IJVAST | Vol. 2, Issue 3 | July 2026 | Open Access — Peer Reviewed Review Article

Effectiveness of AI-BARR in Enhancing Road Safety: A Survey Among Road Users in Dungun District, Malaysia

Norfadhilah binti Hasan[1], Nor Hasnati binti Abdull Patas[2], Noor Azlyn binti Ab Ghafar[3], Nazira binti Yunus[4], Mohd Dasri bin Che Mok @ Adnan[5], Suhaimi bin Abdullah @ Abdul Rahman[6], Mohd Hafili bin A. Halim[7]

[1–7]Jabatan Kejuruteraan Elektrik, Politeknik Sultan Mizan Zainal Abidin, Dungun, Malaysia

Abstract*—Road safety remains a major public concern worldwide, particularly in areas where roads are closed due to landslides, steep slopes, damaged road surfaces, or other hazardous conditions. These locations require effective road barriers to prevent unauthorized vehicle access and minimize the risk of serious accidents. However, conventional road barriers are often poorly visible at night or during adverse weather conditions, making it difficult for drivers to recognize road closures. This increases the likelihood of vehicles entering restricted areas, potentially resulting in severe accidents such as vehicles plunging into ravines or hazardous terrain. This study evaluates the effectiveness of the Automated Road Barrier Using Artificial Intelligence (AI-BARR), an intelligent road safety system equipped with hazard warning lights, automatic vehicle detection, and real-time Telegram notifications to alert the relevant authorities when unauthorized vehicles attempt to enter restricted areas. A quantitative research design was employed using a structured questionnaire comprising ten evaluation items measured on a five-point Likert scale. Fifty road users in Dungun District, Terengganu, participated in the survey after observing a demonstration of the AI-BARR system. Descriptive statistical analysis was used to evaluate respondents' perceptions of the system's effectiveness. The findings showed a high level of acceptance, with agreement percentages ranging from 85% to 92% and an overall effectiveness score of 89.8%. Respondents perceived that AI-BARR effectively improves road safety, increases the visibility of closed roads through hazard warning lights, enhances monitoring efficiency, enables faster authority response via Telegram alerts, and reduces the risk of accidents in hazardous and restricted road areas. These findings suggest that AI-BARR is a practical and effective smart road safety solution for temporary and permanent road closures.*

Index Terms*—Artificial Intelligence, Road Safety, AI-BARR, Traffic Safety.*

I. Introduction

Road safety remains a significant global concern. According to the World Health Organization (WHO) [1], approximately 1.19 million people lose their lives each year due to road traffic incidents, making road-related injuries one of the leading causes of death worldwide. While many of these incidents are associated with human error and traffic collisions, serious accidents may also occur when vehicles enter roads that have been closed due to landslides, steep slopes, damaged road surfaces, bridge failures, or other hazardous conditions.

Poor visibility of conventional road barriers, particularly at night or during adverse weather, may prevent drivers from recognizing road closures in time, increasing the risk of vehicles entering dangerous areas. In addition, traditional road barriers rely primarily on passive warning signs and manual monitoring, limiting the ability of authorities to detect unauthorized access and respond promptly. These challenges highlight the need for an intelligent road barrier system that enhances the visibility of road closures, detects unauthorized vehicle intrusion, and immediately alerts the relevant authorities, thereby improving road safety in hazardous and restricted areas.

In addition, poor lighting conditions during nighttime may reduce drivers' ability to identify obstacles or road hazards effectively. This situation increases the possibility of accidents, particularly in areas requiring additional safety control measures.

The development of an Automatic Road Barrier Using Artificial Intelligence (AI-BARR) aims to provide an intelligent solution by integrating automatic detection, barrier control, and warning mechanisms. The system is designed to detect vehicle intrusion and provide an immediate response without relying entirely on human monitoring.

Therefore, this study evaluates the effectiveness of AI-BARR based on public perception after experiencing the product demonstration. The evaluation focuses on the capability of AI-BARR in improving road safety, reducing accident risks, enhancing monitoring effectiveness, and optimizing operational resources.

II. Literature Review

2.1 Smart Road Safety Systems

The advancement of artificial intelligence and automation technologies has significantly improved transportation safety systems. Smart monitoring systems using sensors, cameras, and automated control mechanisms have been

widely applied to enhance traffic management and reduce human errors [2].

Artificial intelligence-based detection systems are capable of identifying objects, analyzing conditions, and providing rapid responses compared with conventional manual monitoring approaches. These capabilities are important in preventing unauthorized access and improving safety in critical areas [3].

2.2 Automatic Barrier Systems

Automatic barrier systems are commonly used in parking facilities, security checkpoints, and restricted areas. Conventional barriers normally depend on human operation or simple detection mechanisms. However, integration with artificial intelligence enables more efficient decision-making and automatic response.

AI-based barrier systems can reduce the requirement for continuous supervision while improving response time during emergency situations or security breaches [4].

2.3 Importance of Visibility and Night-Time Safety

Poor visibility is one of the contributing factors affecting road safety. During nighttime, drivers may experience difficulties identifying obstacles due to insufficient lighting conditions. Therefore, additional safety features such as warning indicators and illumination systems are essential to improve visibility and reduce potential hazards [5].

AI-BARR addresses this challenge by providing an automated safety mechanism that assists users in identifying risks and controlling access to restricted areas.

III. Methodology

3.1 Research Design

This study employed a quantitative survey method to evaluate the effectiveness of AI-BARR. A questionnaire consisting of ten statements was developed based on the objectives of the project.

3.2 Respondents

A total of 50 respondents were randomly selected among road users in the Dungun area. The respondents were provided with an explanation and demonstration video of AI-BARR operation before answering the questionnaire.

The demonstration approach was selected because actual accident prevention performance cannot be measured within a short testing period. Therefore, respondents evaluated the perceived effectiveness of the system based on its operational concept.

3.3 Data Collection Instrument

A five-point Likert scale was used:

Scale	Interpretation
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

The percentage of respondents who selected Agree and Strongly Agree was calculated to determine the effectiveness level of AI-BARR.

IV. Result

The survey results indicate that AI-BARR received a high acceptance level from respondents. As shown in Table 1, all evaluation items recorded agreement percentages above 85%, demonstrating a strong positive perception of the proposed system. The highest agreement (92%) was obtained for four evaluation criteria: improving road safety in high-risk areas, reducing accident rates, enhancing road safety monitoring effectiveness, and helping users identify obstacles or risk areas clearly, especially at night. Figure 1 further illustrates these findings by providing a visual comparison of the agreement percentages, confirming consistently high acceptance across all evaluation criteria. Overall, the survey achieved an average effectiveness score of 89.8%, confirming that AI-BARR is perceived as an effective and practical solution for enhancing road safety and monitoring efficiency in high-risk areas.

Table 1. Effectiveness Evaluation of AI-BARR

No	Evaluation Criteria	Agreement (%)
1	AI-BARR improves road safety level in high-risk areas	92
2	AI-BARR helps reduce accident rates in high-risk areas	92
3	AI-BARR improves road safety monitoring effectiveness	92
4	AI-BARR enables faster action when intrusion occurs	90
5	AI-BARR helps users identify obstacles or risk areas clearly, especially at night	92
6	AI-BARR overcomes limited visibility problems caused by dark conditions	85
7	AI-BARR automatically detects vehicles passing through restricted areas	90
8	AI-BARR provides early warning during unauthorized intrusion	90
9	AI-BARR reduces the need for continuous human monitoring	90
10	AI-BARR reduces operational costs related to safety monitoring	85

The overall average acceptance score obtained from the survey was:

Average effectiveness percentage = 89.8%

Figure 1. Percentage of Respondents Agreeing on AI-BARR Effectiveness

V. Discussion

The findings demonstrate that AI-BARR is perceived as an effective solution for improving road safety. The highest agreement percentage (92%) was obtained for three main aspects: improving road safety, reducing accident risk, and increasing monitoring effectiveness.

These findings indicate that respondents believe automatic barrier systems can provide better protection compared with conventional approaches that rely mainly on human monitoring.

Furthermore, 90% of respondents agreed that AI-BARR enables faster action during vehicle intrusion. This indicates that automatic detection and warning mechanisms are valuable features in reducing response delays.

The ability of AI-BARR to operate during nighttime conditions was also positively evaluated. Although the visibility-related item recorded the lowest percentage (85%), the result still indicates strong acceptance. This suggests that additional lighting and warning features incorporated into the system can assist users in identifying potential hazards under poor lighting conditions.

In terms of operational efficiency, 90% of respondents agreed that AI-BARR reduces dependency on continuous human monitoring, while 85% agreed that it can reduce operational costs. This demonstrates the potential economic benefits of implementing automated safety systems.

Overall, the survey results support that AI-BARR provides improvements in safety, monitoring efficiency, and resource management.

VI. Conclusion

This study evaluated the effectiveness of the Automatic Road Barrier Using Artificial Intelligence (AI-BARR) based on feedback from 50 respondents in the Dungun area. The findings showed a high acceptance level, with an overall effectiveness score of 89.8%.

The results indicate that AI-BARR has the potential to improve road safety by providing automatic vehicle detection, early warning capability, better monitoring efficiency, and faster response during unauthorized intrusion events. Furthermore, the system can reduce dependency on human supervision and contribute towards operational cost savings.

Therefore, AI-BARR can be considered a promising smart safety solution for implementation in high-risk areas requiring improved road control and monitoring.

References

[1] World Health Organization. (2023). Global Status Report on Road Safety. Geneva: WHO.

[2] M. Elassy, M. Al-Hattab, M. Takruri, and S. Badawi, "Intelligent transportation systems for sustainable smart cities," Transportation Engineering, vol. 16, 2024, ISSN 2666-691X. https://doi.org/10.1016/j.treng.2024.100252

[3] G. Zhao and X. Wu, "Artificial intelligence in campus security and crisis prediction: A review of current applications and future trends," International Journal of Advanced Research (IJAR), ISSN 2320-5407, 2025.

[4] C. Georgopoulou and P. Papantoniou, "A literature review of automated roadside parking monitoring using artificial intelligence algorithms," Electronics, vol. 14, no. 20, p. 4119, 2025. https://doi.org/10.3390/electronics14204119

[5] J. M. Wood, "Nighttime driving: visual, lighting and visibility challenges," Ophthalmic Physiol. Opt., vol. 40, pp. 187–201, 2020. https://doi.org/10.1111/opo.12659

ISSN: Applied For (2026) | DOI: 10.XXXXX/IJVAST.2026.XXXXX | Open Access — CC BY 4.0 License