TRANSITORY OPTIMISM

Changes in passenger perception following bus service improvement over time

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ABSTRACT

This paper tries to better understand transit users' perception towards the **implementation of various improvement strategies** in bus service over time. The study analyses **three surveys** of bus user's perceptions conducted over a period of three years.

It also uses stop-level data collected from the Société de transport de Montréal (STM)'s **AVL/APC systems and bus schedules**, in Montréal, Canada, to measure the actual changes in service.

We use descriptive statistics and regressions to understand the differences between perception and reality over time. The implementation of various strategies has a **limited impact** on the short term users' overestimation of their **waiting time**, while it has a **long term impacts** on their **travel time** overestimation.

INTRODUCTION

METHODOLOGY

Three short surveys were conducted along the Saint-Michel bus corridor to understand the short, medium, and long term changes in passengers' perception. **At each survey**, users were asked to:

- Indicate **which bus route** (67 or 467) they use most often, and to report when they started using this route.
- Report if **they see a difference** in their waiting and travel time now compared to when they started using this route.

Over 4 million stop level observations were collected from the STM's **AVL/APC systems** for both routes. This dataset was **aggregated** according to the implemented strategy or the year of survey period, route number, and direction. For each user:

- The **actual travel time change** = the difference between the average travel time and its SD during the survey time compared to when the user started using the service.
- The **actual waiting time change** = the difference between half of scheduled headway and average delay at each user's boarding stop.

DESCRIPTION OF SURVEYS ANSWERS

	Year 2011 survey		Year 2012 survey		Year 2013 survey		Total
	N	%	N	%	N	%	
Route							
Route 467	183	52%	159	43%	138	45%	480 46%
Route 67	104	29%	144	39%	123	40%	371 36%
Route 67 & 467	67	19%	68	18%	49	16%	184 18%
Frequency of use							
5 days a week or more	224	63%	251	67%	216	70%	691 67%
2 to 4 days a week	91	26%	89	24%	72	23%	252 24%
1 day a week or less	39	11%	33	9%	21	7%	93 9%
Change your stop to use 467 service							
No	223	63%	222	60%	215	69%	660 64%
Yes	103	29%	101	27%	87	28%	291 28%
I am a new user of the 467 service	10	3%	26	7%	8	3%	44 4%
Start using the service period							
Initial situation	99	28%	119	32%	89	29%	307 30%
After smart cards	33	9%	15	4%	17	5%	65 6%
After Route 467	88	25%	45	12%	38	12%	171 16%
After reserved lanes	17	5%	44	12%	32	10%	93 9%
After articulated buses	57	16%	39	10%	14	5%	110 11%
During the surveys collection	60	17%	111	30%	120	39%	291 28%
Waiting time perception							
Decrease in time	133	38%	122	33%	70	23%	325 31%
Increase in time	38	11%	55	15%	77	25%	170 16%
No change	179	51%	189	51%	163	53%	531 51%
Travel time perception							
Decrease in time	184	52%	123	33%	91	29%	398 38%
Increase in time	24	7%	27	7%	31	10%	82 8%
No change	142	40%	218	58%	188	61%	548 53%
Gender							
Female	204	58%	221	59%	186	60%	611 59%
Male	150	42%	145	39%	124	40%	419 40%
Age							
Age 18 -30	109	31%	116	31%	95	31%	320 31%
Age 31-45	78	22%	95	25%	100	32%	273 26%
Age 46-65	71	20%	69	18%	80	26%	220 21%
Age > 65	15	4%	19	5%	18	6%	52 5%
Count of cases	**354**	**(5.2%)***	**373**	**(5.1%)***	**310**	**(5.5%)***	**1037**

*The confidence interval (also called margin of error) at the 95% confidence level

ANALYSIS

1 Several T-tests are conducted to test the change in waiting and travel time estimations over surveys.

Waiting and travel times perception and satisfaction (t-test)

	Route 67			Route 467		
Survey year	**2011**	**2012**	**2013**	**2011**	**2012**	**2013**
Waiting time perception (minutes)						
N	97	126	114	167	137	121
Mean (Std. dev.)	1.4 (4.9)	0.4 (5.8)	-1.1 (5.8)	1.6 (3.9)	0.7 (4.3)	-0.4 (4.0)
Significant level – α*	0.15	**0.00**		0.08	**0.00**	
Travel time perception (minutes)						
N	92	127	112	162	132	126
Mean (Std. dev.)	4.4 (5.9)	1.1 (4.6)	0.6 (3.5)	3.0 (4.3)	1.8 (5.0)	0.9 (5.3)
Significant level - R *, α	**0.00**	0.38		**0.03**	0.17	
Satisfaction (out of 5)						
Overall trip satisfaction						
N	---	136	116	---	154	130
Mean (Std. dev.)		3.9 (0.9)	4.0 (0.9)		4.2 (0.7)	3.9 (0.8)
Significant level - R *, α		0.24			**0.00**	
Waiting time satisfaction						
N	---	136	116	---	155	130
Mean (Std. dev.)		3.7 (0.9)	3.7 (1.0)		3.9 (1.0)	3.6 (1.0)
Significant level - R *, α		0.94			**0.00**	
Travel time satisfaction						
N	---	136	116	---	153	130
Mean (Std. dev.)		3.9 (0.9)	4.1 (0.9)		4.2 (0.8)	4.0 (0.8)
Significant level - R *, α		0.33			**0.03**	

Bold indicate statistical significance
* Significant level of difference in means t-test between consecutive years, e.g. Route 67' 2011 and 2012 records

2 Paired difference t-tests were used to compare users perceptions to the actual time changes

A. Users waiting time paired differences

B. Users travel time paired differences

ANALYSIS, CONT'D

3 Overestimated waiting and travel time benefits perceptions models

Variable	Difference in estimated waiting time savings (sc)			Difference in estimated travel time savings (sc)		
	Mean	Coefficients	t-stat	Mean	Coefficients	t-stat
(Constant)		7.55	0.71		0.24	0.01
Yes, change stops to use R467	0.26	**28.2***	**1.70**	0.27	**74.9*****	**3.29**
After articulated buses	0.64	4.59	0.17	0.65	-3.48	-0.11
After reserved lanes	0.50	**65.8****	**2.02**	0.51	**94.8****	**1.95**
After Route 467	0.42	1.82	0.06	0.43	**93.2****	**2.03**
After smart cards	0.23	-42.5	-0.81	0.25	**112.2***	**1.70**
Initial situation	0.21	**102.4****	**2.07**	0.22	-101.2	-1.60
Year 2012 survey	0.34	28.8	1.44	0.32	**48.6***	**1.85**
Year 2011 survey	0.37	**58.2*****	**2.52**	0.37	**112.5*****	**4.21**
Route 467	0.53	17.6	0.91	0.51	29.2	1.13
Actual change in wait time (sc)	69.8	**0.97*****	**6.00**			
Actual change in travel time (sc)				22.7	**0.93*****	**3.82**
Bus load Change (%)				-5.60	**9.23*****	**2.80**
Distance (km) * load Change (%)				-14.9	**-1.91*****	**-2.73**
N	565			558		
R^2	0.27			0.20		
F statistic	(9, 564) 22.65			(12, 545) 11.51		
F significance (Prob > F)	0			0		

Bold indicate statistical significance
*** Significant at 99% ** Significant at 95% * Significant at 90%

Two linear regression models are developed using the difference in users' perceived waiting and travel time compared to the actual change in them, as the dependent vatriable.

Waiting time

On the short term, passengers overestimated their waiting time by 131 seconds. This value dropped by 22% on the medium term to reach 101 seconds with no significant difference on the long term impacts.

Travel time

On the short term, passengers overestimated their travel time by 224 seconds. This value went down by 29% on the medium term to reach 160 seconds, and by 50% on the long term to reach 112 seconds.

Strategies

Users who witnessed the implementation of articulated buses perceived an additional waiting and travel time saving. Reserved lanes, Express service, and Smart cards have positive impacts on travel time perception, while TSP has not.

Other variables

Decreasing the bus load is appreciated by users who take the bus for longer distances, (a threshold of 4.9 km is estiamted)

Users who choose to walk more to use the faster service perceive more waiting and travel time saving

CONCLUSION

This paper aims to understand the **change in a user's perception** of bus services following the implementation of a set of improvement measures by STM along boulevard Saint-Michel

Comparing users' perception to the actual changes in service, **users overestimated** their waiting and travel times saving. However, these overestimations changed over time.

Users felt a significant positive saving on thier **waititng time** on the short term only compared to the long term, while they did not felt saving on the medium term. Users felt a positive saving on thier **travel time** on the short and medium term compared to the long term.

Therefore, an incremental implementation of improvement strategies is suggested to maintain a higher level of user perception for a longer period.

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