Age group		
0 - 20 years old	102	14.78
21 - 30 years old	275	39.86
31 - 40 years old	160	23.19
41 - 50 years old	87	12.61
51 - 60 years old	38	5.51
> 60 years old	8	1.16
Race		
Malay	171	24.78
Chinese	54	7.83
Indian	1	0.14
Others	397	57.54
Foreigner	12	1.74
Nationality		
Malaysian	672	97.39
Non-Malaysian	12	1.74
Level of Education		
Primary School	97	14.06
Certificate (Polytechnic)	310	44.93
Diploma	59	8.55
Degree	43	6.23
Certificate of Competency	112	16.23
Others	67	9.71
Field of study		
Marine engineer	26	3.77
Navigational officer	24	3.48
Social science	58	8.41
Educations	36	5.22
Army/police	20	2.9
Others	521	75.51
Employment		
Professional	37	5.36
Businessmen	16	2.32
Student	96	13.91
Teacher	4	0.58
General Employment	153	22.17
Others	377	54.64
Sector of employment		
Government	193	27.97
Private	394	57.1
Working Experiences		
< 1 years	134	19.42
1 – 5 years	177	25.65
6 – 10 years	95	13.77
> 10 years	138	20

The Table 3.1 shows that the passenger with age group of 21-30 years old has the highest percentage in total number of respondents, which is 39.86% (total 275 passengers) while passengers with age group of more than 60 years old have the lowest number of passengers, which are only 8 passengers (1.16%). It should be noted that according to previous study, younger passengers have less knowledge about safety compared to older passengers [19]. This is due to negative behaviours possessed by younger generation such as over confidence that they can save themselves, feeling familiar with the safety measures' content as well as negative attitudes during safety briefings. Meanwhile, the highest number of passengers based on race is others, which has a total of 397 passengers (57.54%) while the lowest number of passengers is Indian with total number of 1 (0.14%).

The respondents' nationality shows that only 2% of the passengers were non-Malaysian while 98% of the passengers were local (Malaysian). The presence of foreigners among the passengers might cause problem during emergency drill because some of the passengers could not interact with each other due to language difference [20]. Most of the passengers speak only local language, not English language. It was also found that most of passengers were working in a private sectors (about 53.33%) while 27.97% of the passengers were government staffs. 25.65% of the passengers, which also highest percentage, has been working for 1-5 years, followed by 20.00% (passengers working for more than 10 years), 19.42% of passengers working less than a year and lastly 13.77% of passengers working for 6 to 10 years.

Majority of the passengers (44.93%) had completed certificate at polytechnic followed by 16.23% of passengers had completed certificate of competency, 14.06% of passengers had only completed their primary school, 9.71% of passengers completed other than stated education levels, 8.55% of passengers had completed diploma while 6.23% of the passengers had completed their degree. It should be noted that those with higher educational level give high importance to comfort and safety of the watercraft [21]. It should be noted that majority of the passengers have employment label as others (56.64%). This is followed by general employment (22.17%), student (13.91%), professional (5.36%), businessmen (2.32%) and lastly teacher (0.58%).

3.2. Passengers' observation on ferry services' safety level

Table 3.2
Knowledge of Passengers.

Code	Knowledge on board ferry services		Frequency	%
K1	To ensure the safety of passengers, enough safety equipment is crucial.	No	56	8.12
		Yes	634	91.88
K2	The amount of fire fighting should be prepared to ensure the safety of passengers.	No	99	14.35
		Yes	591	85.65
K3	Safety equipment should be placed at designated areas which is reachable by passenger	No	109	15.8
		Yes	581	84.2
K4	Passenger should be aware the location of emergency exit.	No	86	12.46
		Yes	604	87.54
K5	Passengers should be notice the maximum number of passengers permitted for each route.	No	127	18.41
		Yes	563	81.59
K6	Limit the number of passenger according to number of passengers seat to make sure passenger are comfortable.	No	157	22.75
		Yes	533	77.25

The knowledge of safety among the passengers such as knowledge is an essential factor that affects the safety of the watercraft. The knowledge of the correct utilization of life jackets and other

information regarding safety measures during an emergency situation are some of the examples indicating the importance of passengers' knowledge on ferry and/or speedboat safety level.

Table 3.2 shows the knowledge of passengers which was obtained using 6 questions from distributed questionnaire. According Table 4.1, the 91.88% of respondents agreed to question K1, which is to ensure the safety of passengers, enough safety equipment is crucial. This is proving that the Express and RoRo ferries as well as speedboat are safe and equipped with safety equipment including life jacket. This is highly essential as life jackets are lifesaving appliances which provides buoyancy and prevents passengers from drowning [22]. 85.65% of passengers agreed that the amount of firefighting should be prepared to ensure the safety of passengers. 84.20% of respondents agreed to K3 suggesting that safety equipment should be placed at designated areas which are reachable by passenger while 87.54% agreed that passenger should be aware the location of emergency exit (K4). Emphasized that emergency exit should consists sufficient storage capacity in order to ensure that the safety of operations is not compromised [23]. 81.59% of passengers agreed that passengers should be notice the maximum number of passengers permitted for each route (K5) while 77.25% agreed that limit the number of passenger according to number of passengers seat to make sure passenger are comfortable (K6). Larger space between seats significantly enhances the comfort level in vessels [24].

These shows that the ferry and speedboat follows the maritime regulations in order to maintain the safety level of watercraft. This is highly necessary because the main factor that contributes to ferry and speedboat is due to overload of passengers and/or luggage [25]. Sometimes even when the passengers knew that the watercraft carries more passengers than its capacity, they still willingly board the ferry / speedboat.

3.3. Passengers' attitude on Ferry Services' safety level

Safety culture consists of set of attitudes, beliefs, and shared practices. In addition, documented that safety culture is an assembly of characteristics and attitudes in an organizations and among individuals (in our case, the ferry and/or speedboats passengers) [26]. Direct measuring of safety is impossible since they cannot be observed due to influence of perceptions and beliefs of the passengers [27]. The factors such as ferry / speedboat conditions and the way these watercrafts operated have been reported to have significant effect on how the passengers' feel about safety. Evacuation during an emergency is affected by the attitudes of passengers and cabin crews [28]. Attitudes including attitudes toward safety, risk taking and ignoring some safety rules were investigated through questionnaires [29].

The Table 3.3 shows attitude of passengers, in which the passengers' attitude was analyzed according to their respond such as strongly disagree, disagree, moderate, agree and strongly agree) on ten questions. For the first question, most of the passengers (about 25%) strongly felt that the ferry/speedboat safely reached the port. For A2, 43.77% of passengers agreed and 42.03% of passengers strongly agreed that the cabin crews' knowledge is vital to ensure passengers' safety on board.

For third question, similar respond was received; 40.14% of passengers agreed and 36.67% of passengers strongly agreed that crew members must undergo continuous safety trainings and courses to further enhance their knowledge on safety. This is because crew members' response during emergency is an essential factor in enhancing maritime safety [30]. Sufficient training for crew member can effectively minimize and/or prevent loss of situational awareness caused by mental workload [31]. Crew members must acquire qualifications in order to ensure that safety is not compromised [32]. For forth question (A4), majority of the respondents (50.87%) agreed that they

felt that other than the crew members, ferry / speedboat examiners and agencies followed by law enforcement officers should also be knowledge full.

Table 3.3
Attitude of Passengers

Code	Attitude on board ferry services		Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree
A1	I feel that the ferry/speedboat safely reach the port	Frequency	4	36	88	383	179
		Percent (%)	0.58	5.22	12.75	55.51	25.94
A2	I feel that the local crew members should attend safety course consistently to enhance their knowledge.	Frequency	22	13	63	302	290
		Percent (%)	3.19	1.88	9.13	43.77	42.03
A3	I feel that the crew's knowledge is essential to ensure passengers safety	Frequency	25	20	114	277	253
		Percent (%)	3.62	2.9	16.52	40.14	36.67
A4	I feel that the ferry/speedboat examiners and agencies, as well as the law enforcement officers should be knowledgeable.	Frequency	30	35	88	351	186
		Percent (%)	4.35	5.07	12.75	50.87	26.96
A5	I feel that marine department has ensured highest safety level in ferries and speedboats	Frequency	13	42	135	322	178
		Percent (%)	1.88	6.09	19.57	46.67	25.8
A6	I feel that the classification board for ferries and speedboats has done their work well by making sure that these watercrafts are safe.	Frequency	13	16	167	361	131
		Percent (%)	1.88	2.32	24.2	52.32	18.99
A7	I feel that the space for luggage is appropriate	Frequency	102	55	61	345	127
		Percent (%)	14.78	7.97	8.84	50	18.41
A8	I feel that boat passengers especially small boat passengers should be provided standard for better safety	Frequency	25	28	93	252	292
		Percent (%)	3.62	4.06	13.48	36.52	42.32
A9	I do not like enforcement/examination conducted during operating hours because it slows down our journey.	Frequency	97	139	151	184	119
		Percent (%)	14.06	20.14	21.88	26.67	17.25
A10	I do not care about the ferry/speedboat's safety as long as I reach my destination.	Frequency	237	179	50	150	74
		Percent (%)	34.35	25.94	7.25	21.74	10.72

According to the respond to question A5, which is whether marine department has maintained highest safety level in ferries and speedboats, 46.67% of passengers responded that they agree to the statement. For A6 and A7, similar responds were obtained in which 52.32% of passengers agreed

they felt that classification board for ferry and speedboats has done their work well by making sure that these ferries / speedboats are safe for sailing, and 50.00% of passengers agreed that they felt the space provided for luggage is appropriate and sufficient, respectively. Sufficient luggage space is essential because almost every passenger brings along luggage / bags [33].

Based on question A8, 42.32% strongly agreed that they felt that small boat passengers should be provided with standard procedure for better safety. 26.67% of the passengers agreed to A9 in which they dislike enforcement conducted during on board because it slows down their journey. This shows negative attitude since enforcement from government parties for example Marine Department is vital to ensure safe ferry and speedboat operations in Borneo [34]. Finally, for question A10, 34.25% strongly disagreed that they do not care about the ferry / speedboat's safety as long as they reach their destination. This negative attitude among passengers may cause more havoc during the emergency evacuation process [35].

3.4. Passengers' experience on Ferry Services' safety level

Safety culture as the set of practices developed and applied by the person in charge in order to manage the risks of their profession [36]. Three main factors that contribute to accidents in river, lake and sea are human error, nature and others [37]. It should be noted that most of the accidents reported in court are due to human error while nature factor such as, winter weather bad weather, waterway conditions, and climate change scenario has only contributed too few incidents. Thus, majority of the accidents on water can be mineralized or even prevented through cooperation between the involved individuals and/or organizations.

Table 3.4
Practices of Passengers

Practices on board ferry services		Frequency	(%)
The damage of safety equipments and tools was not fixed immediately.	No	117	16.96
	Yes	573	83.04
Current rest time was not enough for the crew	No	204	29.57
	Yes	486	70.43
Conduct a head count prior to and after completion of boarding and keep a record of this number during the voyage.	No	212	30.72
	Yes	478	69.28
Examination of safety equipments and tools was conducted consistently	No	72	10.43
	Yes	618	89.57
Onboard orientation (e.g. location of exits, life jackets, toilets, other facilities)	No	162	23.48
	Yes	528	76.52
Owner of watercraft ensured and maintained the priority of passengers' safety all the time.	No	547	79.28
	Yes	143	20.72
The crew members themselves gave the safety briefings	No	323	46.81
	Yes	366	53.04
The safety officer in the ferry / speedboat gives correct guidance on utilization of safety jackets.	No	229	33.19
	Yes	461	66.81
When boarding the ferry / speedboat, the crew member ensures the passengers' safety.	Strongly Disagree	20	2.9
	Disagree	19	2.75

Table 3.4 shows the practices of passengers which were analyzed using 9 questions related to practices. The watercraft conditions including condition of safety equipment and tool and how the cabin crews operate the watercraft enhances the perception of safety among the passengers [39].

According to respond P1, 83.04% respondents agreed that the damaged safety equipments and tools are not being fixed immediately. In addition, majority of the passengers (70.43%) agreed that the current rest time for the crew is not enough (P2). 69.28% of the passengers acknowledged that conduct a head count prior to and after completion of boarding and keep a record of this number during the voyage (P3) while 89.57% of respondents acknowledged that examination on safety equipment and tool has to be done consistently. The examination on safety equipment by enforcement bodies has to be done consistently to improve the safety of maritime transport [40].

76.52% of passengers acknowledged the onboard orientation (e.g. location of exits, life jackets, toilets, other facilities). This is because crew members' capability is reflected in their knowledge on the rescue communication system, survival procedures as well as location of lifeboats [41]. However, 79.28% disagreed that the owner of watercrafts should always ensure and maintain the priority of passengers' safety all the time. 53.04% and 66.81% of passengers answered yes for P7 and P8 questions respectively, in which P7 represents the crew members themselves gave the safety briefings and P8 represents that safety officers in the watercraft are giving correct guidance on utilization of safety jackets respectively.

Finally, 63.77% agreed that the crew members ensure the passengers' safety on board. This finding is similar to the result obtained by Lu & Tseng (2012), in which it was reported that passengers give high importance to crew members' capability, followed by safety equipment, ship structure, navigation and communication, ship documentation inspection, and lastly safety instructions. This shows that the Express and RoRo ferries as well as speedboats are safe since safety of the watercraft is manifested in the level of caution by crew members during operation.

3.5. Safety level of watercraft for passengers

Table 3.5
Safety level of three types of watercrafts

Safety	Express		Ro-Ro		Speedboat	
	Frequency	(%)	Frequency	(%)	Frequency	(%)
Not Safe	73	26.35	94	33.94	35	12.64
Safe	192	69.31	183	66.06	113	40.79

Table 3.5 shows the safety level of three different watercrafts investigated in this study such as Express, Ro-Ro and Speedboat. From the table, it should be noted that highest percentage of safety level was found in Express ferry (69.31%), followed by Ro-Ro ferry (66.06%) and lastly by speedboat (40.79%). Similar result was obtained by [42], in which it was reported that current ferry services are safe and manages risks effectively in San Fransisco Bay area. [43] also reported similar result in which passengers were happy with the ferry service in between peninsular Malaysia and tourist spot island according to the good level of satisfaction.

The data from knowledge, attitude and practices have been analyzed and the result indicates that passengers give high importance to the safety of water transport. The analysis of the data obtained from this study can be used to enhance the reliability and safety of the water transport in between Borneo mainland and Labuan. This will aid in further developing the maritime transport since passengers give greater importance to safety of the watercraft compared to the cost [44].

Dispersion of nano particles in a base fluid not only contributes to enhancement of thermal conductivity, but also because of greater heat transfer area, superior convective heat transfer coefficient can be achieved, which will also lead to enhancement of heat transfer. The structure of polymer emulsion microgels system containing a certain amount of water during film-forming process was revealed by SEM in Fig. 1.

4. Conclusion

This study was conducted to see the user's perception of the Labuan ferry service to the mainland Borneo. The overall results show the level of ferry safety is at a safe level for all three types of transport commonly used such as speedboats, express and RO-RO through questionnaires using the concept of knowledge, attitudes and practices (KAP). In addition, it was found that there were differences on consumers' perception on the security level of three mains transportation used.169 out of 690 consumers choose express ferry is at a safe level to be used while 183 users select RO-RO ferry and only 113 users who say the speed boat is safe.

Therefore, hopefully this study will provide useful information to the ferry service operators to improve the quality of services to level that satisfies the user as it can affect their safety. In addition, it is expected that the ferry operators will take preventive measures to overcome accidents and did not take any selfish decision by taking advantage in carrying excess passengers than capacity allowed by the maritime.

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