

The Influence of Travel Experience within Perceived Public Transport Quality

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Abstract—The perceived public transport quality is an important driver that influences both customer satisfaction and mobility choices. The competition among transport operators needs to improve the quality of the services and identify which attributes are perceived as relevant by passengers. Among the “traditional” public transport quality attributes there are, for example: travel and waiting time, regularity of the services, and ticket price. By contrast, there are some “non-conventional” attributes that could significantly influence customer satisfaction jointly with the “traditional” ones. Among these, the beauty/aesthetics of the transport terminals (e.g. rail station and bus terminal) is probably one of the most impacting on user perception. Starting from these considerations, the point stressed in this paper was if (and how much) the travel experience of the overall travel (e.g. how long is the travel, how many transport modes must be used) influences the perception of the public transport quality. The aim of this paper was to investigate the weight of the terminal quality (e.g. aesthetic, comfort and service offered) within the overall travel experience. The case study was the extra-urban Italian bus network. The passengers of the major Italian terminal bus were interviewed and the analysis of the results shows that about the 75% of the travelers, are available to pay up to 30% more for the ticket price for having a high quality terminal. A travel experience effect was observed: the average perceived transport quality varies with the characteristic of the overall trip. The passengers that have a “long trip” (travel time greater than 2 hours) perceived as “low” the overall quality of the trip even if they pass through a high quality terminal. The opposite occurs for the “short trip” passengers. This means that if a traveler passes through a high quality station, the overall perception of that terminal could be significantly reduced if he is tired from a long trip. This result is important and if confirmed through other case studies, will allow to conclude that the “travel experience impact” must be considered as an explicit design variable for public transport services and planning.

Keywords—Transportation planning, sustainable mobility, decision support system, discrete choice model, design problem.

I. INTRODUCTION

THE public transport quality in is an important variable that influence customer perception and could influence also the mobility choices of the passengers [1], [2]. Activity needs require to be satisfied through adequate transport accessibility [3], [4]. In this context, public transport services allow to reduce car usage, especially in the congested urban areas [5]-[7]. Public transport quality is one of the main drivers for transport operators and, for this reason, is important to better individuate which variables are perceived as relevant by the transport users [1], [8], [9]. The transport quality could be

analyzed in two ways: from the operators’ point of view and from the passengers’ point of view [1]. For the transport operators, the quality in function of designed variables (e.g. travel and waiting time, and ticket price); by contrast, for the passengers the quality can be divided into perceived quality [1], [10], [11] and desired quality (that is the target of quality) that the passengers want to receive [1], [12]-[14].

Among the perceived quality variables, the aesthetic of transportation terminals (e.g. airport terminals, rail and bus terminal,) is probably the most influencing the passenger perception. Since 1980, the Station Renaissance (an architectural movement) was developed aimed at satisfying passenger expectations with respect to travel quality such as station comfort, safety and transport services [15]-[17]. According to the Station Renaissance, the transport station becomes a place in which it is possible to carry out many useful activities (e.g. restoration, shopping, personal activity) a part of waiting for a train [16], [17].

In the literature, there are different papers dealing with how terminal quality influences the perceived quality of passengers. For example, Cascetta and Carteni [18] showed that the monetary value of a beautiful and comfortable station is 40 euro cents per trip. This means that the willingness to pay for a passenger, in using a high aesthetic and architectural station, is 40 euro cents per trip.

Because of the perceived quality of the overall trip depends on both the station/bus terminal quality and on the quality of all the transport modes used along the travel, Hernandez et al., [19] identify the project characteristics of a high quality transport terminal in order to enlarge the perceived quality among the passengers.

The aim of this research was to investigate the role and the weight of the travel experience within the perceived terminal quality (e.g. beauty, aesthetic, service offered, comfort). The application case study was the extra urban bus services in Italy. Furthermore, an ad-hoc survey was also performed within major Italian bus terminals.

The paper is divided into five sections; first, some high quality transport terminals round the world are presented, and in the second section, the proposed application case study and the mobility survey is introduced and described. In the fourth section, the main research results are reported, while in the last part of the paper, the conclusions are discussed.

II. A LITERATURE REVIEW ABOUT QUALITY OF TRANSPORT TERMINALS AND STOPS

In the last decades, many high quality transport terminal were built round the world; some examples are in New York

[20], in India [21] (Fig. 1), for the stations, and in Netherlands [22], in German [23] and in Portugal [24], as examples of beautiful bus terminals (Fig. 2). Recently, also different bus stops were designed through high architectural standards (e.g. in Japan and U.S.A. as reported in Fig. 3).

By analyzing the best practices round the world, it is possible to define the main standards for a high quality transport terminal:

- a) aesthetics (architectural quality);
- b) services for passengers;
- c) environmental sustainability of the terminal;
- d) inter-modal integration.

From the case studies available, it emerged that the appropriate definition of the aesthetics of the terminal together with the availability and the quality of different services offered to travelers (e.g. restaurant, bar, free Wi-Fi, shops, e-ticketing) are the main standard for design a high quality transport node. From a functional point of view, both a physical (e.g. parking availability for private cars) and a modal integration (e.g. ticket integration among all public transport modes) allow passengers both to reduce the interchange time and enlarge the perceived quality. Furthermore, in different application case studies emerged environmental attention in the choice of the materials for built terminals (e.g. recycled or recyclable materials; energy saving both for the indoor climate and for lighting).



Fig. 1 Examples of high-quality intermodal terminals round the world [20], [21]



Fig. 2 Examples of high-quality bus terminals in Europe [22]-[24]

III. THE APPLICATION CASE STUDY: THE EXTRA-URBAN ITALIAN BUS NETWORK

To quantify the weight of the travel experience within the perceived terminal quality, a mobility survey was performed among the passengers of the Italian extra-urban bus network, starting from the results of [25]. Some representative bus terminals were chosen among the main ones in Italy. The criteria defined for choosing the representative bus terminals in composing the study panel were:

- terminals both in large and medium-small cities,
- terminals located in north, central and southern Italy,
- terminals with and without high architectural standard;
- terminals with and without the presence of an interchange transport node (e.g. interchange among bus, train, private car and bike).

Finally, five representative bus' terminals were defined:

1. Naples (south);
2. Avellino (south);
3. Crotone (south);
4. Rome (centre);
5. Milan (north).

The principal characteristics of the analyzed terminals are shown in Table I. The city of Naples (located in the South of Italy near Amalfi, Pompei and Sorrento), with a population of about one million people, has a “traditional” bus terminal with an important inter-change node allowing passengers to move

from bus to rail and metro (and vice versa). The services offered to the travelers are: bars, restaurants, shops, and phones. Also Rome (capital city of Italy), with a population of 2.6 millions of residents, has a “traditional” transport terminal with the presence of an integrated interchange node. The main services offered to the travelers are a restaurant and a bar a part of public phones and WCs. Milan (1.2 million residents), jointly with Naples and Rome has a not-high esthetical bus terminal with an interchange node from bus to urban train. The services offered to the travelers are the same of Rome: restaurants, bars, public phones, WCs besides a comfortable waiting area.

The small city of Avellino (427,000 residents) is the worst bus terminal analyzed because of the low-aesthetics of the terminal and the absence of an interchange node and services for passengers. Finally, the city of Crotona (171,000 residents) represents the best practices in Italy with respect to the aesthetics of the terminal. It has also an interchange node from bus to rail services and many services for passengers like: waiting rooms, bars, restaurants, phones, shops and WCs.

In all the terminals of the panel, in 2016 a mobility survey was performed; through a Computer-Assisted Web Interviewing method (developing an ad-hoc App), more than 1,100 passengers were interviewed. The questionnaire was composed in:

- socio-economic information: gender, age, and occupation of the traveler;
- trip characteristics: origin and destination of the travel, all transport modes used, and price/type of the ticket used;
- perceived quality of travel: quoting the quality of different attributes:
 - on-board and waiting time;
 - aesthetics and architectural standard of the bus terminal;

- presence and quality of services like restaurants, bars, shops; and,
- willingness to pay for a high quality terminal in term of both an increase in architectural standards of the terminal and more (in quality and quantity) services for passengers.



Fig. 3 Examples of high-quality bus stops round the world [26], [27]

TABLE I
THE CHARACTERISTICS OF THE BUS TERMINAL ANALYZED

	Milan (Nord)	Rome (Central)	Naples (Southern)	Avellino (Southern)	Crotona (Southern)
Populations of the city (millions)	1.2	2.6	1.0	0.4	0.2
Architectural and aesthetic quality	“traditional”	“traditional”	“traditional”	“traditional”	High aesthetic quality
Availability of services for passengers	bar, restaurant phone, WC, waiting room	bar, restaurant WC, phone	bar, restaurant shops, phone	-	bar, restaurant, shops, phone, WC, waiting room
Presence of an interchange node	YES	YES	YES	NO	YES

IV. ANALYSIS OF THE MAIN RESULTS

The results of the survey show that the 54-57% of those interviewed use the bus for systematic (work and study) purposes. While 56% of passengers, traveling in the main Italian cities (Milan, Rome and Naples), use an extra-urban bus service only occasionally. The opposite occurs for the uses living the medium-small cities of the panel (Crotona and Avellino), where the trip frequency is high for the 62% of travelers.

According to the perceived quality of the bus services, for the main part of the users (terminals) interviewed, the perceived quality were medium-high both for the on-board travel time and for the waiting time and regularity of the service (Fig. 4).

With respect to the perceived quality of the services offered in the terminal (Fig. 5), the quality is perceived as “low” for the 73% of the passengers interviewed in Milan, Rome and Avellino, is perceived as medium quality for 63% of the passengers in Naples, while it is perceived as high for 70% of the passengers living in Crotona (where the most beautiful terminal bus of the panel is located). Furthermore, the 75% of the travelers in Milan, Rome, Naples and Avellino perceived the aesthetic of the bus terminal as “low quality”, while the 80% of the passengers in Crotona perceived as “high aesthetic quality” the terminal (Fig. 6).

Through an in-depth analysis, it was possible to point out that perceived quality is directly correlated with the overall characteristic and personal feeling of the journey, underling a

travel experience effect for travelers. Among the passengers of the high quality bus terminals, 46% of that performing a “long trip” (that is a trip with a total travel time greater than two hours and/or more than one transport modes used) perceived as “low” the aesthetics of the terminal, while the opposite (the 11% of the travelers) occurs for those who perform a “short trip”. This means that the “beauty” of the terminal is under-perceived if the passenger is (or will be) tired for a long travel.

Quality in terms of travel time and waiting time

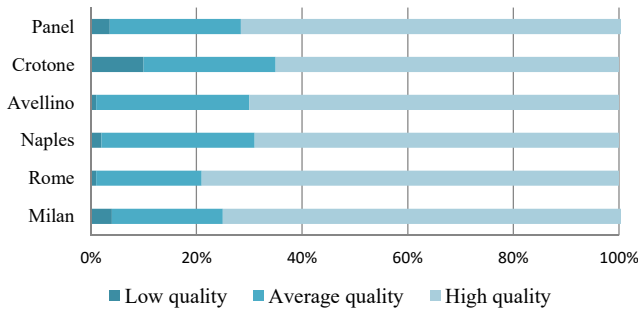


Fig. 4 Survey results: Perceived quality of the bus line services

**Quality in terms of services offered
 (bar, restaurant, shop, free Wi-Fi)**

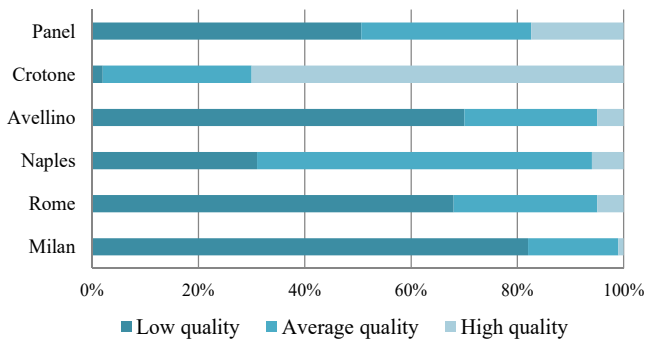


Fig. 5 Survey results: Perceived quality of the terminal services

Quality in terms of aesthetics and architecture of the terminals

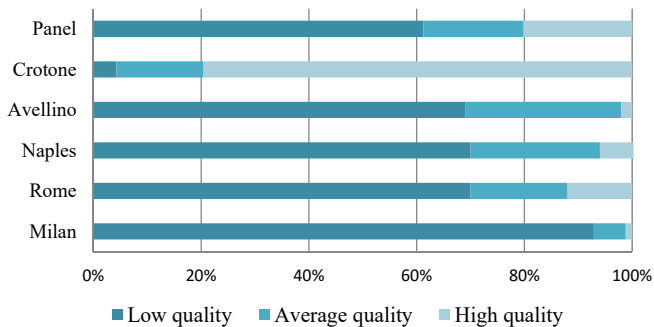


Fig. 6 Survey results: Perceived quality of the aesthetics and architecture of the terminal

The perceived quality of the overall trip with an high quality transport terminal

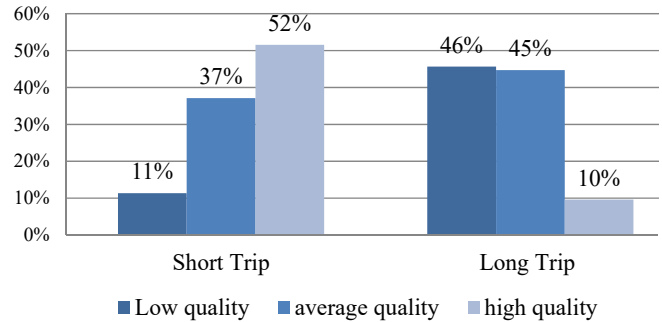


Fig. 7 Survey results: Travel experience effect for the passengers of high quality terminals

V.CONCLUSION

The aim of this paper was to investigate the role of travel experience within the perception of terminal quality (e.g. beauty, aesthetic, comfort and services for the passengers). In 2016, a mobility survey was performed with this aim in Italy. The main results underline that the perceived quality is directly correlated with both the characteristics of the travel and with passengers’ moods (travel experience effect). Even if a passenger spends time in a high quality terminal, the overall perceived quality of the trip is “low” for those travelers who carry out a “long trip” or use more than one transport mode (“low quality” travel), while the opposite occurs for the “short trips”. Furthermore, 75% of passengers interviewed are available to pay up to 30% more for the ticket price for having a high quality terminal. This result is the main original finding and if confirmed, will allow to conclude that the "beauty" of the terminal could be reduced/increased in perception according with the mood of the passenger. For example, a passenger in a “tired mood”, caused by a low quality travel (e.g. in term of high waiting times, irregular services, more than one mode used), will be perceived as a "not-so-high" quality, the beauty of a transport terminal. This situation is known as the "travel experience effect" and could become a design variable in rational decision-making processes [28] and also in cost-benefit analysis [29]. Starting from these results, one possible application will be the quantification of the demand variation caused by the revamping of a station through high quality standards plus the presence of an interchange transport nodes (as suggested in [30]).

Willingness to pay for an high quality terminal

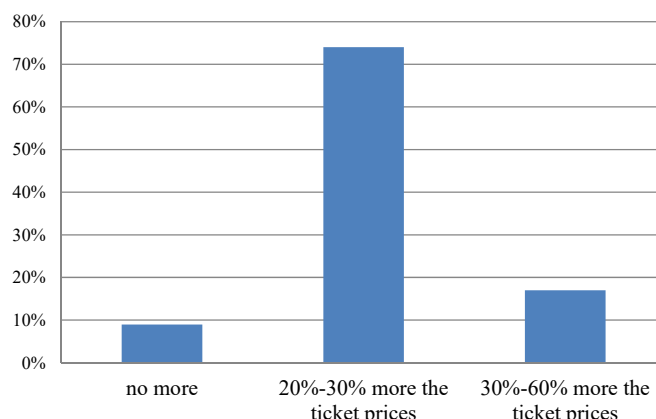


Fig. 8 Willingness to pay for a high standard of architectural and design and more services (bar, restaurant, free WI-FI)

REFERENCES

- [1] E. Cascetta, A. Carteni, A quality-based approach to public transportation planning: theory and a case study, *International Journal of Sustainable Transportation*, 8, 1, (2014).
- [2] E. Cascetta, A. Carteni, A. Carbone, The quality in public transportation. The campania regional metro system” “La progettazione quality-based nel trasporto pubblico locale. Il sistema di metropolitana regionale della Campania, *Ingegneria Ferroviaria*, 68 (3), pp. 241-261, (2013).
- [3] E. Cascetta, A. Carteni, M. Montanino, A behavioral model of accessibility based on the number of available opportunities, *Journal of Transport Geography* 51, pp. 45–58, (2016).
- [4] A. Carteni, Accessibility indicators for freight transport terminals, *Arabian Journal for Science and Engineering*, 39, 11, pp. 7647-7660, (2014).
- [5] M. Bordagaray, L. dell’Olio, A. Ibeas, P. Cecin, P., Modelling user perception of bus transit quality considering user and service heterogeneity, *Transport Science*, 10,8, (2014).
- [6] A. Carteni, Urban sustainable mobility Part 1, *Transport Problems*, 9, 4, (2014).
- [7] A. Carteni, Urban sustainable mobility. Part 2, *Transport Problems*, 10, 1; (2015)
- [8] A. Carteni, L. Pariota, I. Henke, Hedonic value of High-Speed Rail services: quantitative analysis of the domestic tourist attractiveness of the main Italian cities; *Transportation Research Part A: Policy and Practice*, 100, pp. 348-365, (2017).
- [9] A. Carteni, L. Pariota, I. Henke, Gli effetti dell’alta velocità ferroviaria sull’attrattività turistica delle principali città italiane, *Ingegneria Ferroviaria*, 71,3, (2016).
- [10] C.-H. Wen, L.W. Lan, C.-H. Chen, Passengers Perception on Service Quality and their Choice for Intercity Bus Services, *Transportation Research Board*, 84 (2005).
- [11] L. dell’Olio, A. Ibeas, P. Cecin; Modelling User Perception of Bus Transit Quality, *Transport Policy* 17, 6, (2010).
- [12] L. dell’Olio, A. Ibeas, P. Cecin, The Quality of Service Desired by Public Transport Users, *Transport Policy* 18, 1, (2011).
- [13] L. Eboli, G. Mazzulla, An SP Experiment for Measuring Service Quality in Public Transport, *Transportation Planning and Technology* 31,5, (2008).
- [14] A. Nkurunziza, M. Zuidgeest, M. Brussel, F. VandenBosch, Spatial Variation of Transit Service Quality Preferences in Dar-es-salaam, *Journal of Transport Geography* 24, (2012).
- [15] D.A. Hensher, P. Prioni, A service quality index for area-wide contract performance assessment regime, *Journal of Transport Economics and Policy* 36,1, (2002).
- [16] E. Cascetta, A. Carteni, I. Henke, Stations quality, aesthetics and attractiveness of rail transport: empirical evidence and mathematical models (Qualità delle stazioni, estetica e attrattività del trasporto ferroviario: evidenze empiriche e modelli matematici), *Ingegneria Ferroviaria*, 69 (4), pp. 307-32, (2014).
- [17] A. Carteni, G. Galante, I. Henke, The catchment area of high

architectural railway stations: An application of the Graham scan algorithm, *WIT Transactions on the Built Environment*, 135, pp. 463 – 474, (2014).

- [18] E. Cascetta, A. Carteni, The hedonic value of railways terminals. A quantitative analysis of the impact of stations quality on travellers behaviour, *Transportation Research Part A: Policy and Practice*, 61, (2014).
- [19] S. Hernandez, A. Monzon, R. de Oña, Urban transport interchanges: A methodology for evaluating perceived quality, *Transportation Research Part A: Policy and Practice*, 84, (2016).
- [20] <http://www.panynj.gov/wtcprogress/transportation-hub.html>, last access July 2017.
- [21] <https://www.ourvadodara.com>, last access July 2017.
- [22] <http://www.designcurial.com/news/the-worlds-10-best-designed-bus-stations-2016-4823398/5>, last access July 2017.
- [23] http://blunck-morgen.de/zob_hh.html, last access July 2017.
- [24] <http://wikimapia.org/3856397/it/Gare-do-Oriente>, last access July 2017.
- [25] A. Carteni, I. Henke, Public transport quality and travel experience: the Italian case study. *European Scientific Journal (ESJ)*, (2017).
- [26] <http://walyou.com>, last access July 2017.
- [27] <http://www.knstrct.com/home>, last access July 2017.
- [28] E. Cascetta, A. Carteni, F. Pagliara, M. Montanino, A new look at planning and designing transportation systems as decision-making processes, *Transport Policy* 38, (2015).
- [29] A. Carteni, I. Henke: “External costs estimation in a cost-benefit analysis: the new Formia-Gaeta tourist railway line in Italy”, proceeding of the 17th IEEE International Conference on Environment and Electrical Engineering, Milan, Italy, (2017).
- [30] A. Carteni, E. Cascetta, S. de Luca, A random utility model for park & carsharing services and the pure preference for electric vehicles, *Transport Policy* 48, (2016).