quality in the users’ perceived travel experience

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1. Aims of the study

2. Application case studies

3. Service choice model estimation

4. Conclusions
It is well known that **quality in public transport** is an important attribute that **influence** the **customer satisfaction** and could influence also the **mobility choices**

- Quality is one of the main driver for **sustainable mobility**
  - (from private car toward public transport)
Quality in PT is becoming also one of the main driver for competition (in the market) among transport operators.
Background

Among the “standard attributes” of transport quality:

- Punctuality and regularity of services
Among the “standard attributes” of quality:

- **On-board travel time** (e.g. how much time and with what comfort/pleasure)
Background

Among the “standard attributes” of quality:

- cleanliness of trains/buses
Background

There are also “non traditional” quality attributes that influence travelers choices/pleasure, among these one of the most impacting is the aesthetic values of transport terminals (hedonic quality).
Background

Aesthetic aspects investigated in the so-called “Station Renaissance” (Edwards, 1997; Otto, 2000; Kido, 2005; Tenner, 2001)

Vystavochniy center Station, (Kiev, Ucraina)
Background

The economic value of aesthetics is 30-40 Euro cents/trip (25-35% of the ticket price)

Cascetta E., Cartenì A. (2014); The hedonic value of railways terminals. A quantitative analysis of the impact of stations quality on travellers behaviour; Transportation Research Part A, pp. 41-52
Background

Among the “non traditional” quality attributes that influence travelers choices/pleasure, there is also the **on-board services**.

Grand Hiberian (Ireland)
Among the “non traditional” quality attributes that influence travelers choices/pleasure, there is also the on-board services.
The economic **value of the “pure preference” for the HSR brand** is about **22 Euros/trip** (faster trains, high frequency, on-board services), while only the **on-board services** is about **12 Euros/trip**

Carteni, A. Pariota L., Henke I., (2017); Hedonic value of high-speed rail services: Quantitative analysis of the students' domestic tourist attractiveness of the main Italian cities, Transportation Research Part A, pp. 348-365
Background

What is the "value of the travel experience" within the perceived public transport quality?
Three application case studies

- **Bus terminals in the extra-urban Italian network**
  - Milano
  - Roma
  - Napoli
  - Crotone

- **Extra regional trips within the Italian HSR network**
  - Map of Italy with rail network and high-speed train

- **Metro stations of the Line 1 in Naples (Italy)**
  - Photo of the interior of a metro station
# Panel characteristics

## The selection criteria:
- Extra urban BUS terminal
- Small and big cities
- Nord, Centre and South of Italy
- Standard and high quality bus terminals
- Interchange transport node (YES/NO)

<table>
<thead>
<tr>
<th>Region</th>
<th>City</th>
<th>Bus Terminal quality</th>
<th>Interchange Node</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nord</td>
<td>Milano</td>
<td>big</td>
<td>standard</td>
</tr>
<tr>
<td>Centre</td>
<td>Roma</td>
<td>big</td>
<td>standard</td>
</tr>
<tr>
<td>South</td>
<td>Napoli</td>
<td>big</td>
<td>standard</td>
</tr>
<tr>
<td></td>
<td>Avellino</td>
<td>small</td>
<td>standard</td>
</tr>
<tr>
<td></td>
<td>Crotone</td>
<td>small</td>
<td>high</td>
</tr>
</tbody>
</table>
The survey: 400 interviews

A CAWI SP SURVEY (Computer-Assisted Web Interviewing)

- Scenario realism for reducing psychological bias of the response (e.g. Ben-Akiva and Morikawa, 1990; Bradley and Daly, 1991; Hensher, 2006; Cascetta 2009)
  - European best practices (e.g. aesthetics, Wi-fi, info point, shops, waiting room)

- Fractional Factorial Design scheme
  - 8 scenarios for each respondent
  - 2 LOS attributes and 4 levels (proposed in absolute terms)
    - Increase in ticket price
      (10%, 30%, 50%, 100%)
    - Increase in bus terminal “lost” time
      (5, 10, 15, 30 minutes)
The best practices
The best practices

The key factors (success attributes) of the main bus terminals:

ARCHITECTURE, AESTHETICS and SERVICES TO TRAVELERS

TRANSPORT MODES INTEGRATION (bus to bus, bus to rail)

- physics among transport modes
- functional (synchronized schedules and info-mobility)
- ticket and ticketing

SUSTAINABILITY, "REVIEW" THE idea of the bus as a polluting transport mode
The best practices

**Spaarne Hospital bus station, Hoofddorp (Olanda)**_ Nio Architecten

- a strong and connoted image with respect to the austerity and impersonality of the surrounding area

- 100% recyclable polystyrene foam (the world's largest synthetic structure)

- dimensions: 50m x 10m x 5m
The best practice

Slough bus station, Slough (United Kingdom)  Bblur Architecture

- interchange transport node (car-bus-train)
- 97% recyclable aluminum and recycled plastic
- geothermal heat pumps
- low impact light
The best practice

Busbahnhof Poppenbüttel, Poppenbüttel (Germany) – Blunk + Morgen Architecten

- riconoscimenti: Building of the Year 2009
- materiali: acciaio e etfe
- dimensioni: area 1.800 m2
- interchange transport node (car-bus-train)
The best practices: the bus stops 1/2

Krumbach, Vorarlberg, Austria

Gagra bus stop, Abkhazia, Georgia

Casar de Cáceres, Spagna

Fruit bus stop, Giappone
The best practices: the bus stops 2/2

Bus Home, Ventura, California USA

Goal bus stop, Brasile

Library Bus Stop, Colombia

“BUS” Stop, Baltimora, Maryland USA
The questionnaire

A CAWI survey (Computer-Assisted Web Interviewing)

- **Socio-economic characteristics and mobility habits** (eg gender, age, employment, destination, ticket, trip frequency, modes of transport)

- **Quality evaluation**
  - bus service used
  - aesthetics and terminal architecture
  - terminal services (eg bar, restaurant, newspaper, wi-fi)

- **Preference for new terminal services**
  - types (eg info-point, bar, restaurant)
  - willingness to spend
Some results of the survey

**Milano-Roma-Napoli**
- Lavoro: 22%
- Studio: 25%
- Svago: 24%
- Servizi personali: 29%

**Crotone-Avellino**
- Lavoro: 16%
- Studio: 23%
- Svago: 27%
- Servizi personali: 34%

**Trip Purpose**
- For Crotone and Avellino more systematic trips

**Milano-Roma-Napoli**
- Occasionale: 20%
- 2-3 volte al mese: 24%
- Quasi tutti i giorni: 56%

**Crotone-Avellino**
- Occasionale: 24%
- 2-3 volte al mese: 62%
- Quasi tutti i giorni: 14%

**Trip Frequency**
- For Crotone and Avellino high frequency trips
Some results: Tibus, Roma Terminal bus

7 million passengers/year
413 national and international route /day

access / egress transport modes

- Altri Bus: 19%
- Ferrovia: 19%
- Metropolitana: 28%
- Auto: 19%
- Nessun altro: 15%
Some results of the survey

Quality evaluation of the aesthetic of the bus terminal

**Milano-Roma-Napoli-Avellino**

- 75%: low
- 22%: medium
- 2%: high

**Crotone**

- 80%: low
- 16%: medium
- 4%: high
Service choice model estimation

specification calibration and validation

- **Binomial Logit model** with **serial correlation** *(panel data)* for multiple responses of the generic individual *i* (e.g. Cantillo et alii, 2007; Axhausen, 2006; Bierlaire, 2003; Morikawa, 1994)
  - a random term, $\varepsilon_{s_{corr},switch}$, was included in the *switch* utilities and its variance was estimated *(variance of serial correlation)*:
    
    $$U_{switch}^i = V_{switch}^i + \varepsilon_{s_{corr},switch}^i + \gamma_{switch}^i$$

- an **Weighted Maximum Likelihood estimator** was used for models parameter’s estimation *(e.g. Cascetta, 2009; Bierlaire, 2003)*
## Service choice model estimation

<table>
<thead>
<tr>
<th>Model</th>
<th>Parameter</th>
<th>Cost (Euro)</th>
<th>Time (h)</th>
<th>ASC</th>
<th>Var, of serial</th>
<th>Adjusted rho-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>[Rob. T-test]</td>
<td>[Rob. T-test]</td>
<td>[Rob. T-test]</td>
<td>correlation [Rob. T-test]</td>
<td></td>
</tr>
<tr>
<td>Milano</td>
<td>-0.43</td>
<td>[-4.60]</td>
<td>-8.50</td>
<td>2.50</td>
<td>1.77</td>
<td>0.27</td>
</tr>
<tr>
<td>Roma</td>
<td>-0.62</td>
<td>[-3.76]</td>
<td>-7.89</td>
<td>1.60</td>
<td>1.20</td>
<td>0.27</td>
</tr>
<tr>
<td>Napoli</td>
<td>-0.65</td>
<td>[-2.22]</td>
<td>-8.46</td>
<td>1.36</td>
<td>1.71</td>
<td>0.30</td>
</tr>
<tr>
<td>Avellino</td>
<td>-0.94</td>
<td>[-4.87]</td>
<td>-4.46</td>
<td>3.60</td>
<td>1.45</td>
<td>0.56</td>
</tr>
<tr>
<td>Crotone</td>
<td>-0.89</td>
<td>[-1.21]</td>
<td>-4.27</td>
<td>0.41</td>
<td>0.72</td>
<td>0.21</td>
</tr>
<tr>
<td>Panel (all)</td>
<td>-0.56</td>
<td>[-7.57]</td>
<td>-8.61</td>
<td>1.41</td>
<td>2.16</td>
<td>0.30</td>
</tr>
<tr>
<td>Panel (short trips)</td>
<td>-0.49</td>
<td>[-5.36]</td>
<td>-8.49</td>
<td>1.45</td>
<td>2.40</td>
<td>0.30</td>
</tr>
<tr>
<td>Panel (long trips)</td>
<td>-0.48</td>
<td>[-3.76]</td>
<td>-8.11</td>
<td>1.00</td>
<td>1.20</td>
<td>0.28</td>
</tr>
</tbody>
</table>
The main results

All segments:
- 2,5 €/trip is the estimated «hedonic value» for an high quality bus terminal (18% of the average ticket price)… the willingness to pay

Systematic vs. non systematic travellers:
- 1,1 €/trip is the estimated «hedonic value» for the high frequency trip travelers
- 4,0 €/trip is the estimated «hedonic value» for the low frequency trip travelers
The main results

**TERRITORIAL DISTRIBUTION OF THE «HEDONIC VALUE» FOR AN HIGH QUALITY BUS TERMINAL**

- **Different hedonic value for the cities of the panel**

- Grater hedonic values for the cities in the nord, **consistent with the differences in the "cost of life"**

(*) the estimated value for Crotone refers to the willingness to pay only for additional services to travelers since the terminal already has a particular aesthetic and architectural quality
The main results

A travel experience effect was also observed

- **3,0 €/trip** (21% of the average ticket price) is the estimated «hedonic value» for the short-trip travelers (travel time lower than 2 hours)
- **2,1 €/trip** (15% of the average ticket price) is the estimated «hedonic value» for the long-trip travelers (travel time greater than 2 hours)

The «revamping» (to high quality) of all the travel, could reduce this effect?
Conclusions and research perspectives

- **Revamping of Bus Terminal "idea"**
  - Increase in perceived quality (wiliness to pay)
  - Increase in revenues for the territories (e.g. jobs and profits)

... financial analysis for evaluate the return on investment

- **New and more sophisticated modeling approaches to validate these results**
"Se non si perde tempo, non si arriva da nessuna parte ... "  Carlo Rovelli (2014)