A More Sustainable Transport Future

The Effectiveness of Personal Rapid Transport in Edge Cities

Monica Elena Zarafu

University of Technology, Sydney
Faculty of Design, Architecture, and Building

Submitted for the award of
Master of Built Environment (Research)

2012

To my lovely daughter Clara Teodora who wouldn't be afraid to bungee jump from a bridge, but strongly refuses to get behind the wheel and drive over that bridge.

Certificate
of
Authorship / Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Monica Elena Zarafu

Acknowledgements

First and foremost, I would like to thank my supervisor, Associate Professor Heather MacDonald for her continuous support and guidance throughout the course of my candidature. Her invaluable help and carefully considered suggestions on much of my writing helped me finish this thesis in time. I am also particularly indebted to my co-supervisor, Dr Garry Glazebrook, who accepted me as an international student and without whom I would have not carried out this research at University of Technology, Sydney. His kind support, encouragement and assistance continued even after he left the University for a position within City of Sydney.

I am also sincerely grateful to Professor Peter Newman and Professor Anthony Capon for the opportunity to be part of the collaborative research program under the CSIRO Climate Change Adaptation flagship cluster. I would like to express my gratitude towards UTS, Curtin University and CSIRO, who provided the funding for my research. I would also like to give my thanks to Research Fellow Katrina Proust and Associate Professor Barry Newell, who welcomed me and helped me integrate within a great team of valuable scholars.

Professor Martin Lowson from University of Bristol, founder and president of ULTra PRT was generous with his time during my visit in London. A sincere thank you to Martin and Mark Griffiths who facilitated my visit to ULTra PRT at Heathrow, and many thanks to all the staff who spent time answering all my questions about PRT. I would also like to acknowledge Robbert Lohmann from 2getthere and Martin Pemberton from Vectus, and thank them for their helpful information and insights into the PRT concept and technology. Special thanks to Richard Lowson, who was always there to ensure that Martin would make time to answer all my questions. Many thanks are also directed towards John Lees-Miller who provided the expert version of the ATS City Mobil software.

I would also like to acknowledge the great assistance given to me by Evelyn Karantonis and Blake Xu from the Bureau of Transport statistics, who provided large amounts of data on request although they were overwhelmed with ministerial and departmental work.

Thanks are owed to Charlie Lin who assisted me with patronage data for rail stations. Genuine thanks to Anthony Ogle from City of Ryde for his time spent guiding me through the politics, rules and regulations applicable to the area. I still owe him a coffee and my gratitude for influencing me to think differently.

I would also like to send thanks to Dr Peter Rickwood, Dr Sumita Ghosh and Dr Janet Ge for their helpful feedbacks from my Master's assessment, and thanks to Peter McNeil and Ann Hobson for organising very helpful workshops. My thanks also go to Nick Chapman, who has promised to be the first person to try the "flying cars", as he calls them. Thanks to the occupants of our "Active Brains" office for a quiet and stimulating environment. A great thank you to Alejandra for her help in integrating me into the postgrad world and for always having an answer to my questions.

And last, but surely not least, thanks to my great and lovely family. To my husband Marius who did a great job in editing the thesis even in the long night of the culmination of my work with the writing of these thanks, and thank you to my daughter Clara who gave up her time with friends and many potentially early nights to correct my writing errors. Thanks to my parents and my brother in Romania who supported any decision in my life, even if it meant a very painful separation.

Lastly, a big thank you to all those who have witnessed the progression of my work and provided their encouragement and support when it was most needed.

Contents

List of Tables

List of Illustrations

Abstract

This thesis investigates how effective a Personal Rapid Transit (PRT) system could be in addressing sustainability challenges in edge cities. The study aims to enrich debates and decision-making processes over a future vision of more sustainable polycentric cities.

A case study of an 'edge city' within an emerging Australian multi-centred form examines the potential of a PRT system to change travel choice in a car-dominated urban form. The Macquarie Park case study not only extends the number of studies which identified the evolution of edge cities in a variety of national and continental settings, but demonstrates that edge cities have also evolved in Australia over the past two decades.

The thesis develops a design-based solution for increasing the accessibility of main transit nodes in Macquarie Park through a PRT network, and tests its service performance under different levels of demand, during peak and off-peak hours for an average weekday. Simulation results show a positive system performance, at high capacity demand during busy commuting hours and at low capacity demand for all-purpose trips during non-busy hours. The high theoretical performance and the positive return rate of investment draw the conclusion that PRT may be worth considering in future strategies.

This study presents a preliminary analysis of selected environmental, urban and health impacts compared to a business as usual projection of current transportation trends by 2031 and current planned transport improvements. The analysis confirms the findings from other studies regarding the low environmental and urban impacts of the PRT system. Potentially, the urban space released by retrofitting edge cities with a PRT system could be redesigned to encourage greater physical activity and social interaction. The original contribution of this research to the body of knowledge is the analysis of health impacts that a PRT system might have. Nevertheless, it points to further research which should be undertaken to fully understand the health implications of implementing such a novel transport system.

The thesis concludes that an non-traditional transit mode such as Personal Rapid Transit could bridge the gap between the car-dependent urban forms we have inherited and the transit-focused urban future that is essential in order to meet sustainability goals.