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TOWARDS A POLICY FOR ESTABLISHING
MULTIMODAL PASSENGER TERMINALS IN CANADA

by DAVID W.R. BELL, M.A.Sc.
(University of Toronto)

A thesis submitted to the Faculty of Graduate Studies and
Research in partial fulfillment of the requirements for the
degree of Doctor of Philosophy (Engineering).

Department of Civil Engineering
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Carleton University
Ottawa, Ontario
April, 1988

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ABSTRACT

The goal of this research is to develop a methodology aimed at establishing a multimodal passenger terminal policy in Canada. The research also had as specific objectives the development of an information base on multimodal passenger terminals in Canada, the development of an analytical technique for use in transportation planning, the provision of guidelines for developing multimodal passenger terminals in Canada, the identification of future research opportunities and the creation of a greater awareness of multimodal passenger terminals.

In order to set the research in context, historic and forecast intercity passenger transportation activity was examined. The research then outlines multimodal passenger terminal activity in Canada and abroad to establish the potential for multimodal passenger terminal development in Canada.

To determine the extent of policy activity in multimodal passenger terminals world wide, a literature review is presented covering aspects of transportation policy and analytical techniques. It concludes there is very little literature or existing policies on multimodal passenger terminals.

The data-collection phase of the research was two questionnaires. The first was an open-ended questionnaire to several countries including Sweden, France, the Netherlands, Germany, Japan, the United States and Great Britain. The results of this questionnaire were then used as input into the development of a closed-ended Canadian questionnaire. These results were analysed using qualitative and quantitative analytical techniques.

A simple, easily understood analytic approach was developed using paired comparisons of factor scores and the development of an importance index. This became the primary analytical tool. Once the results were achieved, two additional analytical techniques--delphi method and case study--were used to validate the results. The validation provided a greater level of confidence in the results.

The results of the analysis indicate that the critical factors in the development of a multimodal passenger terminal in Canada in order of priority are:

- i) Integration of Various Modes of Transportation
- ii) Promotion of Public Transportation
- iii) Cost of Terminal
- iv) Government Cooperation
- v) Operating Factors (safety, security, etc.)
- vi) Heritage Building Preservation
- vii) Environmental Concerns (noise, air pollution)
- viii) Urban Development
- ix) Reduction of Local Traffic Congestion

A policy statement using the critical factors is presented and an implementation approach is suggested with guidelines. The actual application of the factors on a Canadian example is also presented.

The thesis is completed with conclusions and recommendations and an identification of areas for further research.

This research has made a contribution to the knowledge base of transportation planning through developing a methodology to identify the critical factors in developing multimodal passenger terminals; developing a policy to encourage multimodal passenger terminal projects; creating a data base; exploring an analytical technique and identifying further research opportunities.

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This research could not have been completed without the assistance of many individuals worldwide who responded to questionnaires, provided information and advice. To all of those unnamed persons, I am grateful.

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CHAPTER 1

1.0 INTRODUCTION

The goal of this research is to develop a methodology aimed at a policy to encourage the development of multi-modal passenger terminals (MPT) in Canada. MPTs provide a useful opportunity for transportation efficiency, passenger level of service improvements and modal co-operation.

There is little quantitative research and no existing policy to encourage the development of MPTs in Canada. As a result, useful opportunities may be lost.

In order to understand the importance of MPTs and hence the policy and methodology, there is a need to examine the recent history of transportation in Canada to establish the magnitude and ongoing role of transportation in Canada.

1.1 Historic Transportation Activity in Canada

Transportation accounts for about 6% of total economic activity in Canada.(1) It ranges from 4% in P.E.I. to 10% in British Columbia. Half of all transportation activity takes place in Central Canada (Ontario and Quebec), 44% occurs in the West and 6% in Eastern Canada.

Although increases in output of the transportation sector vary by mode, Table 1.1 indicates that the transportation sector continues to grow in all modes.

Table 1.2 indicates that during the period 1970-85, all modes have shown growth with the auto mode showing its

TABLE 1.1
TRANSPORTATION OUTPUT BY MODE 1981, 1982, 1983

MODE	1981	1982	1983	1985/81	1985/82
	(\$ millions 1971)			ratio	
Air	1607	1500	1779	1.11	1.19
Rail	2061	1686	2089	1.01	1.24
Water	651	564	715	1.10	1.27
Motor	2633	2455	2954	1.12	1.20
Total*	7722	6972	8378	1.08	1.20

* includes pipelines and urban

Source:

Statistics Canada,
Transport Canada,
Informetrica Ltd.

TABLE 1.2

DOMESTIC INTERCITY PASSENGER TRAVEL

(millions of one-way trips)

MODE	1970	1975	1980	1985	1990	1995
Auto	167.6* (78.2)	220.6 (81.5)	274.9 (82.2)	267.5 (85.2)	344.4 (87.1)	423.1 (87.3)
Air	8.0 (3.7)	13.8 (5.1)	18.6 (5.7)	16.6 (5.3)	19.9 (5.0)	25.1 (5.2)
Rail	7.3 (3.4)	5.1 (1.9)	7.4 (2.3)	6.6 (2.1)	6.6 (1.6)	7.4 (1.5)
Bus	31.5 (14.7)	32.5 (12.0)	33.5 (10.0)	23.3 (7.4)	24.9 (6.3)	29.1 (6.0)
Total	214.4	272.0	334.4	313.8	395.8	484.7

* Automobile figures are estimates from auto regulations and Canadian Travel Survey Data. Modal Shares are in brackets.

Source:

Transport Canada

Statistics Canada

continued dominance of intercity passenger travel. It is evident that the bus and rail modes are losing both modal share and number of trips. The bus mode increased until 1980 when it peaked at about 33 million passengers. Non-commuter rail traffic peaked in 1981 with 7.8-million passengers. It then declined for two years following a government decision to reduce a number of routes. According to VIA Rail annual reports, rail passenger then made a recovery with growths of 3.1% and 5.8% in 1984 and 1985 respectively.

1.2 Future Transportation Activity

The future demand for transportation is based on a number of factors which include economic growth, inflation, labour costs, fuel prices and international markets. Based on forecasts of these individual factors, a forecast for transportation activity was developed by Transport Canada. On balance, the negative factors affecting the demand for freight transportation services tend to outweigh the positive ones. Freight transportation is expected to grow at an average annual rate of 2.2% for the period 1985 to 1995, with the truck mode growing at 3.3% and the rail and marine modes expanding at 1.7% each.

Based on the same factors, growth of domestic intercity passenger travel is expected to be relatively strong for the 1985 to 1995 period. As Table 1.3

TABLE 1.3

DOMESTIC PASSENGER TRAVEL 1986 TO 1995
 AVERAGE ANNUAL PERCENT GROWTH IN PERSON- TRIPS

Region	Mode				
	Auto	Air	Rail	Bus	Total
Atlantic	3.9	1.2	-0.3	1.5	3.4
Central	4.5	3.7	1.2	2.2	4.2
Western	5.1	4.4	0.9	2.8	4.7
Inter- regional	4.3	4.6	0.5	2.5	4.3

Source:

Transport Canada
 Freight and
 Passenger Forecasts
 1986
 TP 2957

indicates, total passenger travel demand is expected to increase at an average annual rate of 4.3%.

It can also be seen that bus and rail will be below the total average at 2.3% and 1.1% respectively.

1.2.1 Forecast of Regional Transportation Activity

Table 1.3 provides a breakout of forecast domestic passenger travel by mode and region.

Atlantic Region

Travel demand in the Atlantic region is expected to be led by moderately strong growth in the automobile sector, 3.9% on average; however, demand for the public modes is expected to be fairly weak, reflecting the relative improvement in direct auto operating costs. Air traffic is expected to expand at 1.2% and bus at 1.5%. Demand for rail travel is expected to be quite weak, declining at an annual rate of 0.3%. Total passenger travel in the region is forecast to expand at an annual rate of 3.4% from 1986 to 1995.

Central Region

Relatively strong growth in passenger travel in the Central region (Quebec and Ontario) is expected for the auto, with a 4.5% average annual increase and for the air mode, 3.7%. The strength of the auto mode reflects the very favourable outlook for petroleum prices and the

strength of the air mode reflects more competitive air fares between Toronto-Ottawa and Toronto-Montreal, both high-density routes.

Rail service in the Quebec-Windsor corridor is being progressively improved with the introduction of LRC equipment, some track improvements and reduced travel times. These service improvements are more than offset by the substantial increase in rail fares required to reduce rail subsidies. As a result, the annual increase in rail traffic at 1.2% is expected to be considerably weaker than for auto, air and bus. It is anticipated that real bus fares will rise at about half the rate of rail fares. Thus, the bus mode is expected to improve its competitive position, vis-a-vis rail, and experience an average traffic increase of 2.2% per year. Total passenger traffic in the Central region is forecast to increase at 4.2%, close to the national average.

Western Region

Very strong growth in auto traffic is expected in the Western region with somewhat weaker growth for air and bus traffic and very weak growth for rail traffic. Overall, a 4.7% average annual increase in passenger traffic to 1995 is expected, with auto and air increasing at 5.1% and 4.4% annual rates respectively. Bus traffic is forecast to rise at 2.8% annually and rail traffic at 0.9%.

Inter-Regional Travel

This component, consisting primarily of long-distance domestic travel, comprises passenger travel from one region to another. The overall expected rate of annual increase during the 1986-1996 period is 4.3%, reflecting strong growth in auto and air demand. The strength of air demand is foreseen as a result of lower fares arising from increased competition on long-haul, high-density routes such as Vancouver, Calgary or Halifax to Toronto and/or Montreal. Air traffic is expected to increase at an average annual rate of 4.6% and auto at 4.3%. Bus traffic is expected to rise at a more moderate annual rate of 2.5% while rail traffic is forecast to rise very slowly at 0.5% annually.

1.3 Intercity Bus and Rail Passenger Activity

This research deals with multimodal passenger terminals and two of the major players in their development: intercity passenger bus and rail transportation organizations. It is therefore useful to establish that a future exists for both modes.

1.3.1 Historic Activity

1.3.1.1 Intercity Bus Passenger Activity

In Canada, intercity passenger bus and rail have had a long history. Figures 1.1, 1.2 and 1.3 display the

historical activity for both these modes.

The history of intercity bus shows a decline in passenger traffic in 1980 to 1984. This coincides with the development of VIA Rail Canada Inc., the national rail passenger corporation. Although the number of passengers have declined, the operating revenues have grown from \$265.6-million in 1980 to \$340.2-million in 1983--a growth of approximately 35%. Also throughout the period, the net income after tax of the intercity bus industry has never fallen below \$10 million and has increased above a low point of \$10.4 million in 1983.

1.3.1.2 Intercity Rail Passenger

The use of passenger trains, due to deterioration of the railways system and dramatic improvements in competing modes, declined considerably following the end of the Second World War and reached a low of 2.0 billion revenue passenger-miles in 1961 (Figure 1.2). As a result of the introduction of promotional fares in 1962-63, the railways regained a considerable amount of passenger traffic. Rail passenger travel reached a high of 3.1-billion passenger-miles in 1967 due in part of Expo 67 which generated substantial travel to Montreal. Since 1967, passenger-miles have declined again. The use for 1973 is very low due to a rail strike. Since 1975, rail passenger utilization has shown improvement.(1)

Figure 1.1

Intercity Bus Passengers

Millions of Passengers

Source: Statistics Canada Cat. 50-002

Figure 1.2
Rail Passenger Miles
1960-78

Source; Statistics Canada Catalogue No. 52-207

Figure 1.3

Rail Passengers

Millions of Passengers 1980-1990

Source: VIA Annual Report, Transport Canada, Statistics Canada.

In 1972, 5.91-million passengers used the trains. In 1974, train ridership dropped to 5.18 million. VIA Rail annual reports indicate that in recent years, however, passenger handling has been increasing (10% in 1977, 12% in 1978, 5.4% in 1979). The patronage for 1978 and 1979 was 5.60-million and 5.95-million passengers respectively. Since 1977, the year of VIA's incorporation, and the introduction of its marketing campaign, the number of train passengers has increased each year, for a total increase of 1.5-million passengers or 34% increase in passenger ridership.

Railway passenger miles show a similar trend. Since 1975, passenger miles have increased. (See Figure 1.2)

Trains are more successful in attracting passengers to short-haul services (i.e. up to 500 miles) than long-haul service. Half of rail's total ridership in 1975 was on services of up to 500 miles.(2)

Since 1978 and the takeover by VIA Rail Canada of the major rail passenger network in Canada, activity levels have been improving as shown at Figure 1.3. The activity in terms of rail passengers fell off during the early 1980s mainly due to a reduction in services. This was based on a government decision to reduce total rail passenger subsidies.. This decision was overturned in 1984 and the services

were restored.(3,4) The result has been a levelling off of the decline and an increase in passengers in 1984 and 1985.

1.3.2 Future Activity

1.3.2.1 Intercity Bus Passenger

Intercity bus passenger volumes are forecast to grow at approximately 2.3% per annum during the period 1986 to 1995. The distribution by region is shown at Table 1.3. The areas of major growth will be in Western Canada where the growth rate is forecast to be 2.8% annually. This is based on the assumption that the intercity bus industry will react to the opportunity created by increased rail fares to both increase profit margins and attract additional traffic from the rail mode.

Although the level of activity is below the total growth rate, it will be sufficient to maintain a continued increase in one-way trips to more than 29 million in 1995 (Table 1.2). This will maintain bus passenger modal share at 6%, a significant value for public intercity transport in Canada.

1.3.2.2 Intercity Rail Passenger

The future for rail passenger growth is forecast to show steady increases to more than 9 million by 1990.

The increase will predominate in Central Canada where the growth rate is expected to be 1.2% annually

(Table 1.3). There is expected to be negative growth in Atlantic Canada.

The low growth rates reflect a policy of increased cost recovery announced in the May 1985 Federal Budget (4). In addition to real fare increases of approximately 10% which occurred in 1985, it is assumed that fares will be increased by 3% per year in real terms. It is anticipated the introduction of other cost-reduction measures, such as bi-level equipment for transcontinental trains and modern, more efficient, maintenance facilities, will reduce operating expenses significantly and thus assist in the achievement of cost-recovery objectives. Fare levels for the Central Canada Corridor are assumed to be about 5% higher than for other services to reflect the substantial improvements in rail service currently being introduced in this region.

One key development in rail service in the Windsor-Quebec Corridor has been ~~the~~ two-hour reduction in travel time for all services between Ottawa and Toronto and the moderate time reduction on the Montreal-Toronto route. Another key development is the reopening of the Gare du Palais in Quebec. These improvements should make rail considerably more competitive.(3)

All rail passenger service in Canada is highly uneconomical.(5) In 1984, for example, VIA Rail services received operating subsidies of \$475 million in relation to revenues of \$168 million. 1985 subsidies are \$600 million including some allowance for capital and the reinstitution of previously cancelled services. Rail passenger service also carries the smallest proportion of all public transport passenger-kilometres (6%).

Despite these facts, successive governments have supported the provision of uneconomic rail passenger service on social and national unity goals in response to perceived public preferences.

The key rail-passenger issue is whether the social and secondary economic benefits of this form of transportation are, in fact, sufficient to justify the substantial subsidies paid for this mode, either in relation to other forms of transportation or other federal, social and economic development programs (5). This is a much-debated issue with strong views on both sides.

Some argue that except for a very small number of remote services, there is no transportation need for subsidized rail passenger service. In most cases, a wide range of adequate, lower cost alternatives are available to the public. Moreover, although recent federal Cabinet

decisions and pending legislation reflect a continuing commitment to support rail passenger service, at least on a selective basis, the spirit of these policies emphasizes a phased reduction in subsidies and suggests that unless certain services achieve improvement in financial performance, they will be discontinued.

Others argue there is a social and transportation accessibility requirement for rail passengers in Canada. These two points of view have existed for some time and will probably exist in the future.

1.4 Summary

From the foregoing, it is evident that the transportation sector is an important part of the Canadian economy. Transportation activity has grown in all modes and is forecast to continue to grow.

Intercity bus and rail are also forecast to grow and continue to play major roles in the public sector of intercity passenger transportation. They move large numbers of people and any improvements to the efficiency, level of service or effectiveness would be of benefit.

CHAPTER 2

2.0 MULTIMODAL PASSENGER TERMINALS

2.1 Background

Since the objective of this research is directly aimed at the creation of a policy to encourage the development of MPTs in Canada, it is important to understand Canadian and foreign interest and involvement in MPTs.

Multimodal Passenger Terminals (MPT) are defined as transportation centres where several modes of transportation are physically and operationally integrated, usually under one roof. As Figure 2.1 indicates, vehicles of various modes arrive and depart and passengers interchange among the modes in one terminal complex. These terminals can serve bus, rail, transit, taxis, automobiles, ferries and aircraft. For the purpose of this research, the focus is on surface modes of bus and rail although the basic principles could apply to other modes. Additional operational integration of modes could be accomplished by coordinated schedules, joint use of services, fare integration, etc.

2.2 Canadian Interest in Multimodal Passenger Terminals

Interest in the subject of MPTs in Canada continues to grow. The federal government, through VIA Rail, has been involved in developing MPTs at many locations (6,7,8,9,10, 11,12,13,14).

Figure 2.1
Multi Modal Passenger Terminal Schematic

Most recently, a multimodal terminal has been completed for Quebec City and VIA Rail has been actively promoting the concept at a number of locations. Table 2.2 identifies locations where multimodal passenger terminals have been considered in Canada. The results of the proposals have varied from rejection of the concept to complete implementation. A summary of the status of each terminal appears at Appendix A.

Provincial governments have also been involved in examining the potential for MPTs. In 1982, Ontario developed an approach and tentative program for multimodal passenger terminals (15, 16).

Several municipalities planning transit terminals, (i.e. Owen Sound, Brantford and Kitchener, Ont.) intend to incorporate intercity buses into their projects and have approached the Ontario Ministry of Transportation and Communications for financial assistance. All these latter terminals are to be constructed in downtown areas as part of urban renewal schemes. Further, one municipality, Strathroy, has made tentative inquiries regarding renovation of its railway station and incorporation of intercity buses.

Renewed interest in the development of an intermodal passenger terminal program for Ontario led to a 1985 visit to Michigan by staff of the Intercity Office of the Ministry of Transportation and Communications of Ontario to examine its eight-year-old program and to draw inferences for a possible Ontario program (15).

The results were as follows:

- (i) Intermodal passenger terminals can have major urban development and tourism implications. Coordination of the appropriate government funding agencies will be required to ensure a successful program.
- (ii) The most successful terminals are sited where there is no competition between modes and where the municipality supports appropriate urban development.
- (iii) Emphasis on terminal improvement, participation of all modes and self-supporting operations may be more practical than emphasizing operational integration.
- (iv) Restoration of heritage rail stations as passenger terminals may be impractical due to high maintenance cost, inappropriate facilities and inappropriate location.
- (v) The requirement that the terminal be self-supporting can significantly reduce operating costs by the

rental of space to appropriate clients.

- (vi) Inclusion in the terminal agreement of an escalator clause for rents and of a 'revenue distribution' for profits can ensure deficits do not occur and that profits are dealt with equitably.
- (vii) Inclusion in the terminal agreement of specified maintenance tasks and the requirement for a regular reporting system can ensure that adequate maintenance is carried out.
- (viii) Ongoing funding support may be required to ensure adequate promotion, staff training, adequate equipment and security.
- (ix) Government funds for transit terminals should only be provided if facilities for intercity buses are considered in the project.

Other provincial governments have shown interest and support for MPTs through their involvement in various site-by-site studies. Examples are Saskatchewan (10, 11, 12) which operates the provincial intercity bus system and Quebec which is a partner in the newly-developed Gare du Palais at Quebec City. A number of regional transportation studies in Canada, carried out jointly with provincial governments, have also dealt with the concept of MPTs (17, 18, 19).

TABLE 2.1
CANADIAN MPT DEVELOPMENT PROJECTS

SITE	MODES
KITCHENER, ONT.	BUS-TRAIN
BRAMPTON, ONT.	BUS-TRAIN
KAPUSKASING, ONT.	BUS-TRAIN
LEVIS, QUE.	TRAIN-FERRY
TROIS RIVIERES, QUE.	BUS-TRAIN
QUEBEC CITY, QUE.	BUS-TRAIN
SUDBURY, ONT.	BUS-TRAIN
MELVILLE, SASK.	BUS-TRAIN
REGINA, SASK.	BUS-TRAIN
VANCOUVER, B.C.	BUS-TRAIN
EDMONTON, ALTA.	BUS-TRAIN
MONCTON, N.B.	BUS-TRAIN
SAINT JOHN, N.B.	BUS-TRAIN
MOOSE JAW, SASK.	BUS-TRAIN
WINNIPEG, MAN.	BUS-TRAIN
NORTH BAY, ONT.	BUS-TRAIN
BRANTFORD, ONT.	BUS-TRAIN
CALGARY, ALTA.	BUS-TRAIN
DRUMMONDVILLE, QUE.	BUS-TRAIN
JONQUIERE, QUE.	BUS-TRAIN
LAVAL, QUE.	BUS-TRAIN
PRINCE ALBERT, SASK.	BUS-TRAIN
PORT COQUITLAM, B.C.	BUS-TRAIN
STE. FOY, QUE.	BUS-TRAIN
TIMMINS, ONT.	BUS-TRAIN

The results of these studies have been activities by a number of communities in Canada to examine the potential usefulness of a multimodal passenger terminal in their community.

2.3 United States Interest in Multimodal Passenger Terminals

There have been many communities and state governments involved in MPTs in the United States (20,21,22,23, 23,24,25,26,27,28,29,30,31,32).

As an example, the Michigan Department of Transport Intermodal Passenger Terminal Program (\$2.5-million U.S.) is a significant component of the State's support for intercity surface passenger transport. An important requirement of this program is that the terminal be self-supporting. Items covered in the program include not only construction but marketing, training, new equipment and security. Strong emphasis is placed on ongoing maintenance and regular monitoring of terminal operations is carried out.

There are currently seven intermodal passenger terminals in operation, three in the design/construction stage. Costs range from \$75,000 (U.S. 1985) for minor renovations to \$8.4-million (U.S.) for a major downtown redevelopment project. In the latter case additional funding is available through federal urban development

grants and through private developers. All projects have involved intercity bus carriers. Amtrak has been involved in five projects and local transit or "dial-a-ride" in eight projects.

In the United States, various major projects such as major regional transportation planning studies in the North East Corridor and the San Francisco Bay Area have examined the question of MPTs (30,31,32).

2.4 Foreign Interest in Multimodal Passenger Terminals

MPTs have existed in Europe for many decades. For a variety of reasons explained in section 4.2, they are an integral part of the European approach to intercity surface passenger transportation (33,34,35).

Japan is just becoming involved with MPTs and is developing projects in some major centres,(36) whereas developing countries are just beginning to think about MPTs but little has been done.(35)

2.5 Multimodal Passenger Terminal Participants

Those most concerned with multimodal passenger terminals are carriers, travellers, communities, and the various levels of government. There are also many other concerned parties as Figure 2.2 suggests. Table 2.2 points out detailed advantages and disadvantages for the various concerned parties. The three operators most involved in MPTs are the intercity bus industry,

intercity rail (usually VIA Rail Canada), and the local transit provider in the terminal area. For each of these, there are advantages and disadvantages in MPT, best explained for bus and rail in terms of patronage, terminal facilities, parcel trade, image and operations.

The rail mode has slightly more to gain from MPTs than the intercity bus. Rail has large over-capacity in many of its terminals. Joint use of this would reduce its costs and make more efficient use of space. The intercity bus mode should benefit from new terminals and improved public access. The local transit operation complements the intercity modes because it distributes the intercity travellers at the end of their trips. The actual mix of benefits and disadvantages to the local transit operator depends largely on the location of the MPT.

An MPT complex offers travellers numerous advantages over unimodal terminals, such as improved transit connections and easier terminal access from various part of the city; improved opportunities to transfer between intercity modes to complete a wider range of multi-stage trips and, possibly, some schedule coordination among the carriers.

Figure 22
Multimodal Passenger Terminal Players

Source: Reference 37

TABLE 2.2

POTENTIAL ADVANTAGES AND DISADVANTAGES
OF MULTIMODAL PASSENGER TERMINALS

I. OPERATORS	POTENTIAL ADVANTAGES OF MPT	POTENTIAL DISADVANTAGES OF MPT
A. BUS	<ul style="list-style-type: none"> - attract transfer business - direct competition with lower fare, higher frequency may attract patronage - substitution of other mode unavailable - provide improved complementary services - improved bus terminal image (vitality, etc.) - improved terminal security - improved employee benefits and morale - may attract government contributions - energy savings, etc. - opportunity to sell off valuable downtown property if relocate to RR terminal - improved access to city transit system - increased revenue potential from leases 	<ul style="list-style-type: none"> - direct competition with subsidized and rail passenger may lose patronage - capital for terminal development is scarce - forced into feeder role if closely associated with rail - increased terminal costs - lose some operational control of terminal - due to flexibility, move to rail station - as smaller of two operators may be left with large cost if other modes fail - increased competition from rail for parcel express - lose visibility as bus station

I. OPERATORS	POTENTIAL ADVANTAGES OF MPT	POTENTIAL DISADVANTAGES OF MPT
B. RAIL	<ul style="list-style-type: none"> - due to inflexibility, remain at present location - improved profile of rail mode (more passengers) - improved patronage (improved access, virtues of rail VS bus) - bus feeds rail on short-haul routes uneconomical for rail - reduced terminal cost if RR station shared - may attract more gov't funding - improved employee benefits and morale - improved employee benefits and contributions - energy savings, etc. - improved access to city transit - increased public support - increased political support - increased transfer convenience for passengers - increased revenue potential from leases - potential to rationalize non-profit routes (transfer to bus) 	<ul style="list-style-type: none"> - large terminal costs if other modes fail - lose patrons to bus operators (lower fares, frequency of better bus station, etc.) - lose some operational control - inability to re-use property as they wish - rail freight operators may oppose bus parcel operations from a joint terminal - cost to rehabilitate terminals

	POTENTIAL ADVANTAGES OF MPT	POTENTIAL DISADVANTAGES OF MPT
C. LOCAL TRANSIT		
i) Taxi	<ul style="list-style-type: none"> - more concentrated and continuous demand in one location - reduced queuing time - increased use of intercity travel by bus or rail may provide more traffic 	<ul style="list-style-type: none"> - reduced station-to-station trips - loss of rides to local transit - risk loss of concession stand if two previous stations consolidate
ii) Urban Transit	<ul style="list-style-type: none"> - terminal could be focal point for local operation short haul - users of terminal may choose transit to destination - could be part of terminal - improved waiting for customers from terminal to urban transit 	<ul style="list-style-type: none"> - busy terminal may overload local transit - if station out of way, transit routes may be distorted - schedule co-ordination may be difficult in off peaks - as a feeder service, may have to be extended to local communities
II. TRAVELLING PUBLIC	<ul style="list-style-type: none"> - improved transit access - improved transfer capability - schedule co-ordination - cost and non-price comparison of modes more readily circulable - improved station amenities - improved security and terminal appearance, comfort, etc. - improved terminal access by auto (parking, etc.) 	<ul style="list-style-type: none"> - if MPT not convenient, it may create longer trips for some

POTENTIAL ADVANTAGES OF MPT

POTENTIAL DISADVANTAGES OF MPT

III. COMMUNITY

- provide local activity centre - free up land for redevelopment - form part of an urban upgrading program - potential for increased tax revenues - increased traffic may bring more local business - renovation or construction will bring capital and labour into community - increased real estate values near the terminal	- could be some costs to service facility - loss of some marginal concessionnaires

IV. MUNICIPAL GOV'T

- positive image - addition to municipal network - reduce traffic congestion - increased tax revenue (property, concession, etc.) - removal of cold, inefficient building - financial grants	- more senior levels of gov't affect municipal planning - consolidation could cost jobs - upgrade municipal services to newer facility may be costly - opportunity cost of money to support improvement

POTENTIAL ADVANTAGES OF MPT	POTENTIAL DISADVANTAGES OF MPT
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V. PROVINCIAL GOV'T

- involvement in federal areas of responsibility- intermodal planning impacts- regional planning impacts- improved public transportation may reduce highway demands- improved transfers- access to federal grants destined for local terminals- meet provincial objectives (energy, municipal improvement)	- potential costs for joint involvement

VI. TRANSPORT CANADA

- meet federal objectives of transportation efficiency- meet other federal objectives (energy, industrial development, federal presence)- improved system infrastructure- reduced competition between modes leading to increased system efficiency- potential reduced costs for subsidized modes	- costs for involvement- lost opportunity cost of funding- risk objectives won't be achieved- increased O&M costs if benefits

The municipality has an interest in MPTs because the terminal area is often the only portion of intercity transportation coming under municipality influence. An MPT contributes to a municipality's self-image as being progressive and vital and may be part of a larger municipal redevelopment scheme. The municipality is usually involved in large commercial real estate developments, trading off certain benefits (i.e., taxes to induce development). Thus, this joint development may increase the degree of municipal benefit from a multimodal terminal project.

For the provincial and federal governments, the benefits and disadvantages of MPTs are more complex and difficult to generalize. There are varying levels of provincial interest--Ontario, Manitoba, Saskatchewan and Quebec being perhaps the most interested. Provincial involvement results from the provinces' responsibility for commuter rail and local planning. Also important for the provinces is the trade-off between public modes of intercity transportation (with few demands on provincial funds) and the auto mode (the provision of roads is an enormous provincial expenditure). The federal government also sees the same trade-off and may see MPTs as a way to promote public transport (thus saving energy and subsidies).

Proponents of multimodal terminals often suggest "government" as the MPT builder. Reasons for this include: (i) inadequate/unclear rate of return for investment by carriers; (ii) proponents' lack of resources; (iii) MPTs fulfill some federal interest in the national transportation system, from "energy saving" to providing "equitable" terminal facilities for bus users to righting numerous other "wrongs" (37).

2.6 Potential for Multimodal Passenger Terminals in Canada

Section 2.2 demonstrates that there is substantial activity in Canada in the development of multimodal passenger terminals. A study carried out for the Transportation Development Centre of Transport Canada identified the potential sites for MPTs in Canada (38). The extensive study and analysis used criteria of a number of modes, accessibility by time and distance, frequency of service by mode and potential for expansion of existing terminals in terms of cost. The study reviewed 131 Canadian towns with populations of 15,000 to 300,000. The study concluded there were 14 cities with high potential and 98 sites with moderate potential.

Numerous other studies and reviews have established there is good potential for MPT's in Canada (37,38,39,40,41,42).

2.7 Concerns

There are a number of concerns that have restricted the development of multimodal passenger terminals in Canada.

A major concern is the difficulty in bringing the two major public intercity passenger modes--bus and rail--together. The bus industry believes that larger subsidization of the rail passenger modes puts buses at an unfair competitive disadvantage. Although this is the view presented, discussions with the bus industry indicate a willingness to be involved in MPTs where there is a benefit.

In contrast to intercity rail the bus industry in Canada is regulated by the provinces, fragmented with some 60 plus separate companies in the business, providing mainly regional services(40). The only major exception is Greyhound. that provides transcontinental or national service. Thus at the present, joint bus and rail involvement in terminal development are unique at each location as there is no single national bus industry counterpart for the rail passenger carrier. Past Canadian terminal development efforts were uncoordinated as there was no real incentive to combine efforts and each carrier prepared its own plans. In Saint John, New Brunswick, in 1979, for example, VIA consolidated two former CN and CP stations located in the suburbs at one

downtown location. While VIA was preparing its plans, SMT, the major regional intercity bus carrier, was also preparing plans for its terminal at another location only a short distance away. This example illustrates a missed opportunity (40).

Interest in intermodal coordination is shared by many individuals in rail and bus industries, however, industry-wide acceptance and, of course, implementation has been very slow in Canada. Carriers are hesitant to embark on intermodal projects due to misunderstanding and mistrust of each other's motives and to not being able to clearly visualize how their individual operations would function together on a day-to-day basis.

On the Vancouver project, where some of these elements were present, steps had to be taken to create a good working environment (13,14).

The study was funded 50-50 by VIA Rail and Pacific Coach Lines (PCL), a provincially-owned bus line serving Vancouver Island and the lower mainland. It was realized from the outset that joint funding was an essential ingredient for getting active participation and commitment to consider and act on project results.

Since VIA and PCL had never worked together before, and the respective operational requirements were unknown to the other party, the selected planning approach called for specific inputs from those who were to use the terminal: PCL and VIA operators, dispatchers, ticket agents, and on-board personnel all actively participated in the planning process. After a week-long review, or "Gaming Sessions," the architect/planners who managed these sessions were able to synthesize the relevant constraints and goals which were then used as design guidelines.

Having agreed on individual needs, a final plan which met the requirements of all parties concerned, was produced.

Results of the study showed that:

1. Joint terminal space requirements are less than those for individual carriers. Specific benefits are:
 - . 30% less space for the joint waiting room;
 - . A 15% increase in available commercial space;
 - . Passenger parking can be reduced to 120 from 150 spaces.
2. Due to increased traffic volumes and extended hours of terminal usage, there may be a perceived improvement in "personal safety" and it will be possible to attract superior quality concessions.

These results clearly indicate there are definite incentives, both tangible and intangible, for undertaking multimodal development.

Other studies such as that of the Ontario Task Force on Provincial Rail Policy show similar results (17). In Chatham, Ontario, the main problem was "a lack of enthusiasm due to competition" but it was agreed by all that a transportation centre would result in a more efficient, accessible terminal.

In the same study, the case of London, Ontario, is discussed. There, the intercity bus and rail stations co-exist side by side with no problem.

In Canada, there are a number of other examples such as Kapuskasing, Quebec City, etc., where intercity bus and rail share a multimodal passenger terminal.

A second concern is the unknown aspects of the magnitude of potential benefits. There has not been enough experience in Canada to define the benefits. In the case of Winnipeg, a cost-benefit study was attempted prior to development of the MPT (8). It was impossible to complete, as the results varied with the assumptions on revenue gained through rental rates, tax incentives, passenger volumes, etc. There were a number of non-economic benefits identified in the analysis of an MPT at Winnipeg.

2.8 Summary

Multimodal passenger terminals are a subject of interest in Canada. The major participants are intercity surface transportation operators, local transit, travelling public and municipalities.

There are a variety of advantages and disadvantages to each but, on balance, there appears to be a benefit to developing MPTs. There have been a number of projects undertaken in Canada with varied results and a potential for more MPTs exists.

There are some concerns expressed by the intercity passenger bus industry but these relate more to unfair competition from government-subsidized rail passenger services. Evidence shows that MPTs appear to be able to work to the advantage of participants if properly developed.

There is a lack of quantitative research in this area and what is needed is a methodology to determine the critical factors in developing MPTs in Canada. If these factors were known, a policy could be developed to encourage projects to be implemented to the operational stages. This would then provide the opportunity to clearly identify the economic and non-economic benefits of MPTs and modal cooperation to all participants.

3.0 RESEARCH PROBLEM

A goal of the travelling public (society) could be to have efficient, accessible passenger transportation with a high level of service (comfort, convenience, etc.) at reasonable price.

One way of moving toward this goal would be through modal cooperation at an MPT. To achieve the development of MPTs, a policy for Canada would be a useful tool. Policy development is a complex process with many inputs. Policies are classified in a number of ways depending on the role of the policy. Policies have a number of characteristics and there are a variety of instruments to implement policies (see Chapter 7). Policy development can be described as a function of the value system of the policy maker, information provided to the policy maker and the goal of the policy. This research deals with the information component of the function. If improvements in the information component are made, the policy output may be improved. To create the policy, it is necessary to have an analytical method to determine the critical factors which are the basis of such a policy. These factors are focussed on the information portion of the policy being developed. This research has as its goal a policy for MPTs in Canada using a method to define the critical factors. The factors are the basis of the policy statement.

To better understand the research problem, it is necessary to discuss the parameters, current situation and mechanism for modal cooperation.

3.1 Parameters

There are a number of parameters which apply to this research. It concerns MPTs which pertain to surface intercity modes, mainly bus and rail. An MPT also offers benefits in terms of local transit and private auto but these will occur in some ways at either a rail or intercity bus terminal. This research does not deal with MPTs involving air or ferry passengers but the basic concepts could be applied to these modes. It is clear that MPTs may not be applicable to every community in Canada but there is significant potential for further development beyond those identified in this research.

3.2 Current Situation

At present there has been little or no quantitative research into MPTs in Canada. There have been a series of site-by-site studies but little analytical research on the overall concept. Some work in the area has been done by Transport Canada and Carleton University (37,38,39,40). Upon examination of this literature, it is evident there is little information available for analysis. There is, for example, no data base on the projects, current status, characteristics of terminal development, etc.

The current concern of the competition versus cooperation between intercity bus and rail is ongoing.

In Canada, the degree of modal cooperation between intercity bus and rail is low. There is little evidence that two modes are attempting to cooperate with each other to their mutual benefit or the benefit of the travelling public. If there is any cooperation, it is usually in aspects where there are little opportunities to compete, i.e., intercity buses picking up passengers at an airport to deliver them downtown. In areas where opportunities to compete exist, there appears to be minimal, if any, real attempts by operators to cooperate. Examples are the direct competition between bus and rail on many routes in Canada and the unwillingness of the two parties to share information, jointly examine problems, jointly schedule services, etc.

Modal cooperation could have some obvious benefits. It could reduce inefficiencies in the system. It may also permit public objectives to be met by a viable public carrier instead of a second carrier on the route with public subsidy to meet public objectives. If modal cooperation existed, there could be benefits to the travelling public. Some examples of this are cooperative scheduling to reduce waiting times between inter-modal trips; cooperative use of terminals to make transfers

between modes more efficient and convenient; cooperative ticketing and interlining to reduce trip costs.

This research attempts to develop the critical factors and a policy for multimodal passenger terminals. If multimodal passenger terminals are developed, there would be an opportunity to examine the characteristics of modal cooperation.

3.3 Mechanisms for Cooperation

There are a number of mechanisms that could be considered as methods to foster an environment of modal cooperation.

Primary among these are:

- i) Legislation could be written and approved to change the 1967 National Transportation Act philosophy from competition to cooperation.
- ii) The transportation system could be totally reorganized to enforce modal cooperation. This could be done by removing one mode from competing links in the networks and forcing joint use of facilities, etc.
- iii) The use of pilot projects such as MPT could be a mechanism to try cooperation on a limited scale. If this approach works, the climate for more effort in cooperation between modes may be developed.

The opportunities to change legislation are rare and are only achieved with good evidence and participants support. Legislative change is infrequent and usually requires a proven alternative. Therefore, unless cooperation has been shown to work at least on some limited basis, efforts to seek legislative change would be frustrated.

To force a major system reorganization, either all participants would have to agree or the government would have to take control of major pieces of the national transportation system, which are currently privately owned, and make the changes unilaterally. Both of these alternatives are difficult especially in a climate of mistrust between modes and current government economic regulatory reform activities.

The pilot project approach offers the opportunity to move slowly into cooperative efforts. It would require minimal investment from all parties. The pilot projects could be created and, if results are positive, cooperative efforts could be expanded. This incremental approach is probably the most acceptable in the current climate of mistrust between carriers (5,38,41). A slow approach would also allow careful examination by other affected parties (governments, developers, etc.) to determine their own

potential for future involvement in pilot projects or other cooperative efforts.

From the above, it appears the most likely way to create an environment for cooperation among modes would be an incremental approach through the use of pilot projects for joint cooperative ventures.

MPTs appear to have some potential benefits but to determine the exact nature in practice, a number of operating MPTs will be needed. If they are operating, factual information can be collected and analyzed to quantify the benefits and disadvantages to all parties, especially to intercity bus and rail. With evidence, the reluctance to cooperate may be reduced. In order to have operating MPTs, it is necessary to have a method of determining the critical factors in developing them in Canada. These factors should prove useful in creating a policy which in turn could improve the possibility of developing MPTs in Canada.

3.4 Research Goal

The goal of this research is to determine a methodology to determine the critical factors which are then used as a basis for the development of a multimodal passenger terminal policy for Canada. The policy could assist in establishing pilot projects. Pilot projects would

permit interested parties to determine operational, financial and marketing benefits and disadvantages of modal cooperation.

This research has a number of specific objectives which are to:

- i) Develop an information base on multimodal passenger terminal development in Canada;
- ii) develop a simple, analytical method to determine the important criteria, in priority order, for multimodal passenger terminal development in Canada;
- iii) develop a policy statement which could be used to encourage communities to develop MPT pilot projects;
- iv) create guidelines to be used by parties interested in developing multimodal passenger terminals in Canada;
- v) create a greater awareness of various aspects of multimodal passenger terminals in Canada; and
- vi) identify future research opportunities.

3.5 Research Contributions

This research will make a number of contributions. Some are:

- i) Examination of Canadian experience in MPT's in a more organized method than previously available;

- ii) development of an analytical data base on the subject for Canada by use of a questionnaire;
- iii) develop a simple, useable, understandable method to determine important criteria;
- iv) develop a policy for potential use by various government levels to encourage multimodal passenger terminal projects;
- v) develop a set of guidelines for interested parties to use to take advantage of the policy; and
- vi) create an awareness of the need to think about more than terminal appearance when developing a multimodal passenger terminal.

In a broader sense, if the policy developed by this research are used and MPTs are created, cooperation between various surface modes at the terminal points may be improved. If this proves useful, the cooperation may spread to other areas (common information, common ticketing, interlining between modes, compatible scheduling, common use of right-of-way, etc.). All of this should lead to improved resource utilization by the transportation sector.

Another useful output of the research would be in the area of service to the travelling public. If costly interchanges between terminals can be reduced or eliminated, the trip time should be shorter, the cost and

the inconvenience reduced. This improved level of service may manifest itself in increased ridership for the participating modes.

The development of MPTs could have great advantages for cities or municipalities by creating natural transportation centres, eliminating old terminals and freeing up land to assist in municipal planning and urban development.

3.6 Research Methodology

The methodology used in this research, outlined in Figure 3.1, was one of literature review, and a survey entailing the administration of two questionnaires. In addition, case studies were carried out. The collected data was analyzed to address the research question and provide conclusions and recommendations.

The literature review covered areas of transportation policy, multimodal transportation policy and some analytical techniques which included factor analysis. This literature research was carried out for Canada and other nations with multimodal passenger terminals. The data collection phase consisted of the development and administration of two questionnaires. The first was administered in countries including France, Italy, Holland, Germany, England, Sweden, Denmark, United States and Japan.

FIGURE 3.1
WORK PLAN SCHEMATIC

This was used to determine the appropriate factors to use in the Canadian questionnaire.

The second questionnaire was used to determine the important factors in the development of multimodal passenger terminals in Canada. It was administered to all known multimodal passenger terminal project efforts in Canada. The data was analysed using a variety of techniques. The first was factor analysis which, as discussed later, proved to be unsuccessful. The second, using paired comparisons and an "importance index," developed by the author, provided the necessary results. The third and fourth methods--modified delphi technique and a case study--were used to validate results of the analysis.

The final phase was to develop a policy and prepare the report including recommendations and conclusions.

Further details are available at Appendix B - Detailed Work Plan.

CHAPTER 4

4.0 LITERATURE REVIEW

4.1 BACKGROUND

Literature review was carried out in a number of subject areas at the beginning and throughout the research. The literature review was both useful and necessary for a number of reasons. The initial use of literature review was to develop a research topic. This involved reviewing a wide range of transportation planning material to develop a basic concept. The basic concept of multi-modal passenger terminals was then refined through further literature review. This aspect examined experience in Canada and abroad. As there is little experience and less written material on multi-modal passenger terminals in Canada, the literature of foreign countries was reviewed. This review indicated that some material was available. Because multi-modal passenger terminals are part of transportation philosophy in many European countries, the subject does not have to be well-documented. In the U.S. some material was available but not substantial amounts due to lack of experience. A similar situation was found in other parts of the world..

Literature review was also used to determine a method of analysis for the research problem. A number of methods were examined but a method from the social

sciences, called factor analysis was initially selected. Factor analysis as discussed in section 6.1.2 did not prove useful and a simpler, more flexible method was necessary. Literature research produced a method that was modified for the analysis (42). The method, developed by the author, utilized pair comparisons and an importance index to priority-rank the critical factors in multimodal passenger terminal development.

The output of this research could be used to develop a policy by various interested parties. It was therefore necessary to review literature on transportation policy development. There was a great deal of literature in all aspects of policy development in many disciplines.

In general, literature review was useful in developing the basic problem and the various approaches to examining the problem. Because of the lack of specific data and literature on multimodal passenger terminals in Canada, the literature review was helpful as a guide to areas to examine further.

4.2 TRANSPORTATION POLICY LITERATURE

The initial subject of the literature review was transportation policy. This review concentrated on the European Community since multimodal transportation is more fully developed in Europe than in Canada or the United States.

4.2.1 European Transportation Policy and Terminals

After reviewing European transportation policy and experience in terminal design, a number of differences with Canadian transportation are evident (43,44,45,46,47,48,49, 50). Public transportation in Europe is considerably more successful than it is in Canada and the U.S. ridership volumes are greater, the level of service and frequency is much better. The reasons for the differences are in a number of areas: cultural, geographic, socio-economic, modal ownership, transportation policy and operations.

The underlying philosophy of European public transportation policy and terminal planning is the integration of modes. This fundamental principle means transportation modes should complement each other and function as an integrated system. The most visible aspect is the transportation terminal. Here, trains, buses, streetcars, subways, cars, and bicycles converge and diverge in accordance with coordinated schedules.

A second major aspect is the operational policy of coordinated scheduling. This is a fundamental part of all transportation operations in Europe.

The third area is ticketing. Most European transportation routes fit together in an interconnected network so that the traveller uses a single ticket even if a transfer is necessary.

A less visible area for the integration of modes is at the management level. Many European cities have set up transportation associations which comprise numerous public and private bodies providing transportation. These associations coordinate timetables, conduct research, finance projects and keep the public informed of transportation services.

Modal ownership in Europe is quite different than in Canada. Most modes are nationally owned and operated. This allows European governments to ensure schedule coordination, common ticketing, common services, etc. In Canada due to diverse ownership, cooperation and coordination requires negotiations and agreement among many parties. This makes multi-modal terminals more difficult to develop in Canada.

Another area is the joint development of land on or near transportation terminals as a trend for the future. European countries encourage private enterprise to develop land adjacent to transportation terminals which enhances the transportation system, stimulates urban development and helps finance the infrastructure.

There are often discussions about transplanting European approaches to Canadian problems. This must be done with great care. European cities have their own characteristics which may or may not be compatible with

Canadian cities. An examination of their philosophies, approaches and methodologies are useful and we can learn a great deal from each other.

4.2.1 Basic Structure of the European Transportation System

The transport policy problems of the European Communities arise from basic, geographic facts. Based on statistics from the 1980 Statistical Yearbook of the European Communities, the European Community covers an area of 1.5-million km², or one-sixth of the area of the United States (9.3-million km²). It has 259 million inhabitants, 43 million more than the United States and 10 times the population of Canada. The community's population density is 170 inhabitants per km², almost eight times that of the United States (23 inhabitants per km²) and 60 times higher than Canada (2.8 inhabitants per km²). The population of the European Community is distributed unevenly over its territory; large concentrations of population have emerged and are continuing to develop. The largest is the area in Northwest Europe, roughly bounded by the cities of Liverpool, Eng., Hamburg and Munich, West Germany, Geneva, Paris, Le Havre, France, and Southampton, Eng. This relatively small area of less than 500,000 km² contains 140 million Europeans from seven countries, 85 per cent of them in towns. To the south of the Alps there is the other large concentration: the plain of the Po, with

the cities of Genoa, Turin, Milan and Venice. Some 70 per cent of the community population is thus concentrated on some 40 per cent of the surface area of the community. As these concentrations of population are also the areas with the most intense concentrations of economic activity, the general trend of the traffic flow in Europe lies along a north-south/south-north axis; these European flows are concentrated along the Rhine. To the north and the south there are geographical obstacles to cross - the Channel and the Alps.

The fact that the European Community is the leading trading area in the world largely determines its internal traffic structure. This is particularly true where its seaports and access to and from the internal European transport network are concerned. The major role played by shipping on the Rhine and on the inland waterway network connected thereto has thus contributed to the unparalleled development of Rotterdam - the largest seaport in the world - both as a deep-sea and an inland waterway port. However, there is little, if any, inland navigation in Italy, Greece, the United Kingdom and Denmark. In these countries, coastal shipping and the road and rail systems are more developed and connect the ports to their hinterland.

One important element of the passenger transport network is the railway system, the main lines of which are

largely electrified. The major railways are run by state-owned companies each with its own central national administration. The principal railway networks are those in the Federal Republic of Germany, France, United Kingdom, the Netherlands, Italy and Belgium; the Dutch/Belgian railways form an important link between the larger countries.

The European network of highways and expressways is of considerable importance in passenger movement and reflects the varying population density particularly strongly. This is mainly true for the highway networks in Belgium, the Netherlands, the Federal Republic of Germany, Great Britain and Italy.

There is also a considerable amount of air traffic within Europe - both passenger and air freight and both scheduled and charter flights. Just as each country has its own railway undertaking, each member state has its own national airline. Because the routes are short, these airlines would not be profitable if they relied on internal European passenger traffic alone. Thus they all operate an extensive network of intercontinental flights.

The transport structure of the European Community has changed considerably in the last 20 years. Road freight operations account for an ever-increasing share of goods traffic. In the Federal Republic of Germany, for instance, the proportion rose from 64,000 to 103,000

million tonnes-km between 1966 and 1976, while rail freight traffic dropped (51). This reflects a change in the industrial structure. Industrial firms are becoming increasingly specialised, with the result that many kinds of semi-finished products have to be transported back and forth between these firms - by preference carried by truck.

European Transportation Markets

The basic attitude of the member states to transport policy largely depends on the facts of economic geography described above. The national transport markets of the individual member states differ considerably in structure. Being smaller countries, the Benelux States have largely resorted to road freight transport, which is particularly profitable over short distances and - for bulk goods - to the inland waterways. The railways have a comparative advantage in the Federal Republic of Germany and France where distances are greater. The important influence exerted by the distances to be covered on the structure of the transport market can also be seen in the case of rail-oriented Federal Republic of Germany and truck-oriented Britain: West Germany's seaports are in the North, often remote from the manufacturing industries, while Great Britain's industrial centres are closer to the nearest seaport. As a result, France and West Germany have given a certain degree of priority to rail transport and

have taken measures to restrict long-haul road freight.

West Germany also had to create restrictions of this type because of the considerable amount of transit traffic, which easily leads to congestion on the German highway network. Italy too has clearly opted for rail transport in its attempts to set up industries in the Mezzogiorno region and connect this part of the country to the industrial north. All the other member states generally favour road haulage. These same systems carry passengers in patterns similar to freight.

Each member state has a highly-developed transport system tailored to national interests. Those countries which aim for a certain degree of coordination of the three inland modes of transport have state-imposed rates and capacity restrictions. Only a limited number of road haulage authorisations are available in those countries; private, scheduled passenger services must also be approved by the state.

International transport in Europe is based on quotas - usually bilateral - for the haulage of goods by road. Bilateral agreements have also been signed for the transport of passengers by road and air. Under these agreements, the individual member states guarantee a limited degree of access to their markets.

The railways traditionally cooperate on technical

matters, while each national railway largely applies its own commercial rules and traffic.

International sea transport remains free from restrictions in accordance with freedom of the high seas but, as with the other modes of transport, this does not apply to cabotage (sea transport between two ports in the same State).

Where infrastructure plans and measures are concerned, each member state first sets its own priorities; however, bilateral and multilateral contacts are maintained in order to coordinate international routes for passengers and freight.

Attitude Of European Countries

The different structures of the national transport systems lead to strong conflicts of interest between the member states; these have to be overcome at community level.

European integration is not a question of pursuing harmony for the sake of it. Instead, it is a matter of removing barriers to trade and transportation between the member states. However, only rarely are these barriers easily perceptible or spectacular, for example, when entry into another country is refused. International cooperation among the European states in the transport sector was developed long before the EEC came into being. Only on closer

examination can international transport in Europe be seen to be full of subtle irrationalities and obstacles which arise from the differing national transport systems. These not only make transport itself more expensive but also distort and impede the common market for goods and services. These national regulatory systems for freight and passengers cannot simply be abolished like customs formalities at the internal frontiers of the community.

The only solution is to find a joint answer to these sensitivities. However, this is complicated by the fact that every national transport policy is also determined by an ideology which differs according to the geographical conditions and position of the country in question. As stated above, the importance of the railways in the large continental countries differs from that on the islands and in the smaller countries.

This has an effect on the precarious balance between rail and road. It is quite natural that a state with 80% or more of goods and passenger traffic travelling by road, and with a railway system cut to bare minimum, will tend to reject any controlled market system and demand that its other partners in Europe do the same. On the other hand, a state in which a high proportion of traffic is carried by rail and which is, moreover, located on a transit route will tend rather to call for a limit to the number of

trucks entering.

In view of this strong conflict of interests among the member states of the European Community, it is surprising to see how much shared thinking there now is on many questions. Over the years, there has indeed been a harmonization of transport policy, both freight and passenger.

4.2.2 Integrated Policy of European Transportation

The overall objective of European integration is to improve the living and working conditions of the citizens of the member states.

Transport policy must ensure that passenger transport operations between the member states of the community are organized as simply and efficiently as possible and that the cost to the public is kept to a minimum. Transport policy must make use of the various transport techniques and modes in such a way that the transport of passengers between the different component parts of the economic area constituted by the community can be effected in the best possible conditions without resulting in intolerable burdens on the taxpayer or unacceptable environmental stresses.

The idea of a community transport system is based on the realization that the object of each separate national transport policy was, and is, to regulate the interplay

between the various modes of transport in a given way within the national territory of a given state. It was precisely this which led to the creation of different transport systems in which the different modes of transport acquired their particular roles. In all cases, the national systems monitor all modes of transport and their individual functions and are always subject to state organizations. It was also noted that the national passenger transport systems had helped to establish a balance between the interests of all parties involved in the transport sector - carriers, employees, consignors, owner-drivers and the general public - which the state recognizes as the protector of public order.

This means that the basis for creating a common transport policy must consist of taking the member states' individual national transport systems and gradually developing them into a community transport system leading at community level to balance between the parties concerned, just as the national systems did earlier at national level. To do so, the community must use the same instruments as the States.

It must consider planning and building infrastructures and must also lay down certain rules for the ordering and use of this infrastructure by carriers.

Research carried out for the European Conference of Ministers of Transport shows substantial transportation policy research is focusing on economic regulation. There is currently research activity in Canada, the U.S., Germany, Holland, France, Norway, Switzerland, United Kingdom and Belgium (52). It is clear from the review that the conditions of ownership, planning integration and system structure in Europe are quite conducive to the development of multimodal passenger terminals.

The philosophy of integration encourages rail, bus and other modal operators and interested groups to cooperate to provide efficient, effective transportation services. In Canada, the conditions of private and public ownership, lack of multi-level planning integration and competitive route structures mitigate against modal cooperation.

4.3 Worldwide Transportation Regulation

Transportation regulation as a tool of economic and social development is now becoming a major transportation policy question around the world (53,54).

Great Britain has moved to a less interventionist approach (54). This has been achieved through deregulation of major modes such as the bus industry in 1978 as well as privatization of major parts of the transportation network. The privatization of British Rail and British Airways, the national railway and airline, are examples.

European East Bloc countries have used an approach similar to Britain. They are generally using transportation as a tool of economic development (55). They are attempting to be less interventionist and privatize small segments of the industry. Similarly, Japan and China are moving into a less regulated environment as a transportation policy direction (54).

In the underdeveloped countries, transportation policy is also concerned about passenger and freight transportation as a tool for economic and social development. Countries such as India, Thailand, Brazil, Argentina and Chile are becoming less interventionist. Although the federal governments control the transportation system, they are attempting to put privately-owned railways on a more commercial basis. They have put pricing in the hands of the railways. They have also put more rail freight traffic on a negotiated-rate basis.

The underdeveloped countries use transportation policy and, more particularly, regulation as a method to meet social more than economic objectives. In Jamaica, the intercity public passenger system has as its major objective a system to permit adequate, affordable family visiting throughout the island. Business and work travel and system-efficiency considerations are secondary.

In Canadian and U.S. transportation policy, there is a focus on transportation regulation. Evidence of this is shown with US air deregulation in 1978 and the Staggers Rail Act of 1980. In Canada, economic regulatory reform has been the single, biggest transportation policy issue of the last 3 or 4 years. This culminated in a major government position paper entitled "Freedom to Move." There is a new National Transportation Act (January 1988). This Bill is designed to remove restrictive economic regulatory controls to produce a more market-oriented industry.

4.4 Multimodal Passenger Terminal Policy

The literature on multimodal passenger terminal policy is almost non-existent.

In Europe, integrated passenger transportation and terminals are a basic aspect of transportation planning philosophy. There is, therefore, little need to have specific policies to encourage multimodal passenger terminals. In other parts of the world, the concept is sufficiently new that specific policies have not been developed. The majority of the literature is on a project-by-project basis. Most multimodal passenger terminals in Europe were developed decades ago and have been enlarged and refined over time. Multimodal Passenger Terminals such as Perrache in Lyon, France and Utrecht, the Netherlands are examples of this. There are no records or basic

activity data on the rationale for development of a multimodal passenger terminal. It is therefore impossible to do a before-and-after comparison of impacts and effects. Also, there is no information on the reason for modal cooperation other than the environment (ownership, system integration, etc.). It is therefore not possible to infer the policy that may have existed. In Europe, when a terminal is being redeveloped or modified, studies of a technical nature are carried out. A review of some of these studies suggest that the need for a multimodal terminal is never questioned. The studies concentrate on efficiency, design, options, operating conditions, etc.

In the underdeveloped countries, multimodal passenger terminals do not exist and there is no literature available.

In the U.S. the literature is comprised of site-by-site reviews. The studies examine a completed terminal. There is little literature on the initial development of the terminals. Examples such as the Camden, New Jersey, and Santa Ana, California, transportation centres received brief write-ups in specialized transportation magazines. The Santa Ana terminal was mentioned in the November 1986 Institute of Transportation Engineers Journal and was the recipient of a design award.

It's multimodal passenger terminal aspect was not mentioned.

In Canada, there has been some broad research carried out by Transport Canada and a limited number of university researchers (Braaksma and Khan at Carleton University) but the literature is minimal. There is also some interest in multimodal passenger terminals by the federal rail passenger agency and some provinces and communities. The bulk of the Canadian literature is similar to the U.S. series of engineering studies for specific sites. These studies generally concentrate on the engineering, design and operating characteristics of a potential multimodal passenger terminal. They do not deal with broader aspects of multimodal passenger terminals.

The literature on multimodal passenger terminals is minimal but there are some broad conclusions that might be drawn. The concept of multimodal passenger terminals has not been well researched. The individual terminal project studies concentrate on engineering and urban planning aspects. Policies to encourage multimodal passenger terminals do not exist for two very different reasons: in Europe, it is not needed; outside Europe, the concept has not been the subject of policy discussions. Multimodal passenger terminals are developing on a case-by-case basis with little understanding of the critical factors. The

decisions on each terminal project are made on varying criteria.

The literature review on multimodal passenger terminal policy fully supported the need for research. As a developing concept in Canada, the need for a basic understanding of the criteria to aid the development of multimodal passenger terminals is essential. Further information will assist in identifying the conditions to maximize chances for success.

4.5 Summary

In summary, the literature review indicates there is very little information on multimodal passenger terminal policy in Canada and no literature on quantitative approaches. Since this is the area of research, there was little to draw upon. To develop a policy, a quantitative method was necessary to develop the critical factors for that policy.

The next section deals with questionnaires used to obtain the basic quantitative data used in the analysis.

5.0 RESEARCH QUESTIONNAIRES

5.1 Questionnaire Development

To gather data, a number of methods were considered. From a time and cost perspective, personal interviews were not practical.

Literature research plus some discussions with European transportation planners eliminated further literature review as a data collection method. The method selected for the data collection phase was the use of a questionnaire.

The questionnaire was useful for this research as it was inexpensive, reasonably quick and accurate and a proven method to obtain additional data. The questionnaire could be directed to knowledgeable individuals and follow-up to responses could be undertaken if necessary. The questionnaire also permitted respondents to carefully consider their responses and consult with others prior to responding. Another advantage of the questionnaire was language. A questionnaire and its response can be translated to permit the respondent to answer in their native language. This makes the response more valid as it is less susceptible to errors of misunderstanding. A final advantage of the questionnaire approach was to permit confidentiality of the response. This was promised in all cases and permits the respondent to be open and frank. This increases the validity of the responses.

The questionnaires were developed and administered using an eight-step approach described below. (56,57,58)

The first step was to identify the objectives for which the questionnaire is being prepared. This step involves careful consideration to clearly determine what specific information you hope to obtain from the questionnaire. It is useful to make a list of information you wish to obtain. This was done as a result of the literature review, discussions with transportation planners and the results of the foreign questionnaire.

In this study the basic objective was to determine the important factors in MPT development and the weight (importance) of each factor.

The second step was to choose a response format and determine if open or closed responses were appropriate. The decision for which type depended on several factors:

- . Number of respondents;
- . amount and type of information desired;
- . amount of time available to process and interpret the information; and
- . extent to which the range of possible responses can be anticipated.

In this case, since there are more than 20 respondents to the Canadian questionnaire, a closed-questionnaire format was desirable. There are four types of

closed-questionnaire formats: checklists, two-way questions (yes/no), multiple-choice and rank scale. A rank scale was chosen for this research.

The third step was to identify the frame of reference of the respondents. This step attempts to ensure the respondent will understand the questions. It involves three basic considerations:

- 1) Selecting the vocabulary appropriate for the group of respondents;
- 2) determine how knowledgeable the respondents are likely to be on this subject; and
- 3) determine if the group has a particular bias and if so try to see the issue through their eyes when developing the questions.

Step four was to write the questions. In this step, the following was considered:

- 1) Emphasis in each area was related to the number of questions in that area;
- 2) consider converging questions to improve the validity of the questionnaire; and
- 3) conduct interviews with a few respondents, using open-ended questions to identify possible response choices. In this case, the foreign responses assisted in the Canadian questionnaire.

Step five was to prepare a data summary sheet. This step was done in parallel with the questionnaire development. It helped aid the search for response patterns. This step was carried out early in the questionnaire development to help organize the questions, eliminate unnecessary questions, initiate new questions and focus the questions on the proper level of detail.

The format of any data summary will be affected by the data processing method. In this study, since ~~the~~ results were to be used for factor analysis, the summary sheets were structured for input into factor analysis.

Test questions and revisions to those were the sixth step. In this step, a number of important questions should be asked about each question.

- i) Is there more than one idea?
- ii) Is there a simpler way to ask the question?
- iii) Are the words confusing?
- iv) Is the question asked negatively?

Once the questions were revised, they were tested and revised again.

The seventh step was to assemble the questionnaire. This step referred to the important aspects of:

- 1) Appearance on the page;
- 2) Sequence of questions;
- 3) Contingency questions;

- 4) Introduction of the questionnaire
(purpose, guidelines, etc.)
- 5) Instructions - how to fill it out
- deadlines, etc.
- 6) Size for return mailing.

Administering the questionnaire was the eighth and final step. This involved sending out, following up, answering queries and receiving the returned questionnaires. This basic approach was utilized in both foreign and Canadian questionnaires.

5.2 Foreign Questionnaire

5.2.1 Objectives

As indicated in the work plan, at this stage in the research, a foreign questionnaire was developed. The questionnaire had basically three objectives.

The first was to develop the factors for input into the Canadian questionnaire. It was important to know the factors considered in the development of multimodal passenger terminals in other parts of the world. This was done by asking a series of questions to individuals involved in multimodal passenger terminals in foreign countries. The countries involved were Japan, the U.S. and a number in Europe (the Netherlands, France, Germany and Sweden).

The second objective of the foreign questionnaire was to determine what factors were important in any studies done prior to the development of multi-modal passenger terminals in other parts of the world. The factors important in other countries that carried out studies may have some relevance in Canada. The results could be useful additions to the list of potential factors to be used in the Canadian questionnaire.

The third objective was to determine what factors were important in the on-going operations of multi-modal passenger terminals in other countries. Are the factors for ongoing operations the same as for the terminal development phase or were they different? The results of this question provided an opportunity to gather this information and carry out some analysis to see if any useful conclusion could be developed. Questions such as the consistency between the important criteria in the development, and the important criteria in the ongoing operations, might produce useful insight for the Canadian questionnaire development.

5.2.2 Foreign Questionnaire Development and Administration

The process used for the foreign questionnaire was the standard approach used to develop and administer a questionnaire.

The first step was to draft an initial questionnaire. Using inputs from the literature research, and discussions with persons involved in multi-modal passenger terminals in foreign countries, a draft questionnaire was developed. The major focus of the questionnaire, as is previously stated, was to develop the list of potential factors to be used in the Canadian questionnaire.

Once the initial questionnaire was drafted, the second step was to pre-test it. It was administered in person to a transportation planner involved in one of the major multi-modal passenger terminals in the Netherlands.

The results of this field test indicated there was no major problem in the basic questionnaire design and format but a problem arose with the terminology. The term multi-modal passenger terminal had very little meaning in Europe. European transportation professionals use the term "integrated" passenger terminal. The questionnaire was therefore modified and re-tested.

Prior to mailing the foreign questionnaire, it was examined by experts at Statistics Canada to be sure that structure, form, explanation, wording, and basic layout were appropriate. Having obtained expert agreement that the questionnaire was a valid instrument it was then administered to selected countries.

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Europe, the U.S., Canada and Japan are the major areas in the world where multimodal passenger terminals exist. Very few countries in South America, Central America or Africa have been involved with the concept of multimodal passenger terminals.

The questionnaire was designed to be mailed. Services of the Department of External Affairs were utilized to identify names and addresses of appropriate persons and organizations. The advantage of this approach was that questionnaires designed to be mailed out were sent to appropriate officials and a telephone call or personal visit was made to ensure that they understood the questionnaire. External Affairs, through its various missions, undertook translation, explained terms and concepts in the questionnaire, answered questions and followed up on respondents. External Affairs' translation of the questionnaire was essential as a number of the questionnaire respondents used various languages. This assistance from External Affairs ensured the questionnaire was administered, understood and followed up properly, thereby increasing validity of the results.

It was also necessary to administer some of the questionnaires in Canada to ensure that a factor, unique to Canada, would not be left out of the list that was being

developed for the Canadian questionnaire. Europe, Japan and the U.S. have special conditions that make their transportation systems very different. Without some input from Canadian sites, there was a risk that a factor, relevant to Canada but not identified elsewhere, could be left out of the list of potential factors for the Canadian questionnaire.

The response to the questionnaire was slow; it took seven or eight months to obtain a significant number of responses. The response delay was created by translation, the speed at which the diplomatic system operates and, to a certain extent, by the difficulty in identifying the exact respondent.

Once the questionnaires were completed and returned, the information was extracted and arranged so that analysis could be carried out. The literature review also provided a check to ensure there was a complete list of factors for the Canadian questionnaire. Appendix C contains a sample questionnaire as well as some sample responses.

5.2.3 Foreign Questionnaire Analysis

To determine the appropriate time to move forward to the development of the Canadian questionnaire, two criteria were important. These two factors were the comprehensiveness and consistency of responses.

If the criteria of comprehensiveness and consistency were met, the research could proceed with confidence that all major factors had been identified. A significant statistical validity of the output of the foreign questionnaire was not essential. The essential requirement is confidence that any additional results would not materially affect the list of factors available from the questionnaires.

Comprehensive Criteria

The important aspects of the comprehensiveness criteria were cultural, modal variety, respondent type and relationship to the terminal.

In terms of the comprehensiveness criteria, responses were received from Europe (mainly Sweden, Germany, France, Holland) the U.S., Japan and Canada. These covered the major cultures in the world that were involved in multi-modal passenger terminals. The comprehensiveness of the cultural variable was therefore well covered.

Analysis of the foreign questionnaire identified 10 different modes as serving the various terminals. A frequency graph (Figure 5.1) indicates the percentage of the total respondents that had various modes available at their multimodal terminal. It is evident that all major modes were covered in the responses and the major modes were well represented.

In terms of the types of respondents that answered the questionnaire, the frequency graph (Figure 5.2) indicates the majority of respondents were either terminal owners or operators. Of the six organizational-respondent types, there were only two that were below 50% of the respondents, and those were modal operators at 39, and developers at 4% of the total:

Figure 5.3 displays the results of the analysis of the relationship of the respondent to the multi-modal passenger terminal. There were a total of nine different types of respondents which covered the full range of relationships.

The results displayed on these figures indicate that the comprehensiveness criteria had been ~~met~~.

Consistency Criteria

The analysis for the consistency criteria was carried out in two parts. The first was an analysis of the frequency of factors identification. The second was an analysis of factor importance or ranking. The questionnaire asked, first, what factors did they use if there was a study carried out prior to the development of a multimodal passenger terminal? And as the graph (Figure 5.4) shows, the factors used in the study for decision-making prior to development for multimodal passenger terminal varied greatly.

Figure 5.1

Transport Modal Services Frequency % of Total Respondents

Figure 5.2

Organizational Relationship Frequency

% of Total Respondents

Figure 5.3

Respondents Relationship Frequency

% of Total Respondents

Of nine factors identified, those with a significant percentage were: the requirement in the study that there be an efficient transfer and that a multimodal passenger terminal support urban development.

Analysis of the data on which factors were important in developing a multimodal passenger terminal is displayed at Figure 5.5. The 18 raw factors identified describe similar concepts and some grouping was required. This appears later in the analysis. But initially, these 18 factors indicated an entire range of criteria used when multimodal passenger terminal development took place. Similar factors appeared as considerations in terminal development and terminal studies.

The factors that had significant representation were the requirement for urban development and the necessity to integrate the various modes of transportation serving the terminal. Many factors were down in the 10% or less range. These factors were various descriptions of similar factors.

And finally, in the analysis of the consistency criteria, a frequency distribution was carried out on factors respondents felt were important in the on-going operations of the terminal. Figure 5.6 displays the frequency of occurrence of the 10 factors identified.

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Only one factor, low operating costs, was identified by 10% or less of the respondents. Those occurring over 50% were: a minimum transfer time and a smooth flow of passengers. A number of the factors identified are different descriptions of a smaller set of factors. Again, Figure 5.6 displays a large degree of consistency in the factors identified.

Having completed the analysis of frequency-of-factor identifications on the raw data, it became evident some regrouping was required. This regrouping ensured the analysis was carried out on an appropriate set of factors and not just a terminology difference. An example would be a factor described as bringing modes together, minimizing the transfer time between modes or moving the high volume of passengers smoothly. Each describes modal integration.

In order to regroup factors for use in the consistency analysis, a review of the original factors was carried out and a regrouping took place. The regrouping was able to reduce the original list of 18 factors to a new, regrouped list of nine. A number of the factors were identified consistently and did not require regrouping. Such factors as cost, environmental improvement, government cooperation and urban redevelopment are examples. Some of the more conceptual factors, such as integration of modes and many of the operating factors required some regrouping. The

Figure 5.4
Frequency of Factors In Study
% of Total Respondents

Figure 5.5

Frequency of Factors in Terminal Development

% of Total Respondents

TABLE 5.1
FACTORS IN TERMINAL DEVELOPMENT

<u>ORIGINAL INPUT</u>	<u>GROUPINGS</u>	<u>REGROUPED LIST</u>
URBAN REDEVELOPMENT	J	URBAN REDEVELOPMENT
INTEGRATE MODES	A	INTEGRATION OF MODES
RELIEVE LOCAL TRAFFIC PROBLEMS	E	RELIEVE LOCAL TRAFFIC PROBLEMS
MARKETING CONCEPT	B	
HIGH VOLUME OF PASSENGERS	A	
HIGH VOLUME OF VEHICLE TRAFFIC IN TERMINAL	D	
SAFETY/SECURITY	D	
MIN. ARRIVAL/DEPARTURE TIME/PAX FLOW	A	
NO. OF MODES ARRIVING/DEPARTING CAPACITY	E	
GOVERNMENT CO-OPERATION	F	GOV'T COOPERATION
ENVIRONMENT IMPROVEMENT	G	ENVIRONMENT IMPROVEMENT
COST	H	COST
OLD FACILITY FAILING	C	
PUBLIC TRANSPORTATION PROMOTION	B	PUBLIC TRANSPORTATION PROMOTION
OPERATING FACTORS (SPACE, ETC.)	D	OPERATING FACTORS
BUILDING PRESERVATION	C	BUILDING PRESERVATION
FLEXIBILITY	D	
HANDICAP ACCESSIBLE	D	

original input and regrouped list of factors are shown at Table 5.1.

Once regrouping was completed, a frequency analysis (Figure 5.7) of the new set of factors was carried out. The frequency analysis indicates two significant factors--modal integration and urban redevelopment. Five factors were in the 29 - 36% range and two factors showed a frequency of less than 10%. The results of this analysis indicates a high degree of consistency of factor identification.

To determine if a valid list of factors was available from the foreign questionnaire, the criteria of comprehensiveness and consistency were examined. The analysis indicates all aspects of the two criteria have been reasonably met. Therefore, the hypothesis that sufficient data was available for the Canadian questionnaire was confirmed.

Figure 5.7

Frequency of Factors in Terminal Development (Regrouped)

% of Total Respondents

5.3 Canadian Questionnaire

5.3.1 Development

The first task was to develop the list of factors that would be utilized in the Canadian questionnaire. Review of the foreign questionnaire results and literature research produced a list of nine potential factors. The analysis displayed at Figure 5.7 indicates seven of the factors were frequently identified and two were seldom identified. The frequently identified factors were carried forward to the Canadian questionnaire. Because two factors, transportation promotion and environmental concerns, had a frequency of below 10%, they were examined further. The criteria utilized in this phase of the analysis was the priority each respondent attached to the factor.

Tables 5.2, 5.3 and 5.4 display results of the frequency analysis for terminal development and terminal operating factors. Analysis of ranking frequency, shown at Table 5.2, indicates that every time public transportation promotion was ranked by respondents, it was ranked either as the fourth-most-important or relatively unimportant. Rankings five and above were grouped.

The environmental considerations factor by comparison was ranked second, in every case. This high priority by respondents identifying environmental considerations

indicates it was an extremely important factor in the development of that terminal.

From this analysis it is clear that, although protection of the environment was not ranked very often, it was important and it should be carried forward. Promotion of public transportation, although not ranked very often, was ranked much lower according to the foreign respondents.

After careful consideration and recognizing that the addition of one factor, from eight to nine would not have a significant effect on cost and would have an insignificant impact on the response rate or accuracy of the Canadian questionnaire (56,57,59,60), promotion of public transportation was included.

The Canadian questionnaire was developed using a similar method to the foreign questionnaire.

The questionnaire was then further refined and reviewed by Statistics Canada to ensure the questionnaire was a valid instrument. Following this review, the questionnaire was again modified and pre-tested. The final questionnaire is shown at Appendix D. Also shown at Appendix D is a small sample of typical responses.

The Canadian questionnaire was designed to be close-ended. The respondents were asked to score the importance of each of the terminal development factors.

TABLE 5.2

RANKING FOR TERMINAL DEVELOPMENT FACTORS

Factor	Ranking %				
	1	2	3	4	5
Urban Redevelopment (19)	53	16	26	5	-
Integration of Modes (19)	32	47	16	5	
Relieve Traffic (6)			50		50
Marketing Concept (1)				100	
Number of Passengers (4)		25	25		50
Number of Vehicles (2)				100	
Safety/Security (4)		50	25	25	
Passenger Flow (12)	67	17	8	8	
Modes Arr./Dep. Capacity (4)		25	75		
Government Cooperation (8)		12	50	25	12
Environment (2)		100			
Cost (8)	13	38	13	37	
Old Facility Failing (3)		33		66	
Public Transp Promotion (1)				100	
Operating Functions (2)	100				
Building Preservation (5)		40	40	20	
Flexibility (2)			50		50
Handicap Accessible (2)				50	50

TABLE 5.3

RANKING FOR TERMINAL OPERATIONS FACTORS

Factor	Ranking $\bar{x}$				
	1	2	3	4	5
Minimize Transit Time	100				
Congestion Relief		50	50		
Comfort		100			
Passenger Flow	16		50	33	
Low Operating Cost				100	
Safety		100			
Min. Arr/Dept Time of Modes		33			66
Volume Capacity	25	25	50		
Renovation of Facilities	33	66			
Cooperation	20	40	40		

TABLE 5.4

RANKING FOR TERMINAL DEVELOPMENT FACTORS (REGROUPED)

Factor	Ranking %				
	1	2	3	4	5
Urban Redevelopment (19)	53	16	26	5	
Modal Integration (35)	40	34	14	11	
Local Traffic Relief (10)		10	60		30
Gov't Cooperation (8)		12	50	25	12
Environment (2)		100			
Cost (8)	13	38	13	37	
Promotion (2)				100	
Operating Factors (11)	18	18	9	36	18
Building Preservation (8)		38	25	38	

The numerical scoring was then used for analysis. The critical question, number 4, asked respondents to identify, on a scale of one to seven, how important that factor was when their multi-modal passenger terminal was developed. A low score was least important and a high value was most important. This was not a priority rank but an importance of each factor independent of the others.

5.3.2 Scaling

Scales are used to obtain responses that will be comparable one to another. All the responses need to be expressed in the same terms (56, 60). There are a variety of ways to view scale development. There are some broad families of scales which have common characteristics and a variety of choices within those broad areas. The first broad group of scales are implicit and explicit. Implicit scales are obvious to the respondent and need not be stated. There is a common understanding between the questioner and the respondent.

Explicit scales are used when there is no common understanding between the person asking the questions and respondent. When scales cannot be specified within the question, they must be depicted numerically or graphically in response options. An example would be a line from high to low on which the respondent marks an opinion.

Within the explicit scale area, there are ordinal scales which have the response items in a fixed relationship. The responses form an ordered sequence. One response comes before another in the proper, ordered time sequence of events. The principal advantage of ordinal scale is the ability to obtain a measure relative to some other benchmark. The interval between categories is of little concern.

Another is paired comparison scales used to measure dichotomous choices between alternatives. It does not measure the distance between items in each pair. One major problem is that pair comparison, when several pairs are ranked, lack transitivity. They cannot be compared relative to each other.

A third is horizontal numeric scales used when items are to be judged on a single dimension and arrayed on a scale with equal intervals. Horizontal numeric scales provide both absolute measures of importance and also relative measures or rankings if responses among various items are compared. Scale extremes must be labeled to define the dimension (i.e. Extremely Important) and the words must be bipolar opposites (i.e. Extremely Unimportant). In most cases, the intermediate scale values should not be labeled with words and only numbers should be used, spaced at equal intervals. This technique is

economical since a single question, set of instructions and rating scale apply to many individual items.

Still another type is semantic differential scales used to measure image profiles. Adjectives are used to describe a number of characteristics about a single topic or object. Selection of adjectives is important and polar opposites must be used. This is often difficult. An example would be a scale asking to identify a product as good, fair, poor or bad.

For the Canadian questionnaire, a horizontal numerical scale was chosen.

Attitudinal measurement is a somewhat different and difficult issue (60): So much depends on the respondents attitude and the way the issue is put. A single item or a single question is often unreliable because if it usually approaches an attitude from one particular direction, it may give a one-sided result. However, more important than the number of attitude statements used is the fact that they have been scaled. Attitude scales are measuring instruments that divide people into a number of groups with regard to a particular attitude. They are techniques for placing respondents on a continuum in relation to one another in relative, not absolute, terms. Attitude scales have some important characteristics. They are undimensional. The scale is about one thing at a time.

They are linear with equal intervals.

This means the scale follows a straight line model and that a scoring system can be devised usually based on interchangeable units. They are reliable. This characteristic of consistency means that the measure taken today and at some future point should be nearly identical. They have validity. The scale measures what it is supposed to measure. Finally, attitudinal scales are reproducible. The units on the scale can be reproduced from the score.

There are four commonly known methods of attitude scaling (56, 59, 60), each of which has a different concentration of the above characteristics.

The first are the Thurstone scales which concentrate on the problem of equal or equal-appearing intervals. This approach uses a paired-comparison technique but becomes cumbersome with more than 15 or 20 items.

Second are the Likert scales which are less laborious than Thurstone scales and which deal with ensuring all items measure consistently. They also are very useful in attitude patterning. This technique tries to place respondents in an attitude continuum for each statement. The positions are then given weights for scoring purposes. This scale states the issue and obtains the respondents' degree of agreement or disagreement. This scale is very

popular because it is powerful and simple. It has the flexibility to use a few or many words to explain the question. The vocabulary can be technical and sophisticated or simple, depending on the population being surveyed. A major advantage of the Likert scale is the ability to obtain a summated value. One portion of the population may answer some parts and a second portion of the population answers other portions but the parts can be summed up to get an overall score on the item.

The third are Factorial scales which concentrate on internal consistency to safeguard against inclusion of unrelated items in the scale. A better way to ensure this unidimensionality would be through the use of factor analysis.

The fourth is the Guttman scale which enables the analyst to know exactly which items the respondent has endorsed with not more than 10% error for the sample as a whole.

Each method has desirable features and each is open to criticism. The best method is the one that is most appropriate to the particular problem.

For this research, a Likert scale was utilized as it was necessary to determine respondent attitudes and scores for those attitudes to permit further analysis.

be from one to five, one to ten, ten to a hundred, is the question that is often considered and debated by questionnaire development experts.

After discussions with an expert in this field (57,58) and carrying out literature research (56,58), a range of one to seven was selected as most appropriate. The basic practice in questionnaire development is that one should use a scale of seven plus or minus two. This is because people can hold in their minds seven plus or minus two basic concepts or factors at one time. They are then able to differentiate seven plus or minus two different attitudes against the same question.

The research indicated that respondents often avoid the use of extremes. If a scale from one to five was utilized and the respondents did not use the extremes, the effective range would be three. A range of three responses would be inadequate for analytical purposes. Also a rating scale of greater than five points will require a visual aid or something beyond the use of words.

Another aspect of the ranking scale that required some research was the centrepoint in the scale.

If an odd number of categories is provided for, the middle point is reserved for the indifferent or undecided response. If an even number is provided, the respondent must lean one way or the other. If it is important to know

the direction of the respondent's views, an even number of categories is useful. With a large number of points on the scale, the question of even or odd is moot since respondents will be responding more to a direction than actual numbers. In a scale of one to seven, used in this research, the centrepoin is four. There is a tendency for individuals to check the centrepoin if they have no opinion on the factor. This was overcome in this research by ensuring, when the questionnaire was administered, that people understood that if the factor was not important at all or not even considered, then they should circle the very unimportant portion of the scale.

Also, there is a tendency for people to score between the factors, wanting to score six-plus, seven-minus or put in a decimal score. There are sophisticated methods that attempt to deal with this problem but the analytical method utilized can handle a non-integer response. Therefore, the analytical method allowed the questionnaire to have some degree of freedom and did not necessitate special features to overcome the problem.

Another consideration was whether to start with the lowest or worst category and proceed to the highest or vice versa. There is no good evidence that one form is better than another (56). The general rule is to start at the end of the scale that is least desirable. This approach was

used in the Canadian questionnaire.

In the questionnaire development, it also became evident that all the items had to be checked on question 4. If an item was missing, it would force an analytical procedure to handle it. Through proper administration of the questionnaire, this potential problem was overcome. The result was that factors were scored on all questionnaires.

Once the questionnaire was in its final form, it was discussed with Professor J. Braaksma, an expert in multi-modal terminals, as a final check to ensure clarity and understanding. The questionnaire was then in a position to be administered.

5.3.3 Canadian Questionnaire Administration

A list identifying those individuals that had been involved in multi-modal passenger terminal proposals in Canada was developed from the literature review. The individuals identified were senior municipal and rail passenger planners as well as modal operators.

In the Canadian experience, many of the multi-modal passenger terminals have not progressed to the stage of construction but the thinking, in terms of the factors for development, have been undertaken at a number of locations. The individuals who were involved in the thinking and decision-making were the potential respondents for the questionnaire. Each individual was contacted by phone to

verify the address and explain the purpose of the questionnaire. This ensured that the proper respondents would be answering the questionnaire.

An individual questionnaire for each multi-modal passenger terminal project in Canada was sent to two persons. One, the senior-planning type for the city or the community involved. It was, in many cases, the mayor, the city engineer, the city manager or the city planner who responded to the questionnaire. The second respondent was the chief planner for VIA Rail on the project. In the Canadian setting, VIA Rail has been and continues to be the major participant in the development of multi-modal passenger terminals.

The questionnaires for the VIA senior terminal planners were administered by the director of terminal design and completed by the individual multi-modal terminal project managers. These individuals responded to the questionnaire for their respective projects. (See Table 5.5 for a list of the positions of the respondents to the Canadian questionnaire).

The questionnaire was developed as a mail-out questionnaire but again there was personal follow-up if the questionnaire was not properly completed. The follow-up by phone was necessary in only three cases when responses were tardy.

The questionnaire was simple to understand and therefore easy to administer. The questionnaire asked a series of questions about the location and the modes that serve that terminal, the importance of each of the factors that were used in developing the multi-modal passenger terminal in that community and then requested an explanation of why factors were rated extremely important or extremely unimportant. The written response to the explanation questions allowed a degree of insight into the thinking that went into that specific terminal.

Also included in the questionnaire, shown at Appendix D, is a list of definitions. The respondents were asked to check those criteria or characteristics which they believed made up modal integration. Respondents were free to check as many as they wished from a list of eight.

The analysis of this question was used to confirm the original grouping of factors from the foreign questionnaire analysis. It also helped determine if one or two specific sub-factors of the general factor are important in the Canadian context.

5.4 Summary

In order to develop the methodology to determine the critical factors in a policy for the development of MPTs, a data base was essential. The two questionnaires were used as instruments to create the basic data that was necessary

TABLE 5.5

CANADIAN QUESTIONNAIRE RESPONDENTS

LOCATION	POSITIONS
Moose Jaw, Sask.	Mayor
Regina, Sask.	City Manager Director, of Planning
Prince Albert, Sask.	City Planner
Melville, Sask.	City Clerk
Winnipeg, Manitoba	Chief Planner
Brampton, Ontario	Director of Planning, Policy and Research
North Bay, Ontario	Director of Planning and Works
Sudbury, Ontario	Community Services Planner
Brantford, Ontario	General Manager, Public Utilities Commission
Kitchener, Ontario	Director of Transit
Timmins, Ontario	Director of Public Works and Engineering
Windsor, Ontario	Director, Traffic Engineering Dept.
Kapuskasing, Ontario	Town Administrator
Calgary, Alberta	Chairman, Calgary Transportation Authority
Edmonton, Alberta	General Manager Transportation Dept Director Facility Planning and prog
Port Coquitlam, B.C.	City Engineer

LOCATION	POSITIONS
Vancouver, B.C.	City Planner
Jonquiere, Quebec	Director General of Services
- Trois Rivières, Que.	Assistant Director General
St. Bruno, Quebec	Director General
Laval, Quebec	Assistant Director Transportation Services
Levis, Quebec	Chief Engineer
Quebec, Quebec	Director General
Ste. Foy, Quebec	Chief of Urban Services
Drummondville, Quebec	Director of Planning
Moncton, N.B.	City Engineer City Manager
Saint John, N.B.	General Manager S.M.T. City Manager
All Sites	-VIA Terminal Project Manager for each site -Reviewed by Director, Projects Stations and Infrastructure VIA

CHAPTER 6

6.0 DATA ANALYSIS AND RESULTS

6.1 Factor Analysis

6.1.1 Factor Analysis Method

Once the final output from the Canadian questionnaire was available, the analysis of the data could begin. When the research proposal was developed an analytic approach, called factor analysis, appeared to be a good tool. At that time, factor analysis was selected for a number of reasons. It was an analytic approach that had not been used in transportation policy development and thus provided a research opportunity. Second, factor analysis has been used successfully in other disciplines. Third, factor analysis is a useful tool for reducing a large number of factors to a smaller number of underlying factors. At the start of the research, there was no information available on the potential number of factors that may emerge from the Canadian questionnaire.

Fourth, factor analysis is a respected scientific technique which summarizes the empirical relationship among a given set of variables. At the beginning of the research, due to a lack of literature on multi-modal passenger terminals, it seemed that a sophisticated factor analysis method might be useful.

As this research progressed, it became more and more apparent that factor analysis was an inappropriate analytical technique to meet the research goal (61,62,63, 64).

There was no evidence that factor analysis offered any special contribution to this research. A complete factor analysis with explanation of some sample results appears at Appendix E.

6.2 New Analytical Method

6.1.2 New Analytical Method

In developing the alternative method to analyzing the data, a number of aspects were important. The results of the Canadian questionnaire showed that the number of variables would be small. Based on those involved in multimodal passenger terminal development, the method should be simple in concept and application and the analytical technique should provide an output usable for those involved in MPT development.

The conceptual framework used in this study is based partly on studies conducted by Ross (42) and Cheung (65). Ross developed a method to estimate the attractiveness of parks to a given type of user from data concerning the spatial interactions of individuals using the parks. The approach utilized data on origin/destination flows to produce an attractiveness ranking of 12 parks. The

consistency of the decisions which led to the ranking was found to be significantly non-random.

Ross was dissatisfied with traditional methods of deriving rating scales for different outdoor recreational areas and major users of these areas. Ross wanted to avoid the strong metric assumptions necessary for the derivation of site attraction scales by the gravity model approach yet at the same time, avoids arbitrarily assigning attraction values solely on the basis of the number and capacity of site facilities. He wanted specific and objective rating scales. These scales would have use in planning and other research.

Cheung used a similar method to develop a linear programming model that, subject to the constraints of air travel demand and aircraft capacities, allocates the origin/ destination air passengers between two cities to the various feasible passenger routes defined for that city pair. Each of the passenger routes is assigned a weight to indicate its relative attractiveness. These weights, which form objective function coefficients, actually represent penalties or inconveniences that the passengers incur in travelling from one place to another. The approach has the advantage of being explicit, systematic and consistently applicable.

During the literature review, it became apparent there were many techniques for analysing data resulting from a questionnaire. There were very few techniques for data analysis for transportation policy development. The work by Ross and Cheung was used to address transportation issues and this became a starting point for the development of a new analytical approach. The characteristics of the new technique were that it must be simple to understand, easy to apply and relevant to the development of transportation policy.

The method used in this research consisted of carrying out a paired comparison of the factor scores (one compared against all others) to determine the frequency of the score of one factor (i) exceeding the score of another factor (j). This was performed by developing a simple computer program.

Once the order priority list was created, it became necessary to develop a simple, understandable method of providing a relative ranking. There did not appear to be any method available for transportation policy development and, therefore, a technique was developed.

The resultant information is presented in matrix form at Table 6.1. In this matrix, the (i,j) entry is the number of times that factor i was judged to be more important than

factor j . A second matrix, containing information on the number of times two factors were judged to be equally important is presented at Table 6.2. These two matrices have the following properties.

$C(i,j) + C(j,i) + E(i,j) = \text{the total observations } (42,65)$

where $C(i,j)$ = the number of times that factor i was judged to be more important than factor j

$C(j,i)$ = the number of times that factor j was judged to be more important than factor i

$E(i,j)$ = the number of times that factor i was judged to be as important as factor j .

Table 6.3 is a sum of the matrices at Table 6.1 and 6.2. This indicates the frequency with which factor i was judged greater than and equal to factor j .

From the first matrix, another matrix has been derived and presented as Table 6.4. The entries in this matrix, called the proportion matrix, give the proportion of times that any factor i was judged to be more important than factor j . An entry in this proportion matrix is defined as:

$$P(i,j) = (C(i,j) + E(i,j)) / (C(i,j) + C(j,i) + E(i,j))$$

where $P(i,j)$ = the proportion of times that factor i was judged to be more important than factor j , and

$C(i,j)$, $C(j,i)$ and $E(i,j)$ are defined as before (42,65).

The proportion matrix was also developed for the percentage of time factor i was equal to and greater than factor j :

All the above analysis was carried out four times. Once for the responses from the communities, municipalities, etc. Once for the responses from the terminal planners, once for the combination of the two. This was done to determine if there was a significant difference in the views and results between the two groups. The fourth analysis was for the average data base. The average data base was created by taking the total data and averaging the responses for the urban group to produce one average response. A similar activity was carried out for the rail operator data base. Since there was often more than one response from a community, it was necessary to create a single entry from each community so that the results on the average matrix were not skewed due to the volume of responses.

The results of the various matrices are shown at Tables 6.1 through 6.4.

An importance index was created for each factor using the formula:

$$I(i) = \sum P(i,j) / n-1 \quad (42,65)$$

where $I(i)$ = importance index for factor i

$P(i,j)$ = the proportion of times that factor i was
judged more important than factor j ;

n = number of elements in the row.

To achieve $I(i)$ equal to one, it is necessary to use a constraint in $P(i,j)$. The constraint is the elimination of $E(i,j)$ in the numerator and denominator.

The factors were then ranked according to the size of the importance index. A spread and gap was calculated for each interval. The spread is the ratio of the importance index in question over the largest importance index for that analysis. The gap is the numerical difference between the spread from one factor to another in descending order of size. The spread is an indication of the relative importance of each factor.

This analysis was carried out for all four data sets and for factor i greater than factor j as well as factor i equal to and greater than factor j . The Importance Index for factor i greater than factor j is shown at Table 6.5.

The frequency each factor score was identified by respondents was another indicator of the rank order of importance of the various indicators. These are shown as Tables 6.6 and 6.7.

Another set of analyses was then carried out to determine which factors were the most important.

The analysis shown at Table 6.8 attempts to summarize and simplify the results of the previous analysis. An explanation of the results appears in section 6.2.2.

A simplified example of the basic approach is displayed at Appendix F. Also displayed is the basic data obtained from the Canadian questionnaires.

TABLE 6.1 FREQUENCY OF FACTOR (i) GREATER THAN FACTOR (j)

(i) \ (j)	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation		8	5	9	0	3	2	16	14
Government Cooperation	11		6	15	2	3	7	24	18
Cost of Terminal	13	12		14	3	5	5	22	16
Environmental Concerns	6	5	2		0	1	1	19	11
Integration of Various Modes	18	15	16	21		15	8	22	19
Operating Factors	11	10	4	14	1		4	23	17
Promotion of Public Transportation	16	13	13	23	3	13		20	17
Reduction of Local Traffic Congestion	4	0	1	3	2	1	0		2
Urban Development	7	3	4	9	2	2	3	13	

TABLE 6.2 FREQUENCY OF FACTOR (i) EQUAL TO FACTOR (j)

(i) \ (j)	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation		5	6	9	6	10	6	4	3
Government Cooperation	5		6	4	7	11	4	0	3
Cost of Terminal	6	6		8	5	15	6	1	4
Environmental Concerns	9	4	8		3	9	0	2	4
Integration of Various Modes	6	7	5	3		-8	13	0	3
Operating Factors	10	11	15	9	8		7	0	5
Promotion of Public Transportation	6	4	6	0	13	7		4	4
Reduction of Local Traffic Congestion	4	0	1	2	0	0			9
Urban Development	3	3	4	4	3	5	4	9	

TABLE 6.3 FREQUENCY OF FACTOR (i) GREATER THAN AND EQUAL TO FACTOR (j)

(i) \ (j)	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation		13	11	18	6	13	8	20	17
Government Cooperation	16		12	19	9	14	11	24	21
Cost of Terminal	19	18		22	8	20	11	23	20
Environmental Concerns	15	9	10		3	10	1	21	15
Integration of Various Modes	24	22	21	24		23	21	22	22
Operating Factors	21	21	19	23	9		11	23	22
Promotion of Public Transportation	22	17	19	23	16	20		24	21
Reduction of Local Traffic Congestion	8	0	2	5	2	1	4		11
Urban Development	10	6	8	13	5	7	7	22	

TABLE 6-4 PROPORTION FACTOR (i) GREATER THAN FACTOR (j) PERCENTAGE

(i) (j)	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation	-	14.0	8.8	15.8	0	5.3	3.5	28.1	24.6
Government Cooperation	12.8	-	6.9	17.4	2.3	3.5	8.1	27.9	20.9
Cost of Terminal	14.4	13.3	-	15.5	3.3	5.5	5.5	24.4	17.8
Environmental Concerns	13.3	11.1	4.4	-	0	2.2	2.2	42.2	24.4
Integration of Various Modes	13.4	11.2	11.9	15.7	-	11.2	5.9	16.4	14.2
Operating Factors	13.1	11.9	4.8	16.7	1.2	-	4.8	27.4	20.2
Promotion of Public Transportation	13.6	11.0	11.0	19.5	2.5	11.0	-	16.9	14.4
Reduction of Local Traffic Congestion	30.8	0	7.7	23.1	15.4	7.7	0	-	15.4
Urban Development	16.3	7.0	9.3	20.9	4.7	4.7	7.0	30.2	-

TABLE 6.5 IMPORTANCE INDEX FOR FACTOR (i) GREATER THAN FACTOR (j)

(i)	(j)	Importance Index		Rank	SPREAD, % of Largest	GAP %	
Heritage Building Preservation		7.125		6	43	20.1	
Government Cooperation		10.750		4	64	03	
Cost of Terminal		14.250		3	67	20.9	
Environmental Concerns		5.625		7	34	09	
Integration of Various Modes		16.750		1	100	0	
Operating Factors		10.500		5	63	1.5	
Promotion of Public Transportation		14.750		2	88	11.9	
Reduction of Local Traffic Congestion		1.625		9	10	22.4	
Urban Development		5.375		8	32	1.5	

Score

[illegible]

TABLE 6.7 PERCENTAGE EACH SCORE IDENTIFIED

[illegible]

TABLE 6.8 PRIORITY RANKING TABLE

Factors	Simple Avg. Value of Score	Range Min Max	Importance Index Factor (I) Greater Than (J)	Importance Index Factor (I) Greater Than & Equal Factor (J)	Rank Based on Simple Averaging	Rank Based on (I) >> (J)	Rank Based on (I) >> (J)	Rank Based on No. of times a maximum rating occurred
Heritage Building Preservation	5.04	1 7	7.125	13.250	6	6	6	6
Government Cooperation	5.84	5 7	10.750	15.750	4	4	5	4
Cost of Terminal	5.76	1 7	11.250	17.625	5	3	4	3
Environmental Concerns	4.92	3 7	5.625	10.500	7	7	7	7
Integration of Various Modes	6.48	4 7	16.750	22.375	1	1	1	1
Operating Factors	5.92	4 7	10.500	18.625	3	5	3	5
Promotion of Public Transportation	6.08	4 7	14.750	20.250	2	2	2	2
Reduction of Local Traffic Congestion	3.72	1 6	1.625	4.125	9	9	9	9
Urban Development	4.76	2 7	5.735	9.750	8	8	8	8

6.2.2 New Analytical Method Results

The main analytical method for this research is described in section 6.2.1.^P The analysis was carried out using a computer program developed specifically for this research. All aspects of the analysis were carried out for the four data sets (total, average, VIA and urban/municipality). This produced substantial amounts of computer output. The data set that was most valid for this analysis was the average data. This set was an average of the response scores for the two principal actors in MPT proposals to ensure equal weighting. For this research, they are VIA Rail, and the city or municipality. For this section, the results of only this data set analysis will be used.

Tables 6.1 through 6.8 display the results of the frequency analysis for each factor as compared to all others. Throughout these results, factor 5 (modal integration) appears very important and factors 8 and 9 (reduction of local traffic congestion and urban development) appear relatively unimportant. The same is true for the percentage calculations.

The importance index is displayed at Table 6.5. Based on the importance index, an initial ranking of the order of the factor was made and is presented in the same exhibit. The spread and gap are also shown. These provide an

indication of the relative importance of the factors and the size of the gap between factors ranked in priority order. The importance index was not calculated for factor i equal factor j as this would be a zero set.

Tables 6.6 and 6.7 display the results of the frequency of occurrence of a score (1 to 7) on the factor ranking question.

Again, a scan of these results provides an indication of which factors were relatively more or less important. A large number in the bottom row (score of 7, the maximum) indicates an important factor. A low score in the bottom row and a high score in the third, fourth and fifth rows suggests a relatively unimportant factor.

It should be noted that every factor received a significant number of scores in the 1 and 2 range. This would indicate that none of the factors were redundant. It is fortunate that the final two factors, given careful consideration in the foreign questionnaire analysis, were carried forward.

Table 6.8 summarizes the results of the previous analysis to provide a variety of ways of examining the rank order and relative importance of each factor. Upon examination of this summary table and the previous tables, the following is the order of priority of Canadian MPT development factors: .

1. Integration of various modes of transportation;
2. promotion of public transportation;
3. cost of terminal;
4. government cooperation;
5. operating factors;
6. heritage building preservation;
7. environmental concerns;
8. urban development; and
9. reduction of local traffic congestion.

In examining the various results and rank for each type of analysis for priorities 1 (Integration of modes); 2 (promotion of public transportation); 6 (heritage building preservation); 7 (environmental concerns); 8 (urban development) and 9 (reduction of local traffic congestion) are clear and consistent in all cases. Priorities of operating factors, government cooperation and cost of terminal vary depending on which analysis is examined (Preference Index, frequency of factor i greater than factor j , i equal j , etc.). When the gap and spread of these three factors are examined, they are very close. This indicates these three factors are quite similar in terms of their implication on the development of an MPT. A review of the analysis for factor i equals factor j - Table 6.2 - shows large values in these three factors. This confirms the results. In the view of the respondents,

these three factors were very close and in most cases ranked equal. To provide an appreciation of the relative importance of each factor, a display (Figure 6.1) is presented.

This approach provided a great deal of output which was examined to produce a rank-ordered list of factors. The analysis also provided an indication of the relative importance of the various factors.

The objective of this analysis was to produce a rank ordered list of factors to encourage the development of MPTs in Canada. The analysis to date has produced the factors. The next step is to validate these results by the use of two different analysis techniques.

6.3 Delphi Method

6.3.1 Modified Delphi Method

The results of the analysis from the previous method produced the rank ordered factors that impact MPTs in Canada.

To validate this result, two methods were utilized. The first was a modified Delphi approach and the second a brief case study.

Delphi is a method for structuring a communications process so that the process is effective in allowing a group of individuals as a whole to deal with a complex

Figure 6.1

Relative Factor Importance Display

problem (66). There are a variety of procedures to achieve the specific aspects of Delphi which have applications in a number of areas.

It is not, however, the explicit nature of the application which determines the appropriateness of utilizing Delphi; rather, it is the particular circumstances surrounding the necessarily associated group communication process: "Who is it that should communicate about the problem; what alternative mechanisms are available for that communication and what can we expect to obtain with these alternatives?" When these questions are addressed, one can then decide if Delphi is the desirable choice. Usually, one or more of the following properties of the application leads to the need for employing Delphi:

- . The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments, on a collective basis.
- . The individuals needed to contribute to the examination of a broad or complex problem have no history of adequate communication and may represent diverse backgrounds with respect to experience or expertise.
- . More individuals are needed than can effectively interact in a face-to-face exchange.
- . Time and cost make frequent group meetings unfeasible.

- . The efficiency of face-to-face meetings can be increased by a supplemental group communication process.
- . Disagreement among individuals is so severe or politically unpalatable that the communications process must be refereed and/or anonymity assured.
- . The heterogeneity of the participants must be preserved to assure validity of the results, i.e., avoidance of domination by quantity or by strength of personality ("bandwagon" effect).

For this research, a modified Delphi approach was used. Experts involved in MPTs in Canada were contacted to determine their views on the results of the analysis. Experts who did not respond to the questionnaire were provided with the rank-ordered set of important factors and asked a standard set of simple questions. Their responses were discussed to ensure understanding of the response. This modified approach did not allow for many iterations with additional information being provided to each participant between meetings and group discussions. Since the Delphi technique was not the primary analytical tool, it served the purpose of validating the results and obtaining interesting thoughts on the explanation of the results and their meaning.

6.3.2 Modified Delphi Results

The results of the Delphi approach are shown at Table 6.9, Delphi Results Summary. From this table, it is clear that the list of factors is validated. It is also evident that the general priority ranking of the factors was validated. The Delphi results do suggest a general surprise with the ranking and relative importance of two factors. Those questioned were surprised at the high ranking of public transportation promotion and the relative, lower ranking of urban development. When examining the analysis, it became clear that both these factors indeed were properly analysed and the results valid. The Canadian questionnaire asked respondents to explain the factors which were ~~x~~very important or very unimportant.

The respondents often explained the factors of public transportation promotion and urban development. This indicated the relative importance of these factors was clear to the respondents. The experts, although surprised by the result, did not strongly challenge the validity of the analysis. Since MPT research in Canada is extremely limited, the experts had no basis other than their opinions and experience on which to judge the results.

The experts felt that the result was a contribution to

the subject area and indicated that research was useful to advance knowledge in the field.

The result of the Delphi method validates the factors, their ranking and relative importance.

6.4 Case Study

6.4.1 Case Study Method

A second method to validate the results were two case studies. Two examples of Canadian MPTs were reviewed against the list of important factors to determine their presence or absence. One case was a successful MPT project; the other was unsuccessful in that it has been under consideration for a long time with little or no results. One would expect the strong presence of the important factors in the successful case; the absence of some of these factors in the unsuccessful case.

Although this research uncovered the critical factors in MPT project development, it is evident that a number of factors that are difficult to determine will also impact on the progress of a project. Factors such as the personalities of the major participants, the current state of federal-provincial relations, change of government, etc., could impact the speed and, to some extent, the successful completion of a MPT project. These background factors, which will vary from site to site and situation by situation, are impossible to quantify but do exist. The

DELPHI RESULTS SUMMARY

TABLE 6.9

Question	Results
Are there other factors you believe to be important?	100% indicated no
Do you agree with the basic priority of the factors?	100% indicated yes
Do any factors surprise you by their presence?	100% indicated no
Does the ranking of the factors surprise you	Mixed response 75% expressed surprise at high ranking of public transportation promotion and the lower ranking of urban development
Does the relative importance of the factors seem reasonable?	Mixed response 75% expressed surprise at the relatively high importance of public transportation promotion and operating factors. They were also surprised by the relatively low importance of urban development.

process of management of the project can minimize any negative impacts of such background factors but will never be able to eliminate them all. In the two cases presented, there were some factors such as changes of government and federal-provincial relations which impacted on the speed of developments.

6.4.2 Case Studies Results

Two case studies were selected and reviewed against the results of the analysis. Tables 6.10 and 6.11 show the results of this analysis. Both cases are heritage buildings in the urban area of equal-size Canadian cities. Both were at the time railway stations. The successful case is Gare du Palais in Quebec City. It has been a major project which is now open and in operation.

The first observation is that the average of the respondents' scores for Quebec City is consistent with the overall ranking of the factors. This would suggest that the participants involved in this project were pursuing the factors that created a climate for the development of an MPT.

The second observation is that the more important factors were either present or accommodated by the project developers.

Third, the four factors of lesser importance were not significant at Gare du Palais. The factors of reduction of

local traffic congestion, urban development, environmental concerns and heritage building preservation were not significant concerns because of the existing site location.

The "unsuccessful" case is Regina. The proposal for this MPT has been under development for more than a decade with no resolution or real progress toward the construction of an MPT. Table 6.10 indicates that the participants in this project view the importance of the factors quite differently from Quebec City. They are also at variance with the results of this research. Heritage preservation and urban redevelopment are the important factors in Regina's effort to develop an MPT. The respondent from the City of Regina wrote "heritage is a very important issue." The respondent also wrote "the provincial government pulled back on their cooperation and thus the project seemed to fall through." These two statements tell a great deal about why Regina has had difficulty developing an MPT. The focus on heritage building preservation, a factor of lower importance and the lack of government and modal cooperation (the province owns the regional bus company), a factor of high importance have contributed to the lack of success.

In reviewing these two case studies, it becomes apparent that where the important factors were present, MPT was developed; where the important factors were absent or were low priority, MPT development has had great

difficulty.

The two case studies appear to validate the MPT factors and ranking that emerged from the analysis.

6.5 Summary

This section had as its purpose to develop and describe a new analytical approach to determine the critical factors in multimodal passenger terminal development in Canada. It also displays two analytical methods used to confirm the results.

The new method was able to produce the critical factors in ranked-priority order. These factors are necessary to develop the policy to encourage MPT development. The creation of the methodology to determine the critical factors was the research goal. The result of this chapter is the identification of that quantitative method.

The output from the analysis is used in the next chapter to develop a policy for MPTs in Canada.

CASE STUDY RESULTS

CASE 1 - Gare du Palais, Quebec City (Successful)

TABLE 6.10

Factors	Average of Site Respondents		Current Situation
	Overall Ranking	Scores (Scale 1-7)	
Integration of Various Modes	1	7	VIA, Regional Bus involv- ed and support concept
Promotion of Public Trans- portation	2	7	Linked with city transit system. Used by VIA and city to promote trans- portation
Operating Factors	5	6	Accommodated in design
Government Cooperation	4	5	Fed., Prov., and Munic., gov'ts involved & support
Cost of Terminal	3	6	Costs shared by all parties - large costs
Heritage Building Preservation	6	6	Restoration of a Heritage Building for the MPT
Environ- mental Concerns	7	6	Accommodated in the design
Urban Develop- ment	8	4	Not significant question located in redevelopment area
Reduction of Local Traffic Congestion	9	4	Not significant as local traffic congestion is not a problem

CASE STUDY RESULTS

CASE 2 REGINA - (Unsuccessful)

TABLE 6.11

Factors	Overall Ranking	Average of Site Respondents Scores (Scale 1-7)	Current Situation
Integration of Various Modes	1	7	Train, reg. bus involved bus company support varies over time
Promotion of Public Transportation	2	6	on city bus route, no major issue in project development or promotion rail reloc. maj. issue
Operating Factors	5	5	part of design, esthetics a major concern
Government Cooperation	4	5	Provincial involvement varies, city support varies, fed. support has been consistent
Cost of Terminal	3	6	Fed. gov't prepared to assist, prov. and munic. reluctant to fund, moderate cost
Heritage Building Preservation	6	7	Heritage Building, main focus of city planners
Environmental Concerns	7	2	Not significant accommodated in design
Urban Development	8	7	Railway relocation and redevelopment involved
Reduction of Local Traffic Congestion	9	4	Not a significant problem

CHAPTER 7

7.0 POLICY DEVELOPMENT

As the research is aimed at developing a policy for MPTs in Canada, it is necessary to briefly discuss the principles of policy development. These are then applied to the factors developed in the previous chapter to create a policy for Canada.

7.1 Classification of Policies

There are a number of methods of classifying policies (67,68,69,70,71). They may be classified as interventionist or neutral, financial, or no cost, active or passive, unilateral or cooperative, etc. The differentiation is based on the role and responsibility of the policy developer and the end use of the policy.

An economist would view the objective of a policy as a method to ensure optimum resource allocation on a national, regional or particular industrial sector scale.

A transportation planner may view the objective of a policy as the provision of adequate transportation services to the country, a region or particular area under consideration.

Policies have a number of important characteristics (67):

- a) A policy usually has stated objectives;
 - b) a policy may have unstated objectives;
 - c) a policy objective may change over time;
 - d) a policy often attempts to achieve more than one objective;
 - e) a policy can be output- or input-oriented;
 - f) a policy can be operated through a variety of instruments; and
 - g) a policy can produce unintended effects (externalities).
- Transportation policies have similar characteristics which must be considered when developing a policy statement.

7.2 Policy Instruments

The creation of an industry, service or environment which encourages development can be achieved through a variety of policy instruments. Some of the common policy instruments in transportation are (67):

- a) Investment in equipment or facilities;
- b) provision of research and development services;
- c) payment of grants, special tax concessions, etc;
- d) regulation over conditions of operation for safety reasons;
- e) taxation, especially user charges;

- f) control over entry or exit;
- g) control over behaviour in market place (rate regulation);
- h) control over quality and capacity of facilities and equipment; and
- i) ownership and operation of facilities and equipment.

In Canada, the entire range of policy instruments are available. In transportation, some or many of these instruments may be used to achieve a policy objective. In selecting policy instruments, intended effects should be maximized and the unintended effects minimized as much as possible.

Policy direction and policy instruments can be exercised in a number of ways in Canada. It can be reflected by Acts of Parliament, regulations, Orders-in-Council, funding allotments to government programs, federal-provincial agreements, Cabinet decisions, court rulings, etc. The choice of approach is a function of the type of instrument and the policy objective.

7.3 Policy Statement

In order to create an environment to foster the development of MPTs in Canada, the policy instrument must

be carefully chosen. Since MPTs require cooperation amongst parties, a policy should be active and slightly interventionist to initiate action. It should be cooperative and have financial incentive to encourage cooperation among participants.

Since this policy is to have national application and create a positive environment, policy instruments such as taxation, user charges, rate regulation, etc., would appear inappropriate.

Policy instruments such as investment in equipment, joint funding, facility ownership, provision of research and development services and payment of grants or tax concessions would appear more appropriate.

Based on the priority factors that resulted from the analysis the Canadian Multimodal Passenger Terminal policy should have the following characteristics:

- i) It should encourage modal integration;
- ii) it should provide for a program to focus on promotion of public transportation;
- iii) it should encourage consistency with minimum operating factors such as safety, security, etc.;
- iv) it should encourage cooperation of various government levels;

contributing to the cost of monitoring and evaluating the terminal once it is operational and by encouraging modal integration, public transportation promotion, participant cooperation, reduction of local traffic congestion consistent with good environmental management and appropriate urban development. This policy does not supersede any existing policies of the Department of Transport."

7.4 Policy Implementation

- a) The Department of Transport will support the development of MPTs by providing funding for project planning, development and construction on a cost-shared basis.
- b) The Department of Transport will review any project proposal outline that is submitted with the support of the community.
- c) The Department of Transport will fully fund a process to evaluate the MPT following the completion of construction. The monitoring process will be used to modify and enhance this policy.
- d) Public transportation promotion during development and ongoing operations must be specifically incorporated in the proposal.

In order to implement this or any policy, an approval process would be necessary. For the federal government, the Minister of Transport, under the National Transportation Act, could approve this policy and the funding for implementation. In the case of other jurisdictions, appropriate approval and funding mechanisms should be consistent with the type and degree of participation.

7.4.1 Policy Implementation Guidelines

In order to implement the policy statement, some guidelines for action are presented below as a suggested approach to developing an MPT proposal.

- i) Two modes of transportation, preferably intercity bus and rail passenger services, should be present in the community. Access by other modes, especially auto and local bus, would be useful.
- ii) A potential location for the terminal should be available, preferably at the railway line as it is usually more expensive to relocate rail rights-of-way and infrastructure than roadway facilities for buses. The current railway station, if one exists, is often a good potential location for an ~~new~~

iii) The community and the modal operator must agree to work cooperatively to develop the terminal proposal. Perhaps, a committee composed of interested participants should be developed to pursue the project. The committee should have membership and commitment from municipal and provincial governments, modal operators and other interested urban development agencies. The members of the committee should be at a significant level and be able to make policy, operational and financial commitments.

iv) A proposal which outlines the project costs, timing, participants, etc., should be developed by the committee. All available funding sources should be identified. The proposal should clearly deal with each of the factors identified in this research as well as others unique to their project. The final proposal should include a public transportation promotion strategy, cost and funding arrangements. It should deal with any heritage preservation initiatives, operating factors such as safety, security, public facilities, etc., and local traffic congestion.

- v) The proposal should then be taken to the appropriate agencies for final approval as well as funding commitment. This would be groups like municipal councils, corporation boards of directors, etc. Consistent with normal engineering practices, a cost-benefit analysis of the project should be undertaken.
- vi) If the project is funded, an implementation program can begin to develop. The same interested parties that committed their involvement in the proposal stage should continue as part of the implementation and management group. They should oversee the detailed design and construction phase of the project.
- vii) Once the terminal is constructed, the same committee should continue as a management group (board of directors) to resolve start-up problems and evaluate the ongoing operations.
- viii) Evaluation of the effectiveness of the MPT should be undertaken one to two years after the operation commences. This information will be useful input for future MPT developments and for determining if MPTs provide benefits to participants. To carry

out the evaluation, it will be necessary to establish a baseline of information on operational, financial and marketing aspects before the terminal is constructed.

ix) Once the terminal is in operation, it will be necessary to attempt to maximize cooperation among operators to maximize the benefits for terminal users. This would involve such activities as schedule coordination, common ticketing, through-baggage checking and joint promotion of terminal services. The board of directors can examine these questions on an ongoing basis.

If these guidelines are used, they may assist a community in developing and creating a multimodal passenger terminal.

7.5 Policy Application

In order to better understand how the proposed policy and the guidelines might be used, this section presents an example of a proposed MPT for Winnipeg. The data at Table 7.1 and much of the background on future activity and costing was developed by consultants (72) and is used as a starting point for the analysis of costs and benefits.

Figure 7.1 is an activity flow diagram for an MPT which depicts the functions, flows and their inter-relationship.

It shows there are common passenger access and egress functions for both bus and rail as well some specific vehicle and baggage flows. This conceptual representation indicates that many operating efficiencies and passenger conveniences can be achieved through an MPT. The actual layout of the detailed areas will vary from terminal to terminal depending on need, existing terminal size, operational requirements and other factors. Although the details may differ, the basic functions and flows will be similar to Figure 7.1.

TABLE 7.1
PASSENGER ACTIVITY FOR WINNIPEG MPT 1985 AND 2005

Carriers	1985 Passenger Service	1985 Passenger Loadings*		1985 Peak Month		Estimates for 2005	
		Arriving	Departing	Arriving	Departing	Arriving	Departing
Grey Goose Bus	<ul style="list-style-type: none"> - extensive service to various centres in Manitoba - peak month July 	192,300	210,300	19,000	20,800	259,600	283,900
Greyhound Bus	<ul style="list-style-type: none"> - extensive interprovincial system - many Manitoba-based routes - peak month July 	268,000	275,400	45,700	45,700	361,800	374,800
Beaver Bus	<ul style="list-style-type: none"> - hourly service between Winnipeg and Selkirk, Manitoba - peak months are winter 	75,800	80,000	7,500	8,100	101,300	109,400
Bus Sub-total	536,100	536,100	566,500	72,200	74,600	722,700	765,100
VIA Rail	<ul style="list-style-type: none"> - one daily transcontinental train each way - 3 trains per week each way - Winnipeg / Capreol - Winnipeg / Churchill - peak month is June 	84,800	89,200	11,300	11,600	175,700	183,600
Total	620,900	655,700	655,700	83,500	86,200	898,400	948,700

* through passengers not included

Figure 7.1

MPT Activity Flow Diagram

Current and Future Activity at Winnipeg

By examining Table 7.1 and combining the existing passenger volumes of the major carriers, we will gain some insight into the passenger loadings which would be present in a common terminal. Approximately 1,276,600 bus and rail passengers are transported into and out of Winnipeg annually. During a peak month, approximately 169,700 passengers would use a common terminal.

Peak-day volumes for the carriers would total approximately 7,085 passengers. A concurrent peak-hour for the three carriers would see approximately 760 passengers in the terminal. This peak hour would occur during the early evening.

The 2004 projected volumes supplied by VIA represent an annual growth rate (compounded annually) of approximately 3.7%. VIA Rail has not indicated any changes to its present schedule for 2005 and the growth is projected to occur fairly evenly between the various routes. For these reasons, the busiest days of the week and hours of the day remain identical to the 1985 traffic pattern with Sunday late evening arrivals and Friday early evening departures dominating. The projected peak hour

volume of VIA passengers is 688.

The bus carriers were not so optimistic about traffic growth. Grey Goose did estimate a 25% increase in its passenger volumes during the next 10 years while Greyhound feels their passenger volumes may actually drop because of increased competition from a deregulated air traffic industry. For planning purposes, a 1.5% annual rate has been used as an upper limit to the intercity bus traffic growth. Over a 20 year period, this growth rate, compounded annually, translates into a 35% increase of the 1985-1985 passenger levels.

In selecting this growth rate, it has been recognized that the City of Winnipeg planning department estimates that the urban population base is expected to increase at a rate of approximately 1.0% during the next 20 years.

Table 7.1 contains the projected Grey Goose, Greyhound and Beaver traffic figures for 2005.

Without any change in schedules and a common growth rate applied to all routes, the peak days and hours are projected to occur in 2005 at the same time of the week and

day that they do in 1985. Grey Goose traffic will peak on Fridays and during the late afternoon when departures are particularly heavy. Greyhound will continue to experience heavy traffic on Friday and during the mid-morning and early-evening periods.

The projected Greyhound, Grey Goose and Beaver traffic volumes have also been combined to give total bus volumes to program bus specific areas.

Combining the Design Year volumes for the carriers yields projected terminal traffic volumes. Total passenger volume in 2005 is expected to reach 1,847,100. The peak month in the design year will have a passenger volume of approximately 245,400. Peak day passenger volumes for the terminal are estimated to be 10,140.

In addition to the intercity bus passengers, Winnipeg Transit bus patrons would also be using the terminal. These patrons would come from bus routes operating on Main Street and the Southwest Transit Corridor (SWTC). No routes currently operating on Main Street would switch to the SWTC once it was in place.

The streets and transportation department of the City of Winnipeg has estimated that in 1999, and assuming east yard development, as many as 70 buses using the SWTC will be stopping at Union Station in the a.m. and p.m. weekday peak hours. No information is currently available with respect to the number of passengers embarking or disembarking these buses. These passengers will have a strong impact on the terminal facilities.

The Winnipeg MPT project was developed with input from federal, provincial and municipal levels of government as well as potential operators, businesses and related organizations. They were all members of an advisory committee who worked on the project. The proposal was developed by consultants and jointly funded by federal and provincial governments. All parties were an integral part of the proposal development. They met on a regular basis and discussed future plans and priorities as well as supplying information and expertise to the project proposal development.

The Winnipeg study developed four alternatives and evaluated these alternatives against a number of criteria. The criteria used were modal integration opportunities, public transportation use, cost, environmental concerns,

urban development, local traffic congestion, utilization of the existing Union Station (a heritage building) and basic operating conditions.

The conceptual design was guided by the same group that developed the original concept and options. This group consisted of city, province, federal governments, all operators and a variety of interested parties. This process parallels very much the guidelines suggested in section 7.4. It appears to have been successful in getting a full-scale proposal developed. Figure 7.2 displays the layout of the proposed Winnipeg Multimodal Passenger Terminal. When compared with Figure 7.1, the similarities are apparent.

Costs related to the proposed facility were broken down into capital costs and building operations costs. These are shown at Table 7.2. Capital costs are defined as those attributable to new construction, renovations or land acquisition. Building operations costs are defined as those costs necessary to operate the building on an on-going basis. These do not include any costs to the carrier that are directly attributable to the maintenance of business (i.e. salary, fuel, equipment costs, etc.).

These would be about equal at any city location for the terminal.

The operating costs were based on current local market values for multi-use building costs and lease rates. The rates multiplied by the floor area give the operating cost or revenue. Operating costs include allowances for heat, light, water, janitorial services, refuse removal, building repair and maintenance personnel, security, insurance, taxes and property management.

Financing costs were developed based on a 25-year amortization period, five year term and interest rate of prime plus 1%. The figures show financing costs of all items including land.

FIGURE 7.2

UNION STATION MULTI-MODAL STUDY

ALTERNATIVE 4 LOWER

GABOURY ASSOCIATES ARCHITECTS

TABLE 7.2
WINNIPEG MULTI-MODAL TERMINAL COST SUMMARY

Item	Estimated Capital Costs	Area (sq. ft.)	Estimated Capital Costs	Est. Annual Financing Costs	Est. Annual Operating Costs	Est. Annual Commercial Revenues
1. Union Station Area						
a) Commercial Retail Units		13,773	468,000	62,000	138,000	221,000
b) Main Floor, Common Areas, VIA Offices	36,637	1,242,000	164,000	366,000		
c) Undertrack Concourse		28,860	1,348,000	178,000	289,000	
sub-total	2,527,040	79,270	3,058,000	404,000	793,000	221,000
2. Bus Terminal						
a) CRU's		10,756	1,077,000	142,000	98,000	143,000
b) Carrier Areas		144,781	16,862,000	2,231,000	837,000	
c) Underground Parking		60,000	2,128,000	282,000	270,000	264,000
sub-total	16,584,990	215,537	20,067,000	2,655,000	1,205,000	407,000
3. Sitework	420,760	—	510,000	67,000	—	—
4. Land	—	144,635	4,106,000	543,000	—	—
TOTAL	\$19,532,790	—	\$27,741,000	\$3,669,000	\$1,998,000	—

Economic Impacts of Proposed Terminal

Various economic impacts would likely occur as a result of the construction and operation of the proposed terminal. These impacts include:

1. Direct effects: consisting of the expenditures made from the construction and operation of the terminal for the purchase of labour, goods and services. These effects would be received by the residents of Winnipeg and Manitoba.
2. Indirect effects: consisting of the expenditures captured by other local industries which will supply goods and services to the project. In many cases, the successive purchase of goods and services from one local company by another produces successive rounds of re-spending in the economy.
3. Induced effects: consisting of the effects created in the economy by persons receiving income either directly or indirectly from the project and then spending this income locally on the purchase of consumer goods and services. As with the process described for indirect spending effects, this added demand created for consumer goods and services gives rise to further but successively smaller rounds of spending and re-spending until the money is withdrawn through taxation and purchase of imports.

4. Revenues will be received by the federal, provincial and municipal governments through taxes levied against the economic activity generated through direct, indirect and induced expenditures associated with the project.

Various estimates of these impacts have been made using various models. The results are shown at Table 7.3.

Benefits

A number of other economic benefits can be identified. One major economic benefit is the reduced costs to passengers who currently transfer between the bus terminal and rail passenger station.

Assumption

- i) Passengers interchanging between regional bus and VIA are estimated to be between 5 to 7% (based on discussions with VIA planning and marketing managers). For 2005 this would be 1.839-million transfer trips.
- ii) The current cost to transfer between the two terminals is approximately \$6 in 1985 and \$10 in 2005 and requires 30-40 minutes. (Assumes one hour and assessing peoples value of time at a conservative of the minimum wage \$4/hour in 1985 and \$6/hour in 2005).

If the 2005 volumes of 1.839 million annual passengers are used.

Annual transfer costs .07 (1.839-million) at \$10 = \$1.3 million.

Annual value of time to transfer .07 (1.839-million) at \$6 = \$775,000.

Total of transfer costs to passengers \$2.05-million annually.

In the tables, the value of the current land being utilized by the intercity bus companies and the necessary expansion would approximate the needs identified for the proposed multimodal terminal. From Table 7.2, this would be 215,537 sq. ft. Urban land owned by the city or private holdings in Winnipeg is valued at about \$25 sq. ft.

If the new bus facilities are located elsewhere in the downtown area, the land cost would be approximately $(215,537 \times \$25) = \5.4-million . By locating at the proposed multimodal terminal \$5.4-million worth of land becomes available to the city. Also, if the bus companies sold their current holdings, a substantial amount of capital would be available to assist in the capital cost and ongoing maintenance of their portion of the multimodal terminal.

It is obvious there are many benefits that would arise from the construction of the multimodal facility that are not related to economics. Some of the more important benefits are discussed below.

Non Economic Benefits

I) Carriers

The construction of this facility would undoubtedly have a major positive impact on the image of both carriers. The image of the rail and bus carriers is of utmost importance to their success as a business. Operations must not only be efficient, they must be seen to be efficient. A clean, open, up-to-date facility designed with comfort, efficiency and security in mind. It could reverse some of the negative connotations of rail and bus travel facilities that presently exists in the minds of some of the public.

For the bus carriers, the proposed facility would provide the added space essential for their future growth. The problems that currently exist on the present bus station site, with the neighbours of the bus depot complaining of fumes and noise, would not exist on this site. This is an ideal site from that viewpoint. In addition, the direct access to a future Southwest Transit Corridor will increase the speed and efficiency of getting in and out of the city for some of the bus routes.

For the rail carriers, a new and greatly enlarged facility also has the potential of improving the image of rail travel in the minds of the travelling public. It would also greatly increase the numbers of people passing

through the station which would increase the value of VIA's in-station advertising, rail travel bureau, etc. It would also increase the potential of doing the necessary renovations to the ground floor area of the station and improve the market value of the commercial lease spaces that would be possible sources of revenue for VIA Rail.

An airport link facility would also be a boon for all three carriers. The increased ease of these inter-modal connections would undoubtedly have an effect on the numbers of people who might consider public transportation for some of their travel needs.

ii) Travelling Public

The benefits to the travelling public are primarily related to convenience, efficiency and comfort. There is no doubt, however, that the present locations of the bus, rail and air facilities do not encourage intermodality. The added convenience provided by the adjacency of the bus and rail terminals, together with an airline link, would undoubtedly be advantageous to the travelling public in terms of convenience and travel planning. The construction of this new facility would vastly increase comfort, cleanliness and security essential for the travelling public.

Access to tourist information, services and amenities would also be a major benefit to the travelling

public. Transit buses, airport shuttles, tour buses, car rental and taxis would all be available at the multimodal facility. Hotel information, rail and telephone access, rail and bus travel information; tourist displays and information, as well as a complete range of amenities such as restaurants, gift shop, drugstore, bank, etc., would make this an ideal public transportation facility for the general public.

iii) Governments

Those levels of government which allocate funds to tourism would be better able to concentrate much of their funds related to tourist information more effectively at this focus of tourist arrivals. Of course, many tourists arrive in Winnipeg by other modes, such as car and airline arrivals; however, the concentration of bus and rail arrivals make this an ideal setting for a concentration of tourist information and services.

Another indirect but important benefit to the various levels of government is that this multimodal facility would strengthen and give added value to the dollars expended on rail and road infrastructure through the increased use of bus and rail travel modes that it would help encourage.

iv) City of Winnipeg

This new location for the bus depot and the creation of a larger multimodal facility in this area along south

Main Street has a number of distinct advantages for Winnipeg's downtown core. The facility would act as a sound buffer between the railway tracks and Main Street, increasing the attractiveness of Main Street land for other developments. It is a good use of this land which may otherwise go unoccupied for years due to the sound problem associated with the mainline tracks. It would help encourage the development of the South West Transit Corridor due to the added use of the corridor by intercity buses. It would give added vitality and life expectancy to Union Station, one of Winnipeg's most impressive interior public spaces, as well as being an outstanding example of historic Winnipeg architecture.

There are also advantages to businesses in the downtown area. These businesses could direct their advertising and promotion activities to this concentration of visitors at the facility. Businesses may even feel it would be an economic advantage to run a shuttle bus service to and from the multimodal facility to other areas of commercial activity. Creative businesses could use this concentrated "captive market" to great advantage.

In terms of traffic planning, this location for the concentration of bus traffic has many advantages. It is on the edge of the downtown area and therefore still a valid location in terms of delivery of bus passengers to the

downtown area, while avoiding the traffic and pollution congestion of buses on Portage Avenue or any of the other streets at the heart of Winnipeg's core area.

Summary of Costs and Benefits

The costs and benefits of the Winnipeg Multimodal Passenger Terminal are summarized at Table 7.3. From Table 7.3, it is apparent the land sale and the potential government revenues from the construction will come within \$5 million of the full capital construction cost.

Also, the annual potential revenue and saving in transfer is greater than the operating cost by approximately \$460,000 annually.

These do not include a series of soft benefits that are not quantified nor the potential increased revenue for leases, concession tenders, etc. These could increase the revenue substantially.

There may be a small shortfall in the capital cost for this project but the operating revenues should easily cover the operating costs.

In summary, from a cost/benefit point of view, this project appears that it may well produce a positive result.

TABLE 7.3
COSTS AND BENEFITS SUMMARY

Costs	Benefits
Capital \$27,741,000	<p>Capital</p> <ul style="list-style-type: none"> - Fed. Gov't Revenues \$17,000,000 - Value of land available to city \$5,400,000 (value bus operators receive) - Total Capital available \$22,400,000
Operating \$1,998,000/yr.	<p>Operating Savings</p> <ul style="list-style-type: none"> - Operating Revenues \$407,000/yr plus - advertising plus - lease revenue - Reduced transfer cost \$2,050,000/yr Total Operating Savings \$2457,000/yr
	<p>Other Employment</p> <ul style="list-style-type: none"> - Direct 314 to 750 person years - Indirect 334 to 345 person years GNP Increase \$36,000,000

7.6 Summary

In this chapter, a proposed policy which flowed from the development of critical factors is presented. This completes one of the major objectives of this research of developing a methodology aimed at creating a policy for MPTs in Canada. The policy has been developed to be used by any government or agency. As well, some broad guidelines for developing an MPT are presented for use by a group considering an MPT for their community. Finally, an example is presented to aid in the understanding of how the policy and guidelines might be utilized. In the Winnipeg example, it is evident that many of the principles in the policy and guidelines were used successfully. A brief cost/benefit analysis indicated that in economic terms, the costs and benefits were nearly equal. When the non-quantifiable benefits are added, it may well prove to be a positive benefit/cost situation.

CHAPTER 8

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

This research had a goal and a number of objectives which were identified in section 3.4. The research presented in this document, attempted to achieve these objectives. The following major conclusions can be drawn:

- i) There is a great lack of knowledge and research on the subject of MBTs in Canada.
- ii) There is a lack of literature on MPT development in Canada.
- iii) There is a potential for the development of MPTs in Canada.
- iv) A data base on multimodal passenger terminals in Canada has been created.
- v) A new analytical technique to determine the rank, order and factors critical to multimodal passenger terminals was developed and proved useful in achieving the research objective.
- vi) The two validation methods of Delphi and Case Study validated the results of the analysis.
- vii) The analytical methods utilized were both simple to understand and valid for meeting the research needs.
- viii) The results of this research provide further research opportunities.

- ix) The administering of the Canadian questionnaire, various discussions, and this document should raise the awareness of the multimodal passenger terminal concept among the Canadian transportation community.
- x) A set of guidelines for interested parties was developed to aid in the creation of a multimodal passenger terminal.
- xi) The goal of this research was achieved by the development of a rank-order list and relative importance of the critical factors in MPT development in Canada which were used to develop a policy statement.

The overall conclusion is that the goal of this research has been achieved with the development of a methodology and a policy to encourage the development of multimodal passenger terminals in Canada.

8.2 Recommendations

From the conclusions and based on the research objectives in section 3.4, a number of recommendations have been developed. They are:

- 1) The method used in this research to identify the factors for the proposed policy should be reviewed carefully when Canadian multimodal passenger terminal proposals are being contemplated.

- ii) Some pilot projects should be developed using the policy developed in this research as the basis.
- iii) The policy developed should be considered by various government and transportation industry agencies in developing their MPT proposals and as a method to encourage multimodal passenger terminal pilot projects.
- iv) Pilot projects of multimodal passenger terminals should be monitored carefully to provide information on the operational, financial and marketing benefits.
- v) Further work on multimodal passenger terminals in Canada is recommended utilizing the information and approach developed in this research.
- vi) The analytical method developed by this research should be tested in other transportation planning applications.
- vii) The guidelines presented in Chapter 7 should be considered by communities considering the development of a multimodal passenger terminal.
- viii) Research opportunities identified by this research should be pursued to broaden the knowledge base in this field.

These recommendations, if implemented, should improve the opportunity for development of multimodal passenger terminal projects in Canada.

8.3 Further Research

As a result of this research, a number of potential opportunities for further research have been identified.

i) Now that a data base is available for the first time, various types of research on multimodal passenger terminals in Canada could be undertaken. For example, a stratification of the data by a variety of criteria (i.e. province, community size, linguistic proportions, etc.) with a similar analysis to this research could provide interesting results.

ii) The testing of the critical factors, from concept to implementation and operation, with a community developing a multimodal passenger terminal as a major case study, will provide a research opportunity.

iii) Once additional experience is available in Canada, further refinement of the methodology could be undertaken.

iv) A research effort similar to this could be carried out on U.S. multimodal passenger terminal projects to determine if the criteria are similar or different than in Canada.

v) Once pilot projects are in operation, operators could provide before-and-after data. Research to determine the magnitude of benefits could be undertaken.

vi) Also, analysis of benefit distribution by participant could be carried out.

vii) Research into the impact of each criteria developed in this work could be undertaken once data is available.

viii) Once some MPTs are in operation, research opportunities in optimizing passenger flows, spatial layouts and processing functions could be undertaken.

From the examples above, it can be seen that a number of research opportunities could stem from this research. There are possibly many more opportunities that are subsets of each of these that would be better defined over time. 7

There is no lack of research opportunities in the field of multimodal passenger terminal analysis, policy development, implementation and operations. These, if explored, would further extend the small knowledge base that currently exists.

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APPENDICES

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APPENDIX A

CANADIAN MULTIMODAL PASSENGER TERMINAL
PROJECT STATUS

CANADIAN MPT ACTIVITIES

SITE	MODES	MAJOR PARTICIPANTS	CURRENT STATUS
Kapuskasing Ontario	Local Bus Intercity Bus Intercity Train Taxi Airport Bus	City VIA	Multimodal Terminal in operation - Part of shopping complex - Travel agent in terminal - Promoted by City
Moose Jaw Saskatchewan	Local Bus Intercity Bus Intercity Train	VIA Province of Saskatchewan	- Study 1979 - Provincial support removed - little progress - recent promotion activity by Mayor Lewry
Regina Saskatchewan	Local Bus Intercity Bus Intercity Train Taxi	VIA Province of Saskatchewan	- Studies - Provincial support removed - little progress
Brampton Ontario	Local Bus Intercity Bus Intercity Train Taxi	City VIA	- Study 1983 - little progress
Trois-Rivières Quebec	Local Bus Intercity Bus Intercity Train Taxi	City VIA Voyageur	- Negotiations ongoing - Promoted by City and VIA - Study completed in 1982 - No construction - Land acquired (\$500,000)

CANADIAN MPT ACTIVITIES

SITE	MODES	MAJOR PARTICIPANTS	CURRENT STATUS
Lévis Québec	Local Bus Intercity Train Ferry Boat Taxi	City VIA Société de Traversiers du Québec	Concept Study December 1982 Terminal exists
Drummondville Québec	Local Bus Intercity Bus Intercity Train Taxi	VIA City Voyageur	No activity underway - Part of city center revitalization plan
Jonquière Québec (Place de l'Horloge)	Local Bus Intercity Bus Intercity Train Taxi	VIA City	- Promoted by the City - Study and design completed 1979
Laval Québec	Local Bus Intercity Bus Intercity Train Taxi	VIA City	- Study, December 1982 - No activity underway
Ste. Foy Québec	Local Bus Intercity Bus Intercity Train Airport Bus Taxi	VIA City	- Intermodal station exists - Promoted by the province

CANADIAN MPT ACTIVITIES

SITE	Modes	MAJOR PARTICIPANTS	CURRENT STATUS
St. Bruno Québec	Local Bus Intercity Bus Intercity Train Taxi	City Province VIA	- Heritage building - Part of urban development plan 1983
Québec Québec (Gare du Palais)	Local Bus Intercity Bus Intercity Train Ferry Taxi	VIA City Federal Government Provincial Government	- Completed, opened 1986 - Heritage building - Study carried out - Federal funding
Timmins Ontario	Local Bus Intercity Bus Taxi	City	- Feasibility stage
North Bay Ontario	Local Bus Intercity Bus Intercity Train Taxi Airport Bus	City	- City promoting terminal - Part of city development plan
Brantford Ontario	Local Bus Intercity Bus Intercity Train	City	- Study - Site location being re-evaluated

CANADIAN MPT ACTIVITIES

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SITE	MODES	MAJOR PARTICIPANTS	CURRENT STATUS
Brampton Ontario	Intercity Train	City Province VIA	<ul style="list-style-type: none"> - Plan completed - Provincial funding assistance to acquire land
Port Coquitlam British Columbia	Local Bus Commuter Train	City	<ul style="list-style-type: none"> - Study - Little progress
Vancouver British Columbia	Local Bus Intercity Bus Intercity Train Taxi	City VIA	<ul style="list-style-type: none"> - Study carried out - Little progress - Provincial support with-drawn Pacific Coach Lines
Melville Saskatchewan	Intercity Bus Intercity Train Taxi	VIA City	<ul style="list-style-type: none"> - Study carried out - City promoting concept - Heritage building - Lack of government support (Prov. withdrew) - Little progress
Edmonton Alberta	Intercity Bus Intercity Train	City VIA	<ul style="list-style-type: none"> - Building owned by developer - Study 1981, 1982 - Little progress
Moncton New Brunswick	Local Bus Intercity Bus Intercity Train Taxi	City VIA	<ul style="list-style-type: none"> - Study - Little progress

CANADIAN MPT ACTIVITIES

SITE	MODES	MAJOR PARTICIPANTS	CURRENT STATUS
Prince Albert Saskatchewan	Local Bus Intercity Bus Airport Bus	City Province	- Prov. support withdrawn - Little progress
Winnipeg Manitoba	Local Bus Intercity Bus Intercity Train Airport Bus Taxi	VIA City Province	- Study completed, designed - Construction underway - Federal & Provincial agreement for funding
Kitchener Ontario	Local Bus Intercity Bus Intercity Train Taxi Handicapped Service	VIA City Province of Ontario	- Study - Part of downtown development - Concept adopted by City - Decision pending Fall 1986
Calgary Alberta	Local Bus Intercity Bus Intercity Train Airport Bus Taxi	City VIA	- Study 1981, 1982 - Concept of transportation centre under review
Sudbury Ontario	Intercity Bus Intercity Train Taxi	VIA City	- Study, concept completed - Financial assistance from province for study - Little progress

APPENDIX B

DETAILED WORKPLAN

MPT Policy Work Plan

STEP 1 Literature Review

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
Review Canadian National Transportation Policy Goals	Literature Review Interviews	Transport Canada
Review Foreign National Transportation Policy Goals	Literature Review Interviews	Foreign Government i.e. - France - Holland - Britain - USA
Review Canadian MPT Policy	Literature Review Interviews	Transport Canada Transport Canada Officials Provincial Officials
Review Foreign MPT Policy	Literature Review Interviews	Foreign Governments
Review Canadian Experience with MPT Operations	Interviews Literature Review	Federal Government Provincial Government Operators Municipalities
Review Foreign Experience with MPT Operations	Interviews Literature Review	Foreign Governments Operators Terminal Management

MPT Policy Work Plan

STEP 2 Data Collection - Foreign Experience

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
Determine potential sample universe for foreign questionnaire	Literature Review results	
Develop questionnaire	Statistically valid, defensible questionnaire Should be clear, simple short, internally consistent, minimal response errors, etc.	Advice from Department of Mathematics Dr. Graham Statistics Canada
Develop sample	random, stratified, etc.	Advice from Department of Mathematics
Mail out questionnaires	Mail to appropriate individuals Follow-up letter or phone call after 3 weeks	
Develop form for data extraction Receive responses		
Extract Data	Categorization	

MPT Policy Work PlanSTEP 3 Data Collection - Canadian Experience

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
------------	-------------------	------------------------

Develop questionnaire for Canadian MPT (same as Step 2) See Appendix D		
--	--	--

		- Advice from Experts
--	--	-----------------------

MPT Policy Work Plan

STEP 4 Data Analysis

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
Complete computer analysis to determine variables that contribute to successful MPTs	<p>Output from Program:</p> <ul style="list-style-type: none"> - means and standards deviation of all variables - correlation matrix - inverse and determine of correlation matrix - unrotated (orthogonal) initial factor matrix - final factor matrix - factor score coefficient matrix used to construct factor scales - visual display (plot) of clustering of variables for each pair of factors 	<p>SAS SPS</p> <p>Advice from programming experts TC</p>
Develop new analytical Method	<ul style="list-style-type: none"> - apply new analytical method - determine critical factors 	Output from questions
Rank order variables in terms of their contribution to successful MPT	<p>Use ranking method base on computer analysis output</p>	Output from Computer Analysis

MPT Policy Work Plan

STEP 5 Validate

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
Validate set of variables by applying it to successful and unsuccessful Canadian MPT efforts in Case Study	Case study Discussion with involved parties	Literature review Questionnaire results
Modified Delphi Analysis	- delphi approach using interviews	- knowledgeable persons in the subject area

MPT Policy Work Plan

STEP 6 Develop Conclusions and Recommendations

ACTIVITIES	POTENTIAL METHODS	POTENTIAL DATA SOURCES
Develop Policy Statement	Literature Review Discussions	Policy makers Literature
Develop Recommendations and Conclusions		
Develop guidelines for Implementation	Discussions	Literature Terminal Operators

MPT Policy Work Plan

STEP 7 Report

ACTIVITIES

POTENTIAL METHODS POTENTIAL DATA SOURCES

Report preparation

Report presentation

APPENDIX C

FOREIGN QUESTIONNAIRE

June 1985

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APPENDIX "C"
FOREIGN QUESTIONNAIRE

Your file Votre référence

Dear Madam/Sir:

Our file Notre référence

The Canadian Department of Transport is carrying out a study of integrated/multimodal passenger terminals. The study is to determine what factors encourage the creation of integrated/multimodal passenger terminals and what factors are important to the ongoing operation of the terminals.

Factors can be wide-ranging from very concrete items such as cost and facility availability to abstract such as government support, modal ownership and operator co-operation. The study will concentrate on terminals that have at least inter-city bus and inter-city rail but will not be limited to only these two modes. An integrated/multimodal passenger terminal means a sheltered location where passengers load and unload as well as transfer between two modes.

The attached questionnaire is intended to collect information about your integrated/multimodal passenger terminal(s). Operators of the transportation services may be better informed on some aspects of the information required and you may wish to contact them to obtain answers to those questions.

Some questions may not be relevant to your particular terminal(s). In that case, indicate that the questions do not apply. Please return the completed questionnaire in the enclosed return envelope to:

Mr. David Bell,
Director, Program Evaluation,
Transport Canada,
Place de Ville, Tower C,
Ottawa, Ontario,
CANADA.
K1A 0N5.

Thank you for your cooperation and contribution.

Yours sincerely,

D. Bell

D.W. Bell,
Director,
Program Evaluation Branch.

att.

Canada

INTEGRATED/MULTIMODAL PASSENGER TERMINALS QUESTIONNAIRE

1. a) Name of terminal: _____
b) Owner of terminal: _____
c) Operator of terminal: _____

2. a) Please indicate your organization's relationship with the terminal. Please check as many as apply.

Terminal Owner ☐

Terminal Operator ☐

Terminal User ☐

Transportation Mode Operator ☐

Government ☐

Other, please specify _____

2. b) Please indicate your relationship to terminal. Please check as many as apply.

Terminal Planner ☐

Terminal Management/Administration ☐

Terminal Operator ☐

Transportation Mode Operator ☐

Government - National ☐

Government - Local ☐

Other, please specify _____

3. What types of passenger transportation provide services at this terminal? Please respond with an X.

local bus ☐

intercity bus ☐

intercity trains ☐

commuter trains ☐

subway ☐

light rail transit ☐

ferries ☐

airport ☐

other - please specify _____

4. Was a study carried out prior to the creation of an integrated/multimodal terminal?

Yes ☐

No ☐

If no go to Question 5

If yes what factors were used in the study to determine if an integrated/multimodal terminal should be developed?

7. Are there any development projects planned or underway for this terminal that may affect the terminal users? If so, briefly describe these projects (transportation plan, terminal expansion, local development projects, etc.)

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are some small dark spots and faint marks on the paper, possibly from scanning or handling. A vertical crease is visible near the left edge, suggesting the paper was once folded. The overall appearance is that of a clean, unused piece of stationery.

8. For each passenger transportation service could you provide the number of passengers in 1984?

<u>SERVICE</u>	<u>PASSENGERS</u>
Local bus	_____
Intercity bus	_____
Intercity train	_____
Commuter train	_____
Subway	_____
Light rail transit	_____
Ferries	_____
Airport	_____
Other, please specify	_____
 TOTAL:	 _____

9. If you wish please provide any additional comments or information you feel relevant in dealing with the factors for development and operation of an integrated/multimodal passenger terminal.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or printed text on the paper. A small, dark mark is visible near the top left corner, possibly a staple or a smudge. The overall appearance is that of a clean, unused piece of stationery.

June 1985

APPENDIX "C"

SAMPLE RESPONSE 1

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Your file Votre référence

Dear Madam/Sir:

Our file Notre référence

The Canadian Department of Transport is carrying out a study of integrated/multimodal passenger terminals. The study is to determine what factors encourage the creation of integrated/multimodal passenger terminals and what factors are important to the ongoing operation of the terminals.

Factors can be wide-ranging from very concrete items such as cost and facility availability to abstract such as government support, modal ownership and operator co-operation. The study will concentrate on terminals that have at least inter-city bus and inter-city rail but will not be limited to only these two modes. An integrated/multimodal passenger terminal means a sheltered location where passengers load and unload as well as transfer between two modes.

The attached questionnaire is intended to collect information about your integrated/multimodal passenger terminal(s). Operators of the transportation services may be better informed on some aspects of the information required and you may wish to contact them to obtain answers to those questions.

Some questions may not be relevant to your particular terminal(s). In that case, indicate that the questions do not apply. Please return the completed questionnaire in the enclosed return envelope to:

Mr. David Bell,
Director, Program Evaluation,
Transport Canada,
Place de Ville, Tower C,
Ottawa, Ontario,
CANADA.
K1A 0N5

Thank you for your cooperation and contribution.

Yours sincerely,

D Bell

D.W. Bell,
Director,
Program Evaluation Branch.

att.

Canada

INTEGRATED/MULTIMODAL PASSENGER TERMINALS QUESTIONNAIRE

1. a) Name of terminal: Shinjuku
- b) Owner of terminal: Tokyo Metropolitan Government
- c) Operator of terminal: Shinjuku Terminal Authority ?

2. a) Please indicate your organization's relationship with the terminal. Please check as many as apply.

Terminal Owner ☐

Terminal Operator ☐

Terminal User ☒

Transportation Mode Operator ☒

Government ☐

Other, please specify _____

2. b) Please indicate your relationship to terminal. Please check as many as apply.

Terminal Planner ☐

Terminal Management/Administration ☐

Terminal Operator ☐

Transportation Mode Operator ☒

Government - National ☐

Government - Local ☐

Other, please specify _____

3. What types of passenger transportation provide services at this terminal? Please respond with an X.

local bus ☒

intercity bus ☐

intercity trains ☒

commuter trains ☒

subway ☒

light rail transit ☐

ferries ☐

airport ☐

other - please specify _____

4. Was a study carried out prior to the creation of an integrated/multimodal terminal?

Yes ☐

No ☒

If no go to Question 5

If yes what factors were used in the study to determine if an integrated/multimodal terminal should be developed?

5. What factors do you feel were important in the development of this terminal and which were most important? Please list as many as you can and rank in order to importance. 1st, 2nd, 3rd, etc.

FACTOR	IMPORTANCE
平定の平定(平定) ← The convenience for passenger to transfer	
平定 ← number of passenger	2
利用客の移動 ← moving line of people	
地域の発展計画 ← Local area development planning	1
輸送力 ← Transportation capacity	3
路線計画 ← planning of train	

7. Are there any development projects planned or underway for this terminal that may affect the terminal users? If so, briefly describe these projects (transportation plan, terminal expansion, local development projects, etc.)

Transportation Plan

• Construction of the stations

① Subway line No. 12

(constructed by Transportation Bureau of Tokyo Metropolitan Government)

② Saikyo line operating commuter trains

(constructed by Japan National Railway)

Local Development project

• New office of Tokyo Metropolitan Government will be constructed in Shinjuku Development District.

8. For each passenger transportation service could you provide the number of passengers in 1984?

<u>SERVICE</u>	<u>PASSENGERS</u>
Local bus	16000 by Transportation Bureau
Intercity bus	N.D. concerning four bus operators
Intercity train	649,000 JNR
Commuter train	232,000 Odakyu Railway Co.
	251,000 Keio Railway Co.
Subway	238,000
	150,000 Teito Rapid Transit Authority
	88,000 Transportation Bureau of Tokyo Metropolitan Government
Light rail transit	/
Ferries	/
Airport	/
Other, please specify	/
TOTAL:	1,132,000

9. If you wish please provide any additional comments or information you feel relevant in dealing with the factors for development and operation of an integrated/multimodal passenger terminal.

Shinjuku Terminal is one of the biggest in Tokyo (in Japan).

The terminal consists of stations belonging railway lines mentioned below.

1. Chuo line (inter-city trains and commuter trains (express & local))
2. Yamanote line (commuter trains)

Two lines are operated by JNR

- 3 Marunouchi line (subway) by TRTA

- 4 Shinjuku line (") by TB of TMG

- 5 Keio line (commuter trains) by Keio Teito Railway Company

- 6 Odawara line " by Odakyu "

- 7 Shinjuku line " by Seibu "

Many bus routes operated by five bus operators depart from Shinjuku Terminal

INTEGRATED/MULTIMODAL PASSENGER TERMINALS QUESTIONNAIRE

1. a) Name of terminal: Central Station, Stockholm
b) Owner of terminal: Consortium and State Railways
c) Operator of terminal: Separate operating corporation

2. a) Please indicate your organization's relationship with the terminal. Please check as many as apply.

Terminal Owner ☒

Terminal Operator ☐

Terminal User ☒

Transportation Mode Operator ☒

Government ☒

Other, please specify _____

2. b) Please indicate your relationship to terminal. Please check as many as apply.

Terminal Planner ☐

Terminal Management/Administration ☐

Terminal Operator ☐

Transportation Mode Operator ☒

Government - National ☒

Government - Local ☐

Other, please specify _____

3. What types of passenger transportation provide services at this terminal? Please respond with an X.

local bus ☒

intercity bus ☒

intercity trains ☒

commuter trains ☒

subway ☒

light rail transit ☐

ferries ☐

airport ☐

other - please specify airport buses

4. Was a study carried out prior to the creation of an integrated/multimodal terminal?

Yes ☒

No ☐ If no go to Question 5

If yes what factors were used in the study to determine if an integrated/multimodal terminal should be developed?

1. Efficiency and comfort for passengers and operators.

2. Better utilization of limited downtown space available.

Terminal not yet in operation.

- C 7. Are there any development projects planned or underway for this terminal that may affect the terminal users? If so, briefly describe these projects (transportation plan, terminal expansion, local development projects, etc.)

The super structures of the terminal will contain office
space and major post office. The terminal will be
connected to newly built hotel partly owned by the
State Railways.

8. For each passenger transportation service could you provide the number of passengers in 1984?

SERVICE

PASSENGERS

Local bus	<u>229</u> million trips (total of Stock City buses)
Intercity bus	<u>7</u> million trips
Intercity train	<u>15</u> million passengers
Commuter train	<u>44</u> million passengers
Subway	<u>224</u> million trips
Light rail transit	_____
Ferries	_____
Airport bus	<u>2.9</u> million trips
Other, please specify	_____
TOTAL:	_____

June 1985

SAMPLE RESPONSE 3

Your file Votre référence

Dear Madam/Sir:

Our file Notre référence

The Canadian Department of Transport is carrying out a study of integrated/multimodal passenger terminals. The study is to determine what factors encourage the creation of integrated/multimodal passenger terminals and what factors are important to the ongoing operation of the terminals.

Factors can be wide-ranging from very concrete items such as cost and facility availability to abstract such as government support, modal ownership and operator co-operation. The study will concentrate on terminals that have at least inter-city bus and inter-city rail but will not be limited to only these two modes. An integrated/multimodal passenger terminal means a sheltered location where passengers load and unload as well as transfer between two modes.

The attached questionnaire is intended to collect information about your integrated/multimodal passenger terminal(s). Operators of the transportation services may be better informed on some aspects of the information required and you may wish to contact them to obtain answers to those questions.

Some questions may not be relevant to your particular terminal(s). In that case, indicate that the questions do not apply. Please return the completed questionnaire in the enclosed return envelope to:

Mr. David Bell,
Director, Program Evaluation,
Transport Canada,
Place de Ville, Tower C,
Ottawa, Ontario,
CANADA.
K1A 0N5

Thank you for your cooperation and contribution.

Yours sincerely,

D. Bell

D.W. Bell,
Director,
Program Evaluation Branch.

att.

Canada

INTEGRATED/MULTIMODAL PASSENGER TERMINALS QUESTIONNAIRE

1. a) Name of terminal: Pennacle
 b) Owner of terminal: French Grant
 c) Operator of terminal: _____

2. a) Please indicate your organization's relationship with the terminal. Please check as many as apply.

Terminal Owner ☒
 Terminal Operator ☒
 Terminal User ☐
 Transportation Mode Operator ☒
 Government ☐

Other, please specify _____

2. b) Please indicate your relationship to terminal. Please check as many as apply.

Terminal Planner ☒
 Terminal Management/Administration ☐
 Terminal Operator ☐
 Transportation Mode Operator ☐
 Government - National ☒
 Government - Local ☐

Other, please specify _____

3. What types of passenger transportation provide services at this terminal? Please respond with an X.

local bus ☒

intercity bus ☒

intercity trains ☒

commuter trains ☐

subway ☒

light rail transit ☐

ferries ☐

airport ☐

other - please specify _____

4. Was a study carried out prior to the creation of an integrated/multimodal terminal?

Yes ☐

No ☒ If no go to Question 5

If yes what factors were used in the study to determine if an integrated/multimodal terminal should be developed?

6. What factors are important in the ongoing operation of the terminal? Please list as many as you can ranked in order of importance - 1st, 2nd, 3rd, etc.

FACTOR

IMPORTANCE

Keep people moving
through terminal

1

Maintenance of building

2

All work together

3

7. Are there any development projects planned or underway for this terminal that may affect the terminal users? If so, briefly describe these projects (transportation plan, terminal expansion, local development projects, etc.)

Development of commercial space
at terminal.

8. For each passenger transportation service could you provide the number of passengers in 1984?

<u>SERVICE</u>	<u>PASSENGERS</u>
Local bus	_____
Intercity bus	_____
Intercity train	_____
Commuter train	_____
Subway	_____
Light rail transit	_____
Ferries	_____
Airport	_____
Other, please specify	_____
TOTAL:	_____

9. If you wish please provide any additional comments or information you feel relevant in dealing with the factors for development and operation of an integrated/multimodal passenger terminal.

APPENDIX D
CANADIAN QUESTIONNAIRE

APPENDIX "D"
CANADIAN QUESTIONNAIRE

Your file Votre référence

March 1986

Our File Notre référence

Dear Madam/Sir:

A study is being carried out to determine the factors that influence the development of integrated/multimodal passenger terminals. The study is to determine what factors influence the creation of integrated/multimodal passenger terminals.

Factors can be wide-ranging from very concrete items such as cost to abstract such as government co-operation. The study will concentrate on terminals that have at least inter-city bus and inter-city rail but will not be limited to only these two modes. An integrated/multimodal passenger terminal means a small structure under one roof where passengers load and unload as well as transfer between two modes.

The attached questionnaire is intended to collect information about integrated/multimodal passenger terminal development projects in Canada. You have been selected to respond for your organization. Individual's responses will not be identified without first obtaining permission.

The success of this study is dependent upon a good response from all. Please return the completed questionnaire in the enclosed return envelope to:

Mr. David Bell,
Director General, Public Affairs,
Transport Canada,
Place de Ville, Tower "C",
21st Floor,
Ottawa, Ontario
K1A 0N5

Thank you for your cooperation and contribution.

Yours sincerely,

att:

D.W. Bell

Canada

Chemin de la Capitale

Explanations

In order to be able to respond better, the following is a brief explanation of some of the terms used in the questionnaire.

Local bus	- city or community bus service
Intercity bus	- a regional bus service serving more than one community (i.e., Voyageur, Greyhound, Grey Goose, etc.)
Heritage Building Preservation	- the preservation or redevelopment of an important historic structure within your city
Government Cooperation	- the support and involvement of various government levels (Federal, Provincial, municipal) in the project
Environmental Concerns	- the environmental aspects such as air, noise pollution as well as the aesthetics of the multi-modal passenger terminal
Operating Factors	- concerns that are important to the operation of a facility. Examples are safety, security, handicapped access, location of public facilities (washrooms, phones, etc.)
Promotion of Public Transportation	- this concept involves the use of the multimodal facility as a way to increase awareness and utilization of public transportation
Reduction of Local Traffic Congestion	- the reduction of vehicle traffic around the terminal area
Urban Redevelopment	- the use of the terminal as part of a broader plan to develop or redevelop a section of the city or community
Cost of Terminal	- the capital costs necessary to complete the terminal so that operations could begin

CANADIAN MULTIMODAL PASSENGER TERMINAL QUESTIONNAIRE

1. a) Name of Terminal Project _____

b) Your role in Terminal development project _____

2. What types of passenger transportation services were involved in this project? Please check as many as apply.

Local bus ☐

Intercity bus ☐

Intercity trains ☐

Commuter trains ☐

Subway ☐

Light rail transit ☐

Ferries ☐

Airport ☐

Airport bus ☐

Taxi ☐

Other - please specify. _____

3. What does integration of various modes of transportation mean to you? Please check as many as apply.

Minimize wait time for a transfer between two modes

☐

Improved comfort of passenger during trip

☐

Smooth passenger flow within terminal

☐

Cheaper cost because only one terminal structure is needed

☐

Better scheduling of the different modes of transportation

☐

Cheaper cost to passenger for the total trip

☐

Improved convenience for the passenger

☐

Other - please specify

☐

☐

☐

4. In the consideration of the multimodal passenger terminal, how do you rate the importance of each of the factors listed below?

If the factor is extremely important circle a number from the right side of the scale. If you feel it is extremely unimportant, circle a number from the left side of the scale and if you feel the factor is somewhere between the extremes, circle a number from someplace in the middle of the scale.

	Extremely Unimportant							Extremely Important
Heritage Building Preservation	1	2	3	4	5	6	7	
Government Co-operation	1	2	3	4	5	6	7	
Cost of Terminal	1	2	3	4	5	6	7	
Environmental Concerns	1	2	3	4	5	6	7	
Integration of Various Modes of Transportation	1	2	3	4	5	6	7	
Operating Factors	1	2	3	4	5	6	7	
Promotion of Public Transportation	1	2	3	4	5	6	7	
Reduction of Local Traffic Congestion	1	2	3	4	5	6	7	
Urban Redevelopment	1	2	3	4	5	6	7	
Other - please specify	1	2	3	4	5	6	7	

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears slightly aged or off-white. There are some small dark specks scattered across the surface, possibly dust or minor imperfections in the paper. No text or other markings are present on the page.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slightly textured appearance and some minor blemishes or dust specks. The edges of the paper are slightly irregular.

CANADIAN MULTIMODAL PASSENGER TERMINAL QUESTIONNAIRE

1. a) Name of Terminal Project _____
b) Your role in Terminal development project _____

Manager, Station Facilities, (Montreal) Via Rail

2. What types of passenger transportation services were involved in this project? Please check as many as apply.

Local bus

☒

Intercity bus

☒

Intercity trains

☒

Commuter trains

☐

Subway

☐

Light rail transit

☐

Ferries

☐

Airport

☐

Airport bus

☐

Taxi

☒

Other - please specify _____

3. What does integration of various modes of transportation mean to you? Please check as many as apply.

Minimize wait time for a transfer between two modes

☒

Improved comfort of passenger during trip

☒

Smooth passenger flow within terminal

☒

Cheaper cost because only one terminal structure is needed

☒

Better scheduling of the different modes of transportation

☒

Cheaper cost to passenger for the total trip

☐

Improved convenience for the passenger

☒

Other - please specify

Public transportation becomes more competitive with the automobile, thus promoting more energy efficient transportation modes (trains & buses)

☒

Increased turnover for carriers

☒

Improves regional and provincial transportation network as a whole.

☒

4. In the consideration of the multimodal passenger terminal, how do you rate the importance of each of the factors listed below?

If the factor is extremely important circle a number from the right side of the scale. If you feel it is extremely unimportant, circle a number from the left side of the scale and if you feel the factor is somewhere between the extremes, circle a number from someplace in the middle of the scale.

	Extremely Unimportant							Extremely Important
A) Heritage Building Preservation	1	2	3	4	5	6	7	
B) Government Co-operation	1	2	3	4	5	6	7	
C) Cost of Terminal	1	2	3	4	5	6	7	
D) Environmental Concerns	1	2	3	4	5	6	7	
E) Integration of Various Modes of Transportation	1	2	3	4	5	6	7	
F) Operating Factors	1	2	3	4	5	6	7	
G) Promotion of Public Transportation	1	2	3	4	5	6	7	
H) Reduction of Local Traffic Congestion	1	2	3	4	5	6	7	
I) Urban Redevelopment	1	2	3	4	5	6	7	
Other - please specify	1	2	3	4	5	6	7	

- For those factors you feel were unimportant please briefly explain why?

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are some dark spots and smudges on the left side of the paper, possibly from a staple or handling. The overall appearance is that of a clean, unused piece of stationery.

NO

If YES, please describe

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QUESTIONNAIRE SUR LES GARES MULTIMODALES AU CANADA

1. a) Nom du projet de gare multimodale Gare intermodale

b) Votre rôle dans la création de ce projet La ville de
_____ a réalisé une étude relative à la revitalisation
de son centre-ville. Ce projet fut donc initié par la ville.

2. Quels modes de transport des passagers étaient visés par ce projet? Cochez autant de cases que nécessaire.

Autobus urbain ☒

Autobus interurbain ☒

Train interurbain ☒

Train de banlieue ☐

Métro ☐

Train léger ☐

Traversier ☐

Aéroport ☐

Service d'autobus d'aéroport ☐

Taxi ☒

Autres - veuillez spécifier _____

3. Que signifie selon vous l'intégration de divers modes de transport? Cochez autant de cases que nécessaire.

Réduction du temps d'attente pour une correspondance entre deux modes

X

Amélioration du confort des passagers dans leurs déplacements

Meilleure circulation des passagers à l'intérieur de la gare

Des coûts moins élevés en raison du besoin d'un seul bâtiment

Une meilleure coordination des horaires des différents modes de transport

X

Des frais de déplacement plus avantageux pour le passager

Une plus grande commodité pour le passager

Autres - veuillez spécifier Une gare intermodale augmenterait le nombre de personnes venant à [REDACTED]. Ceci aurait plusieurs conséquences:

1) avantages économiques;

2) conservation de l'importance d'une voie ferroviaire en rive sud plutôt qu'en rive nord. Donc, conservation du trafic passager vers [REDACTED].

4. Quelle importance accordée vous à chacun des facteurs donnés ci-après dans la création d'une gare multimodale?

Noter que le degré d'importance s'accroît suivant une échelle numérique de 1 à 7. Les deux extrémités de l'échelle servent à indiquer: a) que le facteur est sans importance (chiffre 1); b) qu'il est d'une importance absolue (chiffre 7).

	Sans Importance						Importance Absolue
Sauvegarde d'un bâtiment historique	1	(2)	3	4	5	6	7
Collaboration gouvernementale	1	2	3	4	5	(6)	7
Coût de la gare	1	2	3	4	(5)	6	7
Questions environnementales	1	(2)*	3	4	5	(6)*	7
Intrégration de divers modes de transport	1	2	3	4	(5)	6	7
Aspects liés à l'exploitation	1	2	3	4	(5)	6	7
Promotion du transport en commun	1	2	3	4	(5)	6	7
Diminution des embouteillages	1	2	(3)	4	5	6	7
Réaménagement urbain	1	2	3	4	5	(6)	7
Autres - Veuillez spécifier							
_____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7

* dépendamment de la signification du terme «environnementales»

- 5.. Expliquez brièvement les raisons qui motivent les facteurs vous paraissant de la plus haute importance.

Réaménagement urbain: Depuis toujours, la gare actuelle et sa cour de triage, situées en plein centre-ville de [REDACTED] sont des obstacles majeurs à l'élaboration d'un centre-ville harmonieux. En fait, l'espace ferroviaire constitue un cancer esthétique et visuel de premier ordre.

Collaboration gouvernementale: Il est primordial, pour mener à bien une telle initiative, qu'une étroite collaboration puisse exister tant sur les aspects conceptuels que financiers entre les divers paliers de gouvernement.

Pareillement, expliquez brièvement les raisons qui motivent les facteurs vous paraissant sans importance.

Questions environnementales: Si nous supposons que le terme «environnemental» signifie la qualité de l'air et de l'eau, ce projet aura très peu d'impact. Toutefois, si par «environnemental» on implique qualité de vie, esthétique, voir paragraphes précédents.

Sauvegarde d'un bâtiment historique: La vieille gare actuelle n'est pas classée comme bâtiment historique.

6. Il y a-t-il actuellement dans votre localité un projet de création de gare multimodale intégrée?

Oui

Non

Si vous avez répondu oui, veuillez de décrire

Contenu: - réaménagement de la gare du CN existante, y compris le

terrain de stationnement

- déplacement du terminus d'autobus

- utilisation de la cour de triage actuelle pour améliorer
le mobilier urbain.

- aménagement d'un lieu physique entre les deux services sus-
mentionnés

Contraintes à l'aménagement:

- bâtiments existants sur la partie du site qui sera occupée
par le terminus d'autobus

- politique concernant la localisation du corridor
de transport ferroviaire à être confirmée

- viabilité et ampleur d'un tel projet à être évalués avec
les partenaires en cause

Coûts: - à déterminer

Intervenants:

- Via Rail

- Compagnies d'autobus Voyageur et Bourgeois

APPENDIX "D"
SAMPLE RESPONSE 3

-268-

CANADIAN MULTIMODAL PASSENGER TERMINAL QUESTIONNAIRE

1. a) Name of Terminal Project Multi-Modal Facility at
b) Your role in Terminal development project Member, Advisory Committee

2. What types of passenger transportation services were involved in this project? Please check as many as apply.

Local bus ☒

Intercity bus ☒

Intercity trains ☒

Commuter trains ☐

Subway ☐

Light rail transit ☐

Ferries ☐

Airport ☐

Airport bus ☒

Taxi ☒

Other - please specify _____

3. What does integration of various modes of transportation mean to you? Please check as many as apply.

Minimize wait time for a transfer between two modes

☒

Improved comfort of passenger during trip

☒

Smooth passenger flow within terminal

☒

Cheaper cost because only one terminal structure is needed

☒

Better scheduling of the different modes of transportation

☒

Cheaper cost to passenger for the total trip

☒

Improved convenience for the passenger

☒

Other - please specify

☐

☐

☐

4. In the consideration of the multimodal passenger terminal, how do you rate the importance of each of the factors listed below?

If the factor is extremely important circle a number from the right side of the scale. If you feel it is extremely unimportant, circle a number from the left side of the scale and if you feel the factor is somewhere between the extremes, circle a number from someplace in the middle of the scale.

	Extremely Unimportant							Extremely Important
Heritage Building Preservation	1	2	3	4	5	(6)	7	
Government Co-operation	1	2	3	4	5	(6)	7	
Cost of Terminal	1	2	3	4	5	6	(7)	
Environmental Concerns	1	2	3	(4)	5	6	7	
Integration of Various Modes of Transportation	1	2	3	4	(5)	6	7	
Operating Factors	1	2	3	4	(5)	6	7	
Promotion of Public Transportation	1	2	3	(4)	5	6	7	
Reduction of Local Traffic Congestion	1	2	(3)	4	5	6	7	
Urban Redevelopment	1	2	3	4	(5)	6	7	
Other - please specify	1	2	3	4	5	6	7	

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5. For those factors you feel were important please briefly explain why?

The opportunity for a multi-modal facility to complement efforts underway in [REDACTED] for the redevelopment of lands adjacent to the proposed location, as well as ensure the preservation of a nationally designated historic building are important. Without tri-governmental co-operation and assistance, I doubt whether it would be possible for the carriers to assume the costs associated with the proposed multi-modal facility.

For those factors you feel were unimportant please briefly explain why?

The relief of traffic congestion through the construction of a multi-modal facility is not an issue in [REDACTED].

6. Are there any current activities underway in the development of a multimodal/integrated passenger terminal in your community?

YES

☒

NO

☐

If YES, please describe

A study for a multi-modal facility at [REDACTED] Union Station has just been completed by Gaboury & Associates for Transport Canada and the Manitoba Department of Highways and Transportation.

CITY COORDINATOR OF STUDY

2. What types of passenger transportation services were involved in this project? Please check as many as apply.

Local bus ☐

Intercity bus ☒

Intercity trains ☒

Commuter trains ✓

Subway

Light rail transit

Ferries

Airport

Airport bus

Taxi ☒

Other - please specify _____

3. What does integration of various modes of transportation mean to you? Please check as many as apply.

Minimize wait time for a transfer between two modes

☐

Improved comfort of passenger during trip

☐

Smooth passenger flow within terminal

☐

Cheaper cost because only one terminal structure is needed

☒

Better scheduling of the different modes of transportation

☐

Cheaper cost to passenger for the total trip

☒

Improved convenience for the passenger

☒

Other - please specify

☐

☐

☐

4. In the consideration of the multimodal passenger terminal, how do you rate the importance of each of the factors listed below?

If the factor is extremely important circle a number from the right side of the scale. If you feel it is extremely unimportant, circle a number from the left side of the scale and if you feel the factor is somewhere between the extremes, circle a number from someplace in the middle of the scale.

	Extremely Unimportant						Extremely Important
Heritage Building Preservation	1	2	3	4	(5)	6	7
Government Co-operation	1	2	3	4	5	6	(7)
Cost of Terminal	1	2	3	4	5	(6)	7
Environmental Concerns	(1)	2	3	4	5	6	7
Integration of Various Modes of Transportation	1	2	3	4	5	6	(7)
Operating Factors	1	2	3	4	(5)	6	7
Promotion of Public Transportation	1	2	3	4	(5)	6	7
Reduction of Local Traffic Congestion	1	(2)	3	4	5	6	7
Urban Redevelopment	1	2	3	4	(5)	6	7
Other - please specify	1	2	3	4	5	6	7

5. For those factors you feel were important please briefly explain why?

The study would not have got underway without financial assistance from the Province.

At the time ~~the~~ VIA would just have built a station to replace the old one which is in awful condition.

We wanted to get the inter city bus terminal downtown.

For those factors you feel were unimportant please briefly explain why?

There were no environmental concerns expressed.

There was some concern about traffic congestion but this was not a major issue.

6. Are there any current activities underway in the development of a multimodal/integrated passenger terminal in your community?

YES

NO

If YES, please describe

APPENDIX E

FACTOR ANALYSIS SAMPLE RESULTS

FACTOR ANALYSIS METHOD

Factor analysis assumes that the observed variables are linear combinations of some underlying hypothetical or unobservable factors. Some of these factors are assumed to be common to two or more variables and some are assumed to be unique to each variable. The unique factors are then, in exploratory factor analysis assumed to be orthogonal to each other. Hence, the unique factors do not contribute to the covariation between variables. In other words, only common factors which are assumed much smaller in number than the number of observed variables contribute to the covarian among the observed variables.

The linear system assumed in factor analysis is such that the user can identify the resulting covariance structure without error if the underlying factor loadings are known. However, ascertaining the underlying common factor structure from the observed covariance structure is problematic. These basic uncertainties have nothing to do with statistical estimation and must be resolved on the basis of extra-statistical postulates - the postulate of factorial causation and the postulate of parsimony.

Given these postulates and the properties of linear systems, it is possible to identify exactly the underlying factor pattern from the examination of the resulting covariance structure, provided that the underlying pattern

4

of/de

4

is relatively simple and that it satisfies the requirements of simple factor structure.

In practice, however, the covariance matrix one actually examines is affected by a variety of random and non-random errors and will not be the same as the covariance matrix implied by the factor pattern in the population. It is impossible in practice to recover the exact underlying factor pattern; one merely tries to find estimates of the underlying values which meet certain statistical and/or practical criteria.

There are three steps in obtaining solutions to exploratory factor analysis: (i) the preparation of an appropriate covariance matrix; (ii) extraction of initial (orthogonal) factors; and (iii) rotation to a terminal solution.

The uses of factor analysis are mainly exploratory or confirmatory depending on the major objectives of the research. For both, the three basic steps - of preparing the relevant covariance matrix, extracting initial factors, and rotating to a terminal solution - are implicitly involved.

In the factoring step, there is the common factor model, and principal components analysis. The underlying rationale for principal components is different from "common" factor analysis, except that both methods are

means of exploring the "interdependence" among the variables. The basic difference between the two approaches is that the principal components are certain mathematical functions of the observed variables while common factors are not expressible by the combination of the observed variables.

A statistical procedure such as factor analysis that gives both qualitative and quantitative distinctions can be quite useful.

Through factor-analytic techniques, the number of variables for further research can be minimized while also maximizing the amount of information in the analysis. The original set of variables is reduced to a much smaller set that accounts for most of the reliable variance of the initial variable pool. The smaller set of variables can be used as operational representatives of the constructs underlying the complete set of variables.

Factor analysis can be used to search data for possible qualitative and quantitative distinctions, and is particularly useful when the sheer amount of available data exceeds comprehensibility. Out of this exploratory work can arise new constructs and hypotheses for future theory and research. The contribution of exploratory research to science is, of course, completely dependent upon adequately pursuing the results in future research studies so as to

confirm or reject the hypotheses developed.

If a domain of data can be hypothesized to have certain qualitative and quantitative distinctions, then this hypothesis can be tested by factor analysis. If the hypotheses are tenable, the various factors will represent the theoretically derived qualitative distinctions. If one variable is hypothesized to be more related to one factor than another, the quantitative distinction can also be checked.

These uses obviously overlap with purposes served by other statistical procedures. In many cases the other statistical procedures can be used to answer the question more efficiently than one could answer them with a factor analysis.

Many traditional statistics can be viewed as special cases of the factor-analytic model where, because of their limited nature, detailed statistical theories have been developed that greatly enhance the statistic's interpretability. In particular, probability testing is widely available in the traditional statistical areas, although it is more limited in factor analysis. Therefore, whenever the decision is between other statistical procedures and factor analysis, the choice will usually go to the former if they both answer the same question. This should not, however, obscure the fact that the basic rationale and

problems are often the same.

In order to understand factor analysis a brief explanation of the technique and a set of output is provided below.

A frequent source of confusion in the field of factor analysis is the term factor. It sometimes refers to a hypothetical, unobservable variable, as in the phrase common factor. In this sense, factor analysis must be distinguished from component analysis, since a component is an observable linear combination. Factor is also used in the sense of matrix factor, in that one matrix is a factor of a second matrix if the first matrix multiplied by its transpose equals the second matrix. In this sense, factor analysis refers to all methods of data analysis using matrix factors, including component analysis and common factor analysis.

A common factor is an unobservable, hypothetical variable that contributes to the variance of at least two of the observed variables. The unqualified term "factor" often refers to a common factor. A unique factor is an unobservable, hypothetical variable that contributes to the variance of only one of the observed variables. The model for common factor analysis posits one unique factor for each observed variable.

The equation for the common factor model is:

$$Y_{ij} = x_{i1}b_{1j} + x_{i2}b_{2j} + \dots + x_{iq}b_{qj} + e_{ij}$$

where

Y_{ij} is the value of the i (th) observation on the j (th) variable

x_{ik} is the value of the i (th) observation on the k (th) common factor -

b_{jk} is the regression coefficient of the k (th) common factor for predicting the j (th) variable

e_{ij} is the value of the i (th) observation on the j (th) unique factor,

q is the number of common factors, and it is assumed for convenience that all variables have a mean of 0. In matrix terms these equations reduce to:

$$Y = XB + E.$$

X is the matrix of factor scores, and B' is the factor pattern.

There are two critical assumptions:

- . the unique factors are uncorrelated with each other,
- and
- . the unique factors are uncorrelated with the common factors.

In principal component analysis, the residuals are generally correlated with each other. In common factor analysis, the unique factors play the role of residuals, and are defined to be uncorrelated both with each other and

with the common factors. Each common factor is assumed to contribute to at least two variables, otherwise it would be a unique factor.

When the factors are initially extracted, it is also assumed for convenience that the common factors are uncorrelated with each other and have unit variance. In this case, the common factor model implies that the covariance $s(jk)$ between the j^{th} and k^{th} variables, ($j=k$), is given by:

is given by:

$$s(jk) = b(1j)b(1k) + b(2j)b(2k) + \dots + b(qj)b(qk)$$

or

$$S = B'B + U$$

where S is the covariance matrix of the observed variables and U is the diagonal covariance matrix of the unique factors.

If the original variables were standardized to unit variance, the above formula would yield correlations instead of covariances. It is in this sense that common factors explain the correlations among the observed variables. The difference between the correlation predicted by the common factor model and the actual correlation is the residual correlation. A good way to assess the goodness-of-fit of the common factor model is to

examine the residual correlations.

The common factor model implies that the partial correlations among the variables, removing the effects of the common factors, must all be 0. When the common factors are removed, only unique factors remain, which are by definition uncorrelated.

Factor Analysis Results

To explore the applicability of this technique to transportation policy development was part of the research effort. The results indicate for MPT policy development that factor analysis is not a useful technique. A full factor analysis was carried out for completeness. The calculations were performed using the Statistical Analysis System software package. The analysis included a principle factor analysis and four rotations, Varimax, Quarimax, Equamax and Promax. The output was in excess of 160 pages and therefore only a sample of some of the results appear.

A sample of the factor analysis output is shown as Table E.1.

In Table E.1 the program generates from the input data a set of prior communality estimates for each variable, i.e., Heritage Building Preservation, Government Cooperation, etc. These are generated from the variances between variables using the square multiple correlations of each variable with all other variables. These are just a

start point for the principle factor calculation.

The program then generates eigenvalues for each of the factors. In this case the program uses nine factors as a start point. The eigenvalues are the roots of nine characteristic equations or they express the proportionality relationship between the original vector and the transformed vector. The eigenvalues also indicate the contribution of the factors to the variance between variables. In this case factor 1 with an eigenvalue of 1.928667 contributes about 40 percent of the total variance in the data. It contributes the most of the nine factors. The second factor contributes 1.433113 or about 30 percent of the total variance (1.433113 divided by 4.77574 which is the sum of the eigenvalues). The difference lines is the arithmetic difference between each eigenvalue. The proportion indicates the contribution of each eigenvalue to the total of the eigen values.

Since an eigenvalue below zero indicates no contribution to explaining the variance they are eliminated. This leaves six factors for further analysis.

The Scree Plot is a plot of the eigenvalues. This is a physical representation of the eigenvalue information above the plot.

On Table 6.1 the factor pattern for the six remaining factors is displayed. These values are the b_{kj} 's or the

coefficients of the transformed matrix. By interpreting this pattern one can attempt to deduce the meaning of the underlying factor. In this case, factor 1 has large positive values for public transportation promotion, and significant (greater than 0.5) values for environmental concerns. Think about these two variables, it is difficult to develop a factor which would explain this result.

Examining factor two the large values are for operating factors, heritage building protection and integration of modes. These three items all impact somewhat on building layout and design. It could, therefore, be interpreted that factor 2 was an indication of an underlying unknown factor describing building design.

Similarly, factor 3 has only two values of significance, urban development and reduction of traffic congestion. These could be interpreted as a single underlying factor of location. The remaining factors are not significant as their values are either low or negative. This method of interpreting a factor pattern to identify underlying unknown variables is very difficult and subjective.

The final communality estimates are the sum of the squares for each of the b_{kj} 's in the row of the factor patterns.

This example is for an orthogonal rotation. This means a change in the variance of one variable is

independent or does not affect any of the other variables. The other basic type of rotation is an oblique rotation. In these cases a change in one variable affects the other variables. These are not independent and therefore in the printouts of the data, covariance information is displayed.

Although these results are sophisticated from a mathematical view point, it did not provide significant information toward the research objectives. Additional samples of output follow table E1 for information.

TABLE 6.1
FACTOR ANALYSIS OUTPUT
MULTI-MODEL PASSENGER TERMINAL OBSERVATIONS 14:58 MONDAY, AUGUST 1

FACTOR METHOD: PRINCIPAL FACTORS

PRIOR COMMUNALITY ESTIMATES: SMC

H-PLANE P SVT-COUP2 COST-IRM ENVIRONMENTAL INTG-MDE OP-FACTS PROMOTIV RDU-CONG URB-OPVT
0.587433 0.451312 0.422829 0.55801 0.601442 0.597550 0.780956 0.488115 0.309298

EIGENVALUES OF THE REDUCED CORRELATION MATRIX: TOTAL = 4.77574 AVERAGE = -0.530637

EIGENVALUE	1	2	3	4	5	6	7	8	9
DIFFERENCE	1.92866	1.43113	0.920063	0.706373	0.382588	0.029759	-0.148188	-0.221882	-0.254757
PROPORTION	0.495533	0.313550	0.213691	0.324795	0.352829	0.177946	0.073694	0.032875	-0.05333
CUMULATIVE	0.4033	0.7034	0.9171	0.1479	0.0801	0.0062	-0.0310	-0.0465	1.0000
	0.4033	0.7034	0.9171	1.0445	1.1246	1.1308	1.0998	1.0533	1.0000

FACTORS WILL BE RETAINED BY THE MINEIGEN CRITERION

SCREE PLOT OF EIGENVALUES

TABLE E.1

FACTOR ANALYSIS OUTPUT

MULTI-LEVEL PASSING-TO-INITIAL OBSERVATIONS

14:58 MONDAY, 1

INITIAL FACTOR METHOD: PRINCIPAL FACTORS

FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
HBLUGP	0.41458	0.61829	0.22941	-0.02914	-0.18863	0.08153
GVT_CQOP	-0.57334	0.07447	-0.14455	0.27304	0.13133	0.11138
COST_TRM	0.34298	-0.12359	-0.03913	-0.37112	0.44052	0.02378
ENVRNTAL	0.51633	-0.27280	-0.08452	0.52731	-0.34053	-0.04035
INTG_MDE	0.37031	0.58067	-0.40164	0.05571	-0.11233	-0.00883
UP_FACTR	0.01161	0.71757	0.29166	0.05380	0.21727	-0.06925
PRMOTN	0.84427	-0.23786	-0.17359	-0.08805	-0.30544	0.04373
SCU_CONG	0.29152	-0.10479	0.21620	-0.37407	0.19923	0.03150
URB_DVPT	0.39131	-0.17222	0.49296	-0.24784	-0.21587	0.01129

VARIANCE EXPLAINED BY EACH FACTOR

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
	1.92867	1.43313	0.92063	0.70637	0.38258	0.02975

FINAL COMMUNITY ESTIMATES: TOTAL = 5.400703

	GVT_CQOP	COST_TRM	ENVRNTAL	INTG_MDE	UP_FACTR	PRMOTN	SCU_CONG	URB_DVPT
HBLUGP	0.65321	0.43938	0.62805	0.64048	0.65500	0.17837	0.54312	0.33917

INITIAL FACTOR METHOD: PRINCIPAL FACTORS

MULTI-MODEL PASSING-TO-TOTAL PRESERVATION

FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
MLB00.P	0.41858	0.61827	0.22741	-0.02914	-0.18869	0.09152
CVI_CONG	-0.57337	0.07447	-0.14455	0.27304	0.13133	0.11438
COST_TRM	0.39078	-0.12357	-0.03113	-0.37112	0.44052	0.02378
INVTOTAL	0.51633	-0.27287	-0.08452	0.52739	-0.03355	-0.04035
INTG_MDE	0.37031	0.08007	-0.40154	0.05571	-0.03533	-0.00283
CP_FACT	0.01161	0.71757	0.29169	0.05380	0.21727	-0.06725
DEUMJTH	0.88427	-0.23786	-0.17359	-0.08805	-0.00544	0.04373
CVI_CONG	0.29152	-0.10477	0.21320	0.37407	0.19423	0.03150
UPB_DVPT	0.09138	-0.17222	0.47306	-0.24784	-0.21581	0.01129

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.928607	1.433113	0.920063	0.705373	0.382588	0.029759

FINAL COMMUNALITY ESTIMATES: TOTAL = 5.400063

MLB00.P	CVI_CONG	COST_TRM	ENVTOTAL	INTG_MDE	CP_FACT	PRQ40TV	SCU_CONG	UPB_DVPT
0.657211	0.439382	0.465426	0.628852	0.693048	0.655000	0.378347	0.543124	0.389171

4ULTI-MODEL PASSENGER TERMINAL OBSERVATIONS
PRINCIPAL FACTORS ANALYSIS WITH VAFMAX ROTATION

INITIAL FACTOR METHOD: INPUT FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
FFO4011	0.34427	-0.23749	-0.17394	-0.08805	-0.00544	0.04373
CVT_CJUP	-0.57339	0.37447	-0.17394	0.27304	0.13130	0.11438
OP_FACTR	0.01151	0.71757	0.23441	0.05380	-0.21727	-0.06925
H_BLOG_P	0.41839	0.51823	-0.22341	-0.02514	-0.18865	0.06153
INTG_MDE	0.37031	0.56607	-0.46104	0.05571	-0.03503	-0.00283
RCU_CJNG	0.29132	-0.10479	0.51028	0.37407	0.19723	0.03150
PRM_MDTN	0.04131	-0.17222	0.43259	-0.24714	-0.21254	0.01129
ENVY_TAL	0.21633	-0.27280	0.34452	0.52739	-0.03033	-0.04035
CCST_TAM	0.34738	-0.12359	-0.33313	-0.37112	0.44332	0.02378

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.923307	1.433313	0.920063	0.709373	0.382588	0.029759

FINAL COMMUNITY ESTIMATES: TOTAL = 5.403563

H_BLOG_P	CVT_CJUP	OP_FACTR	INTG_MDE	PRM_MDTN	RCU_CJNG	UPB_DVPT
0.434382	0.465426	0.628852	0.693048	0.555000	0.373347	0.543124

RESIDUAL CORRELATIONS WITH UNIQUENESS ON THE DIAGONAL

H_BLOG_P	CVT_CJUP	CCST_TAM	ENVY_TAL	INTG_MDE	OP_FACTR	PRM_MDTN	RCU_CJNG	UPB_DVPT
0.34679	0.02022	-0.03552	-0.04302	0.03320	0.01880	0.04492	0.03476	0.04425
0.02032	0.51062	0.00487	-0.01839	0.00455	-0.03263	-0.03361	0.03170	-0.03972
-0.03552	0.00487	0.53457	-0.04621	0.00381	0.02204	0.03551	0.02172	-0.00616
0.03320	-0.01839	-0.04621	0.37115	0.03459	-0.00812	0.03551	0.06109	-0.01585
0.01880	0.00455	0.00381	0.03459	0.30195	0.02211	0.02261	-0.06359	-0.05210
0.04492	-0.03361	-0.03361	-0.03361	0.03321	-0.03450	-0.03450	0.03341	-0.01947
0.03476	-0.03972	0.03551	0.03551	0.02361	-0.06315	0.01065	0.01065	-0.00121
0.04425	-0.03972	-0.00616	-0.06109	-0.06359	0.03450	-0.03450	0.00447	0.06103

ROOT MEAN SQUARE OFF-DIAGONAL RESIDUALS: OVER-ALL = 0.03518679

H_BLOG_P	CVT_CJUP	CCST_TAM	ENVY_TAL	INTG_MDE	OP_FACTR	PRM_MDTN	RCU_CJNG	UPB_DVPT
0.03518679	0.03518679	0.03518679	0.03518679	0.03518679	0.03518679	0.03518679	0.03518679	0.03518679

MULTI-MODEL PASSENGER TERMINAL OBSERVATIONS
PRINCIPAL FACTORS ANALYSIS WITH VARIMAX ROTATION

INITIAL FACTOR METHOD: INPUT FACTOR PATTERN

PARTIAL CORRELATIONS CONTROLLING FACTORS

	H_LOAD_P	SVT_CJMP	CONST_TRM	ENVN_TAL	INTU_MDE	OP_FACTR	PRJ40TN	RCU_CJNG	UPR_DVPT
H_LOAD_P	1.00000	0.34830	-0.08249	-0.11391	0.16439	0.05436	0.21363	0.04332	0.09615
SVT_CJMP	0.34830	1.00000	0.02932	-0.04225	0.01159	-0.09441	-0.13434	0.06355	-0.07076
CONST_TRM	-0.08249	0.02932	1.00000	-0.10375	0.00949	0.05132	0.21675	0.04335	-0.01079
ENVN_TAL	-0.11391	-0.04225	-0.10375	1.00000	0.10332	-0.02264	0.11711	0.14336	-0.01329
INTU_MDE	0.16439	0.01159	0.00949	0.10332	1.00000	0.09947	0.11756	-0.17119	-0.012131
OP_FACTR	0.05436	-0.09441	0.05132	-0.02264	0.09947	1.00000	-0.30824	0.04928	-0.04242
PRJ40TN	0.21363	-0.13434	0.21675	0.11711	0.11796	-0.30824	1.00000	0.04519	-0.02645
RCU_CJNG	0.04332	0.06355	0.04335	0.14336	-0.17119	0.04928	0.04519	1.00000	0.00846
UPR_DVPT	0.09615	-0.07076	-0.01079	-0.01329	-0.012131	-0.04242	-0.02645	0.00846	1.00000

ROOT MEAN SQUARE OFF-DIAGONAL PARTIALS: CVFR-ALL = 0.11230386

	H_LOAD_P	SVT_CJMP	CONST_TRM	ENVN_TAL	INTU_MDE	OP_FACTR	PRJ40TN	RCU_CJNG	UPR_DVPT
H_LOAD_P	0.121545	0.071133	0.052952	0.105570	0.113976	0.128247	0.177584	0.078031	0.033394

ROTATION METHOD: VARIMAX

MULTI-MODEL PASSENGER TERMINAL DESENVATICS

PRINCIPAL FACTORS ANALYSIS WITH VARIMAX ROTATION

CHARACTERAL TERM SUBSTANTIATION MATRIX

	1	2	3	4	5	6
1	0.60050	0.33355	0.34215	-0.07581	0.25036	0.06442
2	-0.15172	0.91007	-0.22554	-0.28440	-0.11112	-0.00475
3	-0.19374	0.33317	0.43475	0.81085	0.0315	-0.06561
4	-0.17119	-0.03769	0.73520	-0.41473	-0.00527	0.00535
5	-0.336274	0.02423	0.3104	-0.28344	0.1154	-0.11767
6	-0.11331	0.01224	0.03756	0.02618	0.09178	0.09849

QUALITY FACTOR PATTEFN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PROMOTIV	0.34746	-0.06003	0.21975	-0.09575	0.29112	0.11643
CVT_CGUP	-0.61274	-0.12913	-0.04047	-0.24086	-0.13191	0.06725
CP_FACTR	-0.23378	0.75604	0.07167	-0.05776	0.09763	-0.11548
H_BLDG_P	0.23257	0.73712	0.02428	0.04304	-0.03454	0.11330
ROI_CJNG	0.02604	0.13875	0.03764	0.21607	0.06041	-0.00373
PLAVEITAL	0.43113	-0.17461	0.07961	-0.23985	-0.13760	0.00871
UEA_CVPT	0.13477	0.03449	0.03375	0.60691	-0.00355	0.00996
INTG_MDE	0.22409	0.46362	-0.17776	-0.58525	-0.03139	0.05447
COST_TRA	0.21382	-0.01927	-0.00275	0.00787	0.04750	-0.00382

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.531787	1.401543	0.897336	0.808284	0.574193	0.047420

FINAL COMMUNITY ESTIMATES: TOTAL = 5.433563

H_BLDG_P	CVT_CGUP	COST_TRA	ENVPRNTAL	INTG_MDE	CP_FACTR	PROMOTIV	ROI_CJNG	PLAVEITAL
0.554211	0.484382	0.403426	0.528852	0.698048	0.655000	0.378347	0.543124	0.339171

SCORING COEFFICIENTS ESTIMATED BY REGRESSION

SUMMED MULTIPLE CORRELATIONS OF THE VARIABLES WITH EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
0.754021	0.770563	0.622529	0.624076	0.505923	0.073345

MULTI-MODEL PASSENGER TERMINAL CONSERVATICS
PRINCIPAL FACTORS ANALYSIS WITH QUARTIMAX ROTATION

INITIAL FACTOR METHOD: INPUT FACTOR PATTERN

* INPUT FACTOR PATTERN

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PERMITT	0.33427	-0.23786	-0.17353	-0.08805	-0.05444
UPT_CGUP	-0.35483	0.17467	-0.14455	0.27304	0.13130
CP_FACTF	0.01161	0.11757	0.29160	0.05380	0.21127
H_BLOGP	0.41858	0.61829	0.22741	-0.02514	-0.18860
INTG_ADE	0.37031	-0.58607	-0.46164	0.05571	-0.00283
UDU_CUNG	0.29152	-0.13479	0.31328	0.37407	0.19423
UPB_DVPT	0.35131	-0.17222	0.49290	-0.24784	-0.01129
ENVNTAL	0.51633	-0.27280	-0.08452	0.52739	-0.03055
COST_TRM	0.34018	-0.12359	-0.03913	-0.37112	0.44052

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.32857	1.43313	0.92006	0.70637	0.38258	0.02775

FINAL COMMUNITY ESTIMATES: TOTAL = 5.40053

H_ALDGP	UPT_CGUP	COST_TRM	ENVNTAL	INTG_ADE	CP_FACTF	PRC_MOTN	RDU_CUNG	UPB_DVPT
0.65321	0.40339	0.40542	0.02852	0.69304	0.65500	0.87837	0.54312	0.38917

RESIDUAL CORRELATIONS WITH UNIFORMITY ON THE DIAGONAL

H_ALDGP	UPT_CGUP	COST_TRM	ENVNTAL	INTG_ADE	CP_FACTF	PRC_MOTN	RDU_CUNG	UPB_DVPT
0.34079	0.02032	-0.03552	-0.04302	0.05320	0.01880	0.04492	0.03476	0.04425
0.02032	0.34068	0.04487	-0.01339	0.00455	-0.03963	-0.03361	0.03070	-0.03952
-0.03552	0.04487	0.34057	-0.04621	0.00381	0.02204	0.05511	0.02172	-0.00616
-0.04302	-0.01339	0.04621	0.34057	0.03459	-0.00812	0.03551	0.06109	-0.01585
0.05320	0.00455	0.00381	0.03459	0.34057	0.03211	-0.06315	-0.06359	-0.05210
0.01880	-0.03963	0.02204	-0.00812	0.03211	0.34057	0.03941	0.03941	-0.01947
0.04492	-0.03361	0.05511	0.06109	-0.06315	-0.06359	0.34057	0.01065	-0.00721
0.03476	0.03070	0.02172	0.06109	-0.06315	0.03941	0.03941	0.34057	0.06447
0.04425	-0.03952	-0.00616	-0.01585	-0.05210	-0.06359	-0.01947	0.06447	0.34057

ADJUSTED SQUARE OFF-DIAGONAL RESIDUALS: CUEF-ALL = 0.03518679

H_ALDGP	UPT_CGUP	COST_TRM	ENVNTAL	INTG_ADE	CP_FACTF	PRC_MOTN	RDU_CUNG	UPB_DVPT
0.03556	0.02733	0.03752	0.03679	0.03737	0.03435	0.03890	0.03865	0.02952

MULTI-MODEL PASSENGER TERMINAL OBSERVATIONS
PRINCIPAL FACTORS ANALYSIS WITH QUANTIMAX ROTATION

ATTENTION: INPUT FACTS PATTERNS

PARTIAL CORRELATIONS CONTROLLING FACTORS

[illegible]

ROOT MEAN SQUARE DIFF-DIGONAL PARTIALS: CVFR-ALL = 0.17280160

M-PLDGP	GVI-COUP	COST-TRM	EIVRNTAL	INT-VOE	CP-FACTP	PROMOT-4	ROU-CONG	URB-DVPT
0.121575	0.071133	0.032752	0.105570	0.114776	0.128247	0.177548	0.058031	0.063394

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MULTI-MODEL PASS-1000 THE FINAL OBSERVATIONS

PRINCIPAL FACTORS ANALYSIS WITH QUANTIMAX ROTATION

POTENTIAL METHOD: QUANTIMAX

ORTHOGONAL TRANSFORMATION MATRIX

	1	2	3	4	5	6
1	0.70342	0.24990	-0.06171	0.28269	0.10497	0.63713
2	-0.18470	0.31227	-0.27334	-0.21026	-0.38281	-0.30583
3	-0.13222	0.31302	0.79337	0.47686	0.02113	-0.04457
4	-0.19123	-0.04186	-0.43677	0.17246	-0.37942	0.00369
5	-0.27209	0.30702	-0.30181	0.34927	0.33742	-0.08591
6	-0.70075	0.31083	0.01207	0.03706	0.06952	0.99459

ROTATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PROMOTN	0.89197	-0.04593	-0.08745	0.15313	0.20520	0.68560
GVT_COP	-0.01103	-0.13389	-0.25654	-0.00579	-0.12924	0.08728
CP_FACTP	0.24301	0.14949	-0.05433	0.10380	0.07846	-0.10409
M_ALOG_P	0.27239	0.74307	0.35858	0.01374	-0.11485	0.09890
URB_DVPT	0.12291	0.02948	0.00920	0.04251	-0.01402	0.01129
INTG_MDE	0.31039	0.48182	-0.20644	-0.21064	-0.05511	0.03131
ROU_CONG	0.33621	0.12464	-0.20345	0.69246	0.04613	0.00402
ENVNRTAL	0.79584	-0.16932	-0.24817	0.53302	-0.19103	-0.01103
COST_TRM	0.27168	-0.02127	0.01099	-0.01048	0.62525	-0.00043

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.719355	1.412304	0.872677	0.844342	0.514479	0.336806

FINAL COMMUNITY ESTIMATES: TOTAL = 5.400563

M_ALOG_P	GVT_COP	COST_TRM	ENVNRTAL	INTG_MDE	OP_FACTP	PROMOTN	ROU_CONG	URB_DVPT
0.653211	0.459382	0.465426	0.528852	0.698048	0.755000	0.878347	0.543124	0.389171

SCORING COEFFICIENTS ESTIMATED BY REGRESSION

SQUARED MULTIPLE CORRELATIONS OF THE VARIABLES WITH EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
0.838616	0.772229	0.611287	0.510952	0.485851	0.069694

MULTI-MODEL PASSENGER TERMINAL OBSERVATIONS

PRINCIPAL FACTORS ANALYSIS WITH QUANTIMAX ROTATION

QUANTIMAX METHOD: QUANTIMAX

STANDARDIZED SCORING COEFFICIENTS

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PROMOTN	0.32528	-0.10194	-0.08030	0.05363	0.33185	0.17177
SVT_CUP	-0.13737	-0.02007	-0.02400	0.11394	0.05341	0.21077
NO_FACT	-0.01445	0.11721	-0.02244	0.20311	0.33085	-0.16681
N_BUG_P	0.01902	0.1162	0.22529	-0.01889	-0.23420	0.18303
N_BUG_VST	0.08110	0.03447	0.30610	-0.03436	0.33432	0.00343
INTG_MOE	0.06094	0.20177	-0.02079	-0.23167	-0.09334	-0.00574
EDU_CU_V	-0.06012	0.06717	0.06214	0.44762	0.35932	0.03033
ENV_TITL	0.03333	-0.08663	-0.16054	0.42251	-0.32814	-0.05768
COST_TRA	-0.10001	0.00378	-0.10027	-0.00658	0.44034	-0.01924

FACTORS

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MULTI-MODEL PASSAGE FOR INITIAL OBSERVATIONS
PRINCIPAL FACTORS ANALYSIS WITH EQUIMAX ROTATION

INITIAL FACTOR METHOD: INPUT FACTOR PATTERN

INPUT FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PERMUT14	0.31427	-0.23715	-0.17351	-0.48005	-0.13344	0.04373
SVT_COOP	-0.22633	0.37447	-0.17351	0.27304	0.13133	0.11438
CP_FACT	0.01161	0.71757	0.29165	0.05383	0.21727	-0.08925
H_BLOG_P	0.01839	0.61329	0.22741	-0.02514	-0.18366	0.08153
INTG_MDE	0.37331	0.54507	-0.49134	0.05571	-0.03303	-0.00243
FOR_FCTR	0.29132	-0.13473	0.35228	0.37407	0.11323	0.03150
URB_DVPT	0.09131	-0.17222	0.49225	-0.24764	0.21653	0.01129
ENVNTAL	0.51643	-0.27280	-0.33452	-0.52734	-0.03353	-0.04035
COST_TRM	0.34538	-0.12359	-0.03413	-0.37112	0.44052	0.02378

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1.923667	1.433113	0.930063	0.706373	0.382583	0.020759

FINAL COMMUNITY ESTIMATES: TOTAL = 5.400563

H_BLOG_P	SVT_COOP	COST_TRM	ENVNTAL	INTG_MDE	CP_FACT	PROMUTY	RCU_CONG	URB_DVPT
0.653211	0.459382	0.465426	0.529152	0.697043	0.355000	0.878347	0.573324	0.389171

RESIDUAL CORRELATIONS WITH UNIQUENESS ON THE DIAGONAL

H_BLOG_P	SVT_COOP	COST_TRM	ENVNTAL	INTG_MDE	CP_FACT	PROMUTY	RCU_CONG	URB_DVPT
0.36679	0.02032	-0.03552	-0.04302	0.03320	0.01880	0.04492	0.03476	0.04425
0.02032	0.51062	0.00487	-0.01839	0.00455	-0.03963	-0.03361	0.03070	-0.03932
-0.03552	0.00487	0.53457	-0.04921	0.00381	-0.02204	0.05511	0.02172	-0.00616
0.04302	-0.04921	0.37115	0.37115	0.03459	-0.00912	0.03251	0.06109	-0.01585
0.00487	0.03459	0.03459	0.03459	0.33195	0.03211	-0.02261	-0.06359	-0.05210
0.03459	0.33195	0.33195	0.00812	0.32204	0.34500	0.03641	0.03941	-0.01947
0.00812	0.32204	0.32204	0.03531	0.02281	-0.04215	0.12165	0.01365	-0.00721
0.03531	0.05511	0.05511	0.03531	-0.02359	0.03941	0.01065	0.45688	0.00447
0.03941	0.02172	0.02172	0.066134	-0.026359	-0.01947	-0.00721	0.00447	0.61083
0.04425	-0.03552	-0.03552	-0.01585	-0.05210	-0.01947	-0.00721	0.00447	0.61083

NOT MEAN SQUARE DIFF-DIAGONAL RESIDUALS: OVER-ALL = 0.0516075

H_BLOG_P	SVT_COOP	COST_TRM	ENVNTAL	INTG_MDE	CP_FACT	PROMUTY	RCU_CONG	URB_DVPT
0.031558	0.027345	0.030552	0.024745	0.037407	0.034326	0.036935	0.034965	0.023528

PRINCIPAL FACTORS ANALYSIS WITH EQUIMAX ROTATION

INITIAL FACTOR METHOD: INPUT FACTOR PATTERN

POTENTIAL CORRELATIONS CONTROLLING FACTORS

	HBLD6_P	GVT_CJJP	COST_TRM	ENV-TAL	INT_MDE	CP_FACTR	PRJ_MOTI	RCU_CONG	YPR_DVPT
HBLD6_P	1.00000	0.04830	-0.01244	-0.11991	0.16439	0.05436	0.21868	0.08732	0.09615
GVT_CJJP	0.04830	1.00000	0.09732	-0.04225	0.01159	-0.09441	-0.13434	0.08355	-0.07076
COST_TRM	-0.01244	0.09732	1.00000	-0.10375	0.01449	0.05132	0.21609	0.04355	-0.01079
ENV-TAL	-0.11991	-0.04225	0.10375	1.00000	0.10332	-0.02268	0.16711	0.14336	-0.03329
INT_MDE	0.16439	0.01159	0.01449	0.10332	1.00000	0.05947	0.11796	-0.17119	-0.12131
CP_FACTR	0.05436	-0.09441	0.05132	-0.02268	0.05947	1.00000	-0.30824	0.09328	-0.04242
PRJ_MOTI	0.21868	-0.13434	0.21609	0.16711	0.11796	-0.30824	1.00000	0.04518	-0.02645
RCU_CONG	0.08732	0.08355	0.04355	0.14336	-0.17119	0.09328	0.04518	1.00000	0.00846
YPR_DVPT	0.09615	-0.07076	-0.01079	-0.03329	-0.12131	-0.04242	-0.02645	0.00846	1.00000

ROOT MEAN SQUARE DIFF-DIAGONAL PARTIALS: CVFF-ALL = 0.11280580

	HBLD6_P	GVT_CJJP	COST_TRM	ENV-TAL	INT_MDE	CP_FACTR	PRJ_MOTI	RCU_CONG	YPR_DVPT
HBLD6_P	0.121545	0.071133	0.052352	0.105570	0.114976	0.128247	0.177584	0.098031	0.063994

PRINCIPAL FACTORS ANALYSIS WITH EQUIMAX ROTATION

ROTATION METHOD: EQUIMAX

ORTHOGONAL TRANSFORMATION MATRIX

	1	2	3	4	5	6
1	-0.00203	0.00081	0.00093	0.46273	-0.05314	0.40730
2	0.00229	-0.00229	-0.00303	0.53788	-0.20309	-0.15930
3	0.00077	0.00090	-0.00105	-0.00930	0.00136	-0.00054
4	0.00024	0.00143	-0.00152	-0.00566	-0.00133	-0.00103
5	0.00147	0.00273	-0.00339	-0.00534	-0.00105	0.00114
6	-0.00016	0.00045	-0.00040	0.00002	0.00122	0.00117

ESTIMATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
CP_FACT	0.00000	0.00000	-0.00000	0.00000	-0.00000	-0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ENV_FACT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

FINAL COMMUNITY ESTIMATES: TOTAL = 0.00000

ENV_FACT	ENV_FACT	ENV_FACT	ENV_FACT	ENV_FACT	ENV_FACT
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

SCORING COEFFICIENTS ESTIMATED BY REGRESSION

SQUARED MULTIPLE CORRELATIONS OF THE VARIABLES WITH EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MULTI-MODEL PASSAGE OVER T-EQUAL OBSERVATIONS
PRINCIPAL FACTORS ANALYSIS WITH FULL MAXIMIZATION

ADDITIONAL INFORMATION: 7-2113498

STANDARDIZED SCORING COEFFICIENTS					
	FACT01	FACT02	FACT03	FACT04	FACT05
OP_FACT	0.45445	0.14390	0.03493	0.05465	-0.37322
CON_CUNG	0.14143	0.40465	-0.13220	-0.04740	0.34144
EXPENTAL	-0.34721	0.05140	0.05077	-0.08149	-0.16341
PCUBOTH	-0.35458	0.05703	0.47320	0.29372	-0.35210
SVT_CU3P	-0.25435	0.11415	-0.27415	0.03478	-0.20480
HL_CU3P	-0.21173	-0.00609	-0.20314	0.44786	-0.05028
CRB_VJBT	-0.30013	-0.03513	0.10113	0.04555	-0.25268
INTV_MUC	0.06520	-0.17443	0.05170	-0.23632	-0.02661
CUST_TRM	0.13532	-0.16549	-0.13351	-0.13613	-0.00007
					0.38926
					0.24512
					0.04034
					0.30333
					0.63008
					0.05028
					0.25268
					0.02661
					0.38926

• APPENDIX F •

NEW ANALYTICAL METHOD ANALYSIS
APPROACH AND RESULTS

APPENDIX F

NEW ANALYTICAL METHOD EXAMPLE

The basic output data is put in a Lotus 1,2,3 program Data Matrix created indicating number of times one factor was ranked as more important than the other. This is a paired comparison of one factor against all others for each questionnaire. This is done for each factor.

The result is a matrix such as Matrix 1. Factor i Greater than Factor j.

	Factor 1	Factor 2	Factor 3 = j
i Factor 1	0	10	2
Factor 2	6	0	3
Factor 3	4	7	0

Any entry such as 6 indicates that of the total sample on 6 occasions, factor 2 was ranked higher than factor 1.

The calculations also identify how many times the factors are ranked equal.

This is a second matrix.

Matrix 2 - Factor i Equals Factor j

	Factor 1	Factor 2	Factor 3 = j
i Factor 1	0	6	9
Factor 2	6	0	5
Factor 3	9	5	0

The entry 9 indicates that on 9 occasions factor 3 was ranked equal to factor 1. This is a mirror matrix. One half the matrix reflects the other. In the example the number of times factor 1 was equal to factor 3 is 9. This must be true if this is a frequency of occurrence of one factor equal to another.

The next calculation is a matrix that is an addition of the first two matrices. Number of times factor i is greater than and equal to factor j. This produces the matrix below.

Matrix 3 - Factor i Greater and Equal to Factor j

	Factor 1	Factor 2	Factor 3 = j
i Factor 1	0	16	11
Factor 2	12	0	8
Factor 3	13	12	0

The next step is to develop proportion matrices similar to those above. These matrices express the previous matrices in percentage terms. The matrices make it easier to determine which factors are significantly, by observation, of the rows and columns.

Matrix 4 -- Percentage Matrix Factor i Greater than Equal to Factor j

	Factor 1	Factor 2	Factor 3 = j
i Factor 1	0	59	41
Factor 2	60	0	40
Factor 3	52	48	0

Once these matrices were prepared an importance index was developed for each factor. The importance index is the sum of the frequency entries for each (i) divided by the number in the row - minus one. As an example from Matrix 1.

The importance index for Factor 1 is $\frac{0 + 10 + 2}{3 - 1} = \frac{12}{2} = 6.0$

For Factor 2, it is 4.5 and for Factor 3 it is 5.5.

The importance index are then ranked in order of importance, i.e., highest first. This gives an indication of which factor was most important. A similar analysis was carried out for Factor i Greater than and Equal to Factor j.

The results were for Factor 1 $\frac{0 + 16 + 11}{2} = 13.5$

For Factor 2, it is 10 and for Factor 3 it is 12.5.

Once the importance index is known, the factors are ranked in order of highest importance factor. A spread is calculated: This is the ratio of the importance index for a factor (i) over the highest importance index value and expressed as a percentage. This gives an indication of the difference between one factor and another in terms of their relative importance. The final calculation is the GAP, this is a difference between the spread number in ranked order. It is another way of identifying the relative

importance of one factor compared to the factors above and below.

In this example for the importance index for Factor i Greater than Factor j

Factor	Importance Index	Spread	Gap
1	6.0	-	-
3	5.5	$\frac{5.5}{6.0} = 91.7$	8.3
2	4.5	$\frac{4.5}{6.0} = 75$	16.7

The gap and spread indicate that the difference between factor 3 and 2 (16.7) is twice as large as the difference between factors one and 3 (8.3). This is useful in identifying the marginal utility of a factor in the rank ordered priority hierarchy. It would be useful if limited funds are available then the marginal contribution of each factor can be weighed against the marginal cost.

These results along with other results such as frequency of choice of a specific score, range of responses, average response, value, etc., are used to develop a final priority.

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FREQUENCY OF ONE FACTOR (i) GREATER THAN FACTOR (j)

	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation	18	6	11	3	5	6	29	22	
Government Cooperation	17	12	20	8	13	17	41	32	
Cost of Terminal	18	20	17	6	9	10	35	28	
Environmental Concerns	11	17	5	1	3	3	29	23	
Integration of Various Modes	34	20	28	35	24	13	38	29	
Operating Factors	17	18	7	18	1	7	37	26	
Promotion of Public Transportation	30	20	25	37	4	23	35	22	
Reduction of Local Traffic Congestion	10	0	3	9	2	2	0	2	
Urban Development	13	5	11	17	6	8	7	16	

FREQUENCY OF ONE FACTOR (i) EQUAL THAN FACTOR (j)

	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation	-	6	17	19	4	19	5	2	6
Government Cooperation	6	-	9	4	13	10	4	0	4
Cost of Terminal	17	9	-	19	6	24	5	3	2
Environmental Concerns	19	4	19	-	5	20	1	3	0
Integration of Various Modes	4	13	7	5	-	16	24	1	6
Operating Factors	19	10	25	20	16	-	11	2	7
Promotion of Public Transportation	5	4	6	1	24	11	-	6	10
Reduction of Local Traffic Congestion	2	0	3	3	1	2	6	-	23
Urban Development	6	4	2	1	6	7	10	23	-

FREQUENCY OF ONE FACTOR (i) GREATER AND EQUAL THAN FACTOR (j)

	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Heritage Building Preservation		24	23	30	7	24	11	31	28
Government Cooperation	23		21	24	21	23	21	41	36
Cost of Terminal	35	29		36	12	33	15	38	30
Environmental Concerns	30	21	24		6	23	4	32	23
Integration of Various Modes	38	33	35	40		40	37	39	35
Operating Factors	36	28	32	38	17		18	39	33
Promotion of Public Transportation	35	24	31	38	28	34		41	34
Reduction of Local Traffic Congestion	12	0	6	12	3	4	6		25
Urban Development	19	9	13	18	12	15	17	39	

PREFERENCE INDEX FOR FACTOR (I) GREATER AND EQUAL THAN FACTOR (J): (ALL)

(I)		Importance Index			Rank		SPREAD, % of Largest	GAP %	
Heritage Building Preservation		22.250			6		60	14.8	
Government Cooperation		26.250			5		71	06.1	
Cost of Terminal		28.500			4		77	04.4	
Environmental Concerns		20.375			7		55	05.1	
Integration of Various Modes		37.125			1				
Operating Factors		30.125			3		81	08.1	
Promotion of Public Transportation		33.125			2		89	10.8	
Reduction of Local Traffic Congestion		8.500			9		23	24.9	
Urban Development		17.750			8		48	07.1	

[illegible]

[illegible]

MULTIMODAL QUESTIONNAIRE DATA (AVE)

Town	Heritage Building Preservation	Government Cooperation	Cost of Terminal	Environmental Concerns	Integration of Various Modes of Transportation	Operating Factors	Promotion of Public Transportation	Reduction of Local Traffic Congestion	Urban Development
Brampton	6	5	6	6	7	6	7	4	4
Brandon	6	6	7	5	7	7	7	3	3
Calgary	5	7	6	5	5	5	6	6	5
Drummondville	4	6	6	5	6	6	6	3	5
Edmonton	4	6	6	4	7	7	5	5	3
Jonquiere	5	6	6	7	7	6	7	5	5
Kapuskasing	4	5	6	6	7	6	7	4	4
Kitchener	5	6	6	6	7	6	7	5	6
Laval	6	5	6	6	7	6	7	4	4
Lévis	4	6	5	4	6	5	5	4	6
Moncton	4	5	6	5	7	6	7	4	4
Moose Jaw	7	6	5	4	7	6	7	3	5
North Bay	2	5	5	5	5	5	6	3	7
Port Coquitlam	1	7	5	5	7	4	6	1	2
Prince Albert	4	7	7	3	7	7	4	2	5
Quebec	6	5	6	6	7	6	7	4	4
Regina	7	5	6	4	7	6	7	4	6
Saint John	5	6	4	5	6	6	6	3	6
Ste-Foy	7	7	1	5	7	7	4	4	4
Sudbury	6	6	6	4	7	6	6	3	5
Timmins	2	6	6	4	4	6	5	5	5
Trois-Rivières	5	6	7	6	7	6	7	4	5
Vancouver	7	5	6	4	7	6	6	3	6
Winnipeg	6	6	7	5	6	6	6	4	5

END

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