

Forecasting Demand for Demand Forecasting

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Abstract

The City of Calgary plans to conduct a major travel survey in 1991, which will be an important planning resource into the twenty-first century. The purpose of this study was to identify the major issues that travel demand forecasting will be faced with as the year 2000 approaches. An understanding of these issues will be useful in selection of what information to collect in 1991.

The planning context for the application of travel demand forecasting models is changing. Over the past decade there has been increased interest in environmental concerns, in the future this will mean a greater need for models that can provide the information needed for environmental impact studies. The trend toward more public involvement will mean a greater need to have a model that can be "sold" to non technical people. Development impact studies have formed an important part of the demand for travel forecasting and this can be expected to continue.

Changes in travel behaviour will also provide challenges to travel demand forecasting. In the past increased participation in the work force had a dramatic impact on the demand for travel. Other demographic changes in the future may have equally important impacts. Ageing of the population and telecommuting may reduce travel to and from work. People's concern for the environment may cause a shift away from the car toward more environmentally friendly modes, such as walk, bike, and transit. It is possible that because of these changes that the AM and PM peak hours may no longer be the determinant of the roadway needs. This would mean that a wider range of models and model forecast will be needed.

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By James Morison and Yuhan Fung

1 Introduction

The City of Calgary plans to conduct a major travel survey in 1991, which will be an important planning resource into the next century. The objective of this study is two fold: first to reexamine the context of model application, and second to identify trends in travel behaviour that may have to be considered in the future when developing forecasts. An understanding of these issues will be useful in deciding what information to collect and what kind of model or models to develop. In short this is forecasting the demand for demand forecasting.

2 The Planning Context

The planning context within which travel demand forecasting is used is changing, and these changes are part of the challenges that need to be addressed. Three areas of concern have been identified: increased interest in environmental concerns, increased public involvement, and increased model use in the settlement of development issues. All three areas call for new approaches to model development, structure and application.

2.1 Environmental Concerns

The public is increasingly concerned about the environment. In urban areas this has manifested in issues like: urbanization of farm land, air pollution, destruction of natural habitats, recycling, consumption of fossil fuels, etc. As a result, assessing the environmental impact of transportation projects is becoming a greater concern in the development of transportation plans. Models that allow assessment of the environmental impact of transportation projects are needed.

Traditionally travel forecasting models have focused on forecasting of design hour traffic volumes. As the environment become a major consideration other types of forecasts will become desirable. To assess the environmental impacts of a transportation project, estimates of air pollutants, noise levels, fuel consumption, etc. are needed. These kinds of estimates have been developed in the past, but the demand for these estimates can be expected to grow. The types of forecasts from the transportation model needed for environmental impacts go beyond just design hour traffic volumes. They can include: mid-day traffic volumes, evening traffic volumes, travel speeds, travel times, traffic composition and modal split.

There are two major barriers to the evaluation of environmental issues with Calgary's existing transportation model. The first barrier is that the existing model estimates AM peak hour volumes only. No estimates of PM peak hour or mid-day volumes are produced directly by the model. Speiss and Suter (1) have proposed a method for estimating hourly volumes on individual links for each hour of the day. This model or a similar one should be considered for Calgary. A second barrier is that the Calgary model uses a normative modal split model, where modal splits are supplied as input to the model. This does not explicitly allow changes in the road network to impact modal split, and thus transit

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ridership. Since the environmental impact of transit travel and private vehicle travel are quite different, a true evaluation of the environmental impact can not be achieved without modelling both modes and their interrelationships.

These and other barriers can be overcome by developing a travel model that explicitly addresses these issues. It is important to collect data on travel made outside the AM peak hour, since it does have an environmental impact, although it may not be considered in transportation network design.

2.2 Public Involvement in Decision Making

There is a long history of public involvement in decision making for transportation systems. It is expected that in the future this will continue to be an important consideration for transportation planners as both the public and politicians will become more directly involved in the planning process. The extent and depth of involvement is changing, with a more democratic approach to decision making. This will put transportation planners into a more advisory role, rather than a decision making role.

This trend and its impact on transportation planning has been widely discussed. The aspect of interest here is how it affects travel modelling and forecasting. Most non-technical people will have difficulty accepting the limitations of travel forecasting. Transportation modellers will be faced with a choice between models with limited scope that can be easily understood, or models with wider scope that are less easily understood. From the perspective of the transportation modeller it is important to have a rapport with the public. It is to the advantage of the transportation modeller to involve the public at the earliest possible stage of the process. To improve communication two models could be developed: the first being a conceptual model that can be used to explain the process used in forecasting, and the second being used for actual forecasting.

While there is clearly a need for a model that can be "sold" to the public and the politicians, it should be remembered that they need to be comfortable with modellers developing and applying the model. The ability to explain complex technical issues in understandable non technical language may be more effective in developing credibility than any technical innovations in modelling. The effectiveness of modellers would be improved if they met directly with decision makers.

2.3 Development Impact Studies

Development impact studies have become a large part of the demand for demand forecasting. Unlike most long range planning, where most of the work is conditional, development work addresses very specific issues, based on very specific assumptions. The context of the evaluation process is different. In long range and/or strategic planning the limitations of the model are overshadowed by the uncertainty of outside forecasts, such as land use, that the travel forecasts are based on. In development impact studies many of the assumptions made in long range forecasts are no longer assumptions, but specific development proposals. Consequently, the direct use of models developed for long range

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forecasts in development impact studies would be unwise. Since the needs of a development impact study are so much different from long range planning study it is unlikely that a single model can adequately service both. A separate model for development impact studies is needed.

3 Changes in Travel Behaviour

Travel surveys have been used to track travel behaviour for many years and some important trends have been noticed. In this section, attempts are made to anticipate future travel behaviour trends and their effect on overall travel demand. These have serious implications on the type of models that are needed. There are several categories of factors affecting changing travel behaviour. These include: socio-demographic trends, working at home, landuse changes, changes in the types of travel and the effect of environmental consciousness.

3.1 Socio-Demographic Trends

In the past a rapid increase in the proportion of the population that was employed had a very significant impact on travel demand in Calgary. Work trip travel rates increased significantly. The underlying cause of this was the influx of young people during the late 1970's and early 1980's and the increasing number of women in the work force. There is no certainty that these trends will continue in the future, or even that they will not be reversed. The impact on travel because of demographic changes in the future could be as great as in the past. Some relevant demographic trends are:

3.1.1 Aging of the Population

Globally the impact of the decline in the birthrate since the 1960's is starting to manifest itself. The rapid population growth of Calgary in the late 1970's and early 1980's because of in-migration, has masked the effects of this trend. Now that Calgary has become more stable the aging of the population needs to be considered. Review of data from travel surveys done in Calgary show that age has a significant impact on travel behaviour. Age affects the number of trips made, what types of trips are made and the mode used. Travel forecasting models based on travel behaviour of a predominantly young population will not necessarily be useful when the population matures. It will be important to identify how age affects travel and to forecast population by age group to evaluate the impact.

3.1.2 Labour Force Rate Changes and two worker households

The proportion of people who are employed increased from about 35% in 1964 to about 52% in 1981, and has varied between 50% and 52% since then. This is primarily the result of greater participation by women in the labour force. This trend has not only led to an increase in work travel, but has had effects on the mode of travel and the character of non work travel. For example: parents who leave their children at day cares while they are at work can not be as flexible in their choice of mode or route to

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work. With both spouses working during the day, non work activities, such as shopping, will shift to evenings and weekends.

3.2 Working at home

Between 1979, when Calgary first began to identify people who worked at home, and 1981 the proportion of people who work at home grew rapidly. Since then it has not changed significantly, staying at approximately 5%. There is some expectation that this will increase in the future because of telecommuting. While there is no clear indication of such a trend, review of 1981 travel data does show that, while people who work at home do not travel very much during the traditional AM peak, they make just as many trips during the PM peak, make more trips during the mid day period and are much less likely to use transit. It is possible that the design hour volume can no longer be determined using the AM peak hour volume. This may suggest a need for a model that can forecast mid day and PM peak traffic volumes. However, telecommuting did not exist in any real sense in 1981, so that there is no certainty that telecommuters will behave the same way as others who work at home. The extent to which telecommuting will be a significant factor affecting travel is unknown. It would be wise, in the 1991 surveys, to explicitly identify telecommuters.

3.3 Environmental Consciousness

The public is becoming much more aware of environmental issues and the environmental costs of their behaviour. There is a possibility that such awareness could lead to a change in their travel behaviour, such as shifting to transit use. These changes may be evident when the results of the 1991 survey are compared to earlier surveys.

3.4 Changes in the Location of Employment

The decline in the relative importance of the downtown as an employment centre will have a significant impact on travel patterns. Employment surveys in Calgary taken between 1981 and 1988 have shown that while employment in the City has gone up substantially (8.1%), employment in the downtown has grown very little (2.6%). An ongoing program to monitor and forecast employment location would improve travel forecasting.

3.5 Changes in the types of travel

In 1964 home based work trips accounted for about 21% of all trips made in Calgary. By 1981 this had gone up to 27%. This largely reflects the increase in labour force participation during the same period. Some of the other trends noted above could very well result in a further shift in the relative composition of trip purposes. Work related travel has a very high transit mode split, compared to non work travel, a shift toward non work travel could undermine transit ridership. Comparison of the results of the 1991 survey with earlier surveys will give an early indication if this is happening.

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4 Conclusion

Clearly no one model will meet all the needs outlined in this paper. As suggested by Kriger (2), there seems to be a need for many overlapping models, each geared to address some of the issues. The recommendations are:

- 4.1 A conceptual model. This will be a purely descriptive model of travel demand, intended to be used to explain to the public and politicians about travel demand.
- 4.2 City Wide Network Model. This is the traditional travel demand model used in network planning. It should incorporate both transit and vehicle models, and should model their interrelationship.
- 4.3 Landuse and socio-demographic Models. These would be a set of models used to help develop landuse and travel parameters for use in forecasting travel. Although landuse models have been used before, there has been little attempt to forecast travel parameters, such as trip generation rates and modal split behaviour.
- 4.4 Development Impact Model. This model would be similar to the City Wide Network Model noted above, but would be geared to the specific needs of development impact studies. Assumptions and parameters in the model would be based on the specific development proposals that are being considered.
- 4.5 Travel behaviour Database. The importance and usefulness of a travel behaviour database is often overlooked when developing a transportation model. The maintenance of a good travel behaviour database is important to the success of any transportation forecasting effort.

References

- 1 Speiss, Heinz, and Suter, Dieter "Modelling the Daily Traffic Flows on an Hourly Basis", unpublished 1990
- 2 Kriger, David S. "Putting Models in Context: Improving the Effectiveness of Models in the Planning Process" RTAC Conference Calgary 1989