Announcing the Final Examination of Khalid Al Kaaf for the degree of Doctor of Philosophy

Time & Location: November 4, 2014 at 1:00 PM in Engineering building 211P
Title: TRANSFERABILITY AND CALIBRATION OF THE HIGHWAY SAFETY MANUAL PERFORMANCE FUNCTIONS AND DEVELOPMENT OF NEW MODELS FOR URBAN FOUR-LANE DIVIDED ROADS

Road traffic crashes in Gulf Cooperation Countries (GCC) is considered a serious problem that has deep effects on GCC’s population as well as on the national productivity through the loss of lives, injuries, property damage and the loss of valuable resources. Thus, there is an urgent need to alleviate the severity of the traffic safety problem in GCC, which in turn will set a prime example for other developing countries that face similar problems. Two main data sources from Riyadh, the capital city of Kingdom of Saudi Arabia (KSA) and Muscat, the capital city of Sultanate of Oman have been obtained, processed, and utilized in this study. The Riyadh collision and traffic data for this study were obtained in the form of crash database and GIS maps.

The Muscat collision and traffic data were obtained from the Muscat Municipality and Royal Oman Police. Due to the fact that not all developing countries’ highway agencies possess sufficient crash data that enable the development of robust models. This problem gives rise to the interest of transferability of many of the models and tools developed in the US and other developed nations. The first edition of the HSM provides a number of safety performance functions (SPFs), which can be used to predict collisions on a roadway network. This dissertation examined the Transferability of HSM SPFs and developing new local models for Riyadh and Muscat.

In this study, first the calibration of the HSM SPFs for Urban Four-lane divided roadway segments (U4D) in Riyadh and the development of new SPFs were examined. The study calibrates the HSM SPFs using HSM default Crash Modification Factors (CMFs), then new local CMFs is proposed using the cross-sectional method. In addition, new forms for specific SPFs are further evaluated to identify the best model using the Poisson-Gamma regression technique. Results indicate that the specific SPFs provided the best fit of the data used in this study, and would be the best SPFs for predicting severe collisions in the City of Riyadh. The study finds that the HSM calibration using Riyadh local CMFs outperforms the calibration method using the HSM default values.

On the other hand, this dissertation examined the calibration of the HSM SPFs for Urban intersections in Riyadh and the development of new set of models. Three intersection categories were investigated: 3-leg signalized, 4-leg signalized, and 3-leg unsignalized. In addition, new forms for specific SPFs are further evaluated to identify the best model. Results indicate that the new local developed SPFs provided the best fit of the data used in this study. Moreover, this study examined the calibration of the HSM SPFs for Fatal and Injury (FI), Property Damage Only (PDO) and total crashes for Urban Four-lane divided roadway segments (U4D) in Muscat, development of new SPFs, and finally Riyadh FI model were validated using Muscat FI dataset.

Comparisons across the models indicate that HSM calibrated models are superior with a better model fit and would be the best SPFs for predicting collisions in the City of Muscat.

Major: Civil engineering

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Bachelor’s of Civil engineering, BS, 1993, Sultan Qaboos University
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Approved for distribution by Mohamed Abdel-Aty, Committee Chair, on November 4, 2014.
The public is welcome to attend.