Model Development for Reduction of Accidents in Traffic Congested Major Roads

Russel L. Palubon
russelpalubon44@gmail.com

Cezille Joyze R. Pineda
cezillepineda@gmail.com

Venusmar C. Quevedo
venusmar.quevedo@adamson.edu.ph

Noime Fernandez
noime.fernandez@adamson.edu.ph

Department of Industrial Engineering
Adamson University
Manila, Philippines

Abstract

Road Traffic Accidents (RTAs) is a crucial matter that needs to be resolved, for it is one of the prime causes of injuries and fatality. Therefore, methods of reducing the severity of an accident is a fundamental concern to traffic authorities, and of the public in general. In Metro Manila, there were certain roads that are infamous for having high collision incidences, injuries and casualties. This study focused on the top three accident-prone roads with the highest recorded occurrences, specifically EDSA, C-5 Road, and Commonwealth Avenue. The researchers applied Multinomial Logistic Regression to determine the significant factors linked to accident severity and to find the model that would be able to predict RTAs along the three major roads. The factors which substantially influence the response variable, accident severity (Fatal Injury, Non-Fatal Injury, and Damage to Property), were evaluated. The predictor variables were Month, Time, Accident Factor, Collision Type, Weather Condition, Gender, and Age. The data for these variables were collected from Metro Manila Accident Reporting and Analysis System (MMARAS) managed by the Road Safety Unit (RSU), a subunit of Metropolitan Manila Development Authority (MMDA) from the year 2014-2019.

The software used to analyze the data was IBM SPSS. First, the data for each variable were coded separately for each of the major roads. By using the Multinomial Logistic Regression, every variable will be tested to find out the significant factors for each of them. Accident Severity will be placed in the Dependent Variable section. While the predictor variables (Month, Time, Collision Type, Accident Factor and Weather Condition) will be placed on the Factor(s) section. After determining the significant factors the next step is finding the prediction probabilities, these predictor variables will now be placed now to the Covariate(s) section. The particulars necessary for the model were Pseudo R-square, Step Summary, Model Fitting Information, Information Criteria and Cell Probabilities. The Parameter Estimates and Likelihood Ratio Test with Confidence Interval of 95% is needed to know if the parameters are suitable for the model. The subpopulations were categorized according to covariate patterns defined by factors and co-variables. The Estimated response probabilities, Predicted category probability should be included in the Saved variables, so as the Covariance Matrix. The software will generate the results fundamental to answer the research questions.

The three (3) common variables for the three major roads that were linked to accident severity were: Month, Time and Collision Type. The Month affects the accident severity, because there were specific months that RTAs were apparently high.The Time of day is also pointed out to have an effect on accident occurrence. The road condition for

each time period is found to be correlated with the incidence of accidents. The origins of vehicular collisions are complicated, but primarily rely on the behavior of the drivers. Vehicle crash reports have also indicated high speed, reckless driving and violations of traffic, so as alcohol and drug use.

Keywords
Road Traffic Accident, Multinomial Logistic Regression, Accident Severity

Acknowledgements

Getting through our undergraduate thesis required more than academic support especially in this kind of situation wherein a pandemic suddenly surfaced during and even after our research. We were highly indebted to so many people for listening, supporting, and helping us to finish this study.

We would like to thank Engr. Venusmar Quevedo for advising and helping us from the start until the end. We also owe it to Engr. Noemi Fernandez and Sir Darwin Ronquillo, for co-advising and suggesting ways to be able to fully understand the method and the area of the study. They support and guide us to complete the study. We are thankful and grateful for their aspiring guidance. We would also like to thank the personnel of Database Management of the Metropolitan Manila Development Authority (MMDA) especially to Mr. Joshua Angala and Ms. Meann Tanbio for giving us the necessary data that we need for our study.
We would like to thank our family, for their unconditional love and support. For always providing us our needs to be able to finish the study. We would also like to thank our friends and classmates, for believing that we can do it and always being there for us and for offering whatever help they can provide us whenever we need it.

And lastly we ultimately like to thank our Almighty Father, for blessing us with the wisdom needed in our endeavor. With Him, all things are possible. Praise be to Him.

This undergraduate thesis stands as a testament to your unconditional love, support, and encouragement.

Biographies

Russel L. Palubon is an Industrial Engineering recent graduate from Adamson University

Cezille Joyze R. Pineda is an Industrial Engineering graduate recent graduate of Adamson University

Venusmar C. Quevedo, Ph.D is a Full Professor of the Industrial Engineering Department of Adamson University. Her fields of interest include educational research and evaluation, productivity and operational excellence, quality management systems, optimization techniques, operations research, and project management.

Noime Fernandez is an instructor in the Industrial Engineering Department of Adamson University. She finished her MS in Industrial Engineering from De La Salle University as a government scholar.