BUS AND RAIL TRAVEL MODELLING FOR COLOMBO METROPOLITAN REGION: A THEORETICAL APPROACH TO MODE CHOICE MODELLING

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DEGREE OF DOCTOR OF PHILOSOPHY
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JANUARY, 2005
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A THESIS SUBMITTED TO THE DEPARTMENT OF CIVIL
ENGINEERING IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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January, 2005
ABSTRACT

The most common approach to modelling in Sri Lanka is based on zoning of the area concerned, and the identification of the travel network within the area, connecting the different zones. The resulting travel patterns of bus and rail are understood as an inter-zonal travel made between the different zones.

The set of models used for transportation planning in the Colombo Metropolitan Region has inconsistent structural forms with the formulation of different types of variables. Most of these variables are not common to each other. As a consequence the model estimation requires a large data base. Pertaining to this, a set of bus and rail passenger demand model forms is calibrated to a common modelling format, on a scientific basis.

These models attempt to explain (a) bus travel demand, (b) rail travel demand using season tickets,(c) rail travel demand using ordinary tickets and (d) total bus and rail travel demand. In these models, the impedance to travel is expressed in a generalized form, which includes travel fare, waiting time, transfer time and travel time. The product of employee population and the housing density between zones are the best fitted variables which explain the travel characteristics of the region.

The Mode choice modelling is one of the most crucial parts of travel demand modelling. With regards to this, the sound theoretical approach to the modelling facilitates the better understanding of traveller behaviour in the mode choice process. The theoretical framework of the bus and rail choice model has been formulated using logit theory, energy theory and economic theory. The variables fitted in this model are expressed by time variables such as, the utility difference between passengers (a) walking time to the mode, (b) in-vehicle travel times of bus and rail and (c) the loss of traveller comfort due to the loading levels and waiting time of the modes. The inclusion of bus and rail loading factors in the model, is important and has a great ability to represent the traveller characteristics of the inter-zonal travel. Therefore, the model can be applied for transportation planning studies not only to the study area but also to any Metropolitan region in the developing countries, which is of a similar nature in the travel characteristics.

The statistical tests reveal that the set of demand models for bus, rail and total public transportation has been successfully calibrated. It indicates the variation of the coefficient of correlation is between 70% and 80%. In fact, the choice model indicates this value is 85%, and 0.289 of the log likelihood index, which makes one conclude that the theoretical choice model has an acceptable fit, of the variables and the data.
ACKNOWLEDGEMENTS

This thesis is completed with encouragement, ideas and ready assistance from all the devotee people I have met. Sincere gratitude must be personally extended to them for their tremendous service.

Firstly, I am grateful to the Vice Canceller, Dean of the Faculty of Engineering, Director, Post Graduate Studies and Head of the Department of Civil Engineering for the permission granted for this research work.

Secondly, I wish to express my hearty gratitude to my supervisor, Prof. Amal S. Kumarage, Transportation Engineering Division for his dedication and commitment right through the research work and I wish to thank to Dr. Kolitha Weerasekara, Senior Lecture the Open University of Sri Lanka for kindly agreeing to serve as progress review committee member. Special thanks are due to Dr. Upali Vandebona, Senior lecturer, the School of Civil and Environmental Engineering, New South Wales University, Australia for kindly agree to serve as an external examiner for the research study.

Thirdly, I wish to thank the Chairman, the General Manager, the Director Training, and Mr.M.G.E.Perera, the Director Highways Design Division, of the Road Development Authority who granted me full time leave for this research degree programme.

Fourthly, I wish to acknowledge the Asian Development Bank (ADB) for granting me the scholarship under the Science and Technology Personnel Development Project. Also, I would like to thank the former Director Postgraduate Studies and Head of the Civil Engineering Department, Prof. (Mrs.) N. Ratnayake and all others who have selected me for this programme.

Finally, I wish to thank Head of the Transportation Engineering Division, Prof. J.M.S.J.Bandara and all academic and non-academic members of the Civil Engineering Department for all kind of assistance they rendered to me. Also, I would like to thank the Technical Officer of the Transportation Engineering Division, Miss. M.D.R.P.Jayarathne, for her continuous help in all endeavours.

Saman J. Widanapathiranage
January, 2005
This study is dedicated

to

my wife, Nilanthi

and

daughters, Dinali and Dilani
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LIST OF ABBREVIATIONS

ASC  – Alternative Specific Constant
BCT  – Box –Cox Transformation
BGC  – Bus Generalized Cost
B-OBSE – Bus Inter-zonal Observations
CMR  – Colombo Metropolitan Region
CTB  – Central Transport Board
CUTS – Colombo Urban Transportation Study
DEMIDEPT – Demand Estimation Model for Inter-District Public Transport
DSD  -Divisional Secretariat Division
LRI  - Likelihood Ratio Index
MGC  – Minimum Generalized Cost
MLE  – Maximum Likelihood Estimation
MNL  – Multinomial Logit Model
OCH  – Outer Circular Highway
OD  - Origin to Destination
RDO-OB – Rail Inter-zonal Travel Observations.
RSGC – Rail Season ticket Generalized Cost
ROGC – Rail Ordinary ticket Generalized Cost
SLR  - Sri Lanka Railways
SPSS  - Statistical Package for Social Scientist
TDM  – Total Demand Model
TED  – Transportation Engineering Division
VOT  – Value of Time