LEADER
Civil Engineering and Architecture

Civil Engineering and Architecture Journal Vol 1 No.2 (2023) E-ISSN
DOI 10.37253/leader.v1i2.8096

Identification Of Low Public Interest in The Use Of Pedant Bridge Using Fault Tree Analysis Method In Batam City

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ARTICLE INFO

Keywords:

Pedestrian bridge,
Fault tree analysis,
Interest

ABSTRACT

The bridge is construction to continue the road from lower obstacles such as ordinary traffic. Bridges also serve as a link between separate places. Crossing is a process or act of crossing from one place to another by crossing a specific activity. A crossing bridge is a facility intended for pedestrians to carry out crossing activities at crossing points on roads with heavy traffic conditions. The pedestrian bridge serves as a safe way for pedestrians. The crossing bridge also functions as a means of moving pedestrians who will cross. The city of Batam is one of the cities with quite severe traffic jams. Because this often happens when there are many access roads in the city of Batam, road widening is carried out. FTA can assist in recognizing the interrelationships between causes in a system and in evaluating the potential impact of causes in the event of a system failure. The FTA procedure is based on creating a visual representation that identifies each potential cause, the relationship between the causes, and the prioritized prevention strategy.

1. Introduction

The bridge is constructed to continue the road from lower obstacles such as ordinary traffic. Bridges also serve as a link between separate places. Crossing is a process or act of crossing from one place to another by crossing a specific activity. A crossing bridge is a facility intended for pedestrians to carry out crossing activities at crossing points on roads with heavy traffic conditions [1]. The pedestrian bridge serves as a safe way for pedestrians. The crossing bridge also functions as a means of moving pedestrians who will cross. Planning facilities for pedestrians, including crossing facilities must be attention to the seven main objectives viz security, safety, convenience, smoothness, convenience, cohesiveness system, and attraction [2]. In terms of type crossing, group crossing facilities, there are two types of roads viz level crossing and nonlevel crossing. The type of best crossover is the crossing that is not on the same level as the lane on the highway, the first introduced by Leonardo da Vinci.

The crossing path is a pedestrian path that functions as a place to cross. The bridge's construction was seen from several considerations made by the government and its team. The consideration is the level of crossing activity with a high-density frequency. However, pedestrians often prefer to avoid using the crossing bridge even though they are taking a high risk by crossing directly on the highway. The city of Batam is one of the cities with quite severe traffic jams. Because this often happens when there are many access roads in Batam, road widening is carried out [3]. In Batam, there are also many crossing bridges provided by the government for pedestrians. However, there are still many pedestrians in the city of Batam who need to take advantage of these facilities. Therefore, research on the causes of low public interest in using the crossing bridge using the fault tree analysis (FTA) method is needed.

FTA can assist in recognizing the interrelationships between causes in a system and for evaluating the potential impact of causes in the event of a system failure. The FTA procedure is based on creating a

Receieved 20 Mei 2023
Available online 30 Juni 2023
Published by Fakultas Teknik Sipil dan Perencanaan UIB

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visual representation that identifies each potential cause, the relationship between the causes, and the prioritized prevention strategy.

2. Literature Review

Pedestrian comes from the Greek Pedos, which means feet, so pedestrian means pedestrians or people who walk. While the road has meaning as a medium above the earth that makes it easier for humans to walk, pedestrian, in this case, means the movement or movement of humans from one place as a starting point to another as a destination by using the walking mode. Pedestrians are a means of moving or moving a group of people from one place to another as destination on foot. Every pedestrian needs a means that is safe, comfortable, and good to use. For this reason, pedestrians are needed to support the needs of pedestrians. Pedestrians used to be a consideration for pedestrians to use pedestrian facilities and convenience. Therefore, it needs to get attention from the parties who designed the pedestrian. It can be seen from the facilities needed, the location to be used, and the comfort and security maintained [4].

A good pedestrian path must accommodate every pedestrian activity adequately and safely. This statement needs to be considered in the design. Pedestrian paths in big cities have a function for the development of city life, including Can foster healthy activities, thereby reducing the vulnerability to crime; Can stimulate various economic activities so that attractive business areas will develop; Able to present a specific, unique, and dynamic atmosphere and environment in the city center environment. Natural plans for pedestrian facilities must consider safety, security, convenience, smoothness, comfort, system integration, and attractiveness [5].

Generally, the bridge is constructed to continue through a lower obstacle. But some say the bridge is a land transportation infrastructure that can be used for crossing from one place to another that can be exposed by vehicles or pedestrians to rugged terrain (Ramadhan, 2022). The main objective of building bridges is to provide traffic access between two different points to facilitate the transportation and mobility of people and goods. Besides that, bridges can also be used to connect residential areas, industrial areas, and city centers.

Maintenance on the bridge is essential. The goal is to ensure the safety and performance of the bridge. Some of the maintenance actions include routine supervision, damage repair, replacement of damaged components, and increased security. Bridges have become an essential part of modern infrastructure and human possibility to overcome inaccessible natural obstacles.

The crossing bridge of people is infrastructure commonly used by pedestrians to cross. The distribution bridge is also an urban element that functions as a public facility, which is designed as a unique pedestrian path when the path is in the opposite direction [6]. The crossing bridge is currently very much needed by the community as a safe path during traffic jams. The crossing bridge of people has a high effectiveness to preventing pedestrians from vehicle accidents, but the level of users still needs to be higher. This proves that safety is one of many reasons people must use the crossing bridge.

Many reasons used by the community do not use crossing bridges, including related facilities that are less comfortable, safety, and many more factors that influence. Fault Tree Analysis is a system analysis technique used to find the root causes of failure in a system [7]. This method identifies possible causes of failure in the form of a "fault tree" tree. In FTA analysis, a failure is considered the tree's root, while the conditions and factors causing possible failure are called leaves on the tree.

The results of the FTA analysis can assist decision-makers in improving existing systems, designing new systems that are more reliable, and reducing the risk of system failure [8]. FTA analysis can also assist

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companies in meeting occupational safety and health regulatory requirements and correcting inefficient or ineffective business processes. In this study, fault tree analysis can assist in finding the reasons why the public's low interest in using the crossing bridge, where the causes that can be obtained later will be easier to find a solution that will be used.

3. Method

The type of research used is an interview or the Google form method where the distribution of forms will be carried out, which will get results from the location of the error, which results in low public interest in using the bridge, which will be analyzed using a fault tree analysis [9] [10] [11] [12] [13]. In this case, the approach used in this study is qualitative. This means that the data collected is not in numbers but data derived from interviews. So that this qualitative research aims to find out the things that cause the low interest of the community in using the crossing bridge. Therefore, the qualitative approach in this study is to analyze the reasons for the low interest of the community in using the crossing bridge. So, a qualitative approach is an approach or search to explore and understand a central phenomenon. Researchers will use the interview method by submitting general and rather broad statements. The results of this information will be collected, analyzed, and outlined in the form of a written report.

Batam City is one of the cities in the Riau Archipelago Province. The city of Batam has several achievements and the development of the city is quite rapid. Following Presidential decree number 41 of 1973, Batam was designated as an industrial regional work environment supported by the Batam Island Industrial Regional Development Authority or commonly known as the Batam Authority Agency (BOB), which has now changed to the Batam Concession Agency (BP Batam). In the 1980s, based on Government Regulation Number 34 of 1983 the status of the sub-district area was upgraded to the Municipality of Batam. In the late 1990s, with law number 53 of 1999, the Municipality of Batam changed its status to become an autonomous region, namely the Batam City Government to carry out government and development functions by involving the Batam Authority Agency (BP Batam) (BATAM, 2017). Currently, Batam City has 12 sub-districts and 64 sub-districts. In Batam City, there have been many crossing bridges built by the government. However, many people still use this facility.

The types of materials used are derived from primary legal materials. The primary legal material in question is by using the interview method which will be disseminated. The data collection method that will be used in this study is the interview method by distributing the form. The results of the interview will be analyzed using the fault tree analysis method. This will be analyzed to find out the causes of low public interest in using the crossing bridge. Where will be known and will find the right solution to fix it.

4. Result and Discussion

4.1 Characteristics of Respondents

Analyzing the characteristics of the respondents will help to see the relationship between gender, age, education, occupation, origin of the trip, the purpose of the trip, with the frequency and reasons for using the pedestrian bridge. Table 1 shows a summary of the analysis of the characteristics of the respondents.

Table 1. Characteristic respondent

No.	Characteristic	Frequency
1.	Man	50
	Woman	50
2.	Age:	
	13-23	68

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No.	Characteristic	Frequency
	24-34	22
	35-45	10
	46-56	10
3.	Basic	10
	Junior High School	35
	Senior High School	35
	Bachelor	10
	Postgraduate	10
4.	Government employees	10
	Private employees	10
	Student	80
5.	Stop	70
	Termination	10
	Public Transport	5
	House	10
	Other	5

Respondents stated that there were several factors cause the low comfort use of the pedestrian bridge i.e., bridge height, stairs, cleanliness, and the roof of the bridge. Respondents rate that the bridge looks very high so that users feel tired to get on the bridge. Besides the number of children too many stairs and floors cascading holes in the stairs people are reluctant and feel afraid to use the overpass. Cause frequency distribution the high percentage of that factor causing low user interest the pedestrian bridge is shown as for the most frequent reasons stated by the respondent is the condition the bridge is dark because of the ads so frequent criminal acts. This matter which causes low interest people using the bridge crossing. The second reason is from the convenience factor is the distance of the bridge far from the destination. Respondents stated that the distance of the bridge that far from the destination. Respondents felt it was quite time-consuming and exhausting to get to pedestrian bridge and leads to the destination. Therefore, to increase interest and awareness people to use the bridge crossing can be done by reviewing the location and position of the bridge and adequate lighting on the bridge so that people feel it is safe to use the bridge crossing.

4.2 Fault Tree Diagram

Respondents stated that 4 factors were causing the low comfort of using the pedestrian bridge, namely the bridge's height, the stairs, the cleanliness, and the bridge's roof. Respondents considered that the bridge looks very high, so users feel tired to climb onto the bridge. In addition, the number of stairs that are too many and the stairs with holes cause people to be reluctant and afraid to use the pedestrian bridge.

The frequency distribution of the causes of the high percentage of factors causing low interest in pedestrian bridge users is presented, showing that safety is the most dominant factor causing low interest in pedestrian bridge users. The reason most often stated by respondents was that the bridge was dark because of advertisements, so criminal acts often occurred. This is what causes the low interest of the community in using the pedestrian bridge. The second reason is the convenience factor, namely the bridge's distance far from the destination. Respondents stated that the bridge's distance, which was far from their destination, made them feel it took time and effort to get to the pedestrian bridge and lead to their destination. Therefore, to increase public interest and awareness of using the pedestrian bridge, this can be done by reviewing the location and position of the bridge as well as sufficient lighting on the bridge so that people feel safe using the pedestrian bridge.

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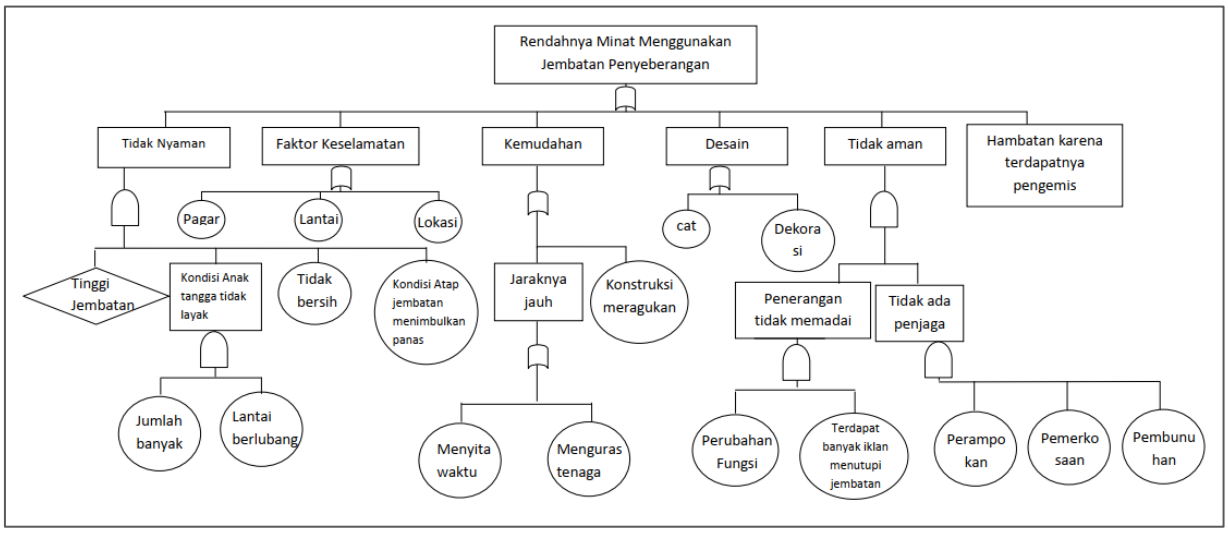

Figure 1. Fault Tree Analysis

The FTA diagram shows four critical events on the inconvenience factor: many stairs, perforated floors, uncleanness, and the condition of the bridge roof, which generates heat. Furthermore, there are three significant events on the safety and convenience factors. In the unsafe factor, there are many underlying essential events, namely changes in function, and many advertisements covering bridges, robberies, rapes, and murders. Other factors that need to contribute more are bridge design factors and barriers.

5. Conclusion

From the results of research using Fault Tree Analysis, it can be concluded that the insecurity felt by users is due to factors from inadequate lighting and can trigger criminal occurrences due to the absence of security officers and the presence of billboards covering the bridge Crossing makes people reluctant to use the crossing bridge. As many as 37% said that the bridge's lighting needed to be improved, and respondents were reluctant to use the bridge. Another factor is the user's discomfort with the condition of the stairs, which could be more feasible, and the heat on the bridge. The convenience factor is also the cause of the low interest in using the pedestrian bridge at the research site because the user doubted the bridge's construction and the bridge's distance, which is far from the destination, so users feel time-consumed and draining.

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Receieved 20 Mei 2023
Available online 30 Juni 2023
Published by Fakultas Teknik Sipil dan Perencanaan UIB