On the attributes and influencing factors of end-users quality perceptions in urban transport: An exploratory analysis

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Abstract

Attempts to bridge the traditional mismatch between the priorities of local transit operators and end-users in urban bus transport are currently undergoing in the chronically under developed Italian market. This implies the need to embrace new perspectives on public transport management, away from traditional supply-side tailored policies and towards more demand-side oriented approaches. Based on a survey comprising more than 3000 on-board interviews, this paper applies a modified SERVQUAL methodology to investigate quality issues in the Cagliari’s urban bus transport system, with the chief aim to discover the extent to which customers’ quality perceptions and expectations are influenced by bus frequencies. In addition, a preliminary Multiple Linear Regression (MLR) model will help identifying which sub-segment of bus users might be advisable to target in order to capitalize on the effect of quality policies put forward by the local transit operator. In doing so, the paper will try to shed some light on those characteristics of the transport service more relevant for the final beneficiaries and help transport operators in identifying their core customers, those towards whom quality and retention strategies should be mainly directed. Finally, even if applied to a local case study, this paper is expected to improve the knowledge of the existing transport demand for bus operators and to offer valuable lessons for public transit agencies worldwide.

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1. Introduction

Local public transport in Italy is being increasingly characterized by the dwindling of government’s funding and a renewed urgency to move away from “in house” services to promote competition and efficiency in a sector historically suffering from low levels of service quality and usage rates (Bentivogli, Cullino & Del Colle, 2008).

The two phenomena are certainly intertwined, with recent literature showing that the opening to the market is rather effective in offsetting the negative effects of funding reduction (Hensher & Wallis, 2005) by prompting
operators to improve their performances, measured by indicators such as bus costs per vehicle kilometre or operating costs, besides boosting their productivity levels and the average service provided per unit of expenditure (Cox & Duthion, 2001). As for the low levels of service quality and usage rates, these largely stem from the monopolistic nature of the Italian market, with local transit agencies more focused on the quantitative supply of transport services rather than the qualitative features of it (Barabino, Deiana & Tilocca, 2011). In addition, the limited application of policies designed to contrast the use of private cars in urban areas and the late introduction of tools designed to promote mass transport modes, such as integrated tariff systems (Abrate, Piacenza & Vannoni, 2009), have added further criticalities to the sector. The difficulty in attracting transport demand has been depicted in a recent analytical report issued by the Gallup Organization on behalf of the European Commission (2011), according to which 54% of Italians prefers using the car as their main mode of transport (the EU27 average is 53%), with just an 18% using the public transport option instead (a percentage lower than the 22% registered for the whole EU27).

The backwardness of customer-based policies, an obvious corollary to this, is a weakness that is finally being addressed, mainly in an attempt to lure in new customers and increase revenues from tickets and passes sales. For local transit agencies, this implies to have a detailed understanding of what end-users require and, accordingly, redirect quality based policies towards the improvement of those elements more influential in ensuring customers retention whilst promoting new riders acquisition. In line with the resurgence of more customer oriented practices, this paper applies a modified SERVQUAL methodology and presents a preliminary Multiple Linear Regression (MLR) model in an attempt to answer the following questions:

- Do quantitative changes in the service provision (increase of bus frequency) exercise a relevant impact on customers’ satisfaction?
- Do demographic features and travel habits explain differences in end-users’ quality perceptions?

The answer to these issues should help clarifying whether improved levels of customers’ satisfaction can be better attained through an increase in the number of bus provided rather than a different management of it, whilst revealing whether demographic features and travel habits impact on the way quality elements are perceived among public transport beneficiaries. A more efficient urban bus transport organization and increased levels of ridership should, hopefully, follow.

This paper is organized as follows. Section 2 shows a concise review of existing studies on the topic. Section 3 illustrates the methodology and data used for the analysis. Section 4 presents the main results, whilst section 5 draws some conclusions and research perspectives.

2. Literature review

The increased relevance of end-users’ needs and expectations is testified by the wealth of studies adopting a passenger’s perspective when dealing with transit service quality issues (Eboli & Mazzulla, 2009; 2010). Moreover, quality factors more likely to affect customers’ experiences when using public transport, enhance loyalty phenomena and modify travel behaviours have been extensively investigated in recent years.

The literature on quality attributes in urban transport is rather comprehensive, with a significant number of studies that have dealt with several of the aspects more likely to influence the decision to rely on mass transit systems as a viable alternative to private vehicles. Among the elements associated with the customers’ experience when using mass transit, the influence of security feelings has been highlighted as being inversely related to the propensity to use the public transport (Stradling, Carreno, Rye & Noble, 2007). Particularly for sub-groups such as women and elderly, the mode of travel choice is more likely to be influenced by the fear of being victimized whilst waiting at bus stops and/or travelling (Loukaitou-Sideris & Fink, 2009; Gilhooly, Hamilton, O’Neill, Gow, Webster & Pike, 2003). However, some studies failed to detect a relationship between such feelings and the frequency of use, particularly with regards to the sub-segment young customers (Currie, Delbosc & Mahmoud,
Likewise, on-board conditions, including features such as bus interior cleanliness, temperature, noise, seats comfort, have been proved to significantly affect travellers’ willingness to use urban bus transport (Wen, Lan & Chen, 2005).

Currie and Wallis (2008) stressed the importance of high frequencies in changing travel behaviours, with an approximate short run demand elasticity of 0.3, equal to a 3.5% bus patronage increase every 10% increase in the average frequency. However, this does not automatically translate into improved customer satisfaction indexes, as highlighted by a recent investigation conducted by Barabino, Deiana and Tilocco (2012). The utter importance of bus punctuality has been acknowledged by Too and Earl (2010) in a study comparing public transport service quality for bus and train riders in the community of Varsity Lakes (Australia). Increasingly, studies have started investigating both at stop and on-board information, which have consistently proved to hold a relevant place in customers’ minds (especially when newcomers), heavily affecting the propensity to rely on public transport for urban displacements (Dziekan & Kottenhoff, 2007; Kinsella & Caufield, 2011). Improved information on the advantages of public transport use might also enhance modal shifts phenomena, from private to public modes, challenging travel habits rarely pondered and heavily based on past perceptions, customary practices and routines (Kenyon & Lyons, 2003). Finally, the attitude of transport operators employees towards bus users has been shown to exercise a great influence on these latter, with negative critical incidents having a pivotal role in determining lasting dissatisfaction feelings towards the transport service provided (Friman, Edvardsson & Gärling, 2001).

An increased attractiveness of public transport vis-à-vis private cars requires, moreover, understanding that different customers have different expectations and different propensities to switch from one mode to the other (Anable, 2005; Beirão & Sarsfield Cabral, 2007). Customer segmentation, the homogeneous grouping of individuals sharing similar characteristics and/or behaviours, is therefore pivotal if transport policies are to reach local transit agencies’ core customers and/or those more prone to switch between transport modes. Furthermore, “one size fits all” policies are likely to result too broad and generic in scope to attain the expected outcomes. Geographic, demographics, behavioural, socio-economic variables (or combinations of them) are prevalently used to split public transportation riders into homogeneous groups and apply the most appropriate policies for each of them (Stein & Sloane, 2003). Moreover, segmentation techniques can be profitably employed to separate and analyze riders’ and non riders’ features, so to pair the retention of existing customers with the acquisition of new ones (Krizek & El-Geneidy, 2007). However, as reported by Cronin and Hightower (2004), budgetary and staff constraints still hinder a wider adoption of marketing led strategies, with a yet too limited use of the vast amount of marketing knowledge potentially available within the transport market.

3. Methodology

Subjective quality measurements in the service sector are nowadays largely based on SERVQUAL analyses, a groundbreaking approach introduced by Parasuraman, Zeithaml and Berry (1985; 1988). The original methodology is based on two sets of 22 items each belonging to 5 quality dimensions: Tangibles, Reliability, Responsiveness, Assurance and Empathy. The difference between quality perceptions (P) and expectations (E) is calculated for each and every item to obtain the SERVQUAL gaps, which represent the quality divide between what is perceived and what would be expected by the average customer experiencing the service. The overwhelming majority of studies applying a SERVQUAL approach result in negative gaps (P – E < 0), showing the service provider’s inability to fully match its users’ quality expectations. Much rarer are the two other possible outcomes (P – E = 0 and P – E > 0), which signal the ability to match or even surpass the expectations held towards the service. The presence of negative gaps is not surprising per se, given the high expectations normally held by the final users of a service and the not always linear relation between satisfaction and service performance (Friman & Fellesson, 2009). Furthermore, the lack of a universal rule to read the gaps results in new challenges linked to their interpretation, since large negative gaps may well be the effect of high quality expectations rather
than low quality perceptions. As a rule of thumb, it can be stated that a company’s goal should be that to minimize the negative gap between these two pillars of satisfaction among customers.

Despite its wide adoption in the broad service sector area, SERVQUAL applications to public transportation have so far been limited, particularly in the urban transport domain. However, its ease of application and results interpretation, two key elements for the transit industry, have suggested the implementation of this quality measurement methodology. In fact, we propose a modified approach made up of 18 items belonging to 4 dimensions, very much in line with the one recently applied by Barabino, Deiana and Tilocca (2012). Significantly, each single quality attribute complies with the requirements set by the CEN 320/TC – EN 13816:2002, a standard on service quality in urban transport which is rapidly becoming a staple of European transit operators. The items choice has been mainly taken to increase the practical validity and applicability of the research conducted, with a fully developed tool readily usable for those local transit agencies willing to certify their services according to the mentioned standard. As for the modifications introduced to the original SERVQUAL methodology, these lie in the lower number of attributes investigated (18 instead of 22) and the exclusion of the dimension Empathy from the analysis, since we believe that it is impossible for transport agencies serving hundreds of thousands of customers on a daily basis to cater for the individual needs of each one. Our modified SERVQUAL has been adopted to answer the first research question, designed to investigate on the relationship between bus frequencies and customer satisfaction.

The response to the second research question, dealing with an in depth analysis of some factors having an impact on satisfaction/dissatisfaction feelings towards the service, has required the adoption of more advanced statistical tools, with the regression analysis representing the most common technique used to analyze the influence exercised by one or more independent variables on a dependent variable. In our case, the impact of gender and frequency of use on the overall satisfaction levels has been assessed by means of a MLR model, with the dependent variable regressed against the 18 parameters part of the questionnaire administered.

3.1. Data gathering

The modified SERVQUAL framework has been tested during an on-board survey implemented in the metropolitan area of Cagliari between March the 13th and the 28th 2012, with questionnaires administered from 7.00 AM to 7.00 PM in order to elicit information for both peak and slack time periods. Administered to CTM’s users (CTM is the local transit agency), the on-board survey has been preferred over other surveying techniques (mail, telephone, web and so forth) because it enables to cover all the urban routes of interest, to obtain higher response rates and to collect the information sought after with the sample surveyed directly experiencing the service (Schaller, 2005). The complex questionnaire framework highlighted the need to use a Paper And Pencil Interview (PAPI) instead of self–administered interviews, in order to enhance as much as possible the quality, accuracy and reliability of the data collected. Hence, a crucial phase of the survey preparation stage was related to the interviewers’ training activities, devised to ensure the highest possible homogeneity during the survey administration phase. The use of an on-board administered questionnaire was characterized by some relevant strengths. In particular: a response rate of 86.7%, a good sampling coverage for each of the routes investigated, a good socio-demographic sampling coverage, the high quality of the data collected (the interaction between interviewers and respondents was pivotal in the achievement of this result), an average number of interviews completed per hour equal to 2.8. These strengths outweighed some weaknesses that arose during the data gathering phase, namely: the presence of both social desirability and acquiescence biases and a limited possibility to check the interviewers whilst operating on-board. To sum up, and coherently with some existing literature (Bonnel & Le Nir, 1998; Sharp & Murakami, 2005), we get the strong impression that this survey administration mode is possibly the one better suited for ensuring the quality and reliability of the data collected. This, in turn, might help local transit agencies to plan and execute sound policies on the basis of the information acquired.

Based on a stratified route sample plan depending on buses frequencies, the questionnaires were administered
by 16 trained interviewers, with 3173 interviews completed out of 3659 contacts established. The sampled population was asked to rate the degree of importance and satisfaction for each of the 18 attributes investigated, measured on a 1 to 10 scale. The use of this scale was suggested by the on-board nature of the survey, as some pilot tests revealed that it was easier for the respondents to provide judgments on a 1 to 10, rather than a 1 to 5 or a 1 to 7 scale (used in the majority of SERVQUAL based investigations). This aspect was particularly relevant given the forced rapidity of the interviewing process, resulting from the need to conclude the interview with the customer still on-board. Nevertheless, the similar reliability of different scales from a statistical point of view has already been pointed out, although more response options tend to lead to somewhat lower scores (Dawes, 2008).

Finally, 15 more questions were added to the questionnaire, so to gather further information on socio-demographic characteristics and travel habits of the interviewees. Summary results and the outcome of a preliminary regression analysis conducted to evaluate the influence of gender and frequency of use on customers’ satisfaction levels are illustrated in the next paragraph.

4. Results

This part of the paper will present the main results emerged from the survey conducted. A brief description of the panel surveyed is shown in sub-paragraph 4.1, with the SERVQUAL gap values per Level of Service (LoS) analyzed in sub-paragraph 4.2 and the main results of a regression model described in sub-paragraph 4.3.

4.1. Summary characteristics of the sample interviewed

As shown in Table 1, around two-thirds of the respondents were female, mainly young/relatively young, with medium-high levels of education and mostly boarding the city buses for study or work related transfers. These summary results are in line with the majority of surveys conducted in recent years and showing a prevailing presence of customers in their working age, female and, increasingly, educated (at least) to high school level.

Table 1. Sample demographics and travel behaviours

| Socio-demographic attributes | Travel habits |
|-----------------------------|--------------|
| Sex                         | Frequency of bus use |
| M                           | 5-6 times per week |
| F                           | 3-4 times per week |
| < 18                        | 1-2 times per week |
| 18-25                       | 1-2 times per month |
| 26-35                       | Occasionally |
| 36-50                       | First time |
| 50-65                       | Work |
| > 65                        | School/University |
| Education                   | Reason for travelling |
| Elementary school           | 5-6 times per week |
| Junior high school          | 3-4 times per week |
| Senior high school          | 1-2 times per week |
| University                  | Occasionallly |
|                             | First time |
|                             | Work |
|                             | School/University |
|                             | Shopping |

Over 90% of the population intercepted stated to use the bus network at least once a week, with 70.67% of them using it on a daily basis. Such high proportion of frequent users results from the choice to rely on an on-board intercept methodology, as demonstrated by a telephone survey conducted during the same year and...
showing lower frequencies of use among the sample surveyed. This outcome demonstrates the validity of the methodology adopted, with the high frequency of use directly correlated to the willingness to be interviewed and the quality of the answers provided (Bonnel & Le Nir, 1998).

Finally, as emerged from a detailed research carried out on the local transit agency past surveys results, we note the substantial homogeneity of both average users’ socio-demographic attributes and travel habits over the years, an element which should help in the preparation and implementation of customers oriented quality policies.

4.2. Quality of service at urban bus network level

To assess whether perceived and expected quality change with the bus frequency, the routes investigated have been classified following the LoS thresholds system developed by Kittelson & Associates, Inc., KFH Group, Inc., Parsons Brinckerhoff Quade Douglass, Inc. and Zaworski (2003). As shown in Table 2, which associates bus headways and frequencies per Level of Service, six different LoS have originally been considered. These range from the highest frequency routes (LoS A) to the lowest frequency routes (LoS F). However, our analysis has encompassed only the first 5 LoS, as no route presents average headways > 60 minutes in the Cagliari’s metropolitan area. Therefore, the 5 sets of gaps values (A, B, C, D, E) refer to buses headways ranging from less than 10 minutes (> 6 buses per hour operating at route level) to 31 - 60 minutes (1 bus per hour at route level).

| Level of Service | Bus headway [minutes] | Bus frequency [bus/hour] |
|------------------|-----------------------|-------------------------|
| A                | < 10                  | > 6                     |
| B                | 10 - 14               | 5 - 6                   |
| C                | 15 - 20               | 3 - 4                   |
| D                | 21 - 30               | 2                       |
| E                | 31 - 60               | 1                       |
| F                | > 60                  | < 1                     |

Source: Adapted from Kittelson & Associates et al.-Transit Capacity and Quality of Service Manual-2nd Edition (2003)

Summary statistics are the outcome of an automatic routine, developed to handle hundreds of thousands of data and show aggregated results in a clear and concise manner through control dashboards specifically built.

Results have been obtained by first grouping routes (and related interviews) according to the 5 LoS considered. Next, the average votes of perceived and expected quality have been calculated for each of the attributes belonging to the 5 groups of routes. Finally, the difference between the average votes of perceived and expected quality provided us with the negative gaps shown in Table 3. However, we point out the possibility to apply other calculation procedures to obtain the gaps.

A first look at the data reveals some expected outcomes, since gaps are constantly negative both for single attributes and LoS, thus denoting that quality perceptions do not match expectations. Bus frequency and punctuality present the highest negative gaps, closely followed by the levels of on-board hygiene. Such gaps are mainly the result of high expectations held towards these attributes, all trailing behind the on-board security against crimes in the customers’ overall ranking of importance. On the contrary, the ability to accommodate users’ expectations is rather good when it comes to routes travel times, bus stops proximity and ease of tickets validation. This result emerges following the concurrent effect of lower-than-the-average importance rates and higher-than-the-average satisfaction rates, showing an increase in the ability to fulfil users’ expectations associated to less relevant public transport features.

Rather surprisingly, attained LoS do not have a clear impact on the gaps, with the lowest overall gap obtained
for a LoS C and the second lowest for LoS A and E respectively. Both perceived and expected quality indexes tend not to show a well defined pattern, with the lack of a direct relation between LoS attained and indexes values. In other words, it seems that the sole quantitative supply is not sufficient to meet customers’ expectations. This, somehow unexpected, outcome is fully coherent with the “quality paradox” phenomenon introduced by Friman and Fellesson (2009), according to whom the axiom more transport supply more satisfied customers does not always hold true. In addition, these results are consistent with previous ones obtained on the same network, thus demonstrating a substantial continuity over the years and suggesting the need to look at other aspects of the transport supply other than the number of en-route buses if the goal is to provide a service capable of meeting its end-users’ needs and, eventually, enhance loyalty and retention phenomena.

Table 3. Overall SERVQUAL gaps per Level of Service

| Attributes investigated | Level of Service |
|-------------------------|------------------|
|                        | A    | B    | C    | D    | E    |
| 1 - On-board comfort    | -1.64| -1.93| -1.01| -1.41| -1.50|
| 2 - Environmental impact of bus traffic | -1.75| -1.81| -1.60| -1.69| -2.02|
| 3 - On-board cleanliness| -2.56| -2.47| -2.10| -2.53| -2.30|
| 4 - On-board space availability | -1.45| -1.97| -0.58| -1.36| -1.11|
| 5 - Bus stops proximity | -0.97| -0.97| -0.72| -1.54| -1.21|
| 6 - Facilities at bus stops (information, seats) | -1.85| -2.29| -2.04| -2.88| -1.85|
| 7 - Mechanical dependability | -1.62| -1.74| -1.42| -1.47| -1.50|
| 8 - Bus punctuality     | -2.30| -2.76| -2.29| -2.42| -2.65|
| 9 - Information at bus stops | -2.02| -2.34| -2.15| -2.76| -1.95|
| 10 - On-board information | -1.41| -1.73| -1.79| -1.65| -1.25|
| 11 - Information at ticket selling points | -1.55| -1.85| -1.81| -2.18| -1.44|
| 12 - Bus frequency      | -2.12| -2.87| -2.70| -3.29| -3.25|
| 13 - Bus route travel times | -1.05| -0.93| -0.84| -1.51| -1.01|
| 14 - Tickets availability | -1.50| -1.54| -1.73| -1.97| -1.43|
| 15 - Ease of tickets validation | -1.17| -1.32| -1.01| -1.39| -0.80|
| 16 - Bus drivers’ ability | -1.92| -2.15| -1.66| -2.21| -1.80|
| 17 - Staff attitude to customers and knowledge | -1.80| -2.17| -2.00| -2.18| -1.73|
| 18 - On-board security (against crimes) | -1.99| -2.20| -2.21| -2.01| -1.86|
| Average gap per level of service | -1.70| -1.95| -1.65| -2.03| -1.70|

4.3. Users’ characteristics and perceived quality

The influence of selected socio demographic characteristics and travel behaviours on perceived quality has been investigated by means of a MLR analysis performed at gender and frequency of use level, with the dependent variable, represented by the overall satisfaction, regressed against the 18 attributes analyzed during the study (see Table 3 for a list of the attributes included). As previously stated, the choice to use a MLR has been taken to overcome a limit of the SERVQUAL approach, less appropriate if the aim is to evaluate the weight of each particular attribute on the overall perceived service quality. Moreover, a MLR analysis might help getting a clearer evaluation on the kind of customer who the local transit agency should target in order to capitalize on the validity of the quality policies implemented, with obvious increased positive returns for both operators and users.

When reflecting on the type of segmentation to employ it has been considered that the sole use of a demographic segmentation (based on gender) would have encountered some major limitations, such as the danger to result in too broad segments, the failure to investigate users’ behaviours and to account for the fact that people sharing some demographics features may well behave differently. Because of these reasons, the influence exercised by the frequency of use on the degree of overall satisfaction held towards the service has been included. In this particular case, the model was estimated by ordinary least squares method, using Genstat® software.

The Matrix notation of our MLR model is the following:
\[ y = X\beta + \varepsilon \]  

with \( y \) representing the matrix of the dependent variable (the overall satisfaction), \( X \) the matrix of the independent variable (the attributes investigated), \( \beta \) the vector of regression coefficients and \( \varepsilon \) the vector of stochastic noise.

Preliminary model results are shown in Table 4. A large variance ratio (v. r.) coupled with a small p-value indicate a “good” goodness-of-fit of the regression model. As a result, the p-value (F prob.) is consistently <.001 and shows a good fit to the data for each regression model.

As expected, the sign of the significant attributes is always positive, denoting a linear relation between the degree of satisfaction at attribute level and the overall satisfaction.

With regards to the impact of gender, the model shows 10 significant attributes for women and 6 for men, with on-board comfort, bus frequency, staff’s attitude towards customers and on-board security all significant regardless of gender issues (see the T prob. in bold included in Table 4 for the significant attributes of each regression). It is worth noting that for both male and female users the staff’s attitude towards customers is the most relevant attribute. Considering the gender distribution of CTM’s users (2/3 are female) it might seem advisable for the company to focus its quality enhancement policies on those attributes more significant for its female than its male clientele.

As for the impact of travel habits on satisfaction levels, Table 4 shows higher statistical significance for the values associated to frequent users, with 10 out of 18 attributes significant for daily users. Again, staff’s attitude towards customers and knowledge is the most important attribute, confirming what emerged in previous studies (Friman, Edvardsson & Gärling, 2001). When comparing regressions 2 and 3, it appears that for both female and frequent users 10 attributes help to explain the MLR. Significantly, 9 out of these 10 attributes are significant for both categories, whilst a difference is shown by bus punctuality, significant at <.001 for female but not for daily users, and mechanical dependability, significant at <.001 for daily but not for female users. Since in this work the waiting time at bus stops is considered as a facet of bus punctuality, it appears that female users pay a particular attention to the time spent whilst waiting at bus stops, possibly because of personal safety reasons already highlighted in the existing literature (Loukaitou-Sideris & Fink, 2009; Chen, Liu & Du, 2011). On the other hand, when daily users are investigated, they seem to be mainly concerned with mechanical dependability aspects linked to the possibility to reach their final destination (be it school/university/work) without disruptions and the desire not to be pinned down whilst on route because of unexpected bus failures. To support this consideration, let’s consider two important frequent travellers of the bus network analyzed: the worker and the student. If, as a result of a bus failure, the worker does not reach his final destination he might lose some work hours and see his wage reduced due to this unplanned inconvenient. Likewise, if the student does not reach the destination on-time, he might lose some lesson hours and, because of this, be damaged in terms of education.

Although significant, the MLR for less frequent users shows a lower reliability of the data collected, with no significant (at t-value < .001) values for the last three categories (regression 5, 6, 7 respectively).

Finally, when looking at the MLR model, and with the sole exception of regression N°2, some unexpected negative coefficients occur, even if not significant and not deserving foremost attention. When focusing on regressions 1 and 3 (the two with the largest v.r. among those presenting negative coefficients), we observe a dichotomy in the patterns of on-board space availability and ease of tickets validation on the one hand, and their related satisfaction levels on the other hand, as the improving of the former is coupled with the slight worsening of the latter. The negative values for the on-board space availability can be explained because of the context analyzed, with a rather supply-oriented service to which correspond average low levels of on-board crowding conditions. This feature might lead passengers to take for granted the space availability within the buses. Indeed, this attribute is never significant to explain the overall satisfaction and, as a result, judgements on it might be of little use and provide a somehow distorted view of the service as really perceived. When looking at the ease of tickets validation, the negative coefficient might be explained considering that a customer can, paradoxically, benefit from the non-functioning of the bus ticket machines. In other words, he can fare evade (thus becoming a
potential fare evader), knowing that if caught by a ticket inspector he could resort to the ticket machines not functioning properly to avoid paying the fine associated to such transgression. However, from the transit agency’s perspective, this aspect is certainly negative, as it reduces the fare revenues, besides increasing the likelihood that honest users start fare evading, triggering a phenomenon that could potentially spin out of control rather quickly (Clarke, Contre & Petrossian, 2010).

Nevertheless, further and more detailed work is needed to confirm these negative coefficients.

5. Brief conclusions and scope for further research

A steady decline in public transport use and the simultaneous increase in competition force local transit agencies to operate in shrinking and more and more fragmented markets, a condition that is putting further strains on a sector already weakened by years of diminishing public funding. The improvement of public transport attractiveness, besides representing a tool to weather the current difficult phase and gain some competitive advantage vis-à-vis foreign entrants, requires the bridging of the current customer-operator divide. This paper applied a modified SERVQUAL methodology and presented a preliminary multiple linear regression analysis in an attempt to evaluate whether quantitative changes in the service provision, socio-demographic characteristics and travel behaviours exercise an impact on customers’ satisfaction levels.

With reference to the first research question, the number of en route buses does not seem to reduce the gap between levels of satisfaction and expectations held towards the service provided, as shown by the trend of the average gaps per LoS in Table 3. As for the second research question, gender and travel habits appear to have a role in explaining differences among the sample surveyed, with a larger number of significant attributes for frequent female users as opposed to occasional male users.

From a practical standpoint the survey outcomes imply the need to focus on qualitative aspects of the service rather than quantitative ones (i.e. the number of buses operating on the urban network). In other words, local transit agencies should first and foremost focus on designing and implementing quality policies for the improvement of the more relevant attributes and the ones more distant from the customers’ idea of a proper service. In addition, the multiple linear regression results seem to suggest the need to concentrate more on high-frequent female customers rather than low-frequent male ones, mainly because of the higher number of significant attributes and their better statistical significance. In particular, it is advisable to address quality issues pertaining to the 9 parameters showing significant coefficients for daily female customers. The fact that these users also represent the 2/3 of CTM’s clientele adds validity to it, by ensuring the wide impact of the quality policies implemented. The concurrent analysis of the SERVQUAL and the MLR results indicates that on-board cleanliness and bus frequency, both characterized by high average gaps and statistically significant at < .001 level for frequent female users, should be addressed immediately. Subsequently, the transit agency might deal with issues related to its drivers’ ability, staff’s attitude and the on-board security levels, with travel times representing the service feature with the lowest priority.

However, these are preliminary results that need to be validated through further refinements of the approach proposed in this study.

Besides the results more closely tied to the on-board survey, the present research has been envisaged to display that activities such as the clustering of users into homogeneous groups, the rating of each sub-group importance, the elementary analysis of inter-groups differences/commonalities with regards to quality needs/perceptions, should allow local agencies to customize quality enhancement policies, target specific service aspects and, eventually, maximize their likelihood to bring about increased ridership and loyalty figures.

Finally, the modified SERVQUAL approach proposed might also be applied in practice as a support tool by Local Public Transit operators wishing to certify their activities according to the CEN 320/TC – EN 13816:2002, an European standard on quality in public transport service provision which is rapidly becoming of pivotal importance mainly among transit agencies operating in continental Europe (Barabino, Deiana & Mozzoni, 2013).
Future researches might target other demographic, socio-economic and behavioural features not investigated here, to shed some additional lights on their influence over public transport riders. The thorough understanding of the role played by factors such as age, education, reasons for using public transport, average trips length, income class and employment type on customers’ feelings of satisfaction/dissatisfaction might be of great utility for transport operators. Finally, the information collected on customers’ characteristics and how they impact on satisfaction levels might also be used in future surveys, targeted at non customers and aimed at capturing new demand for public transport.

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Table 4. Regression analysis, summary results

| ATTRIB. | MALE | FEMALE |
|---------|------|--------|
|         | SEX FREQUENCY OF USE | SEX FREQUENCY OF USE |
| 1       | 5-6 TIMES PER WEEK | 5-6 TIMES PER MONTH |
| 2       | 1-2 TIMES PER WEEK | 1-2 TIMES PER MONTH |
| 3       | OCCASIONAL          | OCCASIONAL          |
| 4       | REGRESSION 1: v.r. = 60.16; F prob. = <.001; | REGRESSION 2: v.r. = 105.69; F prob. = <.001; |
| 5       | REGRESSION 3: v.r. = 112.21; F prob. = <.001; | REGRESSION 4: v.r. = 30.73; F prob. = <.001; |
| 6       | REGRESSION 5: v.r. = 13.93; F prob. = <.001; | REGRESSION 6: v.r. = 5.37; F prob. = <.001; |
| 7       | REGRESSION 7: v.r. = 10.97; F prob. = <.001; |

| Coef. | Est. t(1149) | t pr. | Est. t(1966) | t pr. | Est. t(2210) | t pr. | Est. t(256) | t pr. | Est. t(32) | t pr. | Est. t(153) | t pr. |
|-------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|
| Const.| 1.257       | 6.12 | <.001       | 1.493| 10.03       | <.001| 1.429       | 9.86 | <.001       | 1.142| 3.95        | <.001|
| 1     | 0.881       | 1.07 | 0.294       | 1.202| 2.10        | 0.030| 1.19        | 1.07 | 0.294       | 1.202| 2.10        | 0.030|
| 2     | 0.0192      | 0.59 | 0.557       | 0.113| 2.26        | 0.025| 0.104       | 0.32 | 0.740       | 0.033| 0.05        | 0.99  |
| 3     | 0.0937      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 4     | 0.0603      | 2.96 | 0.003       | 0.055| 2.10        | 0.030| 0.043       | 1.54 | 0.123       | 0.047| 3.08        | 0.002|
| 5     | 0.0134      | 0.69 | 0.506       | 0.036| 2.10        | 0.030| 0.043       | 1.54 | 0.123       | 0.047| 3.08        | 0.002|
| 6     | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 7     | 0.0603      | 2.96 | 0.003       | 0.055| 2.10        | 0.030| 0.043       | 1.54 | 0.123       | 0.047| 3.08        | 0.002|
| 8     | 0.0134      | 0.69 | 0.506       | 0.036| 2.10        | 0.030| 0.043       | 1.54 | 0.123       | 0.047| 3.08        | 0.002|
| 9     | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 10    | 0.0603      | 2.96 | 0.003       | 0.055| 2.10        | 0.030| 0.043       | 1.54 | 0.123       | 0.047| 3.08        | 0.002|
| 11    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 12    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 13    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 14    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 15    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 16    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 17    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
| 18    | 0.0097      | 0.91 | 0.361       | 0.026| 2.11        | 0.035| 0.129       | 1.06 | 0.291       | 0.048| 2.31        | 0.022|
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