MAKING TRANSIT FUNCTIONAL

A guide to a frequent, affordable, and accessible system in Winnipeg

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http://functionaltransit.com/southwest-corridor-versus-frequency-our-report/

"Transit works best where there are many destinations along something that feels like a straight line."

– Jarrett Walker, Human Transit

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3 WHAT IS IMPORTANT FOR TRANSIT INVESTMENT IN WINNIPEG

In this section, we review key criteria that must be considered when investing in public transit.

3.1 UNDERSTANDING THE STEPS OF A TRANSIT TRIP

The solution to creating an effective transit service begins and ends with overall trip time and service convenience. For this reason it is important to consider all stages of a trip made on public transit.

Transit consultant Jarret Walker divides a transit trip into a series of steps[6]:

1. Understanding: finding and reading the schedule as well as calculating the routes and times necessary to complete the trip
2. Accessing: getting to the bus stop
3. Waiting for the bus
4. Boarding and paying
5. Riding the bus
6. Connecting: transferring to a different bus (which will include repeating steps 2-5)
7. Accessing: getting from the stop to the destination

This is a clear structure for calculating how to invest in transit and what types of investments will have the most benefit for transit. Each step of a trip is affected by different factors such as bus stop proximity, bus frequency, payment method, etc.

However, each of these steps are not equal. Time perception differs for each step. The most onerous parts of a trip *feel* like they take more time while easier parts of a trip *feel* like they take less time. Walking and waiting are typically the most onerous. Walker cites the *Transit Capacity and Quality Service Manual* which states that walking and waiting time feels on average twice as long as in-bus time, while time spent between transfers feels 2.5 times longer than in-bus time[7]. A majority of the research estimates out-of-bus travel time to feel 1.5-2.3 times longer than in-bus time[8]; Isecki et al states that out-of-bus travel time can feel 1.5 to 4.5 times more burdensome than in-vehicle time[9].

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[6] Walker, J. *Human Transit*. (Washington: Island Press, 2012): 34-35
[7] Walker, *Human Transit*: 36
[8] Van de Walle, S., and T. Steenberghen. "Space and time related determinants of public transport use in trip chains". *Transportation Research Part A*. 40 no. 2 (2006): 152
[9] Iseki, I., Smart, M., Taylor, B. D., & Yoh, A. 2012. "Thinking Outside the Bus." *Access* 40: 9-15.

Given that waiting and walking time feel much longer than in-bus time, getting to the bus stop, waiting for the bus, transferring buses and getting from the stop to the destination should be considered more important in terms of overall service quality for transit riders than bus speed. Bus frequency improves speed in steps 1, 2, 3, 6 and 7 of a transit trip; it will also make step 5 less stressful. Frequent bus service on our current bus routes means current bus stops remain accessible and waits and transfers are short. We will explain more about our recommendations in section 5.

3.2 CRITICAL ELEMENTS TO BE CONSIDERED WHEN INVESTING IN TRANSIT

When making a transit investment it is important to remember some very important factors. These factors all relate to one another.

3.2.1 Walkability

Walkability is one of the most important factors to consider when investing in public transit. This means placing transit stops within easy walking distance of both riders' homes and their destinations.

Transit stations must be located in walkable areas – areas where it is easy to get from place to place on foot. Walking and transit go hand in hand[10]. According to Walker, "while there are many ways to get to a transit stop, we plan for one method above all: walking. Sooner or later, everyone is a pedestrian. You may arrive at a stop by connecting transit service or by car or by bike, but unless you take your bike onboard, you'll still be a pedestrian at your destination."[11]

3.2.2 Safety

Safety is often cited by riders as very important[12]. Safety can be improved through a number of measures including bus station patrols, better lighting at stations, surveillance cameras (recently installed in all Winnipeg Transit buses for both rider and driver safety). Bus stops and stations can also be placed in pre-existing areas of high activity where "eyes on the street" create both real safety as well as a feeling of safety[13]. Of all of the options listed above, utilizing "eyes on the streets" is most cost-effective because it creates natural perceptions of safety without having to pay for monitoring.

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[10] Wey, W.M., and Y.H. Chiu. "Assessing the walkability of pedestrian environment under the transit-oriented development". *Habitat International.* 38 (2013): 107

[11] Walker, *Human Transit*: 61

[12] Taylor, B., Haas, P., Boyd, B., Hess, D. B., Iseki, H., & Yoh, A. "Increasing Transit Ridership: Lessons from the Most Successful Transit Systems in the 1990s." San Jose: Mineta Transportation Institute, 2002: 21

[13] Oc, T. and S. Tiesdell. "The Fortress, the panoptic, the regulatory and the animated: planning and urban design approaches to safer city centres". *Landscape Research.* 24 no. 3 (1999): 276-277

3.2.3 Serving the existing urban form

The existing urban environment is the area which riders travel to and from. This is important for designing successful bus rapid transit corridors and transit investment in general[14]. Urban developments that accommodate transit should be the target of improved transit service. This means that stops must be accessible and near amenities that transit riders already use. Essentially these areas must make it easy to carry out the seven steps of a transit trip.

According to Delbosc and Currie, "integration of BRT design is important to ridership generation. This concerns both integration of BRT routes into the wider transit network and integration of street access into urban development within station catchments."[15]

3.2.4 Competing with other modes of transportation (i.e. overall trip speed, cost etc.)

Transit improvement is relative, not absolute. The effectiveness of transit investment should be considered in terms of its relative usefulness next to other modes of transportation. Usefulness can be denominated in terms of convenience or overall cost.

While private vehicles have a relatively high financial cost, buses have a relatively high time cost. How people value their time is an important consideration for why transit investment is often aimed at reducing in-bus time relative to a private automobile. Essentially, a car is expensive, while a bus is inconvenient or, alternatively, a car is convenient while a bus is affordable. Making transit relatively more attractive comes in two forms: making cars more expensive or less convenient to use or making taking transit cheaper or more convenient[16].

3.3 WHAT RIDERS WANT

Research on what transit riders prefer tends to fall into two different types: research that directly asks riders what they want and research that uses data on ridership changes as an indicator of whether investment is meeting riders' needs. Both sets of research are important.

What Winnipeggers say they want happens to be exactly what the research says people want: they want accessible stops, they want higher frequency service and they want lower fares[17].

Additionally, for public transit to stay relevant, it must provide service to the destinations to which Winnipeggers are actually going.

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[14] Ontario Professional Planners Institute. *Plain Transit for Planners*: 2-3

[15] Currie, G. and A. Delbosc. "Understanding bus rapid transit route ridership drivers: An empirical study of Australian BRT systems." *Transport Policy* 18, no. 5 (2011): 763

[16] Chen, C., Varley, D., and Chen, J. "What Affects Transit Ridership? A Dynamic Analysis involving Multiple Factors, Lags and Asymmetric Behaviour." *Urban Studies* 48, no. 9 (2011): 1894

[17] Winnipeg, City of. *Winnipeg Transportation Master Plan*: 46

3.3.1 In Winnipeg

In consultations with Winnipeggers, researchers for the *Winnipeg Transportation Master Plan (WTMP)* found that bus frequency was one of the four main priorities for transit named by citizens[18]. Consultations also found that Winnipeggers wanted transit stops to be easier to get to on foot[19].



Figure 1: Winnipeg Transportation Master Plan findings for transit in Winnipeg

3.3.2 What the research says

Research has found that frequency, low fares, safety and reliability are the factors that have the largest impact on ridership.

In a review of 12 American transit agencies that increased service in the 1990s, Taylor et al. found that increased operating hours had "by far the highest correlation between any [transit-service specific] factor and ridership increase."[20] Taylor et al. also reviewed the research literature on transit, finding that among factors that transit agencies had control over, "increasing the quantity of service (in terms of service coverage and service frequency) and reducing fares are both found to have significant effects on ridership."[21]

The direction of causation is important (whether an increase in ridership causes demand for greater service or whether better service led to more people choosing to ride public transit), and demand has been found to follow supply improvements. Taylor et al. are careful to avoid declaring the direction of causality, but in an interview process with transit managers, they

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[18] Winnipeg, City of. *Winnipeg Transportation Master Plan*: 46
[19] Winnipeg, City of. *Winnipeg Transportation Master Plan*: 42 and 46
[20] Taylor, B., et al. "Increasing Transit Ridership: Lessons from the Most Successful Transit Systems in the 1990s": 48
[21] Taylor, B., et al. "Increasing Transit Ridership": 21

found that transit professionals from agencies that increased ridership in the 1990s believed that service improvements were *followed by* increases in demand[22]. Research on service quantity and fare changes has shown that transit improvement is followed by an increases in ridership – albeit with a lag time[23].

Plain Transit for Planners, from the Ontario Professional Planners Institute, confirms that frequency is important and also emphasizes the importance of accessible urban design:

"Key considerations for transit service include frequency of service, customer service, affordability and safety. The environment, which incorporates street design, transit access points, and neighbourhood design, must be supportive of transit service. The success of the transit provided is otherwise limited."[24]

Research on bus rapid transit systems has also found that the factors most commonly associated with increased ridership are higher frequency, lower fares and network comprehensiveness. Statistically significant factors on daily ridership numbers, found by Hensher and Li, are shown below in the order of greatest impact to least. Note, that the top five factors can all be achieved without having an actual BRT system.

1. Fares
2. Frequency of service
3. Length of network
4. Shorter average distance between stations
5. Integration with existing transit routes and network
6. Pre-board fare collection
7. Maintaining a high quality service level[25]

Research on BRT in Australia concluded that "All tests, including some tests after accounting for the effects of service levels, suggest the quantity of services supplied dominates as an influence on ridership."[26]

3.4 WHY FREQUENCY IS SO IMPORTANT

"Frequency and span are the essence of freedom for a transit passenger. High-frequency, long-span service is there whenever you want to use it, even for spontaneous trips."[27]

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[22] Taylor, B., et al. "Increasing Transit Ridership": 107
[23] Chen, C. et al. "What Affects Transit Ridership? A Dynamic Analysis involving Multiple Factors, Lags and Asymmetric Behaviour": 1904
[24] Ontario Professional Planners Institute. *Plain Transit for Planners*: 2-3
[25] Hensher, D. A. and Z. Li. "Ridership Drivers of Bus Rapid Transit Systems." *Transportation* 39 no. 6 (2012): 1218
[26] Currie and Delbosc. "Understanding bus rapid transit route ridership drivers": 763

Frequent service is the most common factor in high ridership because it is the factor that makes transit convenient. Frequent service means speedy access to a moving vehicle going in the direction that the rider needs or wants to go and it also means speedier transfer times.

When riders need to get to diverse destinations, transfers are necessary. Frequent service makes transfers much less onerous because a rider knows they don't have to wait long for their connection, and if they do miss their connection, another one is coming soon. Of all the parts of a transit trip, transfers are the part that riders have the least control over – they don't control where they transfer, how long they have to wait, how many transfers they will have to make and whether their buses will arrive at transfer points on time. Frequent service makes transfer points more flexible and thus more reliable.

Ultimately, bus frequency makes public transit competitive with private automobiles – it makes it available when it is needed – and competitive transit is functional transit. The goal should be having a bus arriving when a rider needs it.

3.5 WHERE WINNIPEGGERS ARE GOING

The places that Winnipeggers are going must also be taken into account. This should be a major consideration for transit investment.

While downtown does dominate as the main single destination, the majority of trips made by Winnipeggers are within their own neighbourhoods. At present, routes to downtown during rush hour are well-served, while there is still a major need for buses that serve destinations within neighbourhoods.

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[27] Walker, *Human Transit*: 85

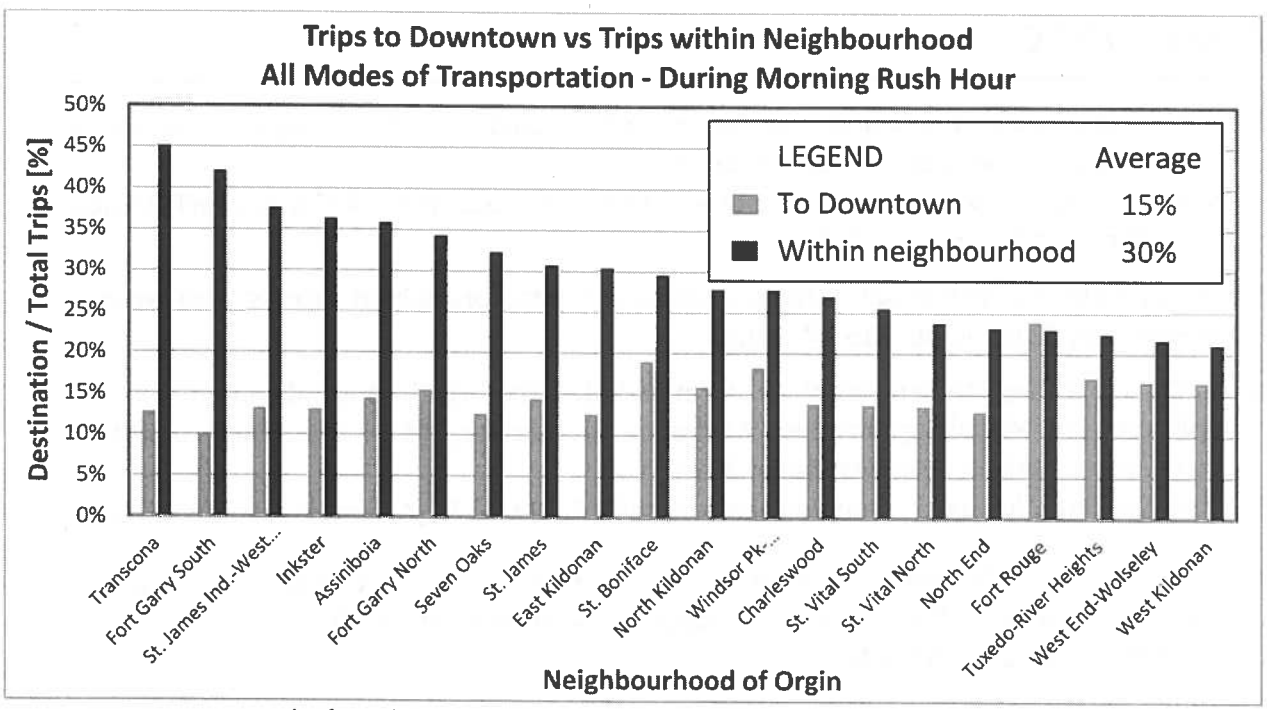


Figure 2: Graph of trip destinations, all modes of transportation, during morning rush hour[28]

Additionally, trips made by Winnipeggers are quite diverse. While trips for work are the largest single trip purpose, shopping and leisure trips combined make up an even larger proportion of trips made by Winnipeggers. Transit service should reflect these diverse needs.

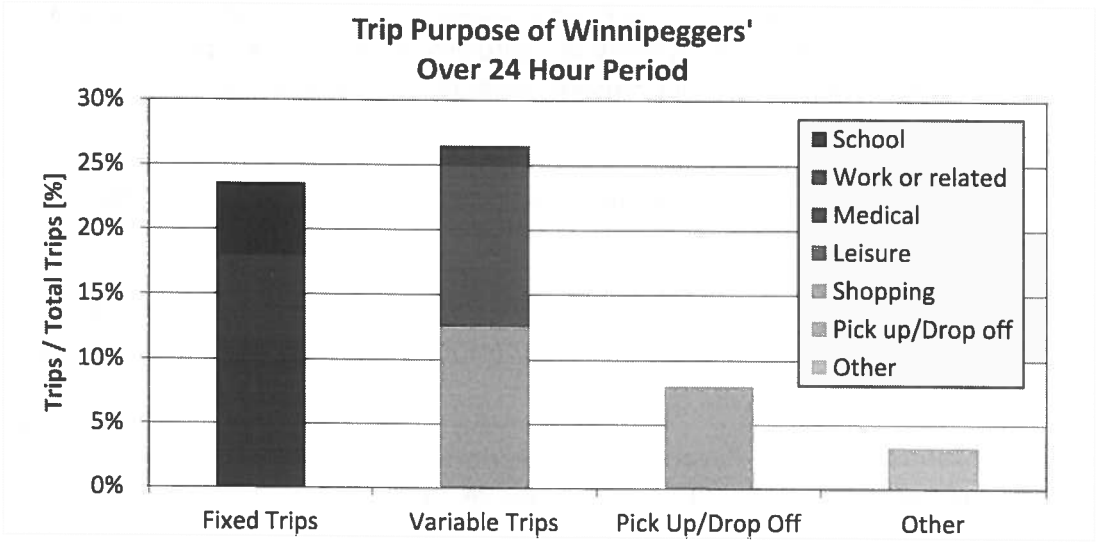


Figure 3: Purpose of Winnipeggers' trips over a 24 hour period[29]

[28] Data from from 2007 Winnipeg Area Travel Survey Results – Final Report, pages 38-79. Elmwood results not shown due to inconsistencies in the reporting of the survey results. Morning rush hour is from 7am to 9am.

[29] Data from 2007 Winnipeg Area Travel Survey Results – Final Report, page 33. Return home trip not shown on graph accounts for 39% of total trips.

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