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UNIVERSITY OF MINNESOTA U-PASS:
A COST/BENEFIT ANALYSIS OF IMPLEMENTING A DEEP DISCOUNT BUS PASS PROGRAM

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INTRODUCTION

As the largest educational institution in the state, the University of Minnesota - Twin Cities represents the second largest volume of trips in the metro area behind downtown Minneapolis[1]. With a daytime population of approximately 39,600 students and an estimated 11,700 faculty and staff representing between 66,850 arrivals, the distribution of modal split can greatly influence campus transportation planning and management for the University and a fraction of the Metro area[2].

Travel modes by all users are dominated by single occupancy vehicles (43%), followed by walking (32%), busing (13%), carpooling (7%), and biking (5%)[3]. The University maintains approximately 18,000 non-specialty[4] parking spaces for these 33,425 automobile arrivals, indicating a tight parking "market." Although difficult to assess, excess parking demand must be distributed among local streets and neighborhoods, private and city parking lots, and/or non-overlapping, multiple-car utilization of on-campus parking spaces[5].

The University of Minnesota's Parking and Transportation Services' annual budget is funded through parking revenues, supporting both parking facilities and non-parking programs. Ideally, they would like parking demand to just equal practical capacity[6], thus reducing congestion and increasing accessibility, while maintaining revenues for other programs. As it stands, demand exceeds current capacity, and as "...low-cost surface lot spaces decrease and are replaced with higher cost structural spaces, additional revenues will need to be generated to balance the budget"[7]. In their most recent customer survey, parking costs were rated 3.16 out of 5, a full point below any other category, indicating a disparity between the reality of future parking costs and the value of parking to the customer[8]. Implementing various transportation

demand management strategies (TDM) can ease the need to build new infrastructure, containing costs, as well as reducing pollution, safety, and other negative externalities.

An important TDM strategy is to use a multiple-strategy approach to reduce congestion. The University has encouraged alternative modes of commuting by designating 1,226 carpool spaces (about 7% of the total), operating an intra- and inter-campus shuttle service to limit localized automobile traffic, installing and maintaining over 6,500 bike racks, and funding four semi-express campus commuter bus routes[9]. As parking prices and congestion rise however, there will be a price-behavior response that will push on-campus parking demand either into the streets and neighborhoods or alternative commute options.

A U-Pass, or university administered deep discount bus pass, can offer counter-incentives to increased parking prices and fill a role in offering alternative commute options. By subsidizing a metro-wide bus pass that is available to faculty, students, and staff, the University can attempt to:

- Reduce local and metro-wide congestion, increasing pedestrian and biker safety, while decreasing pollution;
- Reduce parking congestion in and around the University;
- Reduce the demand for increased parking capacity, which due to land constraints is limited to higher cost multiple-level structures;
- Increase the range of low-cost, yet accessible, commute options.

TRANSPORTATION COSTS BY MODES AT THE UNIVERSITY OF MINNESOTA

The cost/benefit allocation among different transportation modes can be divided into three measurable categories: commute-costs, time-costs, and non-monetary factors[10]. Each mode has different costs and benefits across distances however, so three one-way distances of 1 mile, 2.5 miles, and 7.5 miles were chosen for comparison[11]. As with any cost/benefit analysis, several

assumptions must be made to standardize conditions across modes, which are noted underneath each table.

Commute costs

Commute costs are the direct, measurable costs associated with commuting by each mode, including fuel use, maintenance and repair, and parking.

Table 1. Summary of round-trip commute-costs by distance and mode ($).

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	0.09	0.18	0.76	3.04	2.55
5 miles	0.24	0.45	0.95	3.31	2.55
15 miles	0.71	1.34	1.61	4.20	2.55

- Assumptions: 1) Sunk costs (insurance, registration, capital costs, etc.) and externalities are not included. 2) Accident risk and associated costs are considered equal across modes.
- Walk - (calories). Caloric costs/mile assumed equal to fuel costs/mile.
- Bike - (calories + maintenance). Caloric fuel costs assumed equal to fuel costs/mile. Maintenance assumed equal to car.
- HOV (driver) - [(parking + gas) / 2 passengers] + maintenance & repair. Parking: $1.25/day. (1998-1999 Press Kit, Parking. Op cit.) Gas: $1.15/gallon / 24.4 mpg = $0.047/mile x round-trip mileage. National Highway Traffic Safety Administration. "Automotive Fuel Economy Program." Report to Congress. 1997. www.nhtsa.dot.gov/cars/problems/studies/fuelecon/index.html#fe6. Maintenance and repair: $0.042/mile. Ford Taurus GL, 6 cyl. (3.0 liter). 1997 AAA Statistics. Metro Commuter Services "Real Cost of Driving Alone" online calculator. www.metrocouncil.org/commuter/costcal.asp. accessed 10/5/99.
- SOV - parking + gas + maintenance & repair. Parking: $2.86, average of least-cost surface lot monthly contract ($40.00/month) and high-cost monthly garage contract ($80.00) for 21 day work month. Op cit.
- Bus: Average of least-cost local/non-rush hour rate ($1.00/trip, 15% standard discount, 2 trips) and high-cost express/rush hour rate ($2.00/trip, 15% standard discount, 2 trips).

Table 2. Mode choice ranking by least commute-cost (1 = least cost).

Distance	1	2	3	4	5
2 miles	Walk	Bike	HOV	Bus	SOV
5 miles	Walk	Bike	HOV	Bus	SOV
15 miles	Walk	Bike	HOV	Bus	SOV

It is clear from Tables 1 and 2, that based on direct commute costs, a consistent pattern emerges across distances, with walking, biking, and the HOV, Bus, and SOV being preferred in that order. However, this does not include a valuation of commute time.

Time Costs

Time costs are the summation of transaction time and commute time. Transaction times involve non-commute activities related to the preparation for the commute, such as the search for

parking, locking up one's bike, picking up HOV commuter, commuting to the bus stop itself, waiting for the bus, or commuting from the destination parking lot or bus stop to the final destination. They have been non-scientifically estimated, but sensitivity to these assumptions is discussed following the results to account for potential variations in transaction times.

Table 3. Summary of round-trip commute times by distance and mode (minutes).

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	30	14	26	22	35
5 miles	75	29	34	30	50
15 miles	225	79	59	55	99

- Assumptions: 1) Transaction times (non-commute activites) are a non-scientific estimation. 2) Commute preparation times are assumed equal across modes.
- Total time = Transaction time + Travel time
- Walk = 0 minutes + (distance / 4 mph average speed) x 60 min/hr
- Bike = 4 minutes + (distance / 12 mph.average speed) x 60 min/hr
- HOV = 21 minutes (7.5 minutes to pick-up/drop-off rider, 1 minute search for parking, and 2.5 minute local commute from preferential parking to destination) + (distance / 24.0 mph average speed) x 60 min/hr (1*990 Travel Behavior Inventory Summary Report, Twin Cities Metropolitan Area*. Metropolitan Council, St. Paul, MN, June 1994, Table 8 "Regional Trip Time and Distance Compared to Central Business District.")
- SOV = 17 minutes (2 minute search for parking and 7.5 minute local commute from non-preferential parking) + (distance / 24.0 mpg average speed) x 60 min/hr (Ibid.)
- Bus = 25 minutes (5 minute walk/drive to bus stop, 5 minute bus stop wait, and 2.5 minute local commute from bus-stop to destination) + (distance / 12.1 mph average speed) x 60 min/hr (Ibid.)

Table 4. Summary of round-trip commute time-costs by distance and mode ($).

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	1.83	0.85	1.58	1.34	2.13
5 miles	4.56	1.76	2.07	1.83	3.04
15 miles	13.69	4.81	3.59	3.35	6.02

- Assumes $3.65/hr as average value of travel time for work trips. Sensitivity is $0.06/minute. (Mohn, Craig and Barbara Kanninen. "The Economics of Alternative Transportation Modes." Center for Transportation Studies, University of Minnesota. May 1994. p. iii.)

Table 5. Mode choice ranking by least time-cost (1 = least cost).

Distance	1	2	3	4	5
2 miles	Bike	SOV	HOV	Walk	Bus
5 miles	Bike	SOV	HOV	Bus	Walk
15 miles	SOV	HOV	Bike	Bus	Walk

Based on a valuation of commute times, mode choice changes across distances. Walking and biking, having lower average speeds, become less attractive at longer distances, while the SOV, HOV, and bus become less time-expensive.

Total Costs

Total costs are the summation of commute- and time-costs.

Table 6. Summary of round-trip total costs per day by distance and mode ($)*.

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	1.92	1.03	2.34	4.38	4.68
5 miles	4.80	2.21	3.02	5.14	5.59
15 miles	14.40	6.15	5.20	7.55	8.57

Table 7. Mode choice ranking by least total cost (1 = least cost).

Distance	1	2	3	4	5
2 miles	Bike	Walk	HOV	SOV	Bus
5 miles	Bike	HOV	Walk	SOV	Bus
15 miles	HOV	Bike	SOV	Bus	Walk

Based on total costs, biking and then walking are clearly the modes of choice for the shorter distances. At some distance, walking and then biking become prohibitively time intensive and/or inconvenient, regardless of costs. The HOV is the least-cost mode choice for longer distances. At every point however, the SOV is cheaper than the bus, which are competing substitutes for most users. The difference increases over distance though, as the higher commute costs for the SOV are offset by its higher average speed. A TDM stategy like the U-pass would decrease the costs of bus commuting to the user, making it economically more attractive, and inducing a price-behavior modal shift from the SOV to the bus for some percentage of commuters.

A cost/benefit analysis does not necessarily accurately predict mode choice

U-PASS PROGRAM DETAILS

The concept of a university administered deep discount transit pass for students is not new. A recent report surveying campuses offering a U-pass found twenty-three programs, ranging in size from 6,700 - 49,000 eligible users and $83,600 - $4.3 million dollars in cost[12].

The report did not include regional U-pass programs such as those in Chicago (CTA) and Atlanta (MARTA) that cover multiple universities in one program. A U-pass program is a contract between a university and the local transit authority to provide the university users with universal access bus passes at a deeply discounted price. The university hopes to encourage transit usage (especially peak-period travel), while the transit agency hopes to fill excess capacity and receive lump-sum payments rather than the usual individual cash fares and short-term system passes.

Currently, both the Twin Cities' Metro Transit and the University of Minnesota offer deep discount passes to select users. Metro Transit has the employer sponsored Metro Pass program that offers universal passes to employees. Metro Transit's largest current participant is American Express, where transit ridership increased from 2,800 to 4,500 employees following the Metro Pass' implementation. A U-pass program would simply be a very large expansion of such a program.

The University of Minnesota currently offers a Como Transit Pass to the Como neighborhood, just north of the East Bank campus, bounded on the west by I-35W, on the east by the city of St. Paul and extending north and south of Como Ave six blocks on either side. A bit of history is necessary to explain the evolution of this neighborhood specific transit pass.

Como Avenue was the original corridor for the present-day Campus Connector. At that time, there was a small charge for riding the connector from off-campus. Construction of the intercampus transitway moved the route and neighborhood residents were faced with less frequent service at higher cost from Metro Transit buses. The Como Transit Pass began three years ago as a one-year discount bus pilot program to address these two issues. The Met Council approved the sale of 1,000 Como Transit passes per quarter at $40/pass with the University and Metro Transit making up the different. It has been renewed each year since, and was recently

expanded to include a free bus pass for persons purchasing a $67/semester parking pass at a University owned lot in the neighborhood. Parking and Transportation Services officials were suprised at the demand for the parking/bus pass combination, given that the lot is traditionally underutilized. Many students commented that they did not intend to use the parking pass[13]. A University-wide U-pass would involve expanding the Como Transit pass to serve the student population

U-PASS COSTS AND BENEFITS

Direct

The estimated costs for implementing a University of Minnesota U-pass program is between $2-3 million/year[14]. These costs would then be passed onto the users through a mandatory transportation fee, estimated at $35/semester. Estimating the costs of such a new program can be difficult, but other U-pass program costs can be used as a proxy for measuring how close the UMN's cost estimates might be.

Of the twenty-three universities mentioned earlier, six were similar to the University of Minnesota based on three size and design criteria: 25,000+ eligible riders, students only, and a universal pass (some were restricted to certain sections of the city). Of these six, the average cost was $1.8 million for an average eligible population of 35,500 and the average student fee paid was $46.60/yr. If the averages hold true for the UMN, a U-pass program for 47,818 day and evening students would cost $2.4 million and incur student fees of $62 annually or $31/semester. It appears that the University and Metro Transit's cost estimates are reasonable.

Predicting ridership is difficult and depends on many factors. The average number of rides/person for the six schools considered was 92 rides/year, which corresponds to an annual

cost/ride of $0.76 (based on $35/semester costs). This will shift the average user's costs from $1.29/trip to $0.76/trip, a savings of $1.03/day.

Table 8. Summary of round-trip total costs per day by distance and mode with U-pass program.

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	1.92	1.03	2.34	4.38	3.65
5 miles	4.80	2.21	3.02	5.14	4.14
15 miles	14.40	6.15	5.20	7.55	7.54

Table 9. Mode choice ranking by least total cost with U-pass program (1 = least cost).

Distance	1	2	3	4	5
2 miles	Bike	Walk	HOV	Bus	SOV
5 miles	Bike	HOV	Walk	Bus	SOV
15 miles	HOV	Bike	Bus	SOV	Walk

Predicting post-U-pass ridership is something between an art and a guess. In the University's recent TEA21 grant proposal to fund the program, transit use is predicted to increase by 40% over existing levels. Another means of predicting ridership is through relative changes in prices.

Table 10. Percentage of willingness to pay by mode of total willingness to pay by distance (%).

Distance	Walk	Bike	HOV	SOV	Bus	Total
2 miles	13.4	7.2	16.3	30.5	32.6	100.0
5 miles	23.1	10.6	14.5	24.8	26.9	99.9
15 miles	34.4	14.7	12.4	18.0	20.5	100.0

Table 11. Percentage of willingness to pay by mode of total willingness to pay by distance with U-pass program (%).

Distance	Walk	Bike	HOV	SOV	Bus	Total
2 miles	14.4	7.7	17.6	32.9	27.4	100.0
5 miles	24.9	11.4	15.6	26.6	21.4	99.9
15 miles	35.3	15.1	12.7	18.5	18.5	100.1

Table 12. Difference in willingness to pay by modes (%).

Distance	Walk	Bike	HOV	SOV	Bus
2 miles	-1.0	-0.5	-1.3	-2.4	+5.2
5 miles	-1.8	-0.8	-1.1	-1.8	+5.5
15 miles	-0.9	-0.4	-0.3	-0.5	+2.0
Average	-1.2	-0.6	-0.9	-1.6	+4.2

Table 13. Modal split and effect on arrivals under new relative prices with U-pass.

Modal Split	Walk	Bike	HOV	SOV	Bus	Total*
Current %	32	5	7	43	13	100.0
U-pass %	30.8	4.4	6.1	41.4	17.2	99.9
% change	-3.8	-12.0	-12.9	-3.7	+32.3	-0.1
# arrivals (current)	21,392	3,343	4,680	28,746	8,691	66,852
# arrivals (U-pass)	20,590	2,941	4,078	27,676	11,498	66,783
# change	-802	-402	-602	-1,070	+2,807	+69
# students (current)	16,416	2,565	3,591	22,059	6,669	51,300
# students (U-pass)	15,800	2,257	3,129	21,238	8,824	51,248
# change	-616	-308	-462	-821	+2,155	-52

* Totals may not equal exact % or numbers due to rounding.

Indirect

Benefits: reduce the cost of providing parking and improve parking accesibility, improve transit service to the University, attract and retain students, increasing mobility long (housing) and short (events) term mobility

FUNDING ALTERNATIVES AND STAKEHOLDERS

The funding mechanism for a U-pass program is the most contentious issue. The University, Metro Transit, and students stand to gain and lose in different ways depending on how the structure is laid out. Previous methods to fund the U-pass program through mandatory student fees have failed, and the University administration has placed their support of the program contingent on student fee support.

Student fees
Federal grant
University contribution
Metro Transit

[1] 1990 Travel Behavior Inventory Summary Report, Twin Cities Metropolitan Area. Metropolitan Council, St. Paul, MN, June 1994, p53

[2] "1998-1999 Press Kit., Population." University of Minnesota, Parking and Transportation Services. The percentrage of evening faculty and staff were assumed equal to that of evening students. Assuming to arrive only once per day, the evening faculty, staff, and students were then subtracted from the total daily arrivals to derive daytime arrivals.

[3] Ibid.

[4] "1998-1999 Press Kit, Parking." UMN, P&T Services. Specialty spaces include motorcycle, disability, official, and vendor parking, representing about 500 spaces.

[5] Mathmatically, the average arrivals/space/day exceeds one.

[6] CBD parking utilization is generally limited to 95% of capacity. Torrie, Ralph. Afternoon transportation session. 1:30-3:00pm. "Heat is On" global warming conference. Nov 16, 1999.

[7] "1998-1999 Press Kit, Finance." Op cit.

[8] "1998-1999 Press Kit, Survey Results." Op cit.

[9] "1998-1999 Press Kit, Parking." Op cit.

[10] Non-monetary factors are those non-cost variables which may influence one's decision to choose any one mode or method, both positively and negatively. They include environmental impact, stress of driving and parking, health cost/benefits, hassle, comfort level, weather, and the mental perception of sunk costs. These are both non- and rational choices and will vary by individual in favor of one mode or another, but are not estimated in this analysis.

[11] Students, staff, and faculty commute distances: 20% < 1 mile, 40% 1-5 miles, and 40% > 5 miles. "1998-1999 Press Kit, Population." Op cit.

[12] Brown, Jeffrey, et al. "Unlimited Access." Los Angeles, CA: Institute for Transportation Studies, 1998. Presented at the Transit and University Communities Conference, Fort Collins, CO, June 21-23, 1998.

[13] Huss, Roger. Univ. of Minnesota, Parking and Transportation Services. Phone interview 9/28/99, 4pm.

[14] Sanders, Steve. Univ. of Minnesota, Parking and Transportation Services. In-person interview 11/8/99, 9am.