

DATA VISUALIZATION OF ROAD TRAFFIC ACCIDENT ANALYSIS

Aiman Hafizi Ismail and Aznoora Osman
College of Computing, Informatics and Mathematics,
Universiti Teknologi MARA, Perlis Branch
aimanhizi29@gmail.com and aznoora@uitm.edu.my

ABSTRACT - Due to the growing tendency of the occurrences in conjunction with the growth in the number of registered cars in Malaysia year by year, road traffic accidents have proven to be a severe issue of concern. Information on the causes of the phenomenon is crucial to improving understanding and supporting various responsible agencies with the theory and framework for building the right legislation, and policy, as well as for intervention plans for road traffic accidents. The main objective of the project is to improve comprehension of road traffic accidents by offering a comprehensive and visually captivating summary of accident statistics. The following objectives are outlined to support the aim of the project are to identify the data requirements for road traffic accidents in Malaysia, to design and develop a Road Traffic Accident Dashboard with data visualization and to evaluate the level of user acceptance test toward the Road Traffic Accident Dashboard by using the User Acceptance Test (UAT). The methodology of the Waterfall model has been utilized for this project. It consists of five phases: planning, analysis, design, development and testing. The testing collects feedback on the dashboard from 35 respondents. The evaluation concludes that the dashboard helps to gain insights and spread awareness regarding road traffic accident cases. The Road Traffic Accident Dashboard will not only serve as a tool for informed decision-making but also facilitate effective communication of important road safety information.

Keywords: Road traffic accident cases, big data, data visualization, dashboard.

1. INTRODUCTION

Road traffic accidents, which can happen at any time and anywhere, are now a leading cause of death for many people around the world. An accident could happen due to numerous factors, including the weather, peak traffic hours, sex, age, the geometry of the road, the type of vehicle, the environment, and the number of occupants in the vehicle (Blincoe et al., 2002). The rise in the number of vehicles on the road has resulted in a corresponding increase in road traffic accident cases. This is a cause for concern as it indicates a growing challenge in ensuring road safety. Traditional methods of analyzing accident data may not be sufficient due to the sheer volume of cases. To comprehend the elements impacting the resulting numbers of traffic accidents and injuries, it is necessary to collect high-quality, accurate, and trustworthy statistics that are gathered over time (Lyons et al., 2008). This encourages the idea to design and develop a dashboard for road traffic accident analysis. A good road traffic visualization can make it easier for users to comprehend and locate road traffic information, including data comparisons, data trends, or data relations (Imawan & Kwon, 2015). The objectives of this study are to identify the data requirements for analyzing road traffic accidents in Malaysia, design and develop a dashboard to visualize the statistics and evaluate the effectiveness of the dashboard using user acceptance testing.

2. METHODOLOGY

To facilitate the development of this project, the Waterfall model was adopted, encompassing five distinct phases: planning, analysis, design, development and testing. During the planning phase, research was conducted by studying research articles and journals. Hence, problem statements, objectives, scope, and significance were identified. Proceeding to the analysis phase, a comprehensive literature review to gather relevant information and insights on the topic was conducted. The current and previous related works were gathered and data requirements were identified. Next, during the design phase, a dashboard layout and mock-up design are produced using Figma. The dashboard will display statistics about road traffic accidents graphically. Moving forward to the development phase, datasets obtained from Portal Data Terbuka were acquired and analyzed. The dataset underwent an ETL process before being transferred into the Apache Hive data warehouse. Besides, the Road Traffic Accident Dashboard is also developed by using Microsoft Power BI during this phase. Finally, in the testing phase, the dashboard is evaluated and validated by utilizing User Acceptance Test involving 35 participants to ensure the project objective is met.

3. RESULTS AND DISCUSSION

A User Acceptance Test (UAT) was conducted after the construction phase to collect input from 35 respondents. The questionnaire is split into 4 sections: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (ATT) and Intention to Use (IU). The answer option in the questionnaires is 1 to 5 scales, ranging from strongly disagree to strongly agree. Based on the testing, the Intention to Use section averages the highest. Most respondents agree that the dashboard meets their expectations and they are willing to adopt and utilize it in their daily operations.

4. NOVELTY OF RESEARCH / PRODUCT

The Road Traffic Accident Dashboard utilizes the Power BI platform specifically tailored for analyzing road traffic accident data. The dashboard may bring together diverse and comprehensive data sources related to road traffic accidents, such as accident cases by type of road, total accident cases by state, prediction of death accident cases in the next five years and more. By integrating and visualizing these variables, the dashboard can offer a holistic view of road traffic accidents, enabling users to gain new insights and correlations. Besides, the dashboard incorporated specialized visualizations, such as trend lines displaying accident frequency over time. It provides a novel approach to understanding and interpreting road traffic accident data. The dashboard also prioritizes user experience by providing a user-friendly and intuitive interface. There are interactive elements, customizable filters and easy-to-understand visual representations on the dashboard. This is to allow for effective communication of complex road traffic accident data to users of varying technical backgrounds, making it accessible and actionable.

5. CONCLUSION

The Road Traffic Accident Dashboard seeks to present comprehensive statistics related to road traffic accident cases in a visually appealing and intuitive manner. The study has effectively fulfilled its objectives by employing a thorough and methodical methodology. It has competently developed with the intention to enhance the understanding of road traffic accidents by providing interested parties such as traffic authorities, policymakers, and the general public, with a comprehensive and visually engaging overview of accident statistics.

REFERENCES

- Blincoe, L., Seay, A., Zaloshnja, E., Miller, T., Romano, E., Luchter, S., & Spicer, R. (2002). *The Economic Impact of Motor Vehicle Crashes, 2000* 6. *Performing Organization Code NHTSA Technical Report None None*. www.ntis.gov
- Imawan, A., & Kwon, J. (2015). A timeline visualization system for road traffic big data. *Proceedings - 2015 IEEE International Conference on Big Data, IEEE Big Data 2015*, 2928–2929. <https://doi.org/10.1109/BigData.2015.7364125>
- Lyons, R. A., Ward, H., Brunt, H., Macey, S., Thoreau, R., Bodger, O. G., & Woodford, M. (2008). Using multiple datasets to understand trends in serious road traffic casualties. *Accident Analysis and Prevention*, 40(4), 1406–1410. <https://doi.org/10.1016/j.aap.2008.03.011>