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Service Quality and Consumers Preferences for Hamilton Street Railway (HSR)

Executive Summary

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EXECUTIVE SUMMARY

Executive Summary

This executive summary is developed as part of a research project titled: *A Systematic Assessment and Optimization of Hamilton Street Railway (HSR) Network*. The project seeks to achieve two overarching objectives, and this report addresses the first objective:

> *To arrive at an understanding of the perceived and desired quality of HSR service from the point of view of a wide range of Hamilton residents, including both those who use transit regularly or not at all.*

This executive summary provides a non-technical summary of the technical report "*Service Quality and Consumers Preferences for Hamilton Street Railway (HSR).*" The summary follows the structure of the report, and the findings are summarized in seven sections.

It should be noted that the views expressed in this document are those of the authors and do not necessarily reflect the views of the City of Hamilton.

1. HSR Public Survey

HSR Public Survey is aimed at benchmarking the quality of HSR service based on user preferences and expectations. The survey is intended for those who currently use HSR service or may in the future. The McMaster Research Ethics Board (MREB) approved the survey on July 18th, 2018. Two waves of data collection have been completed. In September 2018, the first wave was collected by the research team at McMaster. In April 2019, the second wave of data collection was completed by the HSR team.

The survey is structured into five main sections, including socioeconomic and demographics, travel behaviour and mobility options, HSR perceived and desired quality, stated preferences experiment, and attitudinal and behavioural orientations.

1.1. Socioeconomic and Demographic Characteristics

The importance of socio-economic and demographic (SED) characteristics cannot be overemphasized in influencing the travel behaviour of individuals. The segmentation of the population based on SED characteristics offers policy/decision-makers useful insights to understand their customers and to address their needs effectively. The survey collected a comprehensive list of SED measures such as age, household size, employment status, among other variables.

1.2. Travel Behaviour and Mobility Options

Studying Hamiltonians' travel behaviour as well as available travel modes is essential for HSR transit planners and decision-makers. The survey adopts a revealed preference approach to observe their actual travel behaviour in real-life conditions. The survey collected a wide range of travel behaviour attributes such as the number of trips, door to door travel time, the primary mode of transport, and other variables.

1.3. HSR Perceived and Desired Quality Aspects

Transit service evaluation is essential for efficient transit service. However, the most challenging part of the evaluation process is to define the evaluation criteria as there is no consensus on an evaluation index for all transit agencies. Therefore, thoughtful selection of the evaluation criteria based on a comprehensive literature review was conducted. The survey collected data on the levels of satisfaction and importance associated with various quality aspects. The data could be seen in two folds. First, 29 satisfaction measures provide an indication of the perceived quality from HSR, which is collected from current HSR customers only. Second, 30 importance measures show the desired HSR quality and were collected from both current and potential customers.

1.4. Stated Preference Experiments

Another dimension to assess customers' preferences is applied through the Stated Choice Experiments. It could be seen as creating a bundle of scenarios, and each user chooses an alternative that best describes their preferences. Stated preference experiment is a potent statistical tool to capture preferences, predict future choices, and estimate the willingness to pay for service improvements.

Two sets of experiments were designed; unlabelled and labelled. The unlabeled stated choice scenarios asked respondents to choose between three bus transit alternatives, as shown in Figure 1-1. The aim is to measure the independent influence of each service

attribute on customers' choices. And to estimate the willingness to pay for service improvements.

While, the labelled stated choice scenario asked respondents, to choose between HSR bus service, auto-driver, and ridesharing alternatives, as shown in Figure 1-2. It is aimed at measuring preferences, willingness to pay for service improvements relative to other modes, and the independent influence of each attribute on mode choice.

Scenario 1 of 8: Bus Transit Choices for One-Way Trip

Trip & Service Attributes	Option - A	Option - B	Option - C
Bus Fare (one-way trip)	$ 3.00	$ 4.50	$ 6.00
Time Spent Travelling on Bus (one-way trip)	30 min	30 min	20 min
A Bus Departs from My Stop (at the start/end and transfer stops)	every 15 min	every 5 min	every 15 min
Walking Time to/from Bus Stop (includes walking time between transfer stops)	10 min	5 min	5 min
Number of Transfers Between Buses (during one-way trip)	1 Transfer	0 Transfer	2 Transfers
Real-time Trip Information (e.g. about delays)	None	At Stop	On Board
To Complete My Regular One-Way Trip, I Would Choose	●	●	●

Figure 1-1: Example of the unlabelled stated choice scenarios

Scenario 4 of 8: Bus, Auto driver, and Ridesharing Alternatives for One-Way Trip

Trip & Service Attributes	HSR	Auto Driver	Ridesharing (Taxi, Uber, Lyft)
Trip Cost - Fare/operation (one-way trip)	$ 3.00	$ 7.50	$ 20.00
Parking Cost	–	$ 0	–
Time Spent Travelling on Bus/Car (one-way trip)	20 min	40 min	30 min
Walking Time (to/from bus stop or parking)	2.5 min	0 min	–
Reliability (On-time Performance)	5 mins Late	–	–
Freedom & Flexibility	Bus Departs every 15 mins	At your disposal	On demand
Access to Real-time Trip Information	At Stop	Mobile device GPS & Radio	Mobile App
To Complete My Regular One-Way Trip, I Would Choose	●	●	●

Figure 1-2 Example of the labelled stated choice scenarios

1.5. Attitudinal and Behavioural Orientations

Many social psychology studies indicate that psychological factors play a pivotal role in the mode-choice decision-making process, and their inclusion improves the predictions of transit quality assessment models. This survey adopts, among others, the Theory of Planned Behaviour (TPB), which was developed by (Ajzen, 1991), in developing the attitudinal and behavioural statements.

In total, the survey introduced 31 statements, arranged in various groups, including attitudes, perceived behavioural control, social norm, car-reliant, ride-hailing, pro- and anti-transit attitude, and behavioural intention.

1.6. Sample Information Data

This survey collected a sample of 5781 respondents, 979 responses in September 2018 and 4802 responses in April 2019. Table 1-1 depicts the distribution of the sample associated with different socioeconomic and demographic characteristics. The sample is statistically representative of the population of Hamilton. Form a geographical perspective, the survey represented all wards in Hamilton, with some minor under representation of four wards; Upper Stony Creek, Lower Stony Creek, Ancaster, and Flambrough as illustrated in Figure 1-3 and Table 1-2.

Table 1-1: Distribution of the sample into different socio-economic groups

Category	Sub-Category	Respondents (%)	Current Customers* (%)	Potential Customers* (%)	Population (%) Hamilton CMA
Total	Total	5627 (100%)	2213 (100%)	3414 (100%)	747545 (100%)
Gender	Male	2222 (39.50%)	783 (35.38%)	1439 (42.15%)	48.90%
	Female	3233 (57.45%)	1349 (60.96%)	1884 (55.18%)	51.10%
	Self-Identity	43 (0.76%)	20 (0.90%)	23 (0.67%)	—
	Prefer not to answer	129 (2.29%)	61 (2.76%)	68 (1.99%)	—
Frequency of use HSR	Daily	2254 (40.05%)	1777 (80.30%)	477 (13.97%)	10.54%
	Weekly	1086 (19.30%)	383 (17.31%)	703 (20.59%)	—
	Monthly	641 (11.40%)	43 (1.94%)	598 (17.52%)	—
	Annually	678 (12.05%)	7 (0.32%)	671 (19.65%)	—
	Never	968 (17.20%)	3 (0.14%)	965 (28.27%)	—
Age	15 to 19 years	398 (7.07%)	243 (10.98%)	155 (4.54%)	5.98%
	20 to 29 years	1267 (22.52%)	688 (31.09%)	579 (16.96%)	13.49%
	30 to 39 years	1101 (19.58%)	441 (19.93%)	660 (19.33%)	12.50%
	40 to 49 years	908 (16.136%)	297 (13.42%)	611 (17.90%)	12.87%
	50 to 59 years	951 (16.90%)	312 (14.10%)	639 (18.72%)	15.27%
	60 to 69 years	707 (12.56%)	171 (7.73%)	536 (15.70%)	11.81%
	70 to 79 years	270 (4.80%)	55 (2.49%)	215 (6.30%)	6.92%
	80 years and over	25 (0.44%)	6 (0.27%)	19 (0.56%)	4.91%
Employment Status	Full-time	2666 (47.38%)	939 (42.43%)	1727 (50.59%)	35.21%
	Part-time	568 (10.10%)	290 (13.10%)	278 (8.14%)	31.24%
	Self-employed	240 (4.27%)	63 (2.85%)	177 (5.18%)	10.46%
	Student (with a job)	508 (9.03%)	311 (14.05%)	197 (5.77%)	—
	Student	430 (7.64%)	259 (11.70%)	171 (5.01%)	—
	Homemaker	150 (2.66%)	59 (2.67%)	91 (2.67%)	—
	Retired	780 (13.86%)	160 (7.23%)	620 (18.16%)	—
	Not working	285 (5.06%)	132 (5.96%)	153 (4.48%)	—
Educational Status	Uni. certificate, above bachelor	1254 (22.28%)	364 (16.45%)	890 (26.07%)	7.475%
	University certificate	1275 (22.66%)	452 (20.42%)	823 (24.11%)	15.55%
	College diploma	1387 (24.65%)	558 (25.21%)	829 (24.28%)	22.867%
	Apprenticeship or trades certificate	295 (5.24%)	110 (4.97%)	185 (5.42%)	6.50%
	High school diploma	1047 (18.61%)	530 (23.95%)	517 (15.14%)	27.846%
	High school (In progress)	234 (4.16%)	134 (6.06%)	100 (2.93%)	—
	No certificate	135 (2.40%)	65 (2.94%)	70 (2.05%)	17.80%
Driving license	Yes	4174 (74.20%)	1216 (54.95%)	2958 (86.64%)	—
	No	1453 (25.80%)	997 (45.05%)	456 (13.36%)	—
Vehicle ownership	0	1198 (21.29%)	851 (38.45%)	347 (10.16%)	—
	1	2273 (40.40%)	895 (40.44%)	1378 (40.36%)	—
	2	1647 (29.27%)	360 (16.27%)	1287 (37.70%)	—
	3 or more	509 (9.04%)	107 (4.84%)	402 (11.78%)	—
Income**	Under $10,000	130 (4.42%)	72 (3.25%)	58 (1.70%)	14.40%
	$10,000 to $19,999	234 (7.96%)	137 (6.19%)	97 (2.84%)	17.58%
	$20,000 to $29,999	303 (10.31%)	165 (7.46%)	138 (4.04%)	14.49%
	$30,000 to $39,999	281 (9.56%)	130 (5.87%)	151 (4.42%)	11.53%
	$40,000 to $49,999	279 (9.50%)	110 (4.97%)	169 (4.95%)	10.15%
	$50,000 to $59,999	287 (9.77%)	102 (4.61%)	185 (5.42%)	7.90%
	$60,000 to $69,999	287 (9.77%)	83 (3.75%)	204 (5.98%)	6.05%
	$70,000 to $79,999	216 (7.35%)	43 (1.94%)	173 (5.07%)	4.45%
	$80,000 to $89,999	212 (7.22%)	44 (1.99%)	168 (4.92%)	3.44%
	$90,000 to $99,999	189 (6.43%)	39 (1.76%)	150 (4.39%)	2.99%
	$100,000 to $149,999	360 (12.25%)	88 (3.89%)	272 (7.97%)	4.81%
	$150,000 and over	160 (5.45%)	17 (0.77%)	143 (4.19%)	2.15%
Dwelling type	Single-detached house	2354 (41.83%)	667 (30.14%)	1687 (49.41%)	—
	Townhouse/Semi-detached	627 (11.14%)	246 (11.12%)	381 (11.16%)	—
	Apartment or Condo	1082 (19.23%)	557 (25.17%)	525 (15.38%)	—
	On-campus accommodation	16 (0.28%)	5 (0.23%)	11 (0.32%)	—
	Other	63 (1.12%)	29 (1.31%)	34 (1.00%)	—
	Missing	1485 (26.40)	709 (32.04%)	776 (22.73%)	—

*Self-reported by respondents based on using HSR as their primary mode of travel or not.

** Prefer not answer and missing data are not reported.

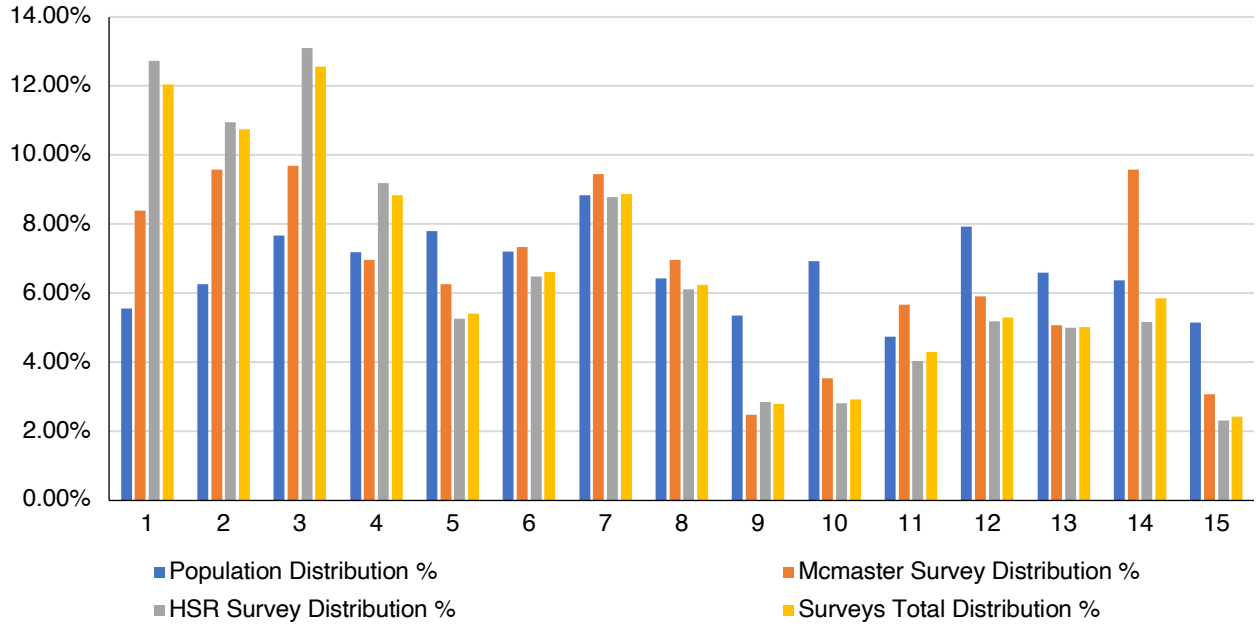


Figure 1-3: Distribution of the sample over Hamilton's wards

Table 1-2: Survey Distribution over Hamilton's Wards

Ward Number	Population	%	McMaster Survey	Distribution per Ward %	HSR Survey	HSR Survey Distribution per ward %	Total Respondents	Total Distribution Per ward %
1	29,845	5.56%	71	8.39%	583	12.73%	654	12.05%
2	33,605	6.26%	81	9.57%	502	10.96%	583	10.74%
3	41,205	7.67%	82	9.69%	600	13.10%	682	12.57%
4	38,590	7.19%	59	6.97%	421	9.19%	480	8.84%
5	41,855	7.80%	53	6.26%	241	5.26%	294	5.42%
6	38,655	7.20%	62	7.33%	297	6.48%	359	6.62%
7	47,455	8.84%	80	9.46%	402	8.78%	482	8.88%
8	34,485	6.42%	59	6.97%	280	6.11%	339	6.25%
9	28,760	5.36%	21	2.48%	131	2.86%	152	2.80%
10	37,220	6.93%	30	3.55%	129	2.82%	159	2.93%
11	25,415	4.73%	48	5.67%	185	4.04%	233	4.29%
12	42,560	7.93%	50	5.91%	238	5.20%	288	5.31%
13	35,365	6.59%	43	5.08%	229	5.00%	272	5.01%
14	34,230	6.38%	81	9.57%	237	5.17%	318	5.86%
15	27,675	5.15%	26	3.07%	106	2.31%	132	2.43%
City of Hamilton	**536,920**		**846**	**100.00%**	**4581**	**100.00%**	**5427**	**100.00%**

Figure 1-4 illustrates the distribution of the sample with respect to the frequency of using HSR service. Approximately 40% of participants are daily users, while 17% of participants have never used the HSR service. In addition, and based on self-reported data of the primary mode of travel, the sample could be classified into two categories; current customers (n= 2,213) and potential customers (n= 3,414). The categorization of current and potential customers was based on a self-reported answer by survey participants. That said, the two categories are not mutually exclusive, for example customers who ride HSR for a small portion of their daily trip, most likely categorize themselves as potential customers. This explains the variation on the numbers reported in the text and in Figure 1-4.

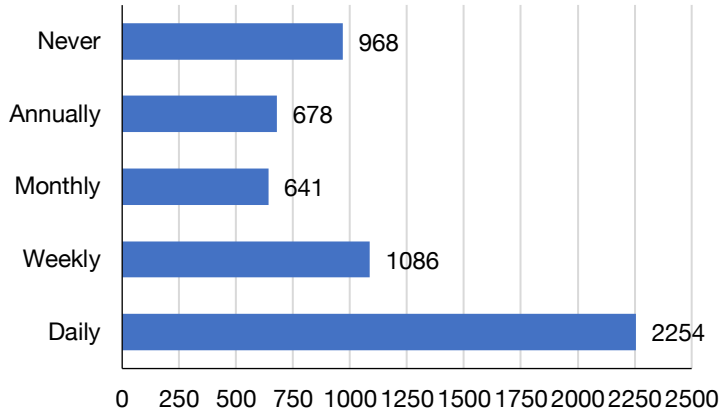


Figure 1-4: Distribution of the frequency of using HSR across the sample

2. HSR Perceived Service Quality (Current Users)

The overall satisfaction with HSR was collected on a scale ranging from 1 (Strongly Unsatisfied) to 10 (Strongly Satisfied). The data was collected from participants who use HSR as their primary mode of travel. The results of this question are presented in Figure 2-1. Approximately 56% of the respondents reported positive levels of satisfaction (7 to 10). While 26% of respondents reported neutral satisfaction (5 to 6), and 17% of respondents reported being relatively unsatisfied (1 to 4).

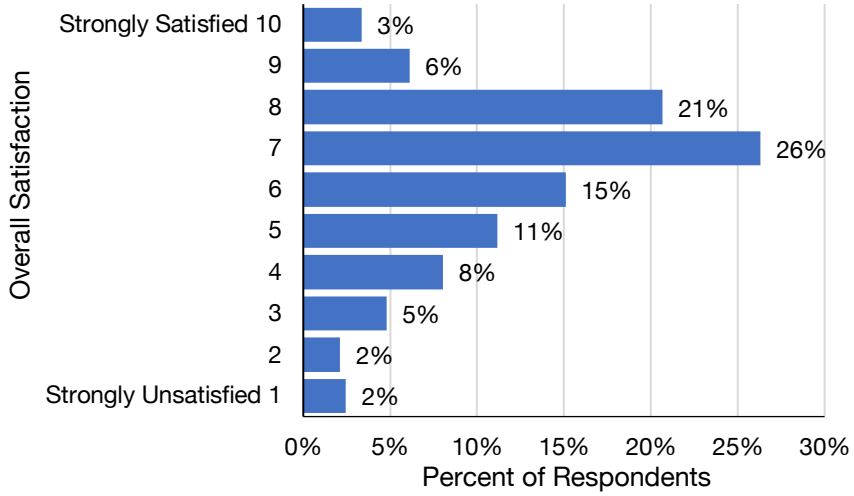


Figure 2-1: Results of overall satisfaction rating for all respondents

Additionally, respondents were asked about their satisfaction with 29 indicators of HSR service on a five-point scale from 1 (Strongly Unsatisfied) to 5 (Strongly Satisfied). A total of 1883 valid responses were collected. Figure 2-2 shows all the complete results for all service indicators.

To sum up, the five indicators with the highest levels of unsatisfaction are; 1) Weather protection at bus stops, 2) Bus crowdedness, 3) Comfort amenities at bus stops/shelters, 4) Frequency of service on weekends and holidays, and 5) Off-peak service frequency. The five indicators with the highest levels of satisfaction are 1) Walking distance from home to

the bus stop, 2) Walking distance from the bus stop to work, 3) HSR service area, 4) Number of transfers needed to accomplish a daily trip, and 5) Staff professionalism and helpfulness.

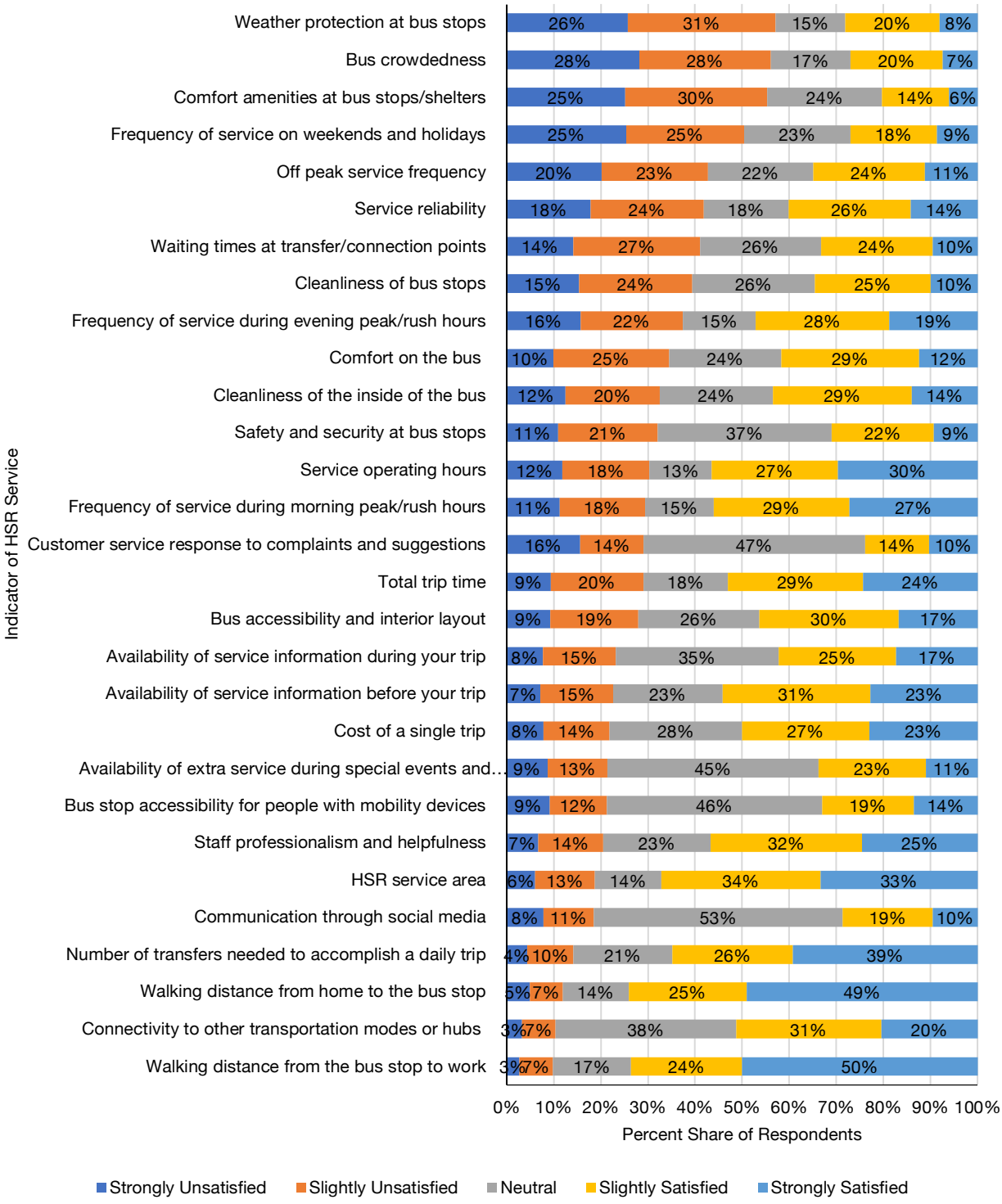


Figure 2-2: Satisfaction with indicators of HSR service

Considering the route-level analyses, Table 2-1 and

Table 2-2 highlight the routes that are associated with low and high levels of satisfaction. The five routes with the highest satisfaction are all shorter, local routes. With the exception of Route 18, they all operate in the Downtown, Central, and Dundurn areas of the City. The

five routes with the highest dissatisfaction all run on the Mountain and travel longer distances. The five routes with the highest levels of unsatisfaction all run on the Mountain and travel longer distances.

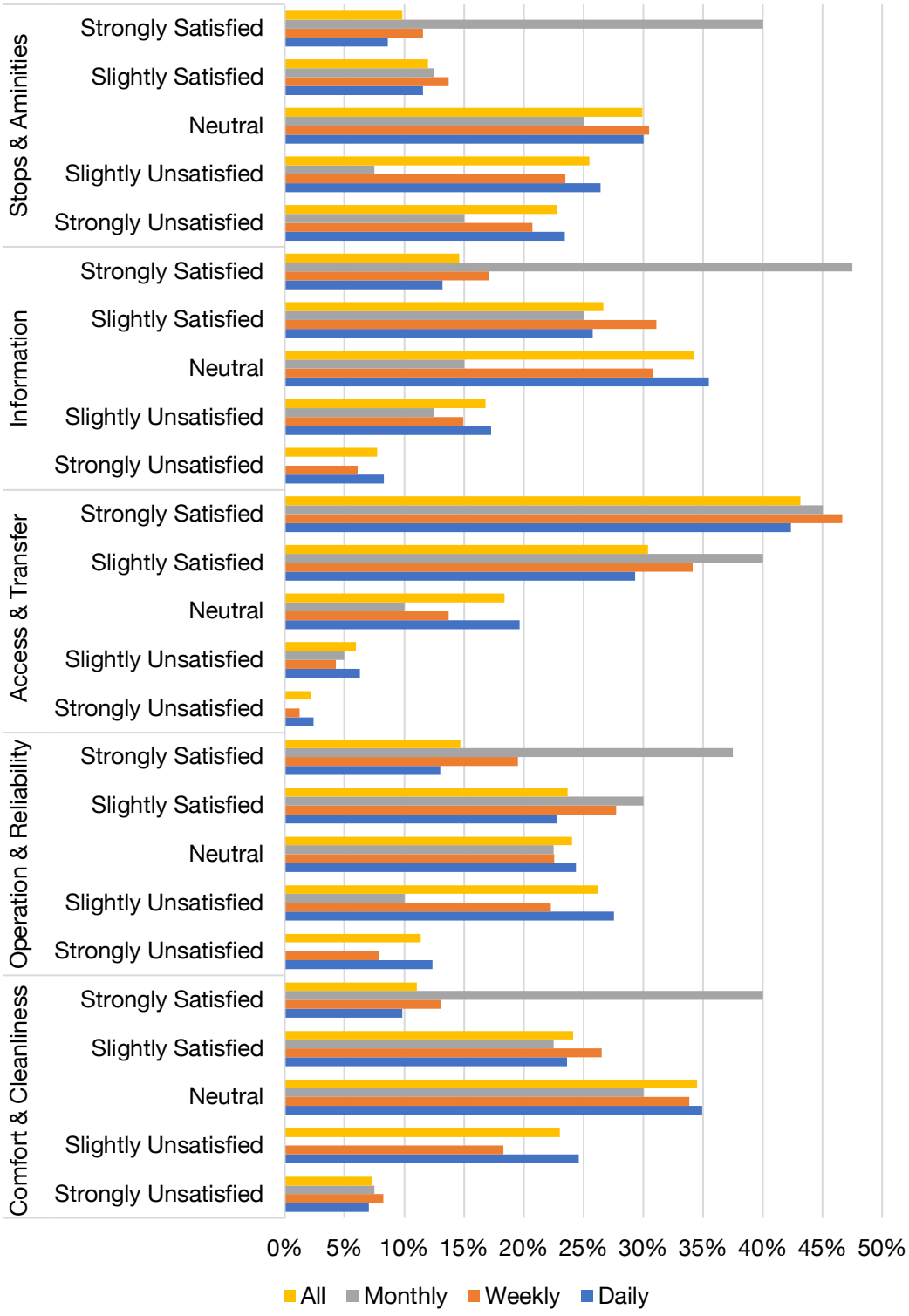
Table 2-1: Top Five routes with Highest dissatisfaction

Rank	Route Name	Number of Customers	Percent of Customers Overall Dissatisfied
1	44 – RYMAL	198	23%
2	41 – MOHAWK	389	22%
3	20 – A-LINE EXPRESS	176	22%
4	27 – UPPER JAMES	329	21%
5	43 – STONE CHURCH	166	21%

Table 2-2: Top five routes with Highest satisfaction

Rank	Route Name	Number of Customers	Percent of Customers Overall Satisfied
1	12 - WENTWORTH	56	71%
2	8 - YORK	51	71%
3	18 - WATERDOWN	27	70%
4	6 - ABERDEEN	111	62%
5	7 - LOCKE	104	2%

The levels of satisfaction expressed by customers to each service attribute are grouped into five constructs that represent; Comfort & Cleanliness, Operation & Reliability, Access & Transfer, Information, and Stops & Amenities. The results presented in Figure 2-3 highlights that, in general, daily HSR customers (the dominant group in the sample) are relatively not satisfied with the quality of HSR service across three constructs; Operation & Reliability, Stops & Amenities, and Comfort & Cleanliness.



Frequency of HSR Usage	Daily	Weekly	Monthly	All (including monthly and never)
Number of Respondents	1507	328	40	1883

Figure 2-3: Satisfaction with HSR service (constructs)

3. HSR Desired Service Quality (All Users)

All respondents, both current and potential customers, were asked to rate the importance of 30 possible improvements to HSR service (indicators) on a five-point scale from 1 (Strongly Unimportant) to 5 (Strongly Important). All improvement indicators and their associated importance are shown in Figure 3-1. In addition, Figure 3-2 reports the results of both current and potential customers.

Considering all survey respondents, the five indicators that were rated as the least important are: 1) USB chargers/plugs are available on buses, 2) The availability of secure bike racks at bus stops is increased, 3) The option to 'Rate your Trip' in real-time, 4) Walking distance to the bus stop is reduced, and 5) WIFI is available on buses. While the five indicators with the highest importance are: 1) Service is more often on time and as scheduled, 2) Wait time at transfer/bus connection points is reduced, 3) Better protection of weather at bus stops, 4) Total trip time is reduced, and 5) Service area coverage is expanded.

For current and potential customers, the results indicate that both groups of customers have lower levels of importance related to the availability of secure bike racks, USB chargers on buses, and reducing the walking distance to bus stops as highlighted Figure 3-2. While for the highly important service improvements, the desires of current and potential customers are almost identical. Both groups emphasize the need for more reliable operation, shorter wait time, weather protection at stops, and expanding the service coverage area as detailed in Figure 3-2.

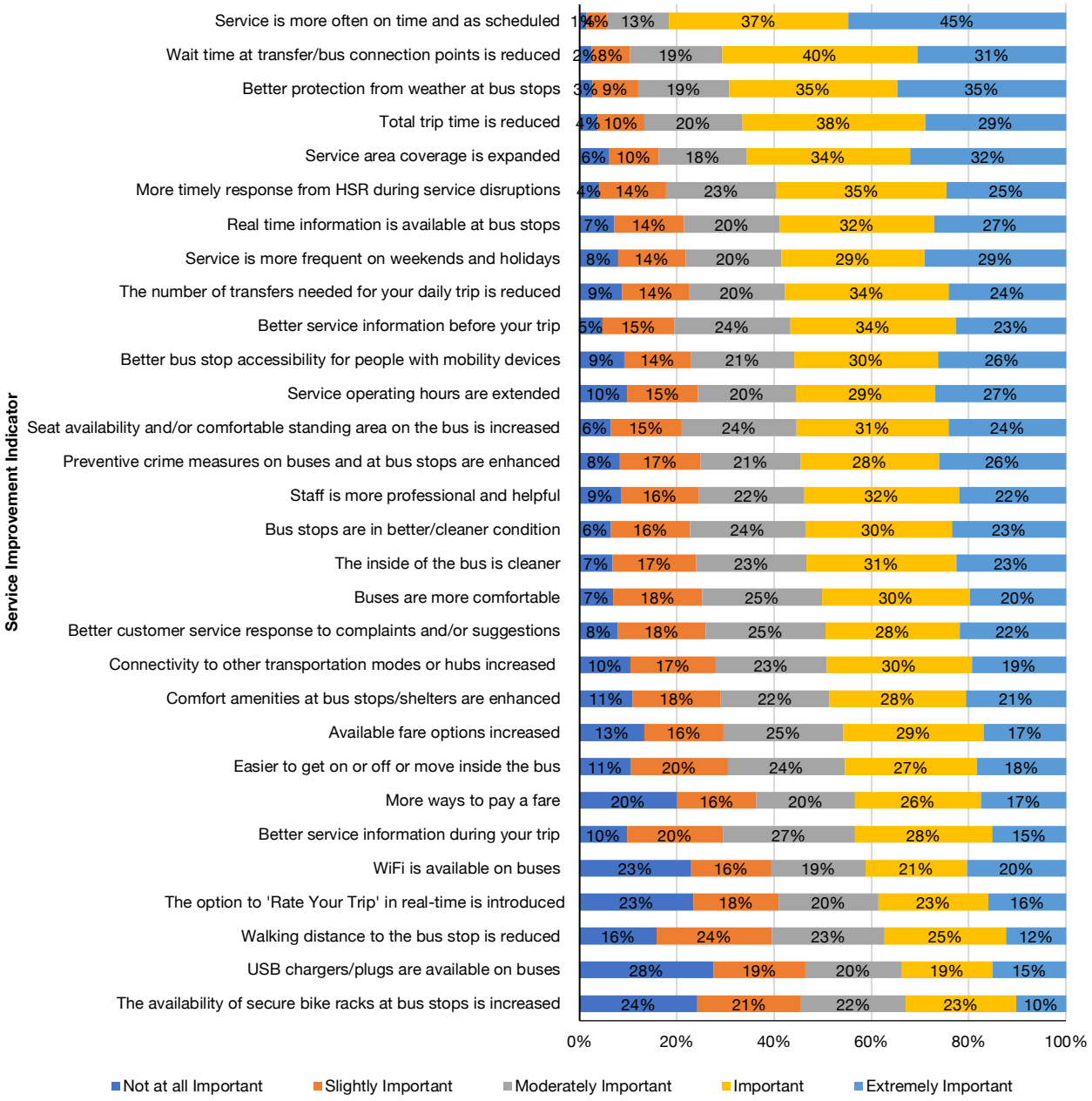


Figure 3-1: Importance of improvements to HSR service (indicator-level)

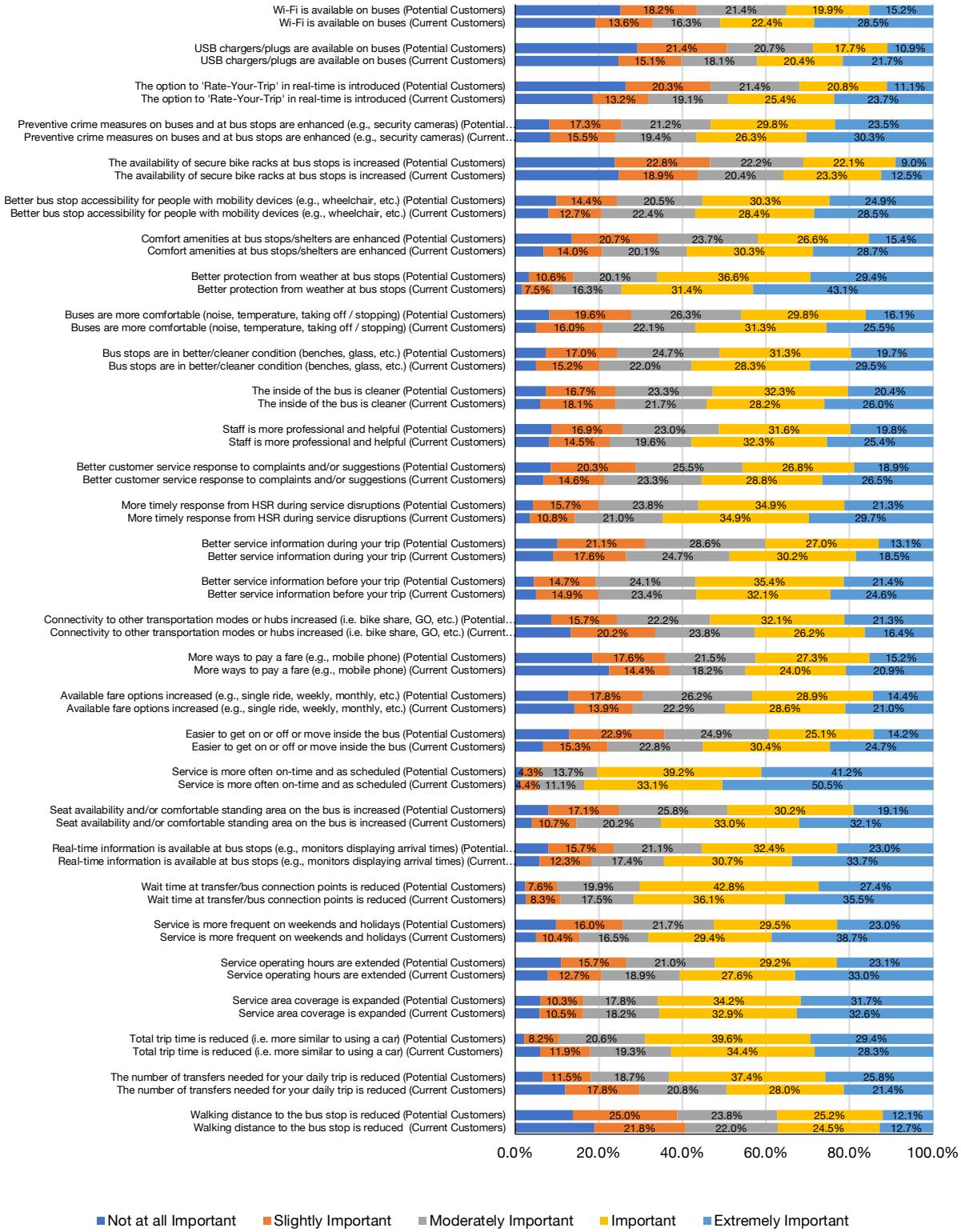
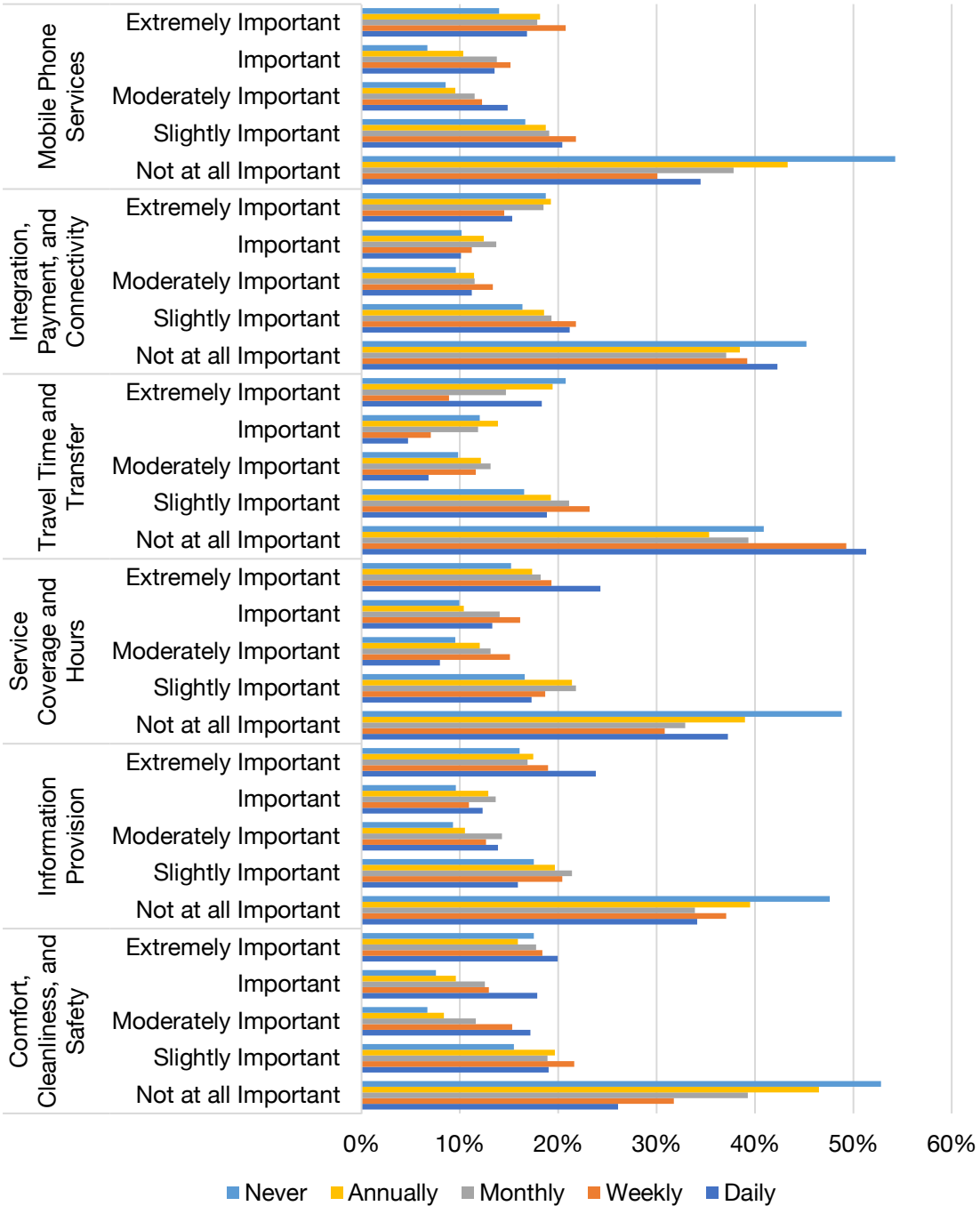


Figure 3-2: Importance of improvements to HSR service (Current n=1883 and potential customers n=2971)

The important data (desired quality measures) is also grouped into six constructs, including Comfort, Cleanliness, and Safety, Information Provision, Service Coverage and Hours, Travel Time and Transfer, Integration, Payment, and Connectivity, and Mobile Phone Services.



Frequency of HSR Usage	Daily	Weekly	Monthly	Annually	Never	Total
Number of Respondents	1926	942	560	577	849	4854

Figure 3-3: Important of improvements to HSR service (constructs)

Figure 3-3 presents the importance allocated to each construct across customers with varying HSR usage frequencies. The results show that despite some minor variation on the desired levels of quality between current and potential customers, both groups expressed a clear message that service improvements are required across all customer types.

4. Importance Performance Analysis (IPA)

The Importance-Performance Analysis (IPA) is applied to integrate both satisfaction and importance measures. This provides a different lens for evaluating the aspects/attributes of products and services. IPA compares the relative importance of service quality aspects and the satisfaction associated with each aspect.

The results of the IPA are graphically displayed on a two dimensional matrix, the x-axis represents satisfaction (performance), and the y-axis represents importance, which forms four quadrants; **Concentrate here** (top left: high importance & low satisfaction), **Keep up the good work** (top right: high importance & high satisfaction), **Low priority** (bottom left: low importance & low satisfaction), and **Possible overkill** (bottom right: low importance & high satisfaction). Figure 6-1 shows the IPA matrix for current customers. The interpretation is focused on Concentrate here quadrant.

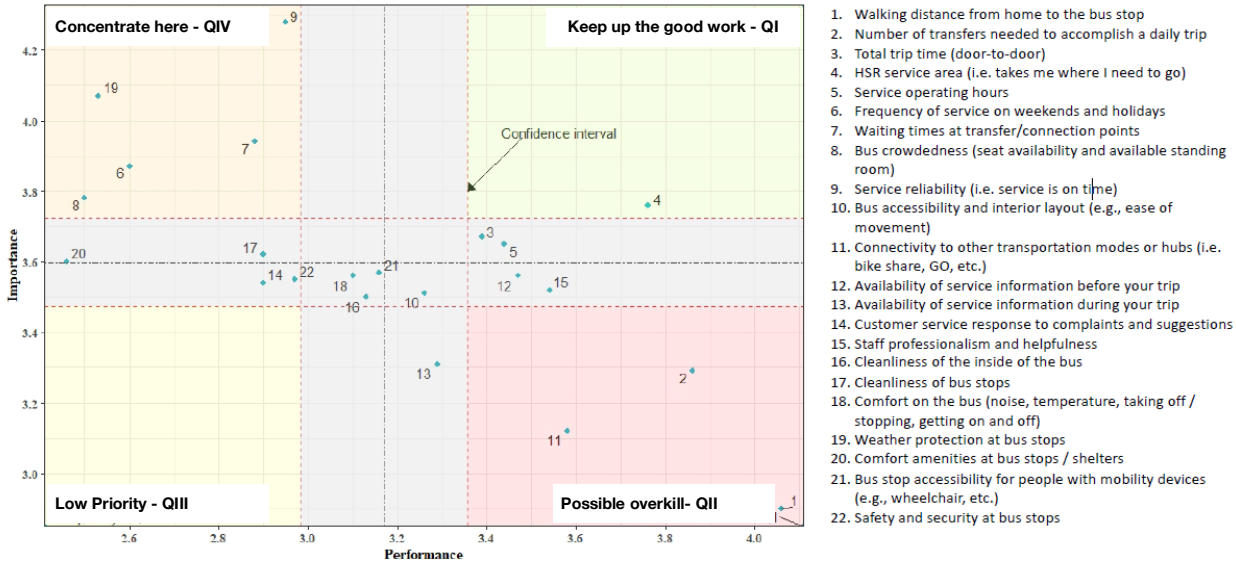


Figure 4-1: IPA matrix for current users

The IPA matrix shows that:

- Seven quality aspects are located in the QIV – Concentrate here quadrant.
- There is a 95% probability that the following five quality aspects are in the QIV – Concentrate here Quadrant regardless of the sample chosen; 9 (service reliability), 19 (weather protection at bus stops), 7 (waiting times at transfer/connection points), 6 (frequency of service on weekends and holidays), and 8 (bus crowdedness).
- While, two quality aspects, that are currently QIV – Concentrate here Quadrant, might shift to the QIII – Low priority quadrant. These are 17 (cleanliness of bus stops), and 20 (comfort amenities at bus stops/shelters).

For more information, the IPA report provides a route-specific IPA analysis as well as IPA based on different SEDs segmentation (e.g. age).

5. Quality Assessment Models and Willingness to Pay (WTP)

The choice experiment data was utilized in a series of discrete choice statistical models. First, the analysis was carried out for all participants. Then the dataset was classified into three groups based on the HSR frequency of use into; **Infrequent/non-customers of HSR** (i.e. never or annually use HSR), **Regular HSR customers** (i.e. weekly or monthly use HSR), and **Daily HSR customers** (i.e. daily use HSR).

Regarding the unlabelled choice scenarios (choosing between different transit services), the general model shows that:

- Hamiltonians, in general, prefer shorter journey and walking times, lower fares, and higher service frequencies (i.e. shorter headways),
- Hamiltonians appreciate on-board real-time information more than at-stop real-time information, and both (i.e. on-board and at-stop) are more preferred to no-real-time information provision at all, and
- They express a high preference for direct trips (i.e. zero transfer) over multiple transfer trips.

And the frequency of use-based models show that:

- Infrequent/non-customers are the most sensitive to journey time, while regular customers are the least sensitive.
- Infrequent customers are more lenient regarding trip fare than other customers' categories.
- Infrequent customers appreciate shorter walking times more than regular customers, while regular customers are the least sensitive to walking times.
- Daily customers show a high preference for high-frequency transit service compared to regular and infrequent customers.
- Infrequent customers demonstrate the highest preference for direct trips compared to other customers' categories, while daily customers demonstrate the highest preference for real-time information provision.

Regarding respondents' willingness to pay for service improvements:

For 10 minutes reduction in journey time (actual time spent on the bus or buses)

- Infrequent customers and regular customers would tolerate a fare increase of $1.35 and $0.85, respectively. And, frequent daily customers are willing to pay $0.82,

A five-minute decrease in walking time

- Infrequent customers and daily customers are willing to pay $0.53 and $0.12, respectively. Regular customers are willing to pay only $0.09,

Five minutes decrease in service headway

- Daily customers are willing to pay $0.37 while both infrequent and regular customers are willing to pay around $0.33,

A zero-transfer trip

- Infrequent customers are willing to pay $4.33, while regular and daily customers would tolerate a $2.36 and $2.04 fare increase respectively,

A one transfer trip

- Infrequent customers will tolerate a $2.71 fare increase while regular and daily customers are willing to pay $1.65 and $1.64 respectively,

At-stop real-time information provision

- Daily and regular customers are willing to pay $0.68 and $0.55 respectively while infrequent customers are willing to pay $0.41

On-board real-time information provision,

- Infrequent customers are willing to pay $0.93 while regular and daily customers will both tolerate a fare increase of $0.88.

With respect to the labelled stated choice scenarios (choosing between bus, auto, and ride-hailing), the analyses investigated the influence of the characteristics of the available travel modes on mode choice from the respondents' perspectives. The general model indicates that:

- There is an intrinsic preference for HSR over other alternatives among respondents.
- Trip cost affects transit use more than private vehicle use while slightly affect the ridesharing alternative.
- Increasing parking cost helps reducing car use in favour of other modes.
- Increasing journey time decreases the utility of the chosen travel mode.
- Walking time seems to be insignificant for HSR use, while out of vehicle walking time decreases the utility of private vehicle use.
- High-frequency transit service and real-time information provision add to the HSR utility and hence increase the probability of using HSR.
- Concerning service reliability, a five minutes late scenario negatively affects HSR utility more than two minutes early scenario.

And the frequency of use-based models show that:

- Infrequent/non-customers are the most sensitive to ridesharing cost, while daily customers are the least. This might be attributed to the low rates of using this mode among daily transit customers,
- Infrequent customers highly support on-board real-time information provision while daily customers are the most supportive, among other customers' categories, of at-stop real-time information provision.
- Infrequent/non-customers are more affected by Out of vehicle walking time than other customers. Additionally, they highly prefer shorter journey times more than other customers,
- Regular customers are the most sensitive to private vehicle's trip cost, while infrequent customers are the least,
- Regular customers are the most sensitive to parking cost compared to other categories,
- Daily customers are the most sensitive to transit fare, while infrequent customers are the least sensitive,
- Daily customers appreciate high-frequency transit service more than others. Additionally, they are the most affected group by the two minutes early scenario as well as the five minutes late scenario,
- Daily customers are the only group of customers where walking time is proved to be significant, albeit at a 90% confidence level. Given the considered walking times in the experiment, daily users do not mind walking to the transit service.

Regarding the willingness to pay for improvements associated with different travel modes:

Journey time

- Infrequent customers are willing to pay: 1) $1.78 for 10 minutes reduction in HSR journey time, 2) $1.50 for 10 minutes reduction in ridesharing journey time, and 3) $1.43 for 10 minutes reduction in private vehicle journey time.

- Regular customers are willing to pay: 1) $3.16 for 10 minutes reduction in ridesharing journey time, 2) $1.42 for 10 minutes reduction in HSR journey time, and 3) $1.03 for 10 minutes reduction in private vehicle journey time.
- Daily customers are willing to pay: $4.42 for 10 minutes reduction in ridesharing journey time, 2) $1.08 for 10 minutes reduction in private vehicle journey time, and 3) $0.99 in 10 minutes reduction in HSR journey time.

Walking time

- This variable does not prove to be significant for infrequent and regular customers while daily customers show a willingness to pay of $0.16 to walk five minutes more to access HSR, which implies that very frequent customers are indifferent regarding walking to transit service considering the proposed walking times (5, 10, 15 minutes).

Out of vehicle walking time

- Infrequent customers are willing to pay $2.32 to decrease out-of-vehicle walking time by 5 minutes while regular and daily customers are willing to pay $0.96 and $0.98 respectively for the same out-of-vehicle walking time reduction.

Service headway

- Infrequent and regular customers are willing to pay $0.47 and $0.46 respectively for 5 minutes reduction in HSR service headway while daily customers are willing to pay $0.41 for the same reduction in the service headway.

HSR service reliability

- Daily customers are willing to pay $1.09 to avoid a 2 minutes early scenario, while infrequent and regular customers are willing to pay around $0.85 to avoid the same scenario. Whereas regular customers are willing to pay $2.17 to avoid a five-minute late scenario while infrequent and daily customers are willing to pay $1.94 and $1.87 to avoid the same 5 minutes late scenario.

Real-time information provision

- At-stop real-time information provision does not prove to be significant for infrequent and regular customers; however, daily customers are willing to pay $0.86 for at-stop real-time information provision. Whereas infrequent and regular customers are willing to pay $1.74 and $1.29 for onboard real-time information, while daily customers are willing to pay $1.03.

To summarize the WTP results for the unlabelled transit scenario experiment, there is evidence that infrequent customers are showing a high tolerance for fare increases to get the service they would want. This could also be interpreted to mean that aspects other than fare costs may explain why such consumers use transit infrequently. There is particular sensitivity to the thought of having to switch buses one or more times to complete the trip. This sensitivity is also there for very frequent customers, but the feeling is less strong. The more experienced customers show more interest in an amenity at the actual bus stop, such as real-time information. Overall, there is some strong evidence that less frequent or casual customers think about transit in a different way from those more experienced, regular and daily, customers.

To summarize the WTP results for the labelled mode choice experiment. It appears that a late bus is perceived as very undesirable by people whether they use transit or not. An early bus is perceived less negatively, although daily customers seem to see it as more of a problem relative to other people. Infrequent/non-customers are much more sensitive to the

journey time spent on a bus and may perceive it as a less desirable environment than being in their private vehicles. They would pay more to shorten this time. They would also perceive any out-of-vehicle walking time associated with an automobile trip in a negative way.

6. Behavioural and Attitudinal Orientation

The attitudinal and behavioural orientation have a significant bearing on the way customers choose to travel. These are considered key influential factors for mode choice. The survey collected several attitudinal and behavioural statements detailed in Figure 5-1. The graph shows how survey participants indicated the accuracy of each statement on a scale of 1 to 5, where 1 is very inaccurate, 5 is very accurate, and 3 is neutral. The results are displayed in ascending order based on the sum of moderately and very accurate.

The results indicate a good perception associated with using transit to navigate around Hamilton. Three statements were perceived to provide an accurate representation of the survey participants, including "I think using transit is a good decision," "It is easy to travel around the city using transit," and "finding routes and schedules does not require too much effort." On the other hand, there are also very positive indications that emerged from the self-reported disagreements with some statements. Most notably is the fact that users do not consider transit as old fashion, nor they think that transit is for those who are less fortunate. In addition, it seems that ridesharing is not one of the dominant modes of travel in the city yet. The same is observed for carpooling.

Additionally, the behavioural intentions of respondents were measured through assigning a level of agreement to the 10 statements shown in Figure 5-2. The most notable results are associated with the willingness to use transit for potential users and continue to use for current users if the service is significantly improved. That said, there is a predominant car reliant attitude emerging from the results, with strong agreement associated with statements such as; “I choose my car for all trips”, and “even if transit is reliable, fast, and free, I would continue using my car”.

Taken together, the results portrayed in Figure 6-1 and Figure 6-2 indicate that the general attitude is receptive of transit use. However, this is conditional on service quality improvements. In addition, it should be noted that such a general attitude is not reflected across the entire sample, as there are some user groups that have no intention to use transit under any circumstances, and **this group should not be targeted through service quality improvements.**

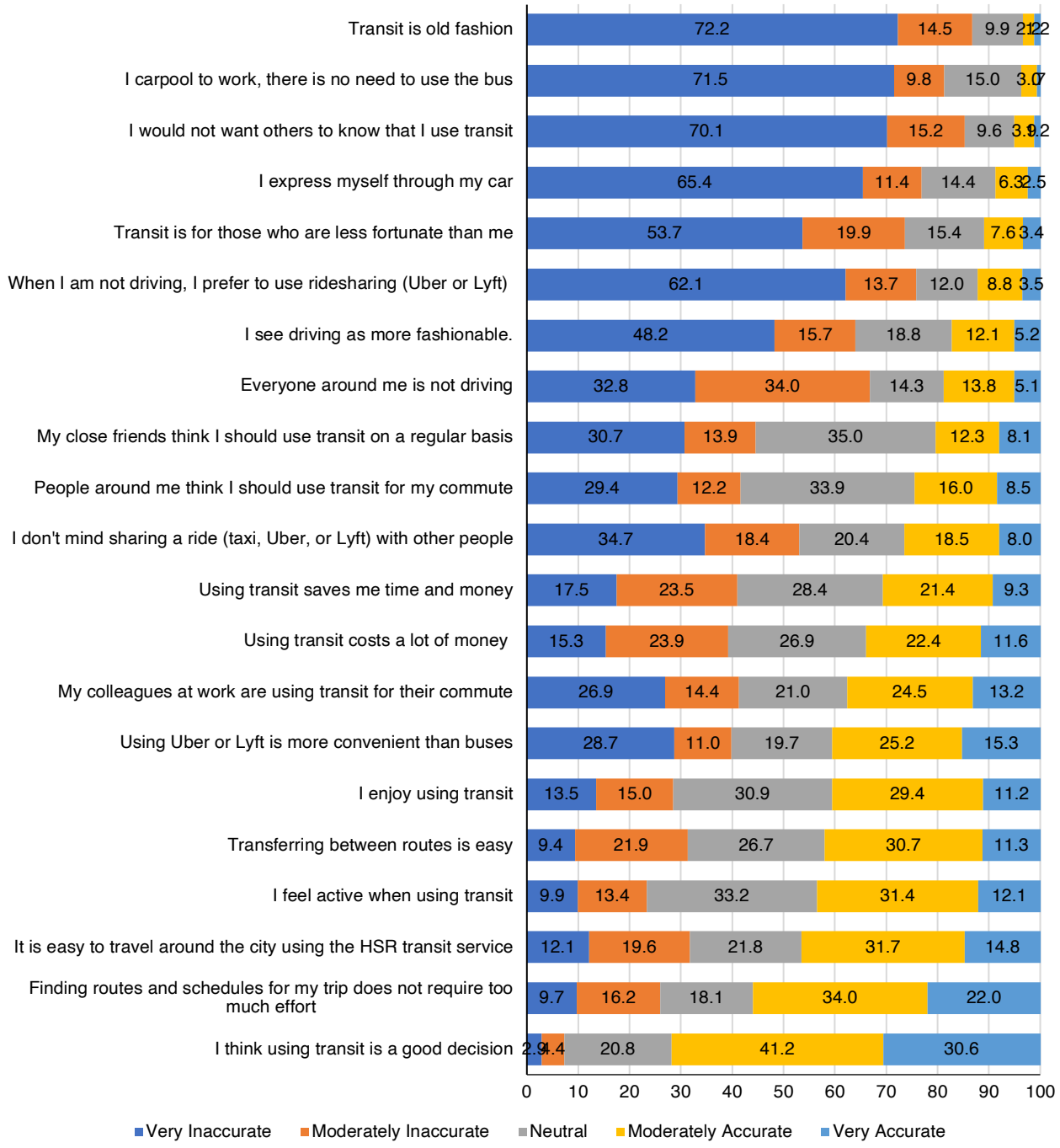


Figure 6-1: Self-reported results of attitudinal statements

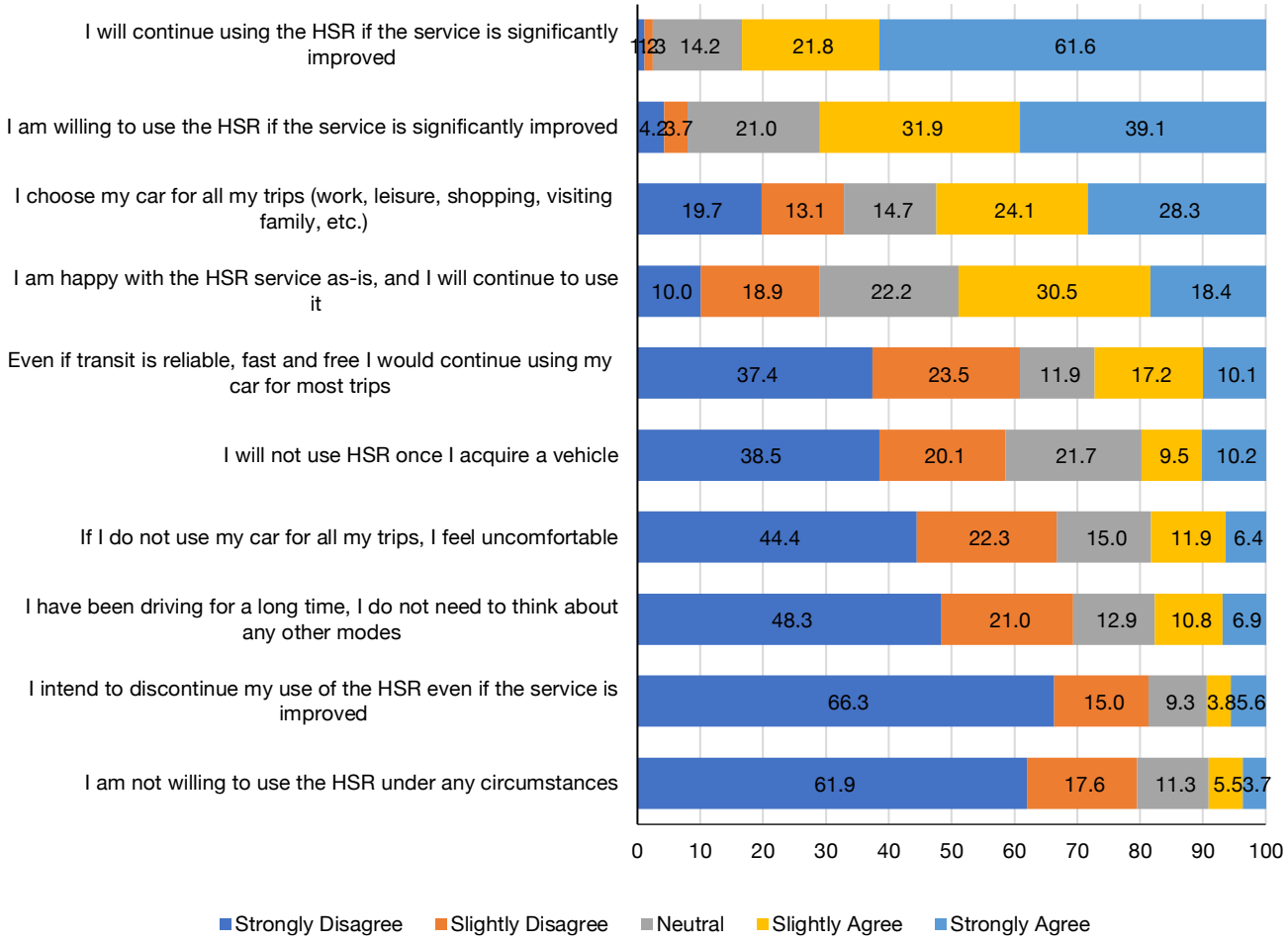


Figure 6-2: Behavioural intention statements

7. Conclusions

Several direct remarks emerged from analyzing the perceptions of customers towards HSR service quality. These are detailed in the report and summarized in the previous sections. That said, some indirect observations are noteworthy.

First, given that this is the first analysis of HSR service quality and consumer preferences, additional targeted analyses are required to further distill the large volume of results generated. Second, the perceptions of customers towards HSR service quality cannot be analyzed in isolation from HSR performance. The developed quality analyses must be used to inform the planning, operation, and performance standards of HSR service.

Figure 7-1 illustrates the Quality Loop Model, which must be integrated to advance the service quality. The model identifies four different measures of bus service quality. These include 1) Perceived Quality (the quality of service as perceived by customers), and 2) Desired Quality (the quality expectations and the desires of customers). Both represent the perspectives of customers, which are analyzed in this report.

Further, 3) Delivered Quality (the quality level delivered by the service provider); Targeted Quality (the quality standards targeted by the service provider); 4) Perceived Quality (the

quality of service as perceived by customers); and Desired Quality (the quality expectations and the desires of customers). Both represent the perspectives of service providers, which must be integrated with the findings of this report. This analysis is currently being developed.

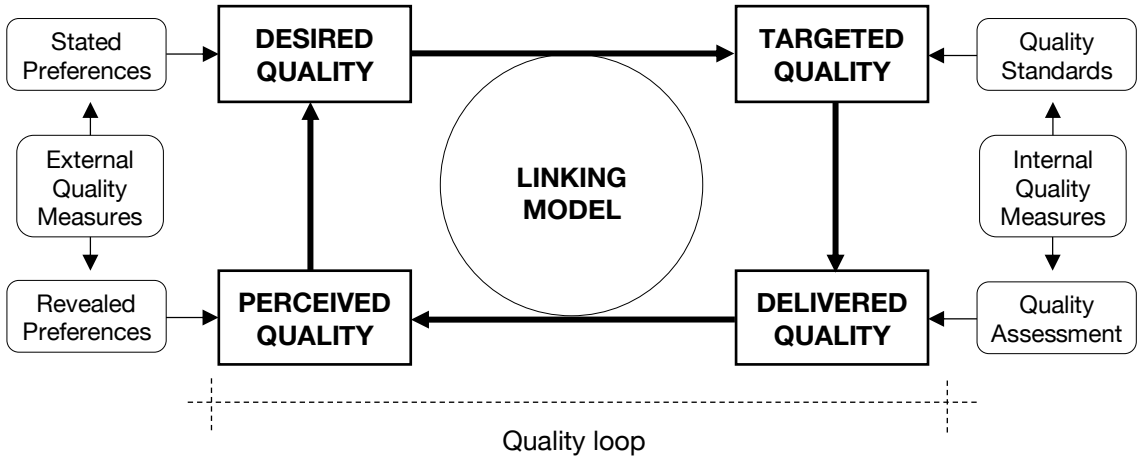


Figure 7-1: The Quality Loop Model

The transit service is considered successful ONLY if the quality loop is retained.

END OF REPORT